<table>
<thead>
<tr>
<th>Stage</th>
<th>Change</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Course Training Standardization</td>
<td></td>
<td>1-1</td>
</tr>
<tr>
<td>Familiarization (FAM)</td>
<td></td>
<td>2-1</td>
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<tr>
<td>Forward Operating Base (FOB)</td>
<td></td>
<td>3-1</td>
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<tr>
<td>Field Carrier Landing Practice (FCLP)</td>
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<tr>
<td>Formation (FORM)</td>
<td></td>
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</tr>
<tr>
<td>Advanced Aircraft Handling (AAH)</td>
<td></td>
<td>6-1</td>
</tr>
<tr>
<td>Tactical Formation (TACFORM)</td>
<td></td>
<td>7-1</td>
</tr>
<tr>
<td>Navigation (NAV)</td>
<td></td>
<td>8-1</td>
</tr>
<tr>
<td>Aerial Refueling (AAR)</td>
<td></td>
<td>9-1</td>
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<tr>
<td>Threat Counter Tactics (TCT)</td>
<td></td>
<td>10-1</td>
</tr>
<tr>
<td>Air-to-Surface (AS)</td>
<td></td>
<td>11-1</td>
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<tr>
<td>Low Altitude Training (LAT)</td>
<td></td>
<td>12-1</td>
</tr>
<tr>
<td>Mechanics (MECH)</td>
<td></td>
<td>13-1</td>
</tr>
<tr>
<td>Close Air Support (CAS)</td>
<td></td>
<td>14-1</td>
</tr>
<tr>
<td>Aerial Interdiction (AI)</td>
<td></td>
<td>15-1</td>
</tr>
<tr>
<td>Air-to-Air (AA)</td>
<td></td>
<td>16-1</td>
</tr>
<tr>
<td>Night Systems (NS)</td>
<td></td>
<td>17-1</td>
</tr>
<tr>
<td>NATOPS Evaluation (NATOPS)</td>
<td></td>
<td>18-1</td>
</tr>
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</table>
FSG CHANGE RECOMMENDATION  
AV8-B FLIGHT SYLLABUS GUIDE  

To be filled in by originator and forwarded to Model Manager

<table>
<thead>
<tr>
<th>FROM</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Originator)</td>
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<table>
<thead>
<tr>
<th>TO</th>
<th>UNIT</th>
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<tr>
<td>(Model Manager)</td>
<td></td>
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<table>
<thead>
<tr>
<th>NAME OF STAGE</th>
<th>REVISION DATE</th>
<th>CHANGE DATE</th>
<th>PAGE</th>
<th>PARAGRAPH</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

RECOMMENDATION (BE SPECIFIC)

JUSTIFICATION

SIGNATURE

RANK

TITLE

To be filled in by Model Manager (Return to Originator)

FROM

DATE

TO

REFERENCE

(A) Your change recommendation dated

Your change recommendation is acknowledged. It will be held for action of the review conference planned for _______________ to be held at ________________

Your change recommendation is reclassified PRIORITY and forwarded for approval to: _______________ by my DTG ________________

_________________________________/S/MODEL MANAGER
Course Training Standardization Program

I. TRAINING OFFICER’S GUIDANCE

1. This document has been structured to provide you with a comprehensive training guide. The document is designed to show you where to locate information and knowledge in the appropriate source for all the skills you will be required to perform to complete the syllabus. This permits you to become familiar with all of the communities publications while relying less on the training command “gouge.” The Stage Heads have provided more information in this document in order to improve upon the clarity and / or content provided in the current publications or lectures. In addition, we inserted common mistakes so you can learn from these errors. Stage Heads have also enclosed standardization direction in the beginning of their stages to expound and solidify material covered in the stage briefs.

2. Why do we tell you this? Several reasons:

   1. This is the aircraft you will fly for the majority of your career. It is incumbent upon you to master its systems and weapons now when you don’t have other work-related tasking. In combat, you will have your and other lives depending on your ability to manage aircraft systems and employ its weapons effectively.
   2. You are a direct reflection of the FRS’s product when you arrive at a gun squadron. We are aviation professionals, not hobbyists. You did well in the training command or you would not be flying in single seat, TACAIR aviation. Keep up your high degree of professionalism and remember your job here is to learn your aircraft and fly.
   3. A sound knowledge base from the FRS will provide a foundation for the fleet to build upon. In addition, you won’t become a training burden on your new squadron because you lack the prerequisite knowledge.

3. The flight training at the FRS is dynamic and fast-paced. You must be prepared to become successful. Stages are sometimes shuffled to get you ready for deployments so you will need to work through your class leaders and the operations schedules section. Enjoy the training and get the most out of every event. Eight months from now no one will ever tell you to study again. Remember, combat is a deadly game…if you lose once you will never play again.

II. Academic and Flight Training Standards

1. **Academic testing.** Replacement Pilots (RPs) will ensure that they have completed the stage exam prior to the first simulator or flight event in stage. Academic exams are your responsibility to accomplish. You can expect to be scheduled for the exam one to two days after the completion of the last academic
lesson, depending on the size of the stage academics and the amount of review time deemed necessary. If for any reason you are not available for the exam at the scheduled time (emergency leave, sick-in-quarters), you must coordinate with the Operations Department to take the exam prior to being scheduled for any events. The following academic grading criteria will be used for all stage exams:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Exam Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>97-100</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>88-96.99</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>84-87.99</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>80-83.99</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>50-79.99</td>
<td>1.0</td>
<td>Requires remediation and re-exam. Original grade weight will be used for end of stage / course calculations.</td>
</tr>
<tr>
<td>\leq 49.99</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1 – Exam Grading**

2. **Flight.** IPs assign grades based on their best judgment of student performance in relation to the student’s peer group. They are not debatable.

3. **Task grade.** Task grades reflect student performance in specific mission elements. The following criteria will be used for task grading on flight or simulator events:

<table>
<thead>
<tr>
<th>GRADE / PROF. LEVEL</th>
<th>DESCRIPTION OF PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>Unknown. Performance not observed or element not performed</td>
</tr>
<tr>
<td>0.0</td>
<td>Dangerous. Performance was unsafe or resulted in aircraft damage</td>
</tr>
<tr>
<td>1.0</td>
<td>Unsatisfactory. Performance indicates a lack of ability or knowledge (requires a refly at a minimum).</td>
</tr>
<tr>
<td>2.0</td>
<td>Below Average. Performance is safe but indicates limited proficiency. Makes errors of omission or commission</td>
</tr>
<tr>
<td>3.0</td>
<td>Average. Performance is essentially correct. Recognizes and corrects errors.</td>
</tr>
<tr>
<td>4.0</td>
<td>Above Average. Performance is correct, efficient, skillful and without hesitation.</td>
</tr>
</tbody>
</table>

**Table 2 – Task Grading**

III. **Incomplete events.** Online Grading System (OGS) will assign an incomplete grade sheet and completion grade sheet for their next event following an incompletion. The IP will fill out the graded items upon debrief completion. OGS will prevent duplicate task grading on the same syllabus event tasks.
IV. **Overall mission grade.** The overall mission grade reflects student performance on all mission tasks accomplished. In no case should the overall grade be higher than those tasks listed in learning objectives for each syllabus event. The overall grade is not an average of specific element but an assessment of overall event performance. Grades will be whole numbers and not fractions. Grading “on the line” or “between numbers” is prohibited.

<table>
<thead>
<tr>
<th>NET Task Grade</th>
<th>Mission Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOD or 4 BA</td>
<td>SOD</td>
</tr>
<tr>
<td>3 BA</td>
<td>BA or SOD (IP discretion)</td>
</tr>
<tr>
<td>2 BA</td>
<td>BA</td>
</tr>
<tr>
<td>1 BA to 1 AA</td>
<td>AVG</td>
</tr>
<tr>
<td>2 AA</td>
<td>AA</td>
</tr>
</tbody>
</table>

Table 3 – Event Grading

V. **SOD Events.** Students will receive a SOD if the IP responsible for leading the event determines the RP is unsafe or is grossly behind his peers in ability or knowledge of a graded task. RPs will report directly to the Pilot Training Officer once he has been informed of the grade. If a SOD is received on a night event, the RP will report to the PTO once his crew rest has been accomplished. The ODO will be notified in these situations so he can inform the morning duty. **RPs will not fly any other events until the matter has been discussed with the PTO or OPSO.**

VI. **End of Stage Marginal.**

1. Students must achieve minimum course training standards required of each specific stage. Stage grades will be calculated utilizing the following format:

   \[
   \text{Stage Grade} = \text{Academic Stage Exam (0.20)} + \text{Flight / Simulator Grades (0.80)}
   \]

2. RP’s stage grades will be compared to the previous academic year group utilizing a Standard Deviation Formula. A student who is ONE standard deviation below his peer group will be considered stage marginal (bottom 32%). End of stage marginal is strictly an operational tool to identify learning difficulty within a stage and will not constitute a SOD.
VII. **Course Marginal.** Student’s flight grades will be calculated utilizing the following format:

**End of Syllabus Grade**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Weighted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAM</td>
<td>0.25</td>
</tr>
<tr>
<td>FOB</td>
<td>0.03</td>
</tr>
<tr>
<td>FCLP</td>
<td>0.05</td>
</tr>
<tr>
<td>FORM</td>
<td>0.03</td>
</tr>
<tr>
<td>AAH</td>
<td>0.04</td>
</tr>
<tr>
<td>TACFORM</td>
<td>0.04</td>
</tr>
<tr>
<td>NAV</td>
<td>0.04</td>
</tr>
<tr>
<td>AAR</td>
<td>0.01</td>
</tr>
<tr>
<td>TCT</td>
<td>0.05</td>
</tr>
<tr>
<td>AS</td>
<td>0.15</td>
</tr>
<tr>
<td>LAT</td>
<td>0.04</td>
</tr>
<tr>
<td>MECH</td>
<td>0.06</td>
</tr>
<tr>
<td>CAS</td>
<td>0.05</td>
</tr>
<tr>
<td>AI</td>
<td>0.01</td>
</tr>
<tr>
<td>AA</td>
<td>0.06</td>
</tr>
<tr>
<td>NS</td>
<td>0.04</td>
</tr>
<tr>
<td>NATOPS</td>
<td>0.05</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 4 – Syllabus Grading

Weighted Values x Stage Grades = Stage Values
Summation of Stage Values = Syllabus Grade

VIII. **Mid Course Calculations (minimum of 5 stages complete)**

1. Adjusted Stage Weight = (Stage Weight / Cumulative weight of completed stages). This value is applied into the above formula to derive course grade to date.
2. RP’s stage grades will be compared to the previous academic year group utilizing Standard Deviation Formula. A student who is overall **TWO** standard deviations below their peer group during the syllabus will be considered Course Marginal (bottom 5%). This can occur after completion of five stages or more. Students who are Course Marginal at any point following the first five stages of training will be recommended for a Progress Review Board at a minimum.
IX. **Publications.** You will receive a copy of this FSG, NATOPS, and NATOPS Performance charts. In addition to this FSG binder you will also receive another binder for additional “Curriculum Pilot Training Material.” This is intended to be the start of your “Harrier Brain.” In it you will find additional information about the AV-8B and its missions in the form of articles, publications, etc. The intent is for you to populate this binder with all the collective “gouge” that you pick up starting here at VMAT-203 and then continuing throughout the remainder of your Harrier flying career. There are several copies of the AV-8B NATIP in the planning room and briefing spaces. This will serve as your primary reference manual for a more in depth, unclassified explanation of the AV-8B tactical systems. There are not enough paper copies of this 1800 page document to provide one per pilot, so they must stay in the planning room and briefing spaces. No kidnapping of the pubs is allowed. The Air NTTP is a document that defines the USMC Harrier Force standards for the conduct of tactical operations. We will train you to this standard. You will also receive a VMAT-203 SOP, MCAS Cherry Point Air Ops Manual, and a MAG-14 SOP. All of the above mentioned documents and several more are also available to you electronically in the “Technical Library” on the Learning Management System resident at VMAT-203 and/or over the internet for out-of-squadron study at [https://ssl.av8b.com/](https://ssl.av8b.com/).

X. **General Instructions.**

1. **Flight Leadership.** Students will not brief or lead any syllabus event with the exception of FAM-1126 and SNTPS-1700 where they will be required to brief the sortie. This restriction doesn’t prevent specific portions of mission (i.e., questions of the day, system knowledge, threat briefs, etc.). If the RP is required to fly in the lead position for a designated period (for example flying in the front seat of a Lead flight to complete a VSTOL refresh), the student will not assume administrative flight lead responsibilities while flying in that position. IPs are responsible for all sortie conduct.

2. **Course Flow.** The training management flow ("dot board") shows the required prerequisites for each event. RPs will ensure they have met all prerequisites for their events and inform the IP if they have not.

3. **RP conduct while in training.**

   a. **Leave Policy.** Your time to train in VMAT-203 is dependent on your continued availability. Therefore, annual leave should not be anticipated or expected until completion of the entire syllabus. Do not make travel arrangements based on a predicted completion date! If extenuating circumstances exist, inform the Operations Officer as soon as possible. In the event leave is unavoidable or if emergency leave is required, the request must be approved by the Operations department and processed through Marine On-Line on a case-by-case basis.

   b. **Snivels.** The Operations department needs to know as soon as possible if you will be unavailable for training at any time. This is done with the Snivel
Log located on the wall outside Operations. The Snivel Log will be “closed” for late snivels 48 hours prior to the day requested. You will need to make a “no fly” snivel for the day following any 24 hour duty. This does not preclude you from receiving lectures or self-paced classroom instruction.

c. **SIQ.** You are responsible for keeping yourself physically fit for flight and to remove yourself from flight status if you are ill. If you are unable to execute the flight schedule because of illness, you must notify the ODO. Then go immediately to sick call and get a “med down” chit. You will be required to get a med up chit from the Flight Surgeon before returning to flight status. You will not be scheduled until you are med up. Keep Schedules notified of your status with a daily phone muster.

d. **RP Duties.** Students will be required to stand A-ODO, MAG Duty, SDO, and Tower ODO at different times throughout training.

e. **RP Tracking Responsibilities.** In order to keep tracking through the syllabus, students are required to update the operations “dot board” after completion or incompletion of each event. The schedule writers put a magnetic dot on the event scheduled. You must remove the dot and write the date of completion in the appropriate spot. If you did not complete, simply remove the dot. This will ensure that you will be scheduled for the appropriate sortie the following day. In addition to updating the dot board, RPs are required to fill out a NAVFLIR for every scheduled event, including sim practices, completed or not. If incomplete, you must fill out a cancellation NAVFLIR using the appropriate cancellation code. You will receive training detailing the correct cancellation codes. The last post-flight task is to update the daily flight schedule on the ODO desk. Include completion or incompletion of your event and the reason if there was a cancellation. For example: cancelled ops; cancelled maintenance; or cancelled weather. If you should fail to accomplish any one of these three tasks, we will not be able to accurately manage training and it will reflect on how quickly you move through training. If you fail more than once, expect to be given additional duties, which can dramatically increase your time to train.
FAM Stage

Name: Basic Mission Planning

Purpose: Plan each flight or simulator to an Air NTTP standard and have a DSU or AMU loaded.

Description of Procedures:

1. Mission planning and briefing requirements are covered in the VMAT-203 SOP and AV-8B Air NTTP. Mission planning will be conducted to this standard starting from an SOP AV-8 mission file (i.e. - NKTSOP.av8m) located in the AV-8 Data folder. Each element of the mission will be built from one of the files in the AV-8 Data folder and modified as necessary for the planned sortie. Once the mission is completed the mission file will be saved on one of 2 class USB memory sticks. On the memory stick create a personal folder with your name or callsign. It is recommended that you save each sub-file of the mission plan, except the stored waypoints file (.av8p), with the event code and the date of the mission (i.e. 105_17JUL06). Remember that there are four different file extensions in JMPS: .av8m (mission); .av8p (stored points); .av8o (overlays); and .jrt (route file). The stored points file typically won’t change unless you go on det somewhere other than Cherry Point or Yuma / El Centro. You will not have to change this file, only attach it to the mission file prior to writing to the DSU or AMU. Also remember that cards can be saved to your personal folder via a right click on the card in the AV-8 UPC.

2. Do not make the error of recycling a previous mission. To ensure that all Air NTTP standards are maintained all new missions should be started from the SOP files and then modified with the deviations from Air NTTP noted as necessary. If you attempt to recycle a previous mission you will forget what changes from Air NTTP have been made leading to confusion, mission errors, and non-standardization.

3. Once a mission file is saved, the required cards and any color maps can be printed. The standard for the required cards are defined in the Air NTTP based upon mission type. These cards will be cut to 5 x 8 inches. You should have a printed communication card and the waypoints for the area in case the DSU or AMU does not transfer.

4. When the aircraft are assigned, the correct aircraft DSU or AMU will be loaded.

5. Have a 1: 250,000-area map of the R5306A with all obstructions, noise sensitive areas, target areas and sub areas listed.

6. Weather and sun position for the flight will be required for briefing. You should also look at the wind aloft field to have an idea of how it will affect the area work and landing pattern.

7. Fuel planning for the FAM stage will be in accordance with the Air NTTP and the below guidance. Tiger fuel as it is listed in the Air NTTP does not really apply to the FAM stage. Joker fuel is defined as “the fuel state at which the flight will terminate the tactical portion of the mission and rejoin to assume an administrative profile for the planned recovery.” To translate that to the FAM stage, Joker will be the fuel state at which RTB will be commenced using the planned recovery to complete all
required landings. Bingo is an emergency fuel situation that requires a climb to intercept a maximum range Bingo profile. Use the following fuel planning guidance to determine how much fuel you need to plan for your Joker.

<table>
<thead>
<tr>
<th>Approach or landing type</th>
<th>Fuel required</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACAN Z (from IAF)</td>
<td>500 Lbs</td>
</tr>
<tr>
<td>GCA</td>
<td>800 Lbs</td>
</tr>
<tr>
<td>FNSL</td>
<td>600 Lbs</td>
</tr>
<tr>
<td>AVNSL</td>
<td>600 Lbs</td>
</tr>
<tr>
<td>SVNSL</td>
<td>700 Lbs</td>
</tr>
<tr>
<td>CL</td>
<td>500 Lbs</td>
</tr>
<tr>
<td>RVL</td>
<td>700 Lbs</td>
</tr>
<tr>
<td>Decel / VL</td>
<td>800 Lbs</td>
</tr>
<tr>
<td>Pressup</td>
<td>300 Lbs</td>
</tr>
</tbody>
</table>

These fuel states are estimated based upon performing a STO or CTO from a full stop. If a roll and go or touch and go is performed to get airborne for the landing then approximately 100 Lbs of fuel can be subtracted from the required fuel.

8. Ensure you have a HI-8 VTR tape (preferably metal) rewound for all flight events.
9. Failure to accomplish this will result in an unsatisfactory event.

Common Errors:

1. DSU or AMU not loaded.
2. Kneeboard cards incomplete or inaccurate.
3. Unprepared Briefing board.
4. No Overlays.
5. No GPS library.

Corrections for Errors:

1. Review FSG for event description and Master Flight Schedule.
2. Allow time prior to brief for Mission Planning.

Source Documents: VMAT-203 SOP, NATOPS
Name: Flight Brief Preparation

Purpose: Ensures the necessary elements are present for an effective brief.

Description of Procedures:

1. Requirements for the brief are covered in the NATOPS, Air NTTP, and VMAT 203 SOP and in the FSG. The flight schedule contains the NATOPS Question of the Day (NQD), and the Emergency Question of the Day (EQD) and mission number for your working area. Write these and all other pertinent information on the board before the brief. Log-in to the computer and call up that day’s sortie.

2. Ensure you read all the requirements and briefing items for the flight and be prepared to discuss these items with IP. Failure to do this will result in an unsatisfactory event!

3. Make sure the appropriate publications (Air NTTP, NATIP, NATOPS, Performance Charts, and Range Manuals) are on hand and that there are markers available. If the flight will include several crews, be sure to select a briefing space large enough to accommodate.

Common Errors:

1. No charts.
2. Incomplete smart packs.
3. Lack of knowledge.
4. Incorrect Admin 1 card information.
5. No Hi-8 8mm VRS tape.

Corrections for Errors:

1. Be thoroughly familiar with all briefing items.
2. Follow the Air NTTP precisely for planning.

Source Documents: VMAT-203 SOP, Air NTTP
Name: Flight Briefing

Purpose: To effectively communicate the plan for the mission to other flight members.

Description of Procedures:

1. In the FAM stage, you will be responsible for briefing an event (FAM-1126). This will ensure that you have a large depth of knowledge on normal and emergency procedures and can methodically orient, plan and communicate all aspects of a flight. The intent is not to have you become flight leads in the FAM stage; that can take a year or more of training. But by briefing the event, you will learn to think through in precise detail how you are going to execute the assigned mission and what contingencies that need to be consider that may affect the mission.

2. You should review the Air NTTP for specifics on how to brief a particular mission type. Although it is very tactical in nature, the Briefing and Debriefing chapter of the TOPGUN Manual also provides very good guidance on briefing techniques and can be adapted to any mission type with a bit of forethought.

3. Rehearse the brief, exactly as you intend to give it, several times to determine areas that are unclear or inefficient. It helps to have an objective “practice” audience for this who is not familiar with your mission planning. You have to remember that your goal is to communicate all the details of your planning that are critical to successful execution of the mission to the other flight members who may not have the luxury of having participated in the mission planning and therefore do not have any background knowledge of the mission or the plan.

4. Use SOPs where they exist to expedite the briefing process; they were created for a reason. Be careful, however, that you do not try to force an SOP into a situation where it does not fit. SOPs are standards that work for a majority of situation but if a circumstance requires a deviation from an SOP for operational effectiveness or safety, note the deviation and brief it in detail to ensure all participating aircrew understand the deviation, its necessity, and how it will be executed.

5. If you have any additional questions on briefing flow or techniques, ask an IP.

Common Errors:

1. Unprepared for brief.
2. Spending too much time discussing administrative items that should be standard knowledge for all participating aircrew.
3. Not briefing or insufficiently briefing critical aspects of the mission.
4. Inefficient brief that takes longer than the allotted time.

Corrections for Errors:

1. Use the planning guides in the Air NTTP to help you plan your mission. The brief will naturally evolve from a solid plan.
2. Know the content of the SOPs that support AV-8B operations and apply them appropriately.
3. Target no more than 20 minutes for briefing the administrative portion of the event.
4. Chronologically think through all aspects of the mission and determine the “fuzzy” areas (new skills, very complicated skills / procedures, etc.) that will require more detailed explanation in the brief. Also, do not forget to “what-if” your plan and think through contingencies so you have a plan for them and so that you can effectively brief how the flight should deal with them.
5. Rehearse the brief.
6. Assuming the brief is efficient, keep track of time while giving it to ensure you adhere to the amount allotted. If during rehearsal you cannot get your brief into the allotted time, it is either because the mission is incredibly complex and requires more than one hour to brief or, more likely especially in the FAM stage, you are not being efficient with your time… keep rehearsing and fine tuning the brief.
7. Leave time prior to “walk time” for questions and to take care of post-brief tasks.

Source Documents: Air NTTP, TOPGUN Manual
Name: Post Brief Tasks

Purpose: Prior to walking the IP will need to gather information such as aircraft assignment, weather, ODO out-brief.

Description of Procedures:

1. Walk 45 minutes prior to T/O. More time will be required if dry suits are required for weather considerations.
2. Once an aircraft is assigned, load a DSU or AMU and calculate performance numbers. An ORM worksheet and ODO out-brief is required prior to walk.
3. The Aircraft Discrepancy Book (ADB) is in maintenance control and will be screened by both the IP and you prior to the flight. The “A” sheet is in front and will document the servicing of the aircraft. Take note of fuel, oil, water, and ordnance sign-offs. Make sure the plane captain in charge of the "turn around" and the maintenance controller have signed the “A sheet.” The pilot in command will sign and date the "A sheet."
4. Approaching the jet, take note of the general condition of the surrounding area (FOD) and the aircraft itself. Look for evenly serviced outriggers, and properly serviced main strut and nose strut. The aircraft should sit slightly nose high (6°) if all struts are properly serviced. There should not be any red gear or pins on the aircraft. There may be chains and tie-downs on the jet. Remove the chains and the intake blanks on walk-around.

Common Errors:

1. Walking late.
2. No ODO out-brief.
3. Forgetting to load a DSU or AMU.
4. Not knowing what to look for in the ADB.
5. Forgetting to sign the “A sheet.”
6. Walking to the wrong jet.

 Corrections for Errors:

1. Know your aircraft side number when you leave MC.
2. Be mindful of the time from brief to walk to engine start.

Source Documents: VMAT-203 SOP, Air NTTP
Name: Exterior Inspection and Before Entering Cockpit Checklist

Purpose: Define the procedures and checks that must be completed on the exterior of the aircraft and prior to climbing into the cockpit.

Description of Procedures:

1. Procedures are in accordance with NATOPS.

Common Errors:

1. Forgetting to check ignition isolation switch.
2. Forgetting to seat the DSU or AMU properly.
3. Ensure the cannon plug is secured to the maintenance panel.
4. Not checking the oil lights.
5. Not pre-flighting the top of the jet.
6. Not pre-flighting the ejection seat.

Corrections for Errors:

1. Utilize the same routine every time you climb into the aircraft.

Source Documents: NATOPS
Name: DSU or AMU Installation / Removal

Purpose: Describe the procedures for inserting and removing the DSU or AMU from the AV-8B without damaging the aircraft.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. When conducting flight operations co-located with the squadron, the plane captain will typically install the DSU or AMU for you while you are conducting your pre-flight inspection on the exterior of the aircraft. If you are on a cross country or operating away from plane captains, you will have to install the DSU or AMU yourself. With the canopy open, reach back over the starboard side of the ejection seat and release the DSU or AMU latch to allow the mount to rotate forward for easy insertion of the DSU or AMU.
3. After inserting the DSU or AMU rotate the mount back up to the vertical position and ensure that the latch is engaged to lock it in position. With the canopy closed the DSU or AMU mount cannot be rotated from the horizontal to vertical position or back without impacting and possibly damaging the canopy, so ensure it is in the up and locked position prior to closing the canopy.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: VRS Installation, Setup and Removal

Purpose: Define the procedures for VRS tape setup and removal.

Description of Procedures:

1. Procedures are in accordance with NATOPS. All aircraft have AFC-422 incorporated so refer to those procedures.
2. There are two methods by which to record HUD or AMPCD data from your flight:
   a. The easiest way to record mission data is to select LOCAL / REC on the recorder. This will force the VRS to record the selected source until REC is deselected.
   b. By selecting STDBY / REMOTE on the recorder, the recording control is transferred to the miscellaneous panel (center pedestal under the standby instruments). This requires additional steps to record mission data but also provides greater flexibility, redundancy and moves the control of the system to the center of the cockpit instead of the back right corner (probably under your nav bag). Using this method will require you to select the RUN position on the miscellaneous panel to initiate recording of the selected source. It also provides you mission computer back-up for recording based upon A/G or A/A master mode selection.
3. Regardless of which method is used to record mission data, you must unthread the tape prior to engine shutdown to be able to extract it after the flight. In LOCAL control simply move the mode selector knob from REC to UNTHRD. In REMOTE control, select the VSTOL or NAV master mode and then select VRS AUTO on the miscellaneous panel. Next select LOCAL and then UNTHRD on the recorder.

Common Errors:

1. Forgetting to set the VRS up to record based upon the briefed plan.
2. Forgetting to turn VRS off and unthread tape prior to engine shutdown.

Corrections for Errors:

1. Just like everything else in the aircraft, pick a method for controlling the VRS record functions and then stick with it. This will build solid habit patterns so that you learn not to forget the VRS setup.
2. Prior to shutdown extract your tape and put it on your kneeboard. This will ensure that you do not inadvertently shutdown with it still threaded. If you forget to do this, signal the plane captain that you want an APU start. Once the APU is on-line you should be able to manipulate the controls as described to extract the tape.

Source Documents: NATOPS
Name:  Ejection Seat Preflight

Purpose:  To check the ejection seat prior to entering cockpit.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. Sometimes the manufactured hole in the seat cushion that allows you to see the emergency oxygen bottle pressure window becomes deformed due to wear and tear on the cushion. When this occurs it may be impossible to see the pressure window through the hole. If necessary, you can lift the seat cushion up to check the pressure gauge. Ensure that when you re-seat the cushion the flap of material in the front center of the cushion is tucked in aft of the ejection handle so it will not interfere with your ability to grab the handle in an ejection situation.
3. When preflight inspecting the seat and when climbing into the cockpit, avoid stepping on the seat. The AN/URT-33 or AN/URT-140 emergency locator beacon is installed on the top, front of the seat pan and can be damaged if stepped on. If you cannot get into the cockpit without stepping on the seat, ensure you step on the back of the seat just forward of the backrest to prevent damage to the beacon.

Common Errors:

1. Incomplete preflight of the ejection seat.

Corrections for Errors:

1. Follow NATOPS procedures for the seat preflight… your life depends on it.

Source Documents:  NATOPS
Name: After Entering Cockpit Checks

Purpose: To prepare the cockpit switches and aircraft equipment for engine start.

Description of Procedures:

1. NATOPS “After Entering Cockpit”

Common Errors:

1. Not strapping into ejection seat.
2. Forgetting to hook up all communication connections.
3. Incorrect switch positions such as:
   a. Exterior Lights Master: In the OFF position.
   c. DP and MC Switches in OFF.
   d. Brake Accumulator: Less than 1000 psi.
   e. ACNIP in manual vice UFC.
   f. Generator not ON.
4. Unable to identify the correct switch positions.
5. Radio settings too low to hear or guard selected.
6. ICS volume too low.
7. UFC Brightness too low.
8. Confusing the boost pump and dump switches.
9. Not ensuring VRS tape is installed.
11. Forgetting checking the DECS enable switch.
12. Leaving the ECS in RAM.

Corrections for Errors:

1. Practice the checklist in the simulator.

Source Documents: NATOPS
Name: Visual Signals

Purpose: To communicate visually with the plane captain and other ground or flight personnel.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. A few additional signals the plane captain may give you that are not depicted in NATOPS are:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Meaning</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cupped hand palm down held over cupped hand</td>
<td>Anti-collision lights are off</td>
<td>Check anti-collision light switch on and external lights master switch in</td>
</tr>
<tr>
<td>palm up with both hands rotated in opposite</td>
<td></td>
<td>NORM position</td>
</tr>
<tr>
<td>directions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cupped hand held over nose and mouth</td>
<td>OBOGS not functioning</td>
<td>Check OXY switch on</td>
</tr>
<tr>
<td>Index and forefinger of right hand pointed</td>
<td>Approach, hover and AUX lights</td>
<td>One finger – turn on hover light</td>
</tr>
<tr>
<td>at eyes followed by one, two or three finger</td>
<td>check</td>
<td>Two finger – turn on approach light</td>
</tr>
<tr>
<td>indicated with left hand</td>
<td></td>
<td>Three finger – turn on AUX light</td>
</tr>
<tr>
<td>Both hands held out to the sides, away from</td>
<td>Turn position lights on / off</td>
<td>Turn the position lights on or off as appropriate</td>
</tr>
<tr>
<td>the waist with the thumbs and fingers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>opened and closed in a pinching motion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand held at chest level away from the</td>
<td>Anti-skid check</td>
<td>Perform anti-skid check</td>
</tr>
<tr>
<td>torso making pinching motion with thumb and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>forefinger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Pre-start Checks

Purpose: To prepare the cockpit switches and aircraft equipment for engine start.

Description of Procedures:

1. NATOPS "Pre-Start"

Common Errors:

1. Forgetting to turn on DECS power switch and/or not placing the fuel shutoff handle down.
2. Placing Fuel Indicator Select Switch in FEED or WING position.
3. Not closing canopy completely.
4. Not resetting BINGO bug to briefed quantity.
5. Not ensuring the generator switch is in the on position.
6. Not knowing what type of throttle is in aircraft.

Corrections for Errors:

1. Ensure left and right fuel indications are correct by placing the fuel quantity switch to total or internal.
2. Write down the briefed fuel states for BINGO bug settings, set the bug initially to the TIGER fuel.
3. Check warning and caution lights prior to start and ensure only the appropriate lights are illuminated.
4. Pull back firmly on canopy bow handles and ensure alignment marks are straight.

Source Documents: NATOPS
Name: TAV-8B Intercom System Check

Purpose: To check intra-cockpit communication capability in the TAV-8 prior to proceeding with cockpit checks.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. After turning the battery on, the voice warning will go through a check of all cautions and warnings and will finish with “CAUTION, CAUTION.” After that, initiate an ICS check with the rear cockpit by selecting the sensor select (castle) switch left and state, “ICS NORMAL.” The rear cockpit pilot will respond with, “LOUD AND CLEAR.” Then select sensor select switch to the right and state, “OVER-RIDE.” The rear cockpit pilot will respond with, “LOUD AND CLEAR.” Finally select the center, small round button on the throttle communication switch and state, “THROTTLE.” The rear cockpit pilot will respond with, “LOUD AND CLEAR.”

Common Errors:

1. Not having all communication connections on the helmet, mask, regulator and aircraft connected causing you to not be able to transmit and/or receive.
2. Having the ICS volume turned down so low that you cannot hear the response from the other pilot.

 Corrections for Errors:

1. Check all connections prior to turning on the battery.
2. Set ICS volume knob to full loud prior to initiating the check. During the check, it can be adjusted to a comfortable level.

Source Documents: NATOPS
Name: Starting Engine Checks

Purpose: To start the aircraft engine.

Description of Procedures:

1. NATOPS “Starting Engine.”

Common Errors:

1. Holding start switch to ON position.
2. Forgetting to check warning and caution lights after start and not holding the switch to the test position long enough for the LIDS caution light to illuminate.
3. Selecting Idle prior to indication of RPM on engine display panel.
4. Forgetting to turn on the AMPCD, HUD or radios.
5. Not ensuring STAB trim is 4° nose down and nozzles to 10°.
7. Not ensuring engine IGVs and RPM within limits.

Corrections for Errors:

1. Follow NATOPS procedures listed on your checklist.

Source Documents: NATOPS
Name: Primary Displays Selection

Purpose: To establish default HUD and AMPCD displays for primary mission events.

Description of Procedures:

1. These are suggested defaults and should be set once all checks are complete.

<table>
<thead>
<tr>
<th>EVENT</th>
<th>HUD MODE</th>
<th>LEFT AMPCD</th>
<th>RIGHT AMPCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAKE-OFF</td>
<td>VSTOL</td>
<td>EHSD-Dcntr</td>
<td>ENGINE PAGE (DAY)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HUD OR HUD/FLIR (NIGHT)</td>
</tr>
<tr>
<td>IMC CONDITIONS</td>
<td>VSTOL</td>
<td>EHSD-Dcntr</td>
<td>AS REQUIRED – HUd IF OTHER SENSORS OR DISPLAYS NOT REQUIRED</td>
</tr>
<tr>
<td>EN ROUTE / RTF (NA)</td>
<td>NAV</td>
<td>EHSD-Dcntr</td>
<td>ECM OR FLIR</td>
</tr>
<tr>
<td>HOLDING</td>
<td>NAV</td>
<td>EHSD-Dcntr</td>
<td>AS REQUIRED</td>
</tr>
<tr>
<td>INSTRUMENT APPROACH / LANDING PATTERN</td>
<td>VSTOL</td>
<td>EHSD-CNTR (adjust scale to show approach / landing reference, i.e. TACAN / Wypt)</td>
<td>AS REQUIRED</td>
</tr>
<tr>
<td>TARGET AREA (NA)</td>
<td>A/G</td>
<td>EHSD-CNTR</td>
<td>DMT/FLIR</td>
</tr>
</tbody>
</table>

NOTE
TAV-8 aircraft will have the EHSI displayed when not manipulating the DDI.

Common Errors:

1. Getting lost in the display and or HOTAS.

Corrections for Errors:

1. Review HOTAS and displays for Night Attack aircraft.

Source Documents: N/A
Name: UFC and ODU Operations

Purpose: To utilize the UFC and ODU to input and manipulate mission systems data.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. The UFC and ODU are critical for the pilot to mission computer interface. You will find as you go through normal procedures and weapon system programming that the instances requiring their utilization are almost innumerable. For the FAM stage, studying NATOPS will give you sufficient reference to their usage that you can conduct normal procedures. In the more advanced stages of the syllabus, additional information concerning their usage will be provided by NATOPS, the AV-8B NATIP, and the Air NTTP.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Radio Communication System Programming

Purpose: To identify the multiple methods of operating the radios based upon system status and aircraft variant or OFP.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. The TAV-8 only has the ARC-182. All the AV-8Bs have the ARC-210. In VMAT-203 the primary method of operating the radios is with control assigned to the UFC. The difference between the two radio types in UFC is transparent when operating in fixed frequency (FF) mode. This information is overwritten with each DSU or AMU transfer.
3. If system degradation causes the UFC to become inoperative, radio operation control can be regained by using the ACNIP and the RSC for either the ARC-182 or the ARC-210. The procedures for programming and using the manual mode for either radio type are described in NATOPS. You should study and become familiar enough with the procedures that you can execute them without aid of reference to regain communication control. The important point to note is that the method for assigning a new frequency to the RSC is backwards. In the TAV-8 with the ARC-182 you make a change to the RSC and then select the radio to which you are going to assign it. With the ARC-210 you select the radio first and then make the frequency / channel change.

Common Errors:

1. Not being familiar with procedures for manual radio operation.

Corrections for Errors:

1. Review NATOPS.

Source Documents: NATOPS
Name: Data Transfer

Purpose: To transfer mission planning information to the mission computer.

Description of Procedures:
1. Procedures in accordance with NATOPS.

Common Errors:
1. N/A

Corrections for Errors:
1. N/A

Source Documents: NATOPS
Name: Ground Alignment

Purpose: To align the INS prior to flight.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. There are no longer any ASN-130 gyros available so only study the procedures for the ASN-139.
3. Although NATOPS states you can select NAV anytime after the QUAL number decreases below 3.0, it is recommended to not select NAV or IFA until you have an OK and a QUAL number of 0.6 or less.
4. Remember anytime the parking brake is released during the alignment the INS goes into align hold. Always check the alignment progress prior to releasing the parking brake; you should not release the parking brake while the INS is showing ATT NOT OK.
5. Normally, the aircraft will remember its location after shutdown from the previous flight. Assuming that everyone is doing post-flight position updates after flying in NAV, you will simply have to confirm the location prior to selecting GND ALIGN. However, if the aircraft has been moved from the shutdown parking location or if the mission computer has been reloaded prior to your flight the aircraft position will initialize to N 00 00.000 W 000 00.000 requiring you to input the aircraft’s position labeled on the deck to the right of the aircraft parking spot.
6. Remember every fifth flight must be flown in NAV instead of IFA. Also, any flight that has poor GPS quality (i.e. degraded GPS signal/system or with crypto not loaded) should be flown in NAV.

Common Errors:

1. Not starting an alignment with the proper aircraft location.
2. Not staying aware of alignment status and prematurely interrupting the alignment prior to achieving OK status.
3. Forgetting to fly the jet in NAV on the fifth flight.

Corrections for Errors:

1. Check and correct aircraft position on the DATA / A/C page prior to initiating alignment.
2. Check alignment status on EHSD prior to taxiing.
3. Check the ADB to determine which flight you are on and whether you need to fly in NAV instead of IFA.

Source Documents: NATOPS
**Name:** Before Taxi Checks  

**Purpose:** The before taxiing checklist will turn on the aircraft systems and check the aircraft for proper operation and identify any discrepancies.

**Description of Procedures:**

1. Procedures are in accordance with NATOPS.

**Common Errors:**

1. Not starting INS alignment after start and/or not checking that qual time is displayed on EHSD.
2. Forgetting to un-box the TRUE heading default.
3. Letting the RPM decay below sub-idle during manual fuel check.
4. Forgetting to signal plane captain for finger checks.
5. Not ensuring the skid light is out prior to moving rudder pedals.
6. Not checking STORES and SMSFF pages prior to AUTO BIT.
7. Stopping the SAAHS and AUTO BIT by selecting another display which will terminate the BIT.
8. Not checking the INS alignment for a “Qual OK” prior to disengaging parking brake.
9. Manipulating switches below the canopy rails on final checks.
10. Having the nozzles at an angle less than 10° and trying to initiate a flaps BIT.
11. Leaving the position lights on after final checks (They should be secured during day/VFR conditions).
12. Incorrect VREST data.

**Corrections for Errors:**

1. Keep manual fuel check quick and do not allow the RPM to approach sub-idle limits.
2. You can only manipulate the UFC, AMPCD, HUD and ODU during the final checks keeping your hands in view to the plane captain at all times.

**Source Documents:** NATOPS
Name: Anti-Skid Check

Purpose: To define procedures for checking the anti-skid system prior to taxiing.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. The anti-skid check is normally done just prior to taxiing. It is signaled to the plane captain by making a pinching motion with the thumb and forefinger.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Brakes and NWS Checks

Purpose: To check the function of the brakes and NWS system prior to leaving the line.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. When ready to taxi, signal the plane captain to pull the chocks. Once the chocks are pulled and the plane captain or line personnel are out from under the aircraft select the anti-skid switch to NWS and rotate the nozzles aft to zero degrees.
3. Follow the plane captain’s signals for the execution of the checks. First will be the brake check. When signaled, reduce the brake pressure to allow the aircraft to roll forward. After about 2-3 feet the plane captain will signal you to stop. Smoothly apply brake pressure to stop the aircraft.
4. When signaled, continue taxiing and follow the signals to check the NWS. The plane captain will point to his/her nose with one and hand and point at the ground in alternating directions with the other hand to signal you to check the NWS in both directions.

Common Errors:

1. Selecting NWS prior to having the chocks pulled.
2. Not selecting nozzles aft prior to taxiing out of the parking spot.
3. “Slamming on” the brakes during the brake check.
4. Not following plane captain’s signals.

Corrections for Errors:

1. Never have hot NWS when maintenance personnel are under or in close proximity to the aircraft.
2. When the plane captain signals for the brake check, smoothly apply the brakes to show that they are working. It is not necessary for you to abruptly depress the pedals and slam on the brakes to check them.

Source Documents: NATOPS
Name: Taxiing

Purpose: To move the aircraft safely from the line area to the warm-up area or hold short position.

Description of Procedures:

1. In addition to the NATOPS “Taxiing” discussion and checklist, read the MCAS Air Operations Manual for local taxiing SOPs. When pulling out of the line on initial taxi, nozzles will be at 0°. This technique diminishes the potential for FOD when sweeping other aircraft with the exhaust. Hot NWS is used for taxiing out of the line. Do not put anything on the glare shield such as Charts, approach plates or kneeboards. This will scratch the windscreen and there is an increased chance of FODing the engine.
2. Strictly adhere to plane captain’s signals until released via his salute. Once established on “B” taxiway or clear of other aircraft return the nozzles to 10° for the remainder of the taxi. Minimum interval for taxi is 1000’, more if required for FOD avoidance.
3. RPS checks can be conducted on “B” taxiway on the way to the warm-up area.

Common Errors:

1. Not being FOD conscious during taxiing.
2. Not having nozzles aft when taxiing in the line or close to other aircraft (ensure nozzles at 10° all other times).
3. Less than 1000’ taxi interval.
4. Excessive speed on taxi.
5. Trying to turn using differential braking.
6. Constantly pressing and releasing the NWS button.
7. Applying excessive brake pressure resulting in jerking movement.
8. Forgetting to set the parking brake and turn off the NWS (anti-skid switch – on) when stopped.
9. Forgetting to do RPS check or performing with insufficient ground speed.
10. Not following the plane captain’s taxi instructions.

Corrections for Errors:

1. Always be aware of where your jet exhaust is pointed.
2. Think FOD is everywhere and ensure trim 4° nose down to keep the front RCS duct closed.
3. At idle power the AV-8B can develop excessive ground speed during taxi. Utilize periodic brake pressure to slow the aircraft but do not keep a constant pressure (i.e. dragging the brakes). This will cause hot brakes. If taxi speed and distance require, and there is low risk of self or wingman FOD, utilize 30-40° of nozzles to control speed.
4. If using the NWS stick button, keep the button depressed until NWS is no longer required.
5. Apply smooth and even brake pressure; the brakes are quite sensitive and below 8 KGS you have no anti-skid protection.
6. Always set the parking brake and turn the anti-skid ON (light out) when stopped with personnel near the aircraft.

Source Documents: NATOPS, MCAS Air Ops Manual, VMAT-203 SOP
Name: CWAIVER Checks

Purpose: To prepare the aircraft for tactical flight operations and to identify mission essential systems problems.

Description of Procedures:

1. Procedures are in accordance with Air NTTP and NATOPS.
2. In the FAM stage a majority of the CWAIVER checks don’t apply to your mission or to the TAV-8. This does not relieve you of the requirement to perform them. As you are performing them, if a particular step is not applicable then state the check and that it does not apply. When you leave the FAM stage you will begin to use more steps of the check.
3. Note that the CWAIVER checks listed in the Air NTTP are much more detailed than those listed in NATOPS. This is due to the Air NTTP being more tactically oriented than the NATOPS. It is recommended that you use the more detailed checks listed in the Air NTTP as you advance in the syllabus to the more tactical stages. This will more thoroughly prepare the aircraft for tactical operations.

Common Errors:

1. Forgetting to perform part or all of the CWAIVER checks.

Corrections for Errors:

1. N/A

Source Documents: NATOPS, Air NTTP
Name: Pre-positioning Checks

Purpose: The Pre-positioning Checks should be conducted to set up the aircraft systems in order to accomplish the sortie mission.

Description of Procedures:

1. Procedures are in accordance with NATOPS.

Common Errors:

1. Forgetting C-WAIVER / takeoff checks.
2. Not verifying waypoint information and NSEQ string.
3. Not setting up Waypoint, TACAN, and Course-line for after takeoff resulting in no directional steering once airborne.
4. Not setting default cards.
5. Forgetting to select “Hot Mic” prior to takeoff checks.

Corrections for Errors:

1. Select “Hot Mic.”
2. Always stop at the warm-up area or hold short and perform your checks; do not rush through your checks.
3. Set yourself up for success by reviewing your takeoff type, turnout and have a game plan for the aircraft once airborne. Set up your EHSD waypoints and TACAN on the ground to provide situational awareness and steering reference once airborne.

Source Documents: NATOPS
Name: AMPCD VRST Displays

Purpose: To compute the aircraft take-off, cruise and landing performance data.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. One point of confusion for VRST computations is the entry of basic aircraft weight v. operational weight. The aircraft ODU says BAW for VRST computations but per NATOPS what should actually be entered is the operational weight (OWT). Both of these weights can be found on the aircraft performance sheet posted in the planning room, ODO and Maintenance Control desks. Don’t use the wrong weight or the VRST computer will compute that you have more performance than you actually do because the BAW is less than the OWT.

Common Errors:

1. Not having correct aircraft and engine performance numbers when computing the VRST data.
2. Not calculating or checking the aircraft gross weight (GWT)
3. Inputting the BAW instead of the operational weight of the aircraft (OWT).
4. Not computing abort data.
5. Not inputting correct BDI and not checking DI for cruise and bingo computations.

Corrections for Errors:

1. Input correct data into the VRST computer and then double check them… garbage in = garbage out and in this case the garbage can kill you.

Source Documents: NATOPS
Name: Configuration Checks (One-Finger Checks)

Purpose: The configuration checklist, referred to as the “One-Finger Checks”, will be performed while in the warm-up area or the hold short to configure the aircraft for the planned takeoff.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. Conduct the “One-Finger Checks” once you arrive in the warm-up area and each subsequent time you position for take-off. Ensure T / O checklist is complete; do not use the placards in the aircraft because they are incorrect.
3. RP: “SEAT(S) IS ARMED, NRAS IS SET XX, PITCH CARATS ARE SET XX, STO STOP IS SET XX, TRIM IS 0, 0, 2” NOSE DOWN. FLAPS, STOL (AUTO), GOOD DROOP LIGHT (OFF). WARNING AND CAUTION LIGHTS ARE OUT.”
4. RP: “UP AND READY”
5. Once positioned on the runway, and ready for Two- / Five-Finger Checks
6. RP: “ONE FINGER”

Common Errors:

1. Forgetting to select NAV or IFA on the INS or not allowing the INS to align to an appropriate “Qual” number.
2. Incomplete or interrupted during checks (ex. forgetting to set the trim).
3. Placing the STO STOP in the incorrect position.
4. Not verifying rudder and aileron trim set to zero.

Corrections for Errors:

1. Follow the takeoff checklist prior to every takeoff and do not pay it “lip service” (CHECK THE INSTRUMENTS)

Source Documents: NATOPS, VMAT-203 SOP
Name: Engine, Water System and Flight Control Checks (Two- / Five-Finger Checks)

Purpose: The engine, water system and flight control checks (Two- / Five-Finger checks) allow the pilot to evaluate engine performance, flap programming and nozzle movement, as well as arming the water system, if required.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. Call tower for takeoff. Once clearance has been received, and the IP has cleared you for run-up, box ACCEL and perform ACCEL checks. Check and report accel time and IGV position to the IP. If water is required, select water to T/O and reset engine RPM.
3. Set 50° nozzles or to STO stop and check flaps remain at 25° (Auto Flap T/O) or program to 62° (STOL Flap T/O) check and report to the IP heads-down flap indications, heads-up flap indications, EDP nozzle indication, and duct pressure. Select nozzles to 10°, 30°, or 82° as appropriate and confirm heads-up. Select EHSD on your AMPCD. Report “2 FINGERS” to the IP. With clearance from the IP engage the NWS button, release the brakes and select full power check your lineup then verify top end RPM, report “TOP END” to the IP. The whole sequence should sound like this.
   a. IP: “CLEAR FOR TWO-FINGER CHECKS.”
   b. RP: “NOZZLES AFT, BOX ACCEL. POWER IS COMING UP; IGV’S ARE COMING DOWN, SET 60% RPM.”
   c. RP: “IGV’S ARE XX DEGREES, TIME IS XX SECONDS.”
   d. If water required, water switch to T/O and reset engine RPM to 60%
   e. RP: "WATER TO T / O" or “WATER NOT REQUIRED”
   f. Rotate nozzles to the STO stop / 50°.
   g. RP: “62°, 62°, 60°, 60°, DUCTS XX).” (working from left to right)
   h. Rotate nozzles to 10° / 30° / 82°.
   i. RP: “(HOVERSTOP) 2 / 5 FINGERS”
   j. IP: “CLEARED TO LAUNCH (lift).”
   k. RP: “ON THE BUTTON, OFF THE BRAKES, POWERS IN THE CORNER.”
   l. RP: “GOOD TOP END RPM.”
4. The AV-8B does not require a throttle “slam.” Remember that the JPTL is turned off with just 35# pressure at the top of the PLA. Smoothly moving the throttle to full power is the preferred method for all takeoffs.
5. If a “wet” takeoff is required, the run-up is conducted dry as before however after reporting the IGV angle and accel time to the IP select the water switch to T/O and reset the accel RPM. Then proceed with the nozzles and flaps check. Once the run-ups are complete you will report “5 FINGERS.”
6. Precisely set the RPM to 60% ± 0.5% prior to proceeding with the remainder of the checks. If the RPM is not at 60% it will make your check of the IGVs and duct pressure invalid.

7. Rehearse the acceleration checks prior to actually performing them in the aircraft, especially the portion with the nozzles and flaps deflected down. If this check is performed on an asphalt surface and you have any appreciable delay with the check, probably due to unfamiliarity or improper execution of the procedures, you will melt the asphalt.

**Common Errors:**

1. Not being aligned with the runway with the nosewheel centered prior to run-ups.
2. Forgetting to box the accel option on the AMPCD engine page.
3. Initiating acceleration checks with water switch armed.
4. Not allowing the engine RPM to accelerate to the required RPM.
5. Not checking engine performance numbers (IGV angle and accel time).
6. Not ensuring water switch is in the proper position.
7. Too slow with nozzle / flap check.
8. Not returning the nozzles to the proper position for takeoff (10°, 30° or 82°).

**Corrections for Errors:**

1. Perform procedures as per the NATOPS.
2. Do not slam the throttle in the corner like you did in the training command; smoothly move the throttle until reaching the stop.
3. Perform the checklist over “Hot Mic.”
4. Center the nose-wheel prior to run-ups in order to track straight down the runway once the power is in the corner.

**Source Documents:** NATOPS
Name: CTO

Purpose: The conventional takeoff or CTO can be used when configuration or environmental conditions preclude use of any other takeoff type (i.e., crosswinds or asymmetric loadings). The CTO is restricted to gross weights that will not cause the wheel / tire limitation speed of 180 KCAS to be exceeded on the takeoff roll.

Description of Procedures:
1. Procedures are in accordance with NATOPS.
2. The following techniques are provided for further clarification. Flaps will be set to AUTO. Call tower for takeoff. Once tower clearance has been received, the IP will give clearance for the run-up. Box ACCEL and perform the ACCEL checks taking note that the flaps remain at 25° during the nozzles check.
3. Aerodynamic control of the rudder will begin to take effect at 50-60 KCAS. Apply a small amount of back stick as the nose “gets lighter” at approximately 120 KCAS (put the witch’s hat on the horizon). The aircraft will break ground with a slight amount of aft-stick at approximately 135 KCAS. Shortly after clearing ground effect, the nose will want to continue rotating up so anticipate adding forward stick pressure to hold the witch’s hat at the pitch carets (approximately 6° above the horizon). Set a positive rate-of-climb. When safely airborne, place the gear handle up and nozzles aft. Prior to 250 KCAS, check all gear up (gear lights and light in handle should be out) and nozzles aft. Select the NAV HUD Master Mode and the appropriate display on the AMPCD. Accelerate to 300 KCAS and comply with the departure procedures.

Common Errors:
1. Tripping the limiters on initial power addition.
2. Nose-wheel not centered straight down the runway prior to run-ups leading to aircraft lurching to the side of the runway.
3. Surprised by thrust of AV-8 and acceleration speed.
4. Trying to lift the aircraft off the ground below 135 KCAS.
5. Over-rotating the takeoff attitude once airborne.
6. Forgetting takeoff type by trying to use nozzles on a CTO.
7. Late to raise the landing gear.
8. Excessive ground speed prior to liftoff (180 KGS max).
9. Forgetting to place nozzles aft once airborne.

Corrections for Errors:
1. Talk yourself through the procedures, if required.
2. Keep airspeed in your scan.
3. Expect that the nose will pitch up if not corrected on lift-off.

Source Documents: NATOPS, VMAT-203 SOP
Name: STOL Flaps STO

Purpose: The STO can be used for the widest variety of aircraft configurations, weights and runway conditions provided that crosswinds remain within specified limits. Nozzle Rotation Airspeed (NRAS) and nozzle angle calculation can be performed using the NATOPS performance charts, Mission Planning System (JMPS / OPSTA) or mission computer VREST function.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. The following techniques are provided for further clarification. Set computed NRAS, PC to 14° and STO-stop to 60°. Flaps should be in STOL. Call tower for takeoff. Perform the engine accel checks and initiate takeoff roll. At NRAS, rotate the nozzles to the STO-stop and allow the aircraft to un-stick while guarding the stick. Maintain wings level, center the vane, then smoothly set takeoff attitude (“Witch’s Hat” symbol at pitch carets). Smoothly begin to nozzle out. A good nozzle rate should bring the velocity vector down to the vicinity of the “witch’s hat.” AOA must not exceed 15°. This is indicated by the “witch’s hat” being significantly higher than the velocity vector. Maintain a positive rate-of-climb by referencing the velocity vector above the horizon bars.
3. Use the velocity vector as a performance indicator, to help maintain a positive rate-of-climb and ensure that nozzle rate is commensurate with power margin. If settling on a STO – DO NOT PULL THE NOSE UP! Instead, put the nozzle lever back to the STO stop until the aircraft is again climbing.
4. Nozzle out to 25°, raise the gear, select AUTO flaps, and complete nozzle out. Prior to 250 KCAS, check all gear up (gear lights and light in handle should be out). Clear the STO-stop, check nozzles aft and select the NAV HUD Master Mode. Accelerate to 300 KCAS and comply with departure instructions.
5. The 15 sec light may illuminate during the takeoff roll / accelerating transition. The aim should be to get wing-borne as soon as excess power allows. Selecting the gear up / nozzles aft will reduce the engine speed / temperature and the 15 sec light will extinguish. However, if excess performance and pilot workload permit, a power reduction may be appropriate to extinguish the 15 sec light once the nozzles are set to 25°. Remember, the only reason to reduce power prior to the 15 sec light flashing is to preserve engine life; so don’t do it unless you have time and performance available.

Common Errors:

1. Tripping the limiters.
2. Late nozzle rotation.
3. Confusion between throttle and nozzle lever at NRAS.
4. Trying to set attitude prior to takeoff (pulling aircraft off the deck).
5. Over-rotation on STO.
6. Letting nose tuck on STO.
7. Improper nozzle out rate for performance.
8. Incomplete clean up after takeoff.
10. Nozzle out to less than 25° with flaps in STOL.
11. Over controlling the nose when centering the vane.

**Corrections for Errors:**

1. Do not slam the throttle.
2. Once power is in the corner, positively place your hand on the nozzle lever and keep it there.
3. Talk yourself through the procedures.
4. 3-Point STO technique = Level the wings, center the vane, set the attitude.
5. Keep some pressure on the “other” rudder pedal to help minimize the amount of rudder application used to center the vane.

**Source Documents:**  
**Video:** STO from Inside the Cockpit, NATOPS, VMAT-203 SOP
Name: VTO / Hover / VL (Press-up)

Purpose: These procedures describe how to transition the AV-8B from a stationary position on a pad to a stable hover position and complete a vertical landing. Once established in a hover the vertical landing procedures listed here will be applied, the only change may be how you arrived into the hover.

Description of Procedures:

1. NATOPS “Vertical Takeoff”; NATOPS “The Hover”; NATOPS “Vertical Landing” contains the specific procedures, the following techniques are provided for further clarification. Request position on a pad. Ensure there is sufficient performance in accordance with the VMAT-203 SOP. Check the windsock near the pad and line up into the wind when cleared for position.

2. Complete the takeoff checklist (use 0, 0, - 1 trim for TAV-8B). STOL flaps and check the aileron droop. Report “1 FINGER COMPLETE” to the IP or LSI and request “PRESS-UP” at the pad – “MARS-9XX, PRESS-UP, SOUTH PAD” with the tower. Once clearance for takeoff / press-up has been received from the tower and IP, perform accel checks. Report “2 FINGERS (or 5 FINGERS if wet), HOVERSTOP” to the IP or LSI. The IP or LSI will acknowledge and announce “CLEARED TO LIFT.” Add full power while maintaining wings level, proper nose attitude, and heading. The primary scan is now out to the front of the aircraft and through the HUD to ensure top end RPM and water flow (if required) and that the wings remain level. Once airborne, your scan should shift to the side to ensure no fore or aft drift. Do not release the brakes until airborne. Passing 30-40’, reduce power slightly to arrive in a 50’ hover. If the aircraft climbs above 60’, gradually arrest the climb, stabilize at the altitude, and then reduce power slightly to acquire a 50’ hover.

3. Pilot workload can be reduced by scanning, trimming, and relaxing. Establish a scan pattern from forward of the aircraft to about the 90° position, either left or right. Drifting and altitude deviations can be more readily perceived with a proper scan. While in the hover, attempt to fly formation on an object. Pick an object far enough away so that you can see the “whole world”, and not fixate on a point so far under the aircraft that the horizon is not in view. Keep scanning. Remember, if you are squared away in one axis of the hover, you are probably drifting in the other.

4. A vertical landing should be started from a stabilized hover. Check that the aircraft is pointed directly into the wind (centered vane). If the winds are shifting, choose a heading and hold – do not chase the vane. When cleared to land by the IP or LSI, and when you are comfortable, reduce power slightly (1-2% RPM) to establish a ROD. To maintain the desired ROD, a small power addition may be required. Continue to descend, controlling ROD with power. Maintain a constant ROD all the way to touchdown. At touchdown, throttle to idle, apply brakes, nozzles aft, water switch off, trim 4° nose down, and clear the pad if necessary. Allow the engine a “cooling off” period as per NATOPS prior to any further press-ups.

5. Key to success: TRIM, SCAN, RELAX!
Common Errors:

1. Trying to VTO at 50° nozzles.
2. Nozzling out to 10° after run-up checks.
3. Brake slide on run-ups.
4. Incorrect nose trim on the VTO.
5. Over-controlling the power during a press-up.
6. Over-controlling flight controls in hover.
7. Chasing the vane with light and variable winds.
8. NOT SCANNING OUTSIDE!
9. Drifting to land.
10. Scanning out only one side of the cockpit.
11. Not enough rate-of-descent to land.
12. Excessive rate-of-descent to land.
13. Late Idle.
14. Drifting forward after touchdown.

Corrections for Errors:

1. Trim, Scan, Relax.
2. Do your checklists slowly and deliberately.
3. Hold the brakes on run-ups. If you start to slide, reduce power, set nozzles to 50°, and reset power.
4. After liftoff, place the outside of your hand on the rail next to the throttle and make small power corrections.
5. Pick an object to keep the nose pointed at and do not chase the vane with light winds.
6. Look to the sides to see forward and aft drift – DO NOT STARE AT THE HUD.
7. Touchdown = Idle, Brake, Nozzles aft, water switch off.

Source Documents: Video: Press-up from both inside and outside the cockpit, NATOPS, VMAT-203 SOP
Name: VTO Accelerating Transition (VTO-Accel)

Purpose: The VTO acceleration is used to transition the aircraft from a completely stopped position on the runway or pad climbing straight up and changing from jet-borne to wing-borne flight.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. The VTO portion is the same as with the press-up procedures but instead of remaining in a hover you will transition to forward flight. The acceleration can be done in two ways, either into the true wind or crosswind. The into-wind acceleration will keep the true wind, and therefore the relative wind, directly in front of the aircraft’s nose. In the crosswind acceleration you fly specific ground track while using the rudder to keep the relative wind on the nose (zero sideslip). In order to establish the proper ground track, you must first point in our desired acceleration line and then begin to nozzle out, while keeping sideslip under control.
3. The following techniques are provided for further clarification. Complete the takeoff checklist, (use 0, 0, -1 for TAV-8B), STOL flaps, and check the aileron droop.
   a. RP: “1 FINGER COMPLETE.”
   b. IP / LSI: “Request takeoff.”
   c. RP: “MARS-9XX, VTO, SOUTH PAD, DOWNWIND” or “MARS-9XX, VTO, SOUTHPAD TO RETURN.”
   d. Tower: “MARS-9XX cleared for take-off.”
   e. Conduct accel checks, when complete…
   f. RP: “2 FINGERS HOVERSTOP” or “5 FINGERS HOVERTOP” (if wet).
   g. IP / LSI: “ROGER HOVERSTOP CLEARED TO LIFT.”
   h. VTO into the true wind.
   i. At 50 feet initiate the appropriate accelerating transition.
4. The accelerating transition will be performed using one of two methods depending upon the amount of crosswind present.
   a. Continuous Crosswind Accel: When the difference between the desired acceleration track and the true wind is less than 30° a continuous acceleration may be used as described in NATOPS. Passing 50', set accel attitude (14° PC) and begin to nozzle out while leaving the throttle at full power. Center the vane prior to 30 KCAS, and continue nozzle out while maintaining a climbing flight path, in the same manner as defined in the STO procedures.
   b. Non-Continuous Crosswind Accel: When the difference between the desired acceleration track and the true wind is greater than 30° with a wind velocity of 5 knots or greater a non-continuous acceleration will be used as described in NATOPS. The maximum allowable difference between the acceleration track and the true wind for RPs is 45°. A difference greater than this requires a change in the acceleration track. The difference in this method is that as the aircraft reaches 50 feet power is reduced to stabilize in the hover after which a
pedal turn is initiated to the desired acceleration track. The pedal turn is stopped, full power is selected and then the accelerating transition is commenced. Center the vane prior to 30 KCAS, and continue nozzle out while maintaining a climbing flight path, in the same manner as defined in the STO procedures.

5. Regardless of which method is used it is critical to have the vane centered prior to 30 KCAS because above this speed any yawing moment may cause an unrecoverable rolling moment. Your rudder pedals will instantly remind you that you are not “zeroing” out sideslip by shaking the appropriate rudder pedal that must be pressed to reduce sideslip. The accel must be performed wings level until reaching 120 KCAS because any rolling moment below this airspeed may cause uncontrollable AOA or sideslip buildup.

6. Initially, the amount of crab to the acceleration line will be largest with slow airspeed. As the airspeed increases the relative wind component will align towards the acceleration track as the effects of the true wind proportionally decreases so the amount of crab required will decrease.

Common Errors:

1. See press-up errors for errors during the VTO.
2. Drifting forward or aft after takeoff because you are not scanning out the sides.
3. Once acceleration line has been set, either crabbing too much or too little and not following your desired ground track during transition.
4. Not setting the takeoff attitude / heading.
5. Improper acceleration (nozzle rate).

Corrections for Errors:

1. Continue to trim, scan and relax.
2. Scan left and right to notice forward or aft drift.
3. Maintain the vane centered throughout accelerating transition.
4. Just like on a STO accelerating transition, keep the wings level, center the vane and then start nozzling out while you set the attitude.

Source Documents: Video: VTO/ACCEL from both inside and outside the cockpit, NATOPS, VMAT-203 SOP
Name: RVTO

Purpose: An RVTO may be performed in those instances when a VTO is desired but the takeoff surface is deemed unsuitable.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. The RVTO requires approximately 100’ of ground roll and should be made as nearly into the wind as possible. The RVTO can be performed up to hover weight as calculated in the performance data. The VREST page does not provide the hover weight calculation, so VTO weight should be used as a conservative measure.
3. With clearance from the tower and your IP initiate the accel checks. The significant difference concerning the "one-finger" checks is the placement of the STO Stop to 70° and returning the nozzles to 30° for the takeoff roll. The remainder of the T/O is the same as a STO except that the nozzle rotation is at 110% RPM instead of at an NRAS. RPM is indicated by three legs of the performance hex in the HUD.
4. As the airspeed is very slow, a good three-step STO technique is vital for performance margin and aerodynamics.

Common Errors:

1. Tripping the limiters.
2. Not calculating VTO the performance.
3. Forgetting to set STO stop to 70° and not returning the nozzles to 30° after run-ups.
4. Late nozzle rotation (excess of 110%, 3-legs of the hex).
5. Confusion between throttle and nozzle lever.
6. Trying to set attitude prior to takeoff (pulling aircraft off the deck).
7. Over-rotation.
8. Improper nozzle rate for performance.

 Corrections for Errors:

1. Do not slam the throttle.
2. Once power is in the corner, positively place your hand on the nozzle lever and keep it there.
3. Talk yourself through the procedures.
4. 3-Point STO technique = Level the wings, center the vane, set the attitude.
5. Use the velocity vector to judge performance margin.

Source Documents: Video: RVTO, NATOPS
Name: After Takeoff Checks

Purpose: To transition the aircraft from the takeoff to wing borne flight and execute a VFR or IFR climb out.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. It is important to develop a consistent habit for this stage. The nozzle out is interrupted at 25° to put the gear up and select flaps to AUTO. Once those two actions are taken care of, continue the nozzle out and complete the remainder of the checklist.
3. With the check list complete, check these additional items. Check that duct pressure is 0-3 psi. Check that your APU, if in STBY, has not shut down by exceeding 325 KCAS. If the EHSD or MAP was selected at the conclusion of the “2 or 5 fingers” checks it will be easy to start heading in the right direction for the working area or the first point of navigation. Take one last look at the VSTOL master mode, making sure the Flaps are up and the Nozzles are 0°. Make the selection of NAV master mode the final step of the After Takeoff Checklist. This final step should be conducted only when all other steps are complete and can serve as a reminder of your clean aircraft status.

Common Errors:

1. Nozzling past 25° when in STOL flaps.
2. Not nozzling out fully.
3. Forgetting the STO Stop.
4. Over-speeding the Gear.

Corrections for Errors:

1. Be meticulous in this checklist.
2. Develop your game plan by “chair flying” the takeoff; expect events to happen quickly after takeoff.

Source Documents: NATOPS, VMAT-203 SOP
Name: VMC Climb

Purpose: To fly the aircraft from the takeoff to an appropriate cruising altitude in the most fuel-efficient manner possible.

Description of Procedures:

1. Aircraft performance will vary widely from aircraft to aircraft and from day to day; the following should give you some techniques for the climb.
2. After cleaning up the aircraft, accelerate to 300 KCAS. The intent is to capture a full power 300 KCAS climb. This will require controlling the airspeed with the nose by beginning the pull-up well ahead of 300kt. It is not uncommon for it to require 20 to 35° nose up to maintain this profile. A look at the NATOPS performance charts, they show that an AV-8B will climb to FL 180 in 90 seconds covering only 9 NM. Ensure you abide by local course rules and are clear of the VFR traffic pattern before initiating your climb.
3. One technique is to begin the level off at climb angle x 100. Example: +20° climb = 2000' lead. To level off, pull the power back to approximately 60 PPM fuel flow and allow the nose to fall through to the horizon. If the level-off was initiated late it may require AOB or a bunt to hit the assigned altitude. As level-off altitude is captured be sure to reset cruise power setting.
4. During the climb contact departure and gain entrance into the area. It is also important to begin a turn to the first point of navigation. If the intent is to level off below 10k MSL, the climb will be at 300 KCAS using the same techniques as above, however, full power might be too much and a reduced power climb should be used.

Common Errors:

1. Excessive climb attitude during initial takeoff.
2. Excessive airspeed in the climb.
3. Blowing level off altitude or using negative G attempting to not miss it.
4. Flying the aircraft into clouds on a VFR flight plan.
5. Leaving power at full when leveling off and not checking and setting VRST / CRS maximum range profile.
6. Waiting too long to talk to controlling agency
7. Not adhering to VFR cruising altitudes.
8. Not navigating to the first point.

Corrections for Errors:

1. AVIATE: NAVIGATE: COMMUNICATE.
2. Use nose attitude to control airspeed in VFR climb.
3. Think ahead and lead the level-off appropriately, 25° nose high with only 1000 feet of altitude to level-off will not work.
4. Use the same procedures for level off every time (velocity vector on horizon bars, fuel flow to 50-60 ppm, navigate to appropriate waypoint, check and set VRST / CRS data, then communicate).

Source Documents: NATOPS, VMAT 203 SOP
Name: Handling Drills

Purpose: The handling drills are intended to provide a basic understanding of how the aircraft handles with power, flap, landing gear, nozzle angle, and trim changes.

Description of Procedures:

1. The instructor pilot will first demonstrate an energy maintaining turn using 360 KCAS and full power. Note the rate-of-turn and that airspeed is maintained. If rate-of-turn is increased by increasing AOA or “G” note that buffet will increase and that airspeed will be decreasing. You will then have the opportunity to examine flight characteristics.

2. Between 10,000 to 12,000’ MSL inside the R5306A examine turn performance with AUTO flaps and Cruise flaps by conducting level turns. Ensure you have 360 KCAS and utilize full power. Note the energy sustaining “light buffet” turn.

3. Descend to 5000 to 7000’ MSL.
4. Slow the aircraft below 250 KCAS.
5. Lower the landing gear and select the V/STOL HUD Master Mode
6. Note the in-transit yellow lights followed by the green down and locked indications.
7. Select 25° nozzles
8. Note the AOA change.
9. Select STOL flaps
10. Note the green STO light on.
11. Slow the aircraft to 10 units AOA and stabilize at altitude
12. Practice some mild level turns.
13. Select 50° nozzles and again slow to 10 units AOA
   a. As you decelerate through 165 KCAS the flaps will program to 62° and droop will occur, causing a nose-down pitch that may require a large back-stick input and additional power to overcome.
   b. Initially, AOA will decrease to 2-4 units and you will have to keep power reduced to slow to 10 units AOA.
   c. Anticipate adding power to stabilize at 10 units AOA.
   d. Note the DROOP advisory light on and the flap indicators.
   e. Practice level and descending turns to get a good feel for how the aircraft will handle in the landing pattern.

14. When complete – Add full power.
15. Establish a positive rate-of-climb.
16. Raise the landing gear.
17. Nozzle out to 25°.
18. Select AUTO flaps.
19. Nozzle out to 0° and ensure all landing gear lights are out.
20. Reselect the NAV HUD Master Mode.
Common Errors:

1. Flying out of the working area.
2. Rough application of angle of bank.
3. Rough velocity vector control on turns.
4. Trying to pull into mild or heavy buffet and bleeding airspeed during hard turns.

Corrections for Errors:

1. Use the EHSD and waypoints to keep the aircraft in the working area.
2. Always relax back stick pressure prior to rolling into an angle of bank.
3. Do not snap on the “G.”
4. Reference the AOA in the HUD for optimum turn performance.

Source Documents: N/A
Name: Approach to Stall, Clean and Dirty

Purpose: The purpose of the approach to stall is to introduce wing-rock, buffet, AOA control and recovery procedures.

Description of Procedures:

1. Intentional Stalls are prohibited in the TAV-8B.
2. Select VSTOL HUD Master Mode.
   a. Clean:
      i. At an intermediate altitude (10,000-12,000’), select cruise flaps and idle power.
      ii. Maintain level flight to slow the aircraft down to approximately 17-18 units AOA.
      iii. At the onset of wing-rock or buffet (this may happen prior to 17-18 units) initiate recovery by first breaking the AOA with forward stick, and then apply full power while monitoring sideslip. It is imperative that forward stick be initiated first because going full power from idle will tend to make the nose pitch up exacerbating your AOA problems. The goal is to get the AOA to 10-12 units and recover back to the original altitude with minimum altitude lost.

   WARNING

   When slowing to 17-18 units AOA, smoothly increase AOA above 14 units; do not “snap on” AOA or “snatch” the stick. Flight in the TAV-8B below 120 KCAS in a nose high condition is prohibited by NATOPS.

   iv. Select Flaps – AUTO.

   b. Dirty:
      i. At an intermediate altitude (10,000-12,000’), slow the aircraft below 250 KCAS, lower the landing gear and establish 10 units AOA, flaps – AUTO, nozzles – AFT, and level flight.
      ii. Adjust flight as necessary to slow to 15 units AOA.
      iii. At 15 AOA or onset of wing-rock / buffet initiate recovery by first breaking the AOA with forward stick, and then applying full power while monitoring sideslip.
      iv. With AOA back at 10-12 units, raise the landing gear and recover to the original altitude with minimum altitude lost. Ensure all gear lights out.
Common Errors:

1. Not reducing the AOA with both stick and throttle.
2. Rough application of back-stick pressure.

Corrections for Errors:

1. Do not “snatch” the stick
2. To reduce high AOA always unload the back-stick pressure, and expect a nose up pitch with the application of full power.

Source Documents: N/A
Name: SAAHS-Off Flight and Landings

Purpose: To give experience and confidence in flying and safely recovering the AV-8B during emergency situations where the Stability Augmentation System (SAS) of the Stability Augmentation and Altitude Hold System (SAAHS) is degraded or not functioning.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. It should be remembered that this is an emergency and that the landing pattern should be slightly longer and the approaches should be slightly flatter than the normal patterns. This will allow you to better trim the aircraft, minimize the dynamics of the approach and landing, and avoid excessive rates of descent.
3. Any discussion on the skills and procedures for safe recovery of an aircraft that has degraded or failed SAAHS must begin with an understanding of the aircraft’s inherent stability in the various regimes of flight:
   a. Pitch: The airplane is neutral to unstable in pitch in the VSTOL regime. As the airspeed decreases below approximately 120 KCAS, during a decel with the nozzles down, you must begin to program the stick forward and trim nose down to counter the increasing nose-up pitch tendency. There is a “neutral point” around 100-110 KCAS where the airplane will tend to maintain its attitude. Forward extending stores, water, and engine thrust (adding power) can further increase the instability. In ground effect on roll-on landings and during the decel, approaching the hover, and while executing the vertical landing, the AV-8B II+ and TAV-8B’s nose often tends to drop unless this is anticipated.
   b. Yaw and Roll: The jet is increasingly stable in yaw and roll at speeds above 60 – 70 KCAS as the airflow over the vertical stabilizer contributes a strong counter-force to yaw and aerodynamic flight controls regain effectiveness. The jet, however, is near neutral stability in yaw and roll between 50 – 60 KCAS and unstable below 50 KCAS. In addition to honoring the one-half lateral stick limitation, you must control yaw at all times using the wind vane, rudder pedal shakers, and VSTOL ball (HUD sideslip indicator) because appreciable yaw between 30 – 90 KCAS can lead to loss of control due to sideslip-induced roll.

4. VSTOL roll stability:
   a. The VSTOL rolling moment = Q x A x B (airspeed x angle of attack x sideslip). As with any algebraic equation, if any two of the terms of the equation have a large value, then even a small value for the third will create a large rolling moment (which leads to a departure and other resultant bad things). If airspeed and AOA are high (i.e. 100 KCAS and 15 units), then only a small amount of sideslip will produce a large rolling moment. A high AOA and large amount of sideslip will also produce a large rolling moment at a low airspeed.
b. Normally, near the ground, changes in airspeed and sideslip are easily noticed because of visual cues; however, AOA can increase rapidly with no obvious indications. AOA will increase rapidly with sink rate, but more dangerously, it will increase instantly with roll if any sideslip is present. The result is an almost instantaneous loss of control. If any factor can be kept to zero, then the product of the equation is zero. The key to avoiding roll due to sideslip during VSTOL flight is to keep sideslip at zero. This is why we keep the nose into the relative wind on all VSTOL evolutions and NEVER fly a crosswind approach using the wing-down top-rudder method.

5. SAAHS-off VSTOL (RVL and Decel / VL):
   a. Most of the system malfunctions that cause the SAAHS to become degraded or fail will also require you to do an RVL or VL to land the aircraft therefore we must understand the capabilities of our primary flight control in the semi-jetborne and jetborne environment, the reaction control system:
      i. The reaction controls are relatively weak compared to aerodynamic controls in conventional flight. Reaction controls are an “acceleration demand” control which means that their thrust displaces the aircraft in the desired direction at a slowly increasing rate. Aerodynamic controls, on the other hand, are more powerful “rate demand” controls which cause a more dramatic and immediate displacement of the aircraft (assumes that there is sufficient wind across the control surfaces – starts at approximately 60 KCAS and increases with airspeed.)
      ii. This is why holding the nose of the aircraft at the desired attitude is so important. If the nose movement is not controlled, it can accelerate at a rate at which the reaction control system cannot overcome. This happened in an AV-8A mishap where the pilot “dumped” the nose from a hover to do a bow at an airshow and built up a rate that was unrecoverable. The TAV-8B in a hover at lower fuel weights (approximately 2000 pounds and below), uses approximately two-thirds of the available RCS power to hold the nose up because the CG is slightly forward of the center of thrust. Care must be taken so momentum, gravity, and pitch rate do not overtake the reaction control effectiveness.
      iii. There is only a finite amount of control effectiveness available from the reaction control system. A simultaneous demand from all axes results in a reduced amount of power from each RCS and, therefore, a relatively diminished reaction control capability. Flying the aircraft in balanced flight (wings-level and into the relative wind) will help reduce the overall bleed demand and provide more available pitch and roll control power / effectiveness.

b. The key to a successful SAAHS-off VSTOL landing is anticipation, smooth airwork, and proper trimming of the aircraft. A different pilot technique is required because you essentially have to do the job of the SAS by immediately correcting any excursions from balanced flight that may build up a rolling moment and
prevent a safe landing. SAAHS-off VSTOL should be done into the wind to keep sideslip at zero and maintain balanced flight. In addition to reducing the opportunity for a rolling moment to build, this reduces the number of variables you must account for and thereby reducing your work load.

c. When performing a SAAHS-off landing, you should lower the landing gear early and trim it for level flight (either for a straight-in or in the landing pattern). You should then fly a slightly longer pattern to allow more straight away to trim and ensure the approach is into the relative wind. You should fly a slightly flatter approach (avoiding unnoticed AOA buildup with increased rates of descent) and look for normal cues for the proper position to select hover stop. Hover stop should be selected so braking stop and excessive nose up profiles are not required to stop the aircraft over the landing spot. This would dramatically increase pilot workload. If this condition occurs, a wave off should be initiated and the approach tried again. Bottom line on the decel: think “vanilla”, immediately correct deviations from balanced flight, trim the aircraft, keep the vane centered, and be smooth.

d. During the decel and in the hover until landing, the vane must be kept into the wind at all times. This may be a challenge because the nose will want to wander and you will need to actively control the aircraft to keep it centered. Any deviations in roll or yaw must immediately be countered so rates that exceed control power / effectiveness are not exceeded (remember the finite capability of the accelerating reaction controls).

e. As with all VSTOL, on SAAHS-off VSTOL you must fly the aircraft all the way to the deck. Deviations cannot be allowed to go unchecked and the rate of descent must be kept under control. If there are winds approaching or exceeding 15 knots, a power addition in close must be anticipated so a controlled descent can be made and a power bounce can be avoided. This is especially important with the fast decel solenoid being disconnected.

f. The selection of an RVL or VL is a factor of several considerations. The first of these considerations starts with the type of landing NATOPS recommends for the aircraft malfunction. Other considerations include winds, runway length, condition, and surface, type of malfunction(s), available performance, and others. For example, on a calm day a SAAHS-off RVL (there will rarely be a time when a 5-6 degree RVL is required – 3 degree should be sufficient in most cases) should be easily controllable. However, with a significant crosswind, a vertical landing may be a better choice as long as the additional power requirement is anticipated and performance margin is available.

Common Errors:

1. Over-controlling aircraft, especially in roll and yaw.
2. Not trimming, which can lead to over-controlling the aircraft.
3. Not scanning vane / sideslip indicator and allowing excessive sideslip buildup.
4. Losing track of other flight parameters (airspeed, altitude, AOA, etc.) while focusing on roll and yaw control.
Corrections for Errors:

1. A good rule of thumb for roll control in SAAHS-off flight is only input half of the stick deflection that you think you need and then evaluate. There is no such easy gouge for the rudder; you must expeditiously input whatever is required to maintain zero sideslip. Typically rudder input will need to be made during turns (the approach turn can quickly become exciting), sustained crosswinds or in gusty wind conditions. Be careful to continually scan the vane or sideslip indicator while you have a rudder input in, especially below 50 KCAS, because the aircraft’s instability will typically require an input in the opposite direction to negate the sideslip caused by the first correction. You will typically not input a rudder correction and leave it in. Think of it as having to “dance on the rudders.”

2. Trim the aircraft to steady state flight; this will significantly reduce your workload.

3. Keep your scan moving through all the other flight parameters to ensure you do not drop critical information while you are wrestling with the jet.

Source Documents: NATOPS, VSTOL Pilot’s Book of Corporate Knowledge
Name: VFR Overhead

Purpose: The VFR entry will be used to recover the aircraft during VMC.

Description of Procedures:

1. Check out of the working area and contact the controlling agency for VFR monitors to the overhead. Ensure you fly an appropriate VFR altitude, and cruise airspeed; if below 10k MSL remain at 250 KCAS. The descent profile is conducted at 230 KCAS, AUTO flaps, and idle power.

2. At Cherry Point, approach control will typically give you an initial descent to 4000 feet and then hand you off to arrival control for final sequencing. If given pilot’s discretion for altitude, use the VRST / BNGO displays DCRG to determine when to start your descent. A visual indication that you are approximately at your descent range is to designate the airfield WYPT and when the designation diamond reaches approximately 6° depressed it is about time to start your descent. Remember this is just a rule of thumb, so you will need to take into account the fact that you are not descending to the airfield, but to the initial and then finally the break altitude. It will, however, prevent you from descending late, requiring an excessively steep / high rate of descent dive into the airfield (remember the “minute to live” rule).

3. Utilize the EHSD steering to help obtain a “visual” of the airfield. Report “FIELD IN SIGHT” to the Arrival controller, de-colonize IFF mode 3C and contact the tower with position and intentions. Comply with the local course rules to the runway initial. Arrive in the overhead at 350 KCAS for the break.

4. Execute the break in a level turn by simultaneously rolling and retarding the throttle to idle as you extend the speed brake. With the AOB set, initiate a 4-G level turn until you intercept 10 units AOA to downwind. Continue your turn to the reciprocal runway heading, roll out then descend to pattern altitude. Once below 250 KCAS and established on downwind, lower the landing gear, select V/STOL HUD Master Mode, RADALT in the HUD, select 25° nozzles, select STOL flaps, (if required,) and complete the landing checklist. Decelerate to 8-10 units AOA and adjust the heading to arrive with the correct abeam distance for the type of landing to be performed.

5. One potentially dangerous handling characteristic of the AV-8B can be experienced out of the break on the downwind. Loss of horizontal stabilator effectiveness when the flaps program down greater than 25° can cause a nose down pitching moment that must be arrested with RCS pressure from the forward RCS duct. This effect is most pronounced in the TAV-8 due to the heavier nose. The problem develops when the flaps are allowed to program with the throttle back at idle, providing very little pressure to the RCS. A typical scenario that induces this is a weak pull in the break that does not decelerate the aircraft quickly so on the downwind the pilot is fast abeam with the throttle still back at idle while selecting gear down, nozzles to 60° and flaps to STOL. At the 180 position the pilot starts the approach turn descent and as the aircraft finally decelerates through the 165 KCAS the flaps program from 25° to 62° near instantly causing a strong nose down pitching moment. Because the aircraft is fast, the pilot still has the throttle back at idle trying to get on-speed with...
little RCS pressure to stop the nose. This coupled with already being in a
descending approach turn can put the aircraft in an extreme nose low attitude with a
high rate of descent and very little altitude to recover. The fix for this problem is to
add power prior to the flaps programming to energize the RCS system so you have
control power to stop the nose down pitch.

**Common Errors:**

1. Excessive airspeed below 10,000’.
2. When returning to the initial, not flying a precise VFR cruising altitude.
3. Forgetting to de-colonize mode 3C in pattern and / or forgetting to select the
   RADALT HUD altitude in pattern.
4. Weak pull to downwind resulting in a pattern that is too wide abeam and fast.
5. Descending in the break.
6. Allowing flaps to program at idle power or close to the ground.

**Corrections for Errors:**

1. Be precise with altitude and airspeed control.
2. Pull 4 “G’s” to 10 units AOA in break.
3. Keep turn in for 180° to reciprocal runway heading.
4. Scan the velocity vector in the turn.

**Source Documents:** Course Rules Brief, NATOPS, MCAS Air Ops Manual
Name: VFR Straight-in

Purpose: To recover the aircraft to airfield under VMC flying directly from the working area to the duty runway. The straight-in will be used when appropriate, directed by approach or during emergencies when aircraft controllability is questionable.

Description of Procedures:

1. Check out of the working area and contact the controlling agency for VFR monitors for the VFR straight-in. Ensure you fly an appropriate VFR altitude, 250 KCAS below 10,000’ MSL and utilize the EHSD steering to help obtain a “visual” of the airfield. Report “FIELD IN SIGHT” to the arrival controller. De-colonize IFF mode 3C and contact the tower with position and intention to fly the VFR straight-in.

2. The tower will normally direct you to report three miles with the gear. Comply with the local course rules and set up for the straight-in by using the EHSD course line dialed in for the duty runway on the TACAN or waypoint for airfield. Within 10 NM of the field or prior to the initial for the straight-in, slow the aircraft below 250 KCAS and lower the landing gear. Select the V/STOL HUD master mode. At the initial for the straight-in (1000’ MSL, 5 DME from Cherry Point) select nozzles and flaps as appropriate, and complete the landing checklist. From the initial, proceed directly to the duty runway maintaining altitude until intercepting a 3° glide slope to the intended point of landing. A 3° glide slope can be established by placing the intended point of landing at your 3° nose down location in your HUD. Once the intended point of landing is in the desired position, place the velocity vector at 3°. By 3 NM ensure aircraft is configured for the intended landing and report “MARS-9XX, 3 MILES, GEAR DOWN.”

Common Errors:

1. Not complying or unfamiliar with the course rules.
2. Excessive airspeed.
3. Poor altitude control.
4. Forgetting to de-colonize mode 3C and / or RADALT in the HUD.
5. Incomplete landing checklist.
6. Descending at the initial leading to a low, flat approach.
7. Leaving the nozzles at 25°: FAST all the way.

Corrections for Errors:

1. Disciplined airspeed and altitude control.
2. Fly your own GCA using the waypoint and Course line.
3. Use the velocity vector and HUD pitch ladders to set up 3° glide slope.

Source Documents: Cherry Point Course Rule Brief, MCAS Air Ops Manual
Name: Landing Pattern

Purpose: To describe the procedures for flying the landing pattern.

Description of Procedures:

1. NATOPS explains the general procedures required to accomplish the four major methods of landing the AV-8B. These are the slow landing (FNSL / VNSL), conventional landing (CL), rolling vertical landing (RVL), and vertical landing (VL). Where the NATOPS is very general in its description of the various landing procedures, this section will go into great detail. Most notable in their absence are pattern numbers and associated groove lengths. The following is a list of terms and some general considerations.

2. Abeam: The abeam position is defined as the position where the aircraft is abeam the intended point of landing on the downwind leg of the pattern. For SLs, the intended point of landing should be past the arresting gear. For CLs, the intended point of landing is the approach end numbers. For RVLs, the intended point of landing will be briefed by the instructor. It will be abeam either an appropriate distance remaining board (i.e., 3-board, 4-board etc.), or a taxi / runway intersection, (i.e., abeam “A” taxiway). For VLs, the desired pad is the intended point of landing. In order to develop a good sight picture for the proper abeam distance, utilize your AMPCD – EHSD by having the home field waypoint selected and the runway course line dialed in. In the lower left corner of the EHSD a delta-course line will be displayed, which is your aircraft’s actual distance from the course line. Use the following abeam distances:
   a. STOL flap landings: 0.8 -1.0 NM abeam
   b. AUTO flap slow landings: 1.0- 1.2 NM abeam
   c. CL landings: 1.3 -1.5 NM abeam distance

3. Timing from abeam (for Winds):
   a. > 20 KNOTS - Delay 5 sec past abeam
   b. 11-19 KNOTS - Delay 10 sec past abeam
   c. 10 KNOTS - Delay 15 sec past abeam

4. Groove: The groove is defined as the wings-level portion of the approach to landing. Groove length varies for different landings and is determined by the timing off the abeam position. Timing off the abeam must be adjusted to compensate for the headwind component down the duty runway.

5. Start: The start is the beginning of the groove. At this position, the aircraft should have the approach turn completed and the aircraft should be wings-level tracking down the extended runway centerline. If there is any crosswind present, a wings level crabbed approach should be flown.

6. Key: The key is only used on a decelerating approach - RVL or VL. The Key is the position where the pilot selects the final nozzle angle (hover stop or thereabouts) and sets the decel attitude. This position is dependent on aircraft ground speed, altitude, winds (headwind / tailwind) and type of landing.
7. **Touchdown point**: The first landing of each sortie shall be beyond the arresting gear to ensure it is not rigged. If the first landing must be a conventional landing, confirm with tower that the gear is de-rigged and land at the approach end.

8. **Power nozzle braking (PNB)**: All landings except RVLs / VLs will require selecting 98° nozzles after touchdown and assessing groundspeed.

9. **Landing rollout to position for takeoff**: If you have just completed a landing and desire to position for takeoff, request “POSITION FOR TAKEOFF” from the tower during the final portion of your rollout. If the tower directs you to “TAXI TO AND HOLD SHORT”, read back the clearance and stop well clear of any aircraft preparing to launch. Also ensure that your tail is clear of the landing rollout. If cleared into position, note the windsock position and taxi onto the runway centerline in the short or long, as directed. Once stopped, either in position or holding short, you may begin the takeoff checklist. When takeoff checks are complete, report “ONE FINGER COMPLETE” to the IP and proceed as noted previously for STO / CTO.

10. **Pattern**: The pattern altitude at MCAS Cherry Point is 1000’ AGL. Ideally we would prefer to fly a 600’ AGL pattern which would allow a constant 3° glideslope from the 180 position to landing, but this is not an option at Cherry Point. Since our target altitude at the 90° position is between 500’ and 600’ AGL, it will require us to fly a steeper 5° glide slope from the 180° to the 90° position, then the 3° glide slope from the 90° to the point of intended landing. All landings performed in the “1000’ pattern” will require this same steep descent to arrive at the 90°. From the 90° use the altitude gates to aid you in arriving at the proper groove altitude. Due to the differences in desired end states, slow landings and conventional landings will use one set of gates and rolling vertical landings and vertical landings will use another set of gates.

11. **Landing gates**:
   a. **Slow landing / CL gates**: The desired end state for the various slow and conventional landings is to rollout with a groove length between 3800-4200’, (approx 0.7 NM), and a 3° glide slope to your point of intended landing. With the trigonometry already done for you, that works out to a gate of 200-225’ AGL for your rollout altitude. Backing up from there, between 350-450’ AGL at the 45°, and 500-600’ AGL at the 90°. These gates allow some flexibility and prevent too much concentration on hitting an exact number.
   b. **RVL and VL gates**: Even though the groove lengths of these two landings are slightly different, use the same altitude gates to get there. For the RVL and the VL, the groove length, or “Key” is approximately 3500’ at 325’ AGL. Backing up to the “45°” and the “90°” on a 3° glide slope, we should find ourselves at 350-450’ AGL and 500-600’ AGL respectively.

12. **Water usage**: Water usage will be in accordance with current squadron SOP. Water checks should be performed at 60° nozzles with water switch in T/O position and water flow confirmed by “W” in the HUD or flow indication on EDP and decrease in total water quantity.
Common Errors:

1. Not committing the pattern numbers to memory.
2. Incomplete landing checklist.
3. Not turning or timing off your intended point of landing.
4. Too wide abeam.
5. Poor heading control on downwind.
6. Poor altitude control.
7. Fast at the abeam position leading to a poor approach to landing.
8. Long in the groove.
10. Forgetting the nozzles at 25° from the 180.

Corrections for Errors:

1. Commit each landing type altitude and gates to memory.
2. Utilize the time displayed in the HUD to allow for appropriate timing from the abeam position to the 180°.
3. Set yourself up for success by getting the aircraft configured and trimmed up by the abeam position.
4. Use the EHSD delta Course line to control abeam distance.
5. Listen up on the radio and pay attention to crosswinds.
6. Get to a good start.

Source Documents: NATOPS
Name: Landing Checklist

Purpose: The landing checklist will be completed prior to every landing to ensure the aircraft is configured for landing.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. It should sound like this:
   a. “GEAR – DOWN”
   b. “FLAPS - STOL (AUTO)”
   c. “STO STOP IS CLEARED”
   d. “DUCT PRESSURE CHECKS GOOD”
   e. “BRAKE PRESSURE CHECKS GOOD”
   f. “WARNING AND CAUTION LIGHTS ARE OUT” (or what lights you see)
   g. “WATER IS NOT REQUIRED” or “CHECK PERFORMED AND ARMED TO LND”
   h. “LANDING LIGHT IS ON”

Common Errors:

1. Missed items on checklist.
2. Interrupted by radio or ICS and not finishing.
3. Trying to select STOL flaps without nozzles greater than 25°.
4. Not clearing the STO-Stop.
5. Excessive airspeed on water check.
6. Forgetting to select the correct position for the water switch.
7. Not checking all warning and caution lights prior to landing.
8. Not checking the RCS duct pressure.

Corrections for Errors:

1. Perform procedures IAW NATOPS.
2. Do not pay “lip service” to any landing checklist item, read the actual quantity that you are looking for and ensure it is within the correct parameters. Never assume! Pilots have made unintentional gear up landings in this aircraft, don't be the next.
3. Always physically check the water switch in the correct position.
4. If interrupted on checklist or missed an item – START THE CHECKLIST OVER.

Source Documents: NATOPS
Name: Wave-off

Purpose: A wave-off may be required due to a fouled landing area, an unsatisfactory approach or insufficient power.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. The following procedures apply to all wave-offs:
   a. Add full power (if not already selected)
   b. Ensure positive rate of climb, then initiate accelerating transition
   c. Maintain a centered vane
   d. When safely climbing away, reduce power as necessary and call "WAVING OFF."
   e. Do not exceed 15 units AOA.
3. Under extreme circumstances, such as water failure or loss of thrust, a positive rate of climb may not initially be possible with full power alone. In this situation, a level or possibly descending flight path may be required to achieve wing borne flight prior to establishing a positive rate of climb. It is important to understand the relationship between aircraft attitude and nozzle angle. Increasing nose attitude without a continued reduction in nozzle angle will result in further deceleration. Again, in these circumstances, the goal is to achieve wing borne flight as soon as possible.
4. Wave-off procedures should not be confused with missed approached procedures that are listed later in this chapter.

Common Errors:

1. Not adding full power or maintaining positive rate-of-climb.
2. Trying to nozzle out to less than 25° prior to moving the flaps to AUTO.
3. Incorrect accelerating transition.
4. Incomplete clean up.
5. Over-speeding the landing gear.

Corrections for Errors:

1. Comply with procedures

Source Documents: NATOPS, VMAT-203 SOP
Name: STOL Flap FNSL

Purpose: The fixed nozzle slow landing is the recommended slow landing technique because it is easier to accomplish and less costly in fuel than the variable nozzle slow landing.

Description of Procedures:

1. Fixed nozzle slow landings: “Fixed-nozzle” landings get their name for the simple fact that you put the nozzles in a fixed position and don’t move them until after touchdown. With high temperature and pressure altitude and at heavy gross weights, care must be exercised as wave-off capability may be degraded. (In those instances, a variable nozzle landing may be preferred).
2. NATOPS “fixed nozzle slow landing (FNSL)” contains the specific procedures.
3. The following techniques are provided for further clarification.
4. On downwind select STOL flaps and complete the landing checklist. Approaching the abeam position select 60° nozzles. Slowing through 165 KCAS the aircraft will tend to “balloon” and pitch nose-down as the flaps program and ailerons droop. Check for a “DROOP” light. Anticipate the power requirements as the aircraft slows and the AOA increases toward 8-10 units. Make an abeam call to the tower – “MARS-9XX, ABEAM, GEAR, SLOW.”
5. Turn off the 180° and maintain aircraft glide path with stick and 8-10 units AOA with power. Target 500-600’ AGL at the 90°, 350-450’ AGL at the 45° and 200-225’ AGL in the groove. This will require approximately 5° glide path from the 180 to the 90 and 3° from the 90 to the groove. Ensure a good lineup with the runway centerline as you roll out of the final turn. In-close (30-50’ AGL), set the landing attitude (“Witch’s Hat” on to 2° above the horizon). Once the attitude is set, power controls the rate-of-descent, and a power adjustment will be required to maintain a proper ROD (200-400 FPM).
6. The aircraft’s nose tends to fall through in close due to stabilator exhaust impingement. At touchdown, select idle and PNB as required. Engage NWS when tracking straight and with the rudder pedals exactly centered.

Common Errors:

1. Trying to set a nose attitude and fly AOA like the training command.
2. Missing checkpoint altitudes.
3. Overshooting or angling approach.
4. Over-controlling the power in close.
5. Improper landing attitude.
7. Improper crosswind landing technique.

Corrections for Errors:

1. Fly the glide slope with the nose.
2. Control AOA with power.
3. Make a correction for lineup at the 90°.
4. Set the landing attitude at 30-50' AGL and hold the witch’s-hat on the horizon, expect a nose down pitch in close. Also once the landing attitude is set, control rate-of-descent with power.

**Source Documents:**  
**Video:** Fixed Nozzle Slow Landing from both inside and outside the cockpit, NATOPS
**Name:** Auto Flaps VNSL

**Purpose:** The variable nozzle slow landings are used when a constant throttle setting is required, (i.e., oil light, stuck throttle, high, hot and heavy, etc.). AUTO Flap VNSLs are used when there is not enough power available for a STOL Flap VNSL.

**Description of Procedures:**

1. NATOPS “variable nozzle slow landing (VNSL) contains the specific procedures.
2. The following techniques are provided for further clarification. On downwind, ensure the nozzles are no greater than 25° then select AUTO flaps and complete the landing checklist. On downwind select 40-50° nozzles. Set desired power, and as the AOA increases, anticipate the nozzle movement required to stabilize at 8-10 AOA.
3. It is important to achieve level flight at 8-10 units AOA and to reference the nozzle angle required to maintain that condition. This nozzle angle will serve as an effective reference angle from which all other adjustments are made. Make an abeam call to tower – “MARS-9XX, ABEAM, GEAR, SLOW.” Adjust the nozzles to fly 8-10 units AOA throughout the remainder of the pattern. If your AOA is low, a slightly greater nozzle angle must be used – but be patient and monitor the AOA trend. If the AOA is high, nozzle out slightly. Anticipate the nozzle movement. If you wait until reaching 10 units AOA, your AOA will over shoot and your rate-of-descent will increase. The stick controls the aircraft’s glide path and the nozzles are now controlling AOA.
4. Off the 180 fly the velocity vector to the 5° pitch bar then wait for the AOA to settle. The combination of AOB and descent to the 90 should require little nozzle adjustment if you started from level flight stabilized at 8-10 AOA. Target 500-600’ AGL at the 90°, 350-450’ AGL at the 45° and 200-225’ AGL in the groove. Monitor your AOA and runway lineup all the way.
5. As you roll wings level you will see a drop in your AOA. You can anticipate an addition of nozzles to maintain 8-10 AOA as you roll into the groove. Passing 100’ AGL you are cleared to use the throttle. Control ROD with the power. If you are fast at this point, you are better off increasing nozzle angle before you go to the power, (especially if it is for an oil light).
6. At 30-50’ AGL set the landing attitude. Continue to fly the aircraft all the way to touchdown. Remember, in order to land the jet with a 3° glide slope, you have to be at 10 units AOA. If you are faster than that, when you set the attitude, the velocity vector will rise and you will end up floating the landing. If you are slower than 10 units, when you set the landing attitude, you will have a higher rate-of-descent than desired.
7. A common mistake is to get slow (>10 units AOA) from the 90° to 45° position, and drop the velocity vector out of your scan. A low, slow condition is only compounded by reducing nozzle angle since initially the AOA increases as the nozzles are moved aft with no lowering of the nose. As a last resort, add power to reduce the AOA and rate-of-descent.
**Common Errors:**

1. Missed checkpoint altitudes.
2. Over-controlling the nozzles.
3. Improper angle of bank resulting in an overshooting or angling approach.
4. Over-controlling the power in close.
5. Improper landing attitude.
6. Letting the nose drop on touchdown.
7. Excessive rate-of-descent on landing.
8. Incorrect power setting.
9. Forgetting to make the call “GOING TO THROTTLE” at 100’ AGL to the instructor.
10. Excessive speed when rolling into the groove.

** Corrections for Errors:**

1. Fly the glide-slope with the nose
2. Control AOA with the nozzles
3. Make small nozzle corrections and wait for the correction to take effect
4. Make a correction for lineup at the 90°
5. Set the landing attitude at 30-50’ AGL and hold the witch’s-hat on the horizon, expect a nose down pitch in close. Also once the landing attitude is set, control rate-of-descent with power

**Source Documents: Video:** Variable Nozzle Slow Landing from both inside and outside the cockpit, NATOPS
Name: STOL Flaps VNSL

Purpose: The STOL-flap VNSL should be used in two instances. One is when we want to reduce our landing speed but we still want to maintain a constant throttle setting. The other is if we are executing a STOL-flap FNSL landing and we realize that we are going to be power limited. We would then transition to a VNSL.

Description of Procedures:

1. NATOPS “variable nozzle slow landing (VNSL)” contains the specific procedures.
2. The following techniques are provided for further clarification. The procedures and pattern altitudes are the same as the AUTO Flap VNSL.
3. The tricky thing about a STOL flap VNSL is the issue of flap programming. Since the flap switch is in STOL, the flaps can program all the way down to 62° as the nozzles are moved from 25 to 50°. This is a good thing because they provide a significant amount of lift. The problem faced is if you get slow and nozzle out past 50° the flaps start programming back up, effectively robbing precious lift and causing AOA to rise precipitously. In order to help prevent this abide by the following NATOPS limits. The minimum power setting for STOL flap VNSLs is 90%. This minimum should prevent you from becoming too slow in the first place. It does not imply that you should shoot for the minimum. The highest power setting allowable is 100%.
4. Of note, you will always have to do an AUTO flap VNSL for the oil light because 85% RPM required by NATOPS is below the 90% minimum for a STOL flap VNSL.

Common Errors:

1. Missed checkpoint altitudes.
2. Over-controlling the nozzles.
3. Excessive nozzle movement below 50 nozzles causing the flaps to program up.
4. Overshooting or angling approach.
5. Over-controlling the power in close.
6. Improper landing attitude.
7. Letting the nose drop on touchdown.
8. Excessive rate-of-descent on landing.
9. Incorrect power setting.
10. Forgetting to call “GOING TO THROTTLE” at 100’ AGL to the instructor pilot.
11. Excessive speed when rolling into the groove.

Corrections for Errors:

1. Fly the glide-slope with the nose.
2. Control AOA with the nozzles.
3. Make small nozzle corrections and wait for the correction to take effect.
4. Make a correction for lineup at the 90°.
5. Set the landing attitude at 30-50’ AGL and hold the witch’s-hat on the horizon, expect a nose down pitch in close. Also once the landing attitude is set, control rate-of-descent with power.

**Source Documents:**  

**Video:** Variable Nozzle Slow Landing from both inside and outside the cockpit, NATOPS
Name: Power Nozzle Braking (PNB)

Purpose: To safely decelerate the aircraft from landing speed to taxi speed.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. All landings except RVLs / VLS will require selecting 98° nozzles after touchdown and assessing ground speed. If situation dictates, use PNB. PNB will be required on all AUTO Flap landings.
3. Ensure trim is a minimum of 2° nose down before advancing the power to 70%.
4. Because the engine was at idle, it will take a few seconds for it to spool up. Do not continue moving the throttle forward until you see 70% because the engine will continue to accelerate past 70% causing you to possibly get airborne! A technique is to place the throttle to approximately the 60% RPM position (you should have a general idea of this throttle location from all your two-finger checks) and allow the RPM to catch up and stabilize then advance it further to stabilize at 70%.
5. Do not use the brakes while performing PNB. If using PNB, at 60 KGS, reduce power to idle, ensure the nozzles are out of braking stop and use brakes as needed.
6. If PNB is not required, the RP will indicate this to the IP, receive concurrence, and at this time, place the nozzles back to hover stop. As the aircraft slows below 60 KGS, decrease the nozzle angle to 60° and then match the nozzle angle to ground speed (50° nozzles at 50 KGS, 40° nozzles at 40 KGS, etc.) down to 30 KGS at which point nozzles can be placed to 10° if ground speed is under control.
7. If you are above 100 KGS passing the “3-board,” a roll and go shall be executed.

Common Errors:

1. Slow to select braking stop.
2. Not verifying full braking stop prior to advancing throttle.
3. Not trimming 2° nose down prior to advancing throttle.
4. Inappropriate power settings for ground speed.
5. Using wheel brakes during PNB.
6. Not terminating PNB at 60 KGS.

Corrections for Errors:

1. Be smooth and deliberate with PNB execution and procedures.

Source Documents: NATOPS
Name: Conventional Landing (CL)

Purpose: The CL is used primarily when our reaction control system is suspect due to fire or other damage. Other than these instances the only reason to do a CL is to practice in the event that we find ourselves in any of these instances.

Description of Procedures:

1. It requires a substantially greater distance to stop a CL than a SL or RVL due to the fast approach speed and the brake design. The brakes were designed primarily for V/STOL and are marginal for a CL without PNB. For this very reason it is not recommended to commit to a CL where you do not plan on using PNB.

2. NATOPS "conventional landing (CL)" contains the specific procedures.

3. The following techniques are provided for further clarification. On downwind select AUTO flaps and complete the landing checklist. Check your duct pressure and then nozzle aft to 0°. Make the abeam call to tower – "MARS-9XX ABEAM, GEAR, CONVENTIONAL, REQUEST OPTION."

4. Use the stick to control the aircrafts glide path and power to control AOA (10 to 12 units). Target 500-600' AGL at the 90°, 350-450' AGL at the 45° and 200-225' AGL in the groove. Be aware that if you delay your turn from the abeam you will have to bump up your altitudes.

5. As you roll out on final anticipate the decrease in AOA. This will require a slight power reduction to remain on speed. Check to ensure that you are below that maximum tire speed, 180 KGS. A 3° glide slope at typical CL approach speed will yield a rate of descent at touchdown that approaches or exceeds the maximum allowable by NATOPS. Therefore, on final, fly a 3° glide slope and flare to establish a 2 to 2.5° glide slope on touchdown by increasing AOA from 10 units to 12 units in close.

6. At touchdown, select idle and begin PNB. With the aircraft tracking straight and the rudder pedals centered, engage NWS. Do not use wheel brakes while in braking stop or you will blow the tires due to the ineffectiveness of the anti-skid system during PNB.

Common Errors:

1. Too close abeam.
2. Fast at the 180°.
3. Long in the groove.
4. Overpowered in the approach turn.
5. Inadequate AOB resulting in an overshooting or wrapped up start.
6. Low and flat approach.
7. Over-controlling the power in close leading to a land long.
8. Forgetting to slow to 12 units on final.
10. Late PNB / selecting HS vice BS.
11. Excessive power on PNB (getting airborne).
12. Not enough power on PNB.
13. Landing in STOL Flaps.

**Corrections for Errors:**

1. Get to a good start by flying the proper abeam distance and slowing the aircraft to 10 units AOA.
2. Note the winds and make a correction for lineup at the 90°.
3. Fly 3° glide slope, flare to achieve 2 to 2.5° glide slope prior to touchdown.
4. Set the landing attitude in close.
5. Ensure flaps in AUTO.
6. Delaying or slow onset of PNB.

**Source Documents:** *Video:* Conventional Landing from Both Outside and Inside the Cockpit, NATOPS, VMAT-203 SOP
Name: Hover Stop Slow Landing (HSSL)

Purpose: The purpose of the HSSL is to give you a slower landing speed and reduce landing rollout distance.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. To amplify the NATOPS it is important to mention that removing your hand from the throttle and moving the nozzles to hover stop requires well thought out and deliberate actions.
3. At 10-20 feet above the runway select hover stop and the place your hand back on the throttle and manipulate it to maintain a constant rate of descent all the way to touch down. Immediately after selecting hover stop the aircraft will gain lift, but will very quickly decelerate which will reduce wing lift. This must be compensated for with engine lift (i.e. increasing throttle) to maintain a constant rate of descent.
4. Be methodical and continue to fly the jet to the deck.

Common Errors:

1. See STOL flaps FNSL for approach errors.
3. Adding too much power in close resulting in “floating” down the runway.
4. Pulling the nose up to land.

Corrections for Errors:

1. Keep the rate-of-descent constant once selecting the hover stop position.

Source Documents: NATOPS
Name: “Touch and Go” or “Roll and Go” Landings

Purpose: To get airborne after landing without coming to a stop.

Description of Procedures:

1. There are three types of touch-and-go landings: the touch-and-go (no intent to PNB), refused landing (PNB commenced) and the roll-and-go.
2. The touch-and-go (no intent to PNB) can be initiated on touchdown from a SL or CL. On touchdown, smoothly apply full power. Allow the aircraft to break ground, ensure wings level, center the vane, and set the takeoff attitude as you begin to nozzle-out, or CTO as before. If idle is selected anytime after touchdown, execute roll-and-go procedures.
3. Refused landing (PNB commenced) applies whenever the PNB procedures were begun after landing. Cease PNB by selecting idle and moving the nozzles to 10°. Advance the power to full. When RPM reaches 3-legs of PMI (110%), smoothly increase the nozzle angle until aircraft becomes airborne (this typically occurs between 25-50° nozzles). As the aircraft becomes airborne, ensure wings level, center the vane, and set takeoff attitude while nozzleing out. These procedures will most likely be used on a CL, which failed the <100 KCAS check at the 3-Board.
4. A roll-and-go can be initiated from any roll-on landing. On touchdown, select idle and ensure aircraft is tracking down the runway. Move the nozzles to 10°, and select full power. When RPM reaches 3-legs of PMI (110%), smoothly increase the nozzle angle until aircraft becomes airborne. As the aircraft becomes airborne, ensure wings level, center the vane and set the takeoff attitude as you begin to nozzle-out.

**NOTE**

On the touch-and-go especially, but also on the roll-and-go’s, avoid tripping the limiters when selecting full power.

Common Errors:

1. Selecting IDLE on touch-and-go.
2. Tripping the limiters.
3. Confusion between nozzle and throttle levers.
4. Bringing in nozzles too quickly on roll and go resulting in nose tuck.
5. Incorrect procedures (i.e. roll and go during planned touch-and-go).

Corrections for Errors:

1. Think of hand movements on touchdown – Never rush.
2. Smoothly input nozzles until aircraft becomes airborne.
3. Make smooth deliberate hand movements.
4. Never slam the power in the corner.
5. If incorrect procedures performed, complete current landing.

Source Documents: N/A
Name: RVL

Purpose: The rolling vertical landing is a precision landing intended to be used at a forward site, road, short or damaged airfield. The emphasis on the RVL is a precision landing to a defined point on the airfield using a target glide slope of 4-5° (VMAT -203), and 60 KGS.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. The following techniques are provided for further clarification.
3. RVLs are often the beginning of performance limited landings for a FAM flight. Particular attention needs to be given to updating the performance numbers. Up to an hour has passed since takeoff when you left the pattern with current ATIS information. A lot can change in that time that could have a dramatic effect on your performance numbers.
4. On downwind, select STOL flaps, complete the landing checklist, and fly 8-10 units AOA. Approaching the abeam position, select 60° nozzles, make your abeam call to tower – “MARS-9XX, ABEAM, GEAR, RVL.” Ensure you have sufficient performance using the following NATOPS and SOP RVL capabilities:

<table>
<thead>
<tr>
<th>SPEED (KCAS)</th>
<th>NATOPS RVL CAPABILITY</th>
<th>VMAT-203 SOP LIMIT FOR RP SOLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>VL + 2700 LBS</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>VL + 3100 LBS</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>VL + 3500 LBS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VL +2000 LBS</td>
</tr>
</tbody>
</table>

5. Extend off the abeam to produce a groove length of 3500’. This will be your Key position or the point at which altitude and nozzles are set for landing. This will be a different sight picture than you are used to. Remember to begin your timing abeam your intended point of landing, which will usually be a 3-board at Cherry Point or the end of the carrier box at Bogue Field. The aircraft’s track over the ground will carry you over the approach end at 325’ AGL and look as though you are flying too tight and too high.

6. As you begin your descent off the 180° a combination of stick and power reduction should be used to establish a 5° glide-slope and AOB as required to arrive at the 90° position at 500-600’ AGL. At the 90° position, reset the glide-slope to 3°. As you reach the 45 position your altitude should be 350-450’ AGL. At the 45° position you can adjust your nozzles to 68-73° depending on winds. Continue your glide-slope looking to “Key” on runway centerline 3500’ prior to the touchdown point at approximately 325’ AGL. With the wings level and the vane centered set the landing attitude. The intent is to maintain your 3° glide-slope to intercept a 4-5° glide-slope to the intended point of landing.

7. If your groove length was correct, you should find your point of intended landing at 4-5° in the HUD, at which time, start your final descent. If you are long in the groove,
you will have to shallow out your initial flight path and if you are tight you will have to start down the 5° glide-slope right away. If you are long in the groove, do not descend below 200’ AGL prior to intercepting a 4-5° glide-slope.

8. At your final descent point, holding your attitude constant, (“witch’s hat” on the horizon), reduce power slightly to begin your 5° descent. Control rate of descent with power and ground speed with your nozzle angle. Scan your lineup and ensure AOA no greater than 15 units. Visually assess glide-slope with reference to the HUD and intended point of landing.

9. AOA is a function of the angle between the witch’s hat and the glide slope. A 4-5° glide slope with the witch’s hat on the horizon will typically yield AOA between 12-14 units. If late starting the final descent and high on the glide slope, a higher rate of descent is required to correct this, but increasing the rate of descent without a corresponding decrease in nose attitude (witch’s hat below the horizon) will cause the AOA to overshoot the 15 unit NATOPS limit. If the nose attitude is decreased to prevent the AOA from exceeding the limit the effective nozzle angle will be decreased which will cause the aircraft to decrease its deceleration or even accelerate causing a deviation from the target 60 KGS. It is recommended to not allow a “high” situation to occur in the first place to prevent these compounding problems. In close, just prior to touchdown if a “high” situation has developed, it is unacceptable to drop the nose below the landing attitude while reducing power to increase the rate of descent to fix the high without exceeding 15 units AOA because this will cause an excessive rate on touchdown and could cause the aircraft to strike the ground nosewheel first, damaging the aircraft. Your only options at this point are to maintain the landing attitude and use power to fly the proper rate of descent / AOA. This will cause a “land long”, but will not damage the aircraft. If the land long will cause lack of runway remaining to become critical, execute a wave-off.

10. While on glide-slope keep the aircraft on runway centerline and maintain 60 KGS ground speed. Optimum rate of descent for a 5° RVL is 500 FPM. If there is any crosswind present, a wings level approach should be flown using smooth rudder to assist the aircraft in its natural alignment just prior to touchdown. Note: When rudder input is required to align the nose of the aircraft with the runway, a power addition will normally be required since the aircraft is now flying an out of balance condition. Failure to add power or to take out crab prior to touchdown can result in an increased ROD causing the aircraft to “wheelbarrow” on rollout.

11. At touchdown, select idle, allow the aircraft to settle on the runway, and smoothly apply brakes. When tracking straight down the centerline of the runway and with rudder pedals centered, engage NWS. Selection of idle at touchdown is mandatory to keep the aircraft from power bouncing. When comfortably tracking straight down the runway, the nozzles should be reset to 10° and the water switch selected to OFF (if armed).

Common Errors:

1. Timing to the 180° from the end of the runway vice abeam the intended point of landing.
2. Too wide abeam.
3. Improper rate of descent off the 180° resulting in a high altitude at the 90° or 45° position.
4. Descending below 200’ AGL prior to intercepting a 4-5° glide-slope to the intended point of landing.
5. Forgetting to transition the nozzles to 68-73 at the 45°.
6. Chasing line up and letting your scan break down.
7. Late to start rate of descent to the intended point of landing and then reducing power excessively resulting in high AOA.
8. Over-controlling the power to the intended point of landing.
9. Accepting line up off centerline or lateral drift.
10. Excessive rate-of-descent on landing.
11. Late idle.
12. Pulling the nose-up in close.

Corrections for Errors:

2. Utilize the HUD 5° pitch ladder to fly glide-slope. When the velocity vector reaches 5° down it will flash, therefore you will need to scan the intended point of landing relative to the pitch ladder if you choose to fly a 5° glide-slope. If you keep the intended point of landing at the 4-5° pitch ladder, you will fly a consistent glide slope. If you see the intended point of landing move to the 3° location then you have too much rate-of-descent. If the intended point of landing moves to the 6° location then you do not have enough rate-of-descent.
3. If high and not in close, decrease pitch attitude slightly while decreasing power to increase rate of descent to fix high without exceeding AOA limit.
4. Utilize a crabbed approach to maintain lineup and realize that your head is not the center of the airplane, the center of the airplane is well behind the cockpit.
5. If a crab is required some natural alignment will occur in close, if the nose is still not tracking down the runway, utilize rudder to take out the crab.
6. Do not accept excessive rate of descent / AOA to make your intended point of landing
7. Do not accept drift on landing.
8. When rolling out on final do not continue rate-of-descent below 200’ AGL until reaching a 4-5° glide slope to your intended point of landing.

Source Documents:   Video: RVL from both inside and outside the cockpit, NATOPS, VMAT-203 SOP
Name: Decel / VL

Purpose: The deceleration to a vertical landing is used to transition the aircraft from wing-borne flight to jet-borne flight. The deceleration to the VL can be performed in three different manners: Into the wind, Crosswind and with Braking Stop.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. Similar to the VTO / acceleration the deceleration to vertical landing can be done either into the wind or crosswind. Additionally, the use of a nozzle angle greater than 82° can be performed using the braking stop deceleration. Once established in the hover, the vertical landing is identical to the landing performed during a press-up.
3. The following techniques are provided for further clarification.
   a. Into wind decel: Fly a pattern similar to an RVL, but fly the pattern relative to the pad on which you are going to land. Fly a 10-12 unit AOA approach to intercept the key at 3500’ prior to the pad at 325’ AGL. With the wings level, select hover stop. (The key is where the VL descent point occurs – therefore, the pad is 5° below the horizon if you are at 325’ AGL.) Note the nozzle angle (82 +/- 1), and check the flap angle (62). Report – “HOVERSTOP” to the IP or LSI. Manage the power to maintain desired glide-slope and set the landing attitude (witch’s hat on the horizon). From this point until 30 KCAS the wings must remain level and AOA below 15 units. An engine performance check is required for all decels at 60 KCAS; if insufficient power exists, wave-off. In order for this check to be valid, the aircraft must be substantially level during the check. JPT should indicate no more than 735° / 109% dry or 755° / 115.5% wet. This is most easily seen with no reject selected in the VSTOL HUD as 2 sides of the PMI hex. Aim the aircraft for a position 150’ AGL above the pad and slightly offset to one side. This will allow you to keep sight and not FOD the pad in the cross. Control closure to the pad by making small pitch adjustments. Use rudder to keep the vane centered. A moderately large power addition can be expected as the aircraft slows down through 40-50 KCAS due to loss of wing lift. If your closure is under control the IP or LSI will report – “CLEARED TO CROSS.” Imagine a 45° bearing line extending out from the pad. When your flight path intercepts this bearing you should begin your cross by lowering your wing in the direction of the pad. When stabilized over the pad the IP or LSI will report – “CLEARED TO 50.” Reduce power to arrive in a 50’ AGL hover and complete the VL as described in the press-up procedures. If during the decel your closure is excessive, you will not receive a “CLEARED TO CROSS.” Continue to fly the aircraft to a position abeam the center of the pad at 150’AGL. Once you have the aircraft under control the IP / LSI will give you the clearance to cross.
   b. Crosswind decel: The most difficult item to comprehend on a crosswind decel is the fact that your ground track (momentum) will remain straight as long as your vane is centered while approaching the pad. To do this, you must first get the aircraft pointed at the pad and then center the vane as it becomes necessary.
This is the key to flying good crosswind decels. While at 60° nozzles approaching the 3500’ key, ensure your aircraft’s ground track is going toward the pad. It may not be in your HUD, so some interpolation may be necessary. After going to hover-stop there is initially not much requirement for centering the vane. The crab angle increases as your speed decreases, with the majority of heading change taking place at less than 50 KCAS. The same V/STOL aerodynamics which are applied on the accel apply here as well. This is a wings level approach. Resist the urge to use bank angle to correct for any misalignment in the approach until below 30 KCAS. To stop your aircraft over the pad with a wind on the beam, you can slightly raise a wing in the direction of your momentum while pulling nose up, if needed, but be sure the vane is centered. With a tailwind the approach is very much like a normal decel, unless you have a strong quartering tailwind. Once cleared over the pad complete the VL as described above.

c. **Braking stop decel:** Fly a pattern as before to slightly closer key (approximately 500’ closer). At the key, select hover stop and continue decel as before. The rate-of-closure to the pad will be greater than before, and an attitude adjustment will be insufficient to stop the aircraft over the pad. When this is realized, lift the nozzle lever over the hover stop and slide it part way into the braking position. Return your hand to the throttle and maintain appropriate glide slope with power; ensure not to exceed 15 units AOA until below 30 KCAS. If required, slide the nozzles further into braking stop. Power requirements will be more pronounced as airspeed will decrease more rapidly. With closure under control, ensure adequate power to hold altitude. To move the nozzles back to the hover stop use an open hand to slide the lever over the detent and visually confirm 82° in the HUD. Continue your decel as described above.

**Common Errors:**

1. Flying too wide abeam and long in the groove.
2. Timing for the 180° position when abeam the end of the runway vice timing off the pad.
3. Not offsetting to one side of the pad.
4. Early hover stop.
5. Forgetting the 60 knot check.
6. Becoming under powered and settling once selecting hover stop as wing lift decreases.
7. Having too much rate-of-descent to the pad and flying a low flat approach.
8. Poor attitude control.
9. Pulling power while increasing nose attitude to stop closure, resulting in a settle and rapidly rising AOA.
10. Overshooting the spot.
11. Letting wind push the aircraft away from the pad during crosswind decel.
12. Over-controlling the nozzle lever when moving the nozzles out of braking stop back to hover stop.
13. Letting altitude drop from scan and descending below 150’ AGL prior to cross
15. Improper water switch position.

**Corrections for Errors:**

1. Start your timing for the 180° position when abeam the pad.
2. Set up a 3° glide-slope to arrive abeam the pad at 150' AGL. This can be done by referencing the velocity vector and placing it beyond the pad vice directly abeam the pad, which will lead to a low approach.
3. When rolling out in the groove, check your ground speed to judge closure rate and hover stop cue.
4. After selecting hover stop, scan velocity vector for glide-path and rate-of-descent,airspeed for 60 knot check and groundspeed for closure rate. Keep the “witch’s hat” on the horizon to keep attitude constant.
5. Anticipate an increase in power as wing lift decreases to zero.
6. Do not descend below 150' AGL until cleared to 50' by your IP or LSI.
7. Scan to the sides to recognize fore and aft drift.
8. If using braking stop, add power to maintain altitude and then smoothly slide the nozzle lever forward until slightly past the hover stop detent, check HUD nozzle angle and reset 80-82° nozzles.
9. Trim, scan, relax.
10. Minimize your variables: Try to keep attitude and vane constant. Do not make corrections in more than one direction.
11. BS usage has a range of nozzle position. 98° is not always required.

**Source Documents:**  **Video:** Decel / VL both inside and outside the cockpit, NATOPS
Name: Box-Pattern

Purpose: The purpose of the box pattern is to develop your scan pattern and build confidence in your abilities to hover the AV-8B - not an “air-show.”

Description of Procedures:

1. Perform a VTO to a steady 50’ AGL hover as in the press-up procedures. Ensure you stabilize in a hover before beginning the box-pattern. When ready, dip a wing slightly towards the left to start a translation. When a small rate-of-movement has started, level the wings. When you desire to stop, dip the opposite wing slightly. When all lateral drift has stopped, level the wings again. Stabilize.
2. Raise the nose slightly to start an aft drift. When the desired rate is reached, lower the nose to the original attitude. When you desire to stop, lower the nose slightly until all aft drift has stopped. Stabilize.
3. Now translate sideways again this time to the right, to line up with the middle of the pad, then stop and stabilize.
4. Dip the nose slightly to start a forward drift. Prior to reaching the center of the pad, raise the nose slightly to stop all forward motion. As you stop, reset the correct hover attitude and stabilize prior to commencing a VL.
5. Be precise when executing the box-pattern. Separate the maneuver into individual tasks. Bleed usage during the box-pattern can cause an altitude loss; therefore, adjust power as necessary to maintain 50’ AGL, and monitor engine performance prior to and during the maneuver. Remember to reset the correct Hover attitude once the desired rate of movement has been attained. This maneuver will require you to scan your 3-9 line and straight ahead. If you do not scan both axes you will not be able to execute a precise drift in any of the prescribed directions. Remember that below 60 KCAS, the velocity vector is actually a vertical velocity indicator. Therefore if the velocity vector is at 0° pitch you are neither climbing nor descending. This should simplify your scan to the front.

Common Errors:

1. See Press-up procedures for common errors.
2. Overshooting desired hover position.
3. Not scanning out far enough to the side.

Corrections for Errors:

1. Scan outside.
2. Make a correction then reset the hover attitude and wait for the correction to take effect, once your reach your desired position a re-correction will be required.
3. Scan all the way to the 3-9 line, not just the 11-1 position.

Source Documents: NATOPS
Name: Pedal Turn

Purpose: The purpose of the pedal turn is to develop your scan pattern and build confidence in your abilities to hover the AV-8B - not an “air-show.”

Description of Procedures:

1. Perform a VTO to a steady 50’ AGL hover as in the press-up procedures. Apply rudder pressure in the desired direction of turn, and scan in the direction of turn. When the desired nose movement is attained, release the rudder pressure.
2. After approximately 90° of turn, the wind may actually accelerate the nose movement. Opposite rudder may be required to maintain a constant turn-rate.
3. Passing the 180° position, you may need some additional rudder in the desired direction of turn, because the nose is now coming back into the wind. When within approximately 30° of the original heading, apply opposite rudder to stop the nose.
4. Scan and fly the aircraft to remain over the center of the pad using AOB and pitch as necessary for winds. Bleed use during the pedal-turn can cause an altitude loss, so adjust power as necessary to maintain 50’AGL, and monitor engine performance prior to and during the maneuver.

Common Errors:

1. See Press-up procedures for common errors.
2. Overshooting desired hover position.
3. Rotating around the cockpit instead of the center of the aircraft.
4. Not anticipating wind effects.

Corrections for Errors:

1. Scan outside.
2. Make a correction then reset the hover attitude and wait for the correction to take effect, once your reach your desired position a re-correction will be required.

Source Documents: NATOPS
Name: Cruise Flaps Landings

Purpose: To recover the aircraft when a malfunction prevents the use of AUTO or STOL flaps.

Description of Procedures:

1. There are several malfunctions related to the flaps that may cause you to elect to place them in the cruise position for a recovery. Due consideration must be given to what that is going to do to your performance during the landing. You can expect that during a cruise flap approach to landing that you will have a higher approach speed for a given AOA and a higher throttle setting for a given nozzle angle. This is due to the loss of flap programming (25° in AUTO or 62° in STOL) causing the wing to create less lift which must be compensated for with either a higher approach speed or more engine lift. In STOL flaps the wing stalls between 40-50 KCAS. In cruise flaps stall occurs between 100-120 KCAS. Because of this, if you must do a cruise flap landing you will want to perform either an RVL or a VL if you have sufficient performance.

Common Errors:

1. Allowing AOA to exceed 15 units AOA in the landing configuration.
2. Settling during decel as airspeed goes below 100 KCAS and the wing stalls

Corrections for Errors:

1. Fly 10-12 units AOA throughout approach.
2. Anticipate power requirements as wing stalls earlier.

Source Documents: NATOPS
Name: Handling Aircraft Malfunctions and Emergency Procedures

Purpose: To successfully identify and correct or compensate for aircraft malfunctions / failures.

Description of Procedures:

1. Procedures are in accordance with NATOPS. The VMAT-203 SOP for Flight Operations also describes the standard manner and procedures for dealing with an emergency with both a single aircraft and a formation of aircraft in VMAT-203.
2. The following additional guidance for handling an emergency or malfunctions is provided:
   a. **Deal with immediate problem.** This is typically the immediate action items listed in NATOPS but you need to assess what is the biggest threat to yourself or the aircraft and deal with that first. An example of this would be getting an OIL caution light right after take-off. The immediate action from NATOPS requires you to pull the power back to 85% maximum power but doing so will cause you to settle back into the ground and crash.
   b. **Fly the aircraft.** While diagnosing the problem and determining and implementing immediate actions and emergency procedures you must still fly the aircraft correctly. You cannot allow the basics like altitude, airspeed, AOA and navigation fall out of your scan. Using our OIL light situation again, an example of not correctly flying the aircraft would be after getting the indication right after take-off, you climb to pattern altitude (good) and then maintain wings level as you go through your immediate action items and call base to back you up. While all of the procedures have been done correctly, you are now 5 miles upwind and have extended the amount of time that you must be airborne with an impending engine failure.
   c. **Identify the problem.** The warning and caution lights and audio system of the aircraft is very good at helping you determine when and what system has failed. However, you still need to go through a deliberate process of identifying the exact problem or problems if you have compound emergencies. If you do have multiple malfunctions or failures the next step in identifying the problem is to prioritize the malfunctions by severity. For example, a flap failure compounded with a fire light requires prioritizing of the procedures because they conflict with each other. The flap failure tells you to select 40° or greater while the fire light procedures requires you to get the nozzles aft ASAP. The Harrier is an incredible aircraft to fly but it is very intolerant of incorrect normal and emergency procedures. Therefore, you must be sure you have correctly diagnosed what the malfunction or failure is. “No fast hands in the cockpit.”
   d. **Determine corrective action / procedures.** If the emergency is covered by an immediate action then apply the appropriate procedures. If it is not an immediate action item and time is available, open your NATOPS pocket checklist or have you wingman do it, and read through the procedures to correct the problem. Regardless, of whether the emergency is covered with an immediate action item or not, call base and have the ODO review the procedures with you in a
challenge and response, including those that you have already performed to ensure that you have not forgotten anything.

e. **Implement correction.** After you have identified the problem and determined the proper procedures then deliberately and correctly perform the procedures.

f. **Evaluate response / effectiveness.** After performing the corrective actions your job is not done until the aircraft is safely back in the chocks, shutdown. You must continually evaluate the effects of your actions to ensure they were correct and effective and that no further degradations have developed.

g. **Apply common sense and systems knowledge.** As the Harrier continues to age, more and different system failures are developing that have not been seen before and were never anticipated by the engineers that initially designed the plane two decades ago. There is no substitute for strong systems knowledge. This is what will allow you to safely recover the aircraft in the event that you do experience a malfunction not covered by the emergency procedures sections in NATOPS.

3. Common compound emergencies:
   a. Fire light / flaps malfunction
   b. Low fuel / landing gear malfunction
   c. Oil light / electrical malfunctions
   d. Compound electrical / avionics malfunctions
   e. Stuck throttle or nozzles plus other malfunctions
   f. NORDO plus other malfunctions

**Common Errors:**

1. Not flying aircraft
2. Not correctly diagnosing problem
3. Not familiar with systems and corrective procedures.

**Corrections for Errors:**

1. Remember, Aviate, Navigate, Communicate… always.
2. Know your systems and procedures.

**Source Documents:** NATOPS, VMAT-203 SOP
Name: After Landing Checks

Purpose: The post-flight procedures will be performed when clear of the active runway to prepare the aircraft for shutdown or hot refueling.

Description of Procedures:

1. Procedures in accordance with NATOPS.

Common Errors:

1. Forgetting to safe the seat and canopy.
2. Failing to trim 4° nose down.
3. Forgetting to select cruise flaps during taxi back to line.
4. Forgetting to select 10° nozzles
5. Forgetting to call base once on deck.
6. Forgetting to record post-flight data.

Corrections for Errors:

1. Follow the checklist.

Source Documents: NATOPS
Name: Hot Brake / De-Arming Inspection

Purpose: To check the aircraft for hot brakes and to safe ordnance prior to returning to the line.

Description of Procedures:

1. At Cherry Point the hot brake check and de-arming of free-fall or captive carry ordnance will be conducted at the water tower adjacent to “B” taxiway.
2. Follow the plane captain’s signals in to parking. As you pull into the line area, select nozzles to 0°. Once stopped, set the parking brake and select cold nose wheel steering (anti-skid ON, SKID light out). After you have confirmed that the parking brake is on and NWS is cold, signal the plane captain to chock the aircraft. You will have to keep your hands up while the plane captain goes under the aircraft to chock it and to check the brakes just like in final checks.
3. If the aircraft needs to be de-armed [in the FAM stage you might fly with ITERs (bomb racks) on the aircraft that need to be “safed” prior to taxiing into the fuel pits or the flight line] the plane captain will then pass control of the aircraft over to an Ordnance supervisor who will signal you to show your hands while one of the Ordnance Marines goes under the wings to safe the ITERs.
4. After de-arming control will be returned to the plane captain who will once again signal you to show your hands while the chocks are pulled. You will then be directed to taxi either to the fuel pits or the line.

**WARNING**
The potential for injury to one of the maintenance Marines is high during the de-arming, hot brake check and watering evolutions if positive control of the aircraft control surfaces and awareness to ground personnel location is not maintained. There have been mishaps and quite a few near-misses due to a communication break down and lack of awareness with Marines in close proximity to the aircraft. You, as a Marine officer, must look after the safety of our Marines. If there is any doubt about whether it is safe to move a control surface or the location of any of the personnel around your aircraft, stop the evolution and get the plane captain’s attention to clarify.

Common Errors:

1. Forgetting to select 0° nozzles prior to pulling into the line area.
2. Not selecting cold NWS prior to clearing the plane captain to go under the aircraft.
3. Forgetting to have ITERs safed prior to refueling or pulling into the line.

Corrections for Errors:
1. Follow your checklists.

Source Documents: VMAT-203 SOP
Name: Hot Refueling Procedures

Purpose: Hot refueling is performed to refuel the aircraft with the engine running.

Description of Procedures:

1. Hot refueling will decrease the turn-around requirement for the maintenance department and provide the aircraft for training quickly to another pilot. During hot refueling, many of the post-flight shutdown procedures can be performed so that all that will be required is to taxi back to the line and shutdown.
2. Procedures are in accordance with NATOPS and the Cherry Point Air Operations Manual.
3. After refueling if you are flying a pit turn, you must return to the line to go through “final checks” again before taking off for your second sortie.

Common Errors:

1. Not performing or incomplete Hot Refueling checklist
2. Not monitoring fuel quantity, resulting in an asymmetric situation.
3. Forgetting to get “final checked” on a pit turn.

Corrections for Errors:

1. Monitor fuel during fueling.
2. You will always return to the line after going through the pits; either to shut down or for final checks.

Source Documents: NATOPS, MCAS Air Ops Manual
Name: Postflight Data Retrieval

Purpose: To record flight information to turn in to Maintenance.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. If the flight was flown in NAV you must update the INS and record the performance data for Maintenance. If the GPS is providing high quality data (no system degradations – DSEL, BIT codes or crypto not loaded), a GPS update is the easiest to perform. If you cannot perform a GPS update due to system failure or degradation then you must perform an overfly update using the LAT / LONG painted on the deck adjacent to the parking spot.
3. After recording the sortie JPT, reset the JPT by pushing “JPT” on push button 10 (top right corner of AMPCD).

Common Errors:

1. Forgetting to perform an INS update when one is required.
2. Forgetting to record the bearing and distance of the error prior to accepting it.
3. Forgetting to check and record the BOA codes.

Corrections for Errors:

1. Follow your checklists.

Source Documents: NATOPS
Name: Instrument Flight Planning

Purpose: To prepare for an IFR flight.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. You must create a navigation plan on JMPS for your flight plan. When performing terminal area delays (approaches) at an airfield other than your destination, create a delay at that location on your route that will equate to the amount of fuel needed for the approach (use 600 lbs for a TACAN penetration approach, 800 lbs for a PAR and 500 lbs off an en route descent to the final portion of an approach). The same technique should be used if any holding is planned.
3. You must have a DD-175 for all simulator and flight events. For flight events, let your IP review and approve your DD-175 a few minutes prior to your brief so you can fax the approved copy to Base Ops and Weather prior to the brief for your DD-175-1 and filing. If you have any questions on how to fill out the DD-175 refer to General Planning. The AV-8B uses an equipment code of HAR/I.
4. You must have the following publications for any instrument flight or simulator:
   a. U.S. IFR Supplement
   b. Flight Information Handbook
   c. High altitude IFR charts
   d. Approach plates for your destination, intermediate approach airfields and alternates

5. Review your route and be familiar with the en route NAVAIDS and fixes. Also study your approach plates and be intimately familiar with the approaches and SIDs for your destination, intermediate airfields and alternates.

Common Errors:

1. Not having the proper publications or a navigation plan.
2. Missing or incorrect DD-175.
3. Not incorporating delays into plan.

Corrections for Errors:

1. Have all required publications and planning.
2. Chair fly your plan and ensure you have not omitted anything significant and that you are familiar with the route and approaches.

Source Documents: NATOPS, Air NTTP, General Planning
Name: Instrument Takeoff and Climb Profile

Purpose: To perform a takeoff and departure climb in actual instrument conditions.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. If fuel is critical, obtain the clearance and a weather update while on the APU. Ensure the cockpit is properly configured, with the correct TACAN station, squawk, and INS point selected. Prior to takeoff into instrument conditions, ensure the APU is on-line and the standby instruments are operating correctly. Execute the briefed takeoff and ensure all post-takeoff checks are completed. Concentrate on the HUD instrument display prior to going IMC. Comply with the ATC clearance.
3. All climbs will be flown at 300 KCAS and maximum thrust (combat deselected) when VMC. If IMC is expected, a reduced power setting should be used to avoid disorienting flight attitudes. 10-15° nose-up is acceptable during IMC (power may need to be reduced to maintain 300 KCAS). Maintain 300 KCAS until intercepting the appropriate climb Mach - 0.75 Mach (AV-8B) / 0.78 Mach (TAV-8B) for a clean aircraft. If leveling off at an intermediate altitude less than 10,000 feet, use an appropriate power setting / climb angle. Lead level-offs by an appropriate margin to prevent breaking assigned altitudes. Breaking an assigned altitude may result in a flight violation. Ensure that 10,000’ and 18,000’ checks are completed.

Common Errors:

1. Excessive airspeed on climb-out.
2. Using power and not attitude to control airspeed on climb-out.
3. Exceeding 15° nose up in actual instrument conditions.
4. Not intercepting the appropriate climb Mach.

Corrections for Errors:

1. Make sure to set the appropriate power setting based on the conditions.
2. Set the correct power and then control airspeed with the nose.
3. If you have to exceed 15° then reduce power.
4. Make sure to intercept the correct Mach

Source Documents: INST Lesson, NATOPS
Name: Intermediate Level-offs

Purpose: To be able to level off at the appropriate altitude.

Description of Procedures:

1. Intermediate level-offs are inevitable. At intermediate level-off altitudes, you should pull the power back to maintain Max range cruise (approximately 6.5 units AOA for the AV-8B and 5.5 units AOA for the TAV-8B) which will require approximately 50 PPM for fuel flow. When climbing from an intermediate altitude, apply full power, accelerate to 300 KCAS / or appropriate climb Mach prior to establishing a climb. If the remaining altitude is small (less than 1 minute to complete), it is recommended that a full-power climb be initiated at the current KCAS / Mach. Above FL 300, it is imperative that you accelerate to the appropriate climb Mach prior to beginning the climb or you will not be able to maintain 500 FPM rate-of-climb.

Common Errors:

1. Blowing through assigned altitude.
2. Leveling off prior to assigned altitude.
3. Not reducing power during level-offs.

Corrections for Errors:

1. Start level off IAW procedures for VFR / VMC Climb

Source Documents: INST Lesson
Name: "Partial Panel" Instrument Procedures

Purpose: To safely control the aircraft in IMC with loss of primary attitude instruments.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. Cross-check all standby instruments to ensure they are erect and accurate, and establish the appropriate scan. If the AMPCD is still working, the HUD may be called up on the either AMPCD and flown as the primary reference. If only one AMPCD is operational, switch periodically to the EHSD display for current aircraft position. If the HUD and both AMPCDs have failed (e.g., generator failure), then a good standby-instrument scan must be established coupled with a no gyro approach.

Common Errors:

1. Not putting the HUD display in the AMPCD.
2. Not establishing the appropriate scan.
3. Erratic basic air-work.

Corrections for Errors:

1. Select the HUD display in the AMPCD.
2. Establish a good standby-instrument scan.
3. Ensure smooth airwork.

Source Documents: INST Lesson, NATOPS
Name: Unusual Attitude Recovery Procedures

Purpose: In order to develop solid instrument flying skills and good "SA" in order to correct for and avoid unusual attitudes.

Description of Procedures:

1. Unusual attitudes may be entered due to pilot disorientation, vertigo, excessive task-loading, or unusual maneuvering while IMC. Develop solid instrument flying skills and good “SA” in order to avoid Unusual Attitudes or correct them early. While the HUD is the primary flight instrument, it is sometimes difficult to immediately determine aircraft attitude and bank angle. The HUD horizon bars give reference to the nearest horizon by "pointing" to that horizon. Sometimes pilots must use a combination of HUD and head-down scan in order to determine the aircraft’s attitude and bank angle. To recover from an unusual attitude:
   a. Check altitude: If at low altitude, you may be forced to make an immediate recovery- vs. -ejection decision.
   b. Check attitude: Ensure that inverted nose-high is not confused with inverted nose-low.

2. Nose-High: If airspeed is 200-300 KCAS, leave the throttle as set. If 100-200 KCAS, add full power. Lower the nose to the horizon using a pushover, overbank, or nose-slice technique. Negative G pushovers may be vertigo inducing. If less than 100 KCAS, execute OCF procedures.

3. Nose-Low: Roll the shortest direction to wings-level and apply G (no greater than 15° AOA) until reaching the nibble of buffet. If airspeed passes 300 KCAS, reduce the throttle to idle and extend the speed brake. Check altitude above terrain and obstructions in the area.

4. Upon Recovery: Climb to safe altitude, determine the cause of the unusual attitude, and advise controlling agencies and your wingman of your altitude, position, and intentions.

   NOTE
   Unusual attitudes will only be performed in the simulator.

Common Errors:

1. Not recognizing correct attitude (nose-up or nose-down).
2. Not executing the correct procedure based on attitude.
3. Losing excessive altitude on recovery.

Corrections for Errors:
1. Use a combination of HUD and head-down scan in order to determine the aircraft's attitude and bank angle.
2. Execute the correct procedures.

Source Documents: INST Lesson, NATOPS
Name: Holding Procedures

Purpose: To correctly enter holding at the correct airspeed and use the proper entry procedure.

Description of Procedures:

1. Three minutes prior to entering holding, adjust power to arrive at the holding fix with maximum endurance airspeed (230 KCAS maximum). Either request maneuvering airspace from ATC or enter holding as published. Consider your turn radius, approximately 1 percent of your ground speed expressed in nautical miles, when turning onto the holding radial.

Common Errors:

1. Not entering holding at the correct airspeed.
2. Not using the proper entry procedure.

Corrections for Errors:

1. Make sure to slow to maximum endurance airspeed not to exceed 230 KCAS at least 3 min prior.
2. Make sure to enter holding using the correct procedure as indicated on the High Altitude Approach Plates.

Source Documents: INST Lesson, FLIP publications
**Name:** IFR Penetration Procedures

**Purpose:** The IFR penetration procedures will be applied whenever working VFR on top or if recovering to your destination by radar vectors, TACAN, or GCA.

**Description of Procedures:**

1. Procedures in accordance with NATOPS.
2. En route descents should be accomplished at idle RPM and 230 KCAS if single, or 250 KCAS, 30 PPM (for wingman) if in section. TACAN approaches are flown at 250 KCAS with AUTO flaps. To ensure that the aircraft systems and cockpit temperature are adjusted for descent from altitude, complete “SWIFTA” checks prior to commencing a descent or approach penetration. Be sure to place APU in standby mode once inside the start envelope if IMC is expected.

   **NOTE**

   Remember that a cold aircraft at altitude will fog up when descending to warm, humid conditions at the destination airfield. Prevent this with use of DEFOG as listed in the SWIFTA check.

3. The optimum profile is achieved by remaining at altitude as long as possible. With this in mind, and realizing that ATC will often direct your descents, the goal should be to begin your descent at a point in space that will allow you to fly a maximum-range descent profile and arrive at another point in space (IAF or VFR initial point) without leveling off early or adding power.

4. To determine the correct FPA and / or descent point, use the following data: 1° equals 1000' at 10 miles; a 230-knot idle descent gives a 6 to 7° FPA; therefore, an idle, 230-knot descent will lose 6-7000 feet in 10 miles.

5. Example - You are currently level at FL 330, and you want to descend to arrive at BENGY at 15,000'. There are 3 situations to discuss:
   a. Unrestricted - Knowing that you need to lose 18,000 feet, you should use an idle, 230-knot descent as described above. This will take approximately 30 NM (assuming a 6° FPA).
   b. ATC directs you to start your descent at 45 NM prior to BENGY. Knowing that this is earlier than your optimum descent point, you should use a 4° FPA, 230-knot descent using minimum throttle necessary.
   c. ATC directs you to maintain altitude until 20 NM prior to BENGY. You should use an idle descent with an FPA of approximately 10° and we don’t care what airspeed, as long as you are not supersonic.

**Common Errors:**

1. Not setting the correct power setting.
2. Poor airspeed control.
3. Getting to the assigned altitude early and having to add power.
4. Not getting down to the assigned altitude by the appropriate time.
5. Not doing the penetration checklist.
6. Starting APU outside start envelope.

**Corrections for Errors:**

1. Make sure to calculate an appropriate descent rate in order to arrive at your assigned altitude and the correct time.
2. Know the APU starting envelope.

**Source Documents:** INST Lesson, NATOPS
Name: TACAN Approach Procedures

Purpose: The TACAN approach is performed for IFR recoveries.

Description of Procedures:

1. Use the EHSD course steering switch in conjunction with the AMPCD to give a plan view of aircraft position. (Don't forget - you must have TCN or TO/S boxed to get the "course line" to appear). Enter the IAF as a TACAN offset. If holding is required, slow to 230 KCAS 3 minutes prior to reaching the holding fix. 9 Units AOA should be used as a maximum endurance setting if experiencing a long holding delay. Shoot the approach at 250 KCAS. Lower the landing gear approximately 5 NM prior to the FAF. With the gear down, maintain 8-10 units AOA. At 1-2 NM prior to the FAF, set 25° nozzles, select STOL flaps and complete the landing checklist. Report the FAF with the gear. Maintain 8-10 units AOA on the approach. Target airspeed of 170-175 KCAS will keep the aircraft from experiencing any "droop" from the flap system. If landing off the approach, at circling minimums or as briefed, transition to 60° nozzles, and maintain 8-10 units AOA. TAV-8B aircraft have a noticeable nose down attitude when the flaps program at 165 KCAS with the throttle at idle. Mid throttle position will ensure you have the RCS energized to compensate for the nose drop. Readjust power to maintain the velocity vector on the intended point of landing, trim the aircraft, and check lineup.

Common Errors:

1. Flying the approach off the offset or INS waypoint instead of the TACAN.
2. Forgetting SWIFTA Checklist.
3. Overshooting the initial approach fix.
4. Chasing radials and poor altitude / airspeed control.
5. Not enough rate-of-descent to make altitudes.
6. Forgetting landing checklist.
7. Forgetting to select V/STOL HUD Master Mode.
8. Not resetting the LAW.

Corrections for Errors:

1. Always fly the approach using the TACAN channel and back up with waypoint.
2. Use the course line and delta-course line to avoid overshooting radials.
3. Study the approach prior to execution.
5. Whenever lowering the landing gear select V/STOL.
6. Set your LAW up for platform check and then reset to HAA.

Source Documents: INST Lesson, FAM Lesson
Name: RADAR Approach Procedures (PAR, ASR)

Purpose: Radar controlled approaches are used for IFR recoveries.

Description of Procedures:

1. Procedures in accordance with NATOPS.
2. The approach configuration is AUTO flaps and 250 KCAS while on the downwind / base leg, using standard-rate turns (approximately 30° AOB). Lower the landing gear when directed by the controller or no later than base leg. Leave the flaps in AUTO, maintain 8-10 units AOA, and use standard-rate turns (approximately 20° AOB). At 1-2 miles prior to the glide-slope, select 25° nozzles, STOL flaps and complete the landing checklist. Intercept the glide-slope and follow controller's instructions until reaching decision height, using 1/2 SRT (approximately 10° AOB). If landing, at decision height, or as briefed, transition to 60° nozzles, and maintain 8-10 units AOA, readjust power, trim the aircraft, and check line up.
3. You may request a practice minimum-fuel PAR and a "30 SECONDS TO GLIDE-SLOPE INTERCEPT" call. At 30 seconds prior to intercepting the glide-slope, the RP will lower the landing gear, select 25 nozzles, STOL flaps, and complete the landing checklist. The remainder of the approach will be flown at 8-10 units AOA.

NOTE

If leading a section on PAR fly no slower than 8 units AOA and choose an airspeed that will preclude aileron droop.

Common Errors:

1. Poor airspeed / altitude control.
2. Forgetting to select 25 nozzles and STOL flaps.
3. Forgetting to select V/STOL HUD master mode.
4. Missed radio calls.
5. Lowering landing gear above 250 KCAS.

 Corrections for Errors:

1. Always back-up the approach using the TACAN, waypoint and course-line.
2. Study the approach prior to execution.
3. Check winds aloft on AMPCD-DATA-A/C pg.
4. Whenever lowering the landing gear select V/STOL.
5. Set your LAW up for platform check and then reset to DH.

Source Documents: NATOPS, INST Lesson, FAM Lesson, FLIP publications
Name: Missed Approach Procedures

Purpose: A missed approach will be executed when unable to transition safely to a landing from any approach.

Description of Procedures:

1. At the missed approach point, with 25° nozzles or less, smoothly add 10-15% power, establish a positive rate-of-climb, and raise the gear. Select AUTO flaps and complete the nozzle-out. If greater than 25° nozzles, full power will be used, set the climb attitude, nozzle out to 25°, raise the landing gear, select AUTO flaps and complete the nozzle-out.

Common Errors:

1. Adding full power with nozzles less than 25° and over-speeding the landing gear.
2. Not adding full power with nozzle angle greater than 25° and settling or going low.
3. Trying to nozzle out to less than 25° prior to moving the flaps to AUTO.
4. Incomplete clean up.

Corrections for Errors:

1. Comply with procedures.
2. Always nozzle out to 25°, check flaps to AUTO and raise the landing gear.
3. Complete the nozzle out to 0 and confirm 0 reading in the HUD or engine display panel.

Source Documents: INST Brief
Name: Airways Navigation

Purpose: To fly jet routes between destinations.

Description of Procedures:

1. Study your route before you attempt to fly it. Review the meaning of the symbols and labels in the legend of the chart.
2. With the HAR/I equipment code you are not limited to TACAN or TACAN fixes for navigation. With an INS/GPS coupling you are allowed to fly to fixes defined by latitude and longitude. You are not allowed to fly GPS approaches, though. The Harrier INS/GPS coupled navigation system is extremely accurate but it has not been certified by the FAA for GPS approaches.

Common Errors:

1. Flying point to point on a jet route instead of following the outbound course to the halfway point and transitioning to the inbound course.

Corrections for Errors:

1. Fly the airways just like you learned in training command, nothing has changed except that you are in a different aircraft and have to apply the same rules to new systems.

Source Documents: N/A
Name: Maximum Range Cruise Profile

Purpose: To be able to fly most fuel-efficient profile that will maximize range.

Description of Procedures:

1. Procedures in accordance NATOPS.
2. When level at cruise altitude, pull the throttle back to approximately 50-60 PPM and check the VRST CRUS page for optimum cruise KCAS or IMN. Ensure that the GW and DI are correct on the VRST CRUS and BNGO pages. Establish and maintain optimum cruise speed. AFC / ALT hold may be used; however, ensure that airspeed does not fall out of your scan.
3. The TACAN should be the primary navigation aid on the airways. INS waypoints should be planned to reflect the route of flight, corresponding to the TACAN stations over which you intend to fly. The INS plan should also include the primary divert fields along the route. The scale used on the EHSD display should optimize situational awareness. AUTO or MANUAL scaling may be used to maintain SA. “Boxing” the SEQ function and selecting the scale which gives you the most information is the recommended technique.

Common Errors:

1. Forgetting to reduce throttle after level off.
2. Not understanding functions of VREST CRUS and BNGO pages.

Corrections for Errors:

1. Make sure to reduce throttle to approximately 50-60 PPM and fly max range speed.
2. Study NATOPS, VREST functions.

Source Documents: INST Lesson, NATOPS
Name: Minimum Fuel GCA

Purpose: To land the aircraft in a minimum fuel situation in IMC conditions.

Description of Procedures:

1. You may request a practice minimum-fuel PAR with a "30 SECONDS TO GLIDE-SLOPE" call. Approach will vector you to intercept final slightly outside the glideslope. At 30 seconds prior to intercepting the glide-slope, lower the landing gear, select 25 nozzles, STOL flaps, and complete the landing checklist. The remainder of the approach will be flown at 8-10 units AOA.

2. It is important that you complete the landing checklist prior to intercepting the glideslope because once you are on the glideslope you will potentially be over-tasked with flying the aircraft and listening to the controllers directions.

3. It is also critical that you slow the aircraft to on-speed as fast as you safely can prior to the glideslope because once you start descending on the glideslope it will be harder to slow down. You cannot be fast in close on this approach as it will lead you to a potentially dangerous situation where you select 60° nozzles in close and reduce the throttle to work off the fast. As the airspeed decreases below 165 KCAS the flaps program to 62° and the aircraft nose tucks down severely in close proximity to the ground. This was the cause of a fatal mishap in VMAT-203 in the past.

Common Errors:

1. Not completing landing checklist.
2. Flying fast all the way.

Corrections for Errors:

1. Completely the landing checklist immediately after lowering the gear, nozzles and flaps.
2. Use intermediate nozzle angles if necessary as you get closer to the runway so that you can work off speed and get in the final landing configuration while maintaining power and RCS pressure. This is a fine line to walk, though, because using too much nozzles, too early will cause you to decelerate quickly and will cause you to burn more fuel, which defeats the whole point of flying the minimum fuel approach in the first place.

Source Documents: INST Lesson
Name: Fuel Planning Considerations

Purpose: To introduce the student to fuel planning in the training environment.

Description of Procedures:

1. Fuel planning requires an assessment of numerous factors, to include distance, weather, drag index, type of recovery and routing restrictions, to name a few. A common technique for fuel planning is to use backwards planning beginning with a desired landing fuel quantity. Adding fuel required for various RTB procedures or considerations will assist in the calculation of Tiger/Joker/Bingo fuel states.

2. **Bingo**: The Air NTTP describes Bingo as “Fuel state at which flight member must proceed along established routing under a maximum range profile, whether rejoined as a flight or not. At Bingo, aircrew should check their VRST page and determine if they need to execute a NATOPS bingo profile, proceed direct, or declare an emergency.” Two techniques for Bingo fuel calculations exist. One method is to select a Bingo fuel state based on an actual Bingo profile to include aircraft configuration, drag index, winds, and distance to travel. This would be used in a combat situation. The second method is similar, but instead of an actual Bingo profile, it uses a planned RTB altitude, usually a maximum of 16,500' MSL or 17,500' MSL to avoid flying into Class-A airspace. A good rule of thumb for this profile is 100#/10nm for a 6.5 AOA administrative RTB. This would be used in a training situation. Although, we should be aware of our emergency Bingo fuel requirements, we should not put ourselves in that position in a training environment.

3. **Joker**: The Air NTTP describes Joker as “Fuel state above Bingo at which separation/bug-out/event termination should begin. The same threat considerations apply in the air-to-air threat arena. Joker fuel should allow for 2 minutes of sustained maneuvering, conducted within visual range (WVR) engagement and separate. In training, unless the objective is to fly a tactical egress, Joker will be the fuel state at which the flight will terminate the tactical portion of the mission and rejoin to assume an administrative profile for the planned recovery.” A technique for Joker fuel calculation involves backwards planning from the destination airfield.

4. **Tiger**: The Air NTTP describes Tiger as “Enough fuel and ordnance that will enable the flight to accept a “commit” (offensive air support [OAS]/anti-air warfare [AAW] mission). This means enough fuel to ingress into the target area from present position, engage the target, and egress out of the target area accounting for the expected threat.” In the training environment, Tiger is commonly set to allow for one more raked range pass, one more CAS 9-line, a five minute warning until Joker, or the fuel at which the flight must complete its last training objective or T&R requirement.

5. **Example 1.** Air-Air section flight utilizing the W122 Area 15-17. Furthest point away from destination = 80nm.

   1200# at straight-in initial. If we hit BINGO at the furthest point, a straight-in requires less fuel.
   + 800# for 80nm, 6.5 AOA transit at highest VFR altitude, normal descent profile.
=2000# Bingo.
+ 300# Join up after complete. This varies with pilot experience, wx, number in flight, etc…

=2300# Joker.
+ 800# for 5min remaining to complete Training Objectives at expected average fuel flow.

=3100# Tiger.
In reality we are keeping track of our fuel state and KIO at Joker. We begin our RTB are <50nm out (worst case) when we reach Bingo fuel state. Though, we are probably closer. This allows fuel to execute the overhead and be abeam with at least 1200# IAW SOP.

6. Example 2. TAV-8B FAM flight to the R5306A (60nm furthest point) with 1x Hi-Tacan then tower downwind for landings.
1200# at straight-in initial.
+ 600# for 60nm, 6.5 AOA transit at highest VFR altitude, normal descent profile.

=1800# Bingo
1600# at pad for one last VTO accel to return
+ 200# re-position / cool down / run-ups
+ 800# decel VL
+ 600# roll-n-go
+ 800# hi Tacan

=4000# Joker
+ 500# for 5min remaining to complete Training Objectives at expected average fuel flow.

=4500# Tiger
As you can see, the Bingo was still calculated for and admin transit from the furthest point to destination excluding training objectives during the RTB and back at the field. However, Joker was backward planned with these Training Objective accounted for. Tiger should take into account the types of maneuvers and how much fuel flow they require. Five or ten minutes remaining is not a constant value from one flight to another.

Common Errors:

1. Incomplete or unrealistic fuel management numbers
2. Fuels that don’t have an associated meaning or a meaning that is not useful for the flight.

Corrections for Errors:

1. N/A

Source Documents: NTTP
Forward Operating Base Stage

Name: Cherry Point Departures to Bogue Field

Purpose: The VFR entry to Bogue Field will be utilized when the weather permits VMC conditions from takeoff, transit, and recovery. IFR will be flown if IMC conditions are to be encountered en route to Bogue Field.

Description of Procedures:

1. Clearance. All aircraft departing MCAS Cherry Point for Bogue Field shall contact Cherry Point Clearance for VFR or IFR clearance to Bogue. Utilize the call-sign assigned from the flight schedule. Depart Cherry Point as assigned via local course rules.

2. Delta / marshal. The “marshal” pattern is a day VFR pattern oriented overhead Bogue Field, aligned with the duty runway, and remaining within 5 NM of Bogue. Altitude is 2500’ MSL or as assigned; pattern direction is southeast. Flights requiring a gross weight adjustment will remain with Cherry Point departure, and will request at or above 6000’ AGL to adjust fuel, but be in their assigned marshal altitude within 5 NM of Bogue TACAN. Remain in the marshal stack until paddles reports your signal is “CHARLIE.”

3. Check-In. At the beginning of each FOB period, each aircraft will check-in with the LSS and pass wet and dry VL performance, current fuel state, and water quantity. If already in the marshal stack, pass this information when paddles requests it.

4. VFR / IFR recovery. Aircraft operating VFR, or with vectors to “VFR underneath,” shall utilize the break at 1000’ AGL. IFR recoveries will be conducted when aircraft cannot be vectored to “VFR underneath.” Contact Bogue GCA for PAR full-stop to the duty runway. The FOB / FCLP pattern can be flown down to “Special VFR” (800’ / 2 NM) at Bogue tower's approval.

   **NOTE**

   Minimum vectoring altitude for Cherry Point approach is 1600’ MSL.

5. Entry / Break.
   a. When paddles reports “YOUR SIGNAL IS CHARLIE,” report departing the marshal to Bogue tower. Report the initial to Bogue tower. Bogue tower will switch the inbound aircraft to paddles frequency out of the break prior to the 180.

   **NOTE**

   Winds shall be given by the LSS prior to the break.
b. The pilot shall fly up the western side of the runway for a level 1000’ AGL break. Do not fly outside Bogue Class-D airspace.

c. Once wings-level on downwind, and over the intracoastal waterway, descend to 600’ AGL and commence the landing checks. Perform a water check, if required. (All aircraft must remain at or above 1000’ AGL over Emerald Isle.)

d. The abeam position is **0.8 to 1.0 NM** abeam the landing spot at 600’ AGL.
   Landing checks should be complete, to include ANTISKID - ON, 60° nozzles, and 8-10 units AOA. Complete the “abeam call” to paddles. All heavy waveoffs will be performed dry and no greater than 60° nozzles.

6. **Delta / foxtrot operations.** Delta or foxtrot taxiways at Cherry Point may be used on occasion for FOBs. The LSS shall conduct a detailed brief if Cherry Point is to be used for this stage of training.

**Common Errors:**

1. Not following proper procedures.

**Corrections for Errors:**

1. N/A

**Source Documents:** Cherry Point Course Rules Brief, FOB Stage Brief
Name: Abeam Call

Purpose: The abeam call during FOB events informs the LSS of the aircraft status prior to landing. When properly executed it is an enhancement to situational awareness for the pilot and the LSS. Improperly executed it is a sign of low SA or pending poor performance.

Description of Procedures:

1. At the appropriate abeam position transmit: “MARS-XX (AIRCRAFT SIDE NUMBER), ABEAM, GEAR, (CURRENT FUEL STATE), (WET / DRY), SKID (ON / OFF), CALL-SIGN (first pass only)” and listen for LSS direction / response.

Common Errors:

1. Making incomplete calls.
2. Transmitting while another aircraft is in the groove.

Corrections for Errors:

1. Establish and maintain good habit patterns for performing checklists.

Source Documents: VSTOL LSO NATOPS
Name: Wet / Dry Call

Purpose: The wet / dry call is imperative to inform the LSS the status of aircraft water state.

Description of Procedures:

1. When making wet and dry calls, the following definitions apply:
   a. Wet
      i. Water check has been completed (not required after wet STO)
      ii. Water switch is armed
      iii. There is enough water on-board to last the entire landing

      **NOTE**
      If water onboard is less than 300 lb., the "WET" call shall be followed by the water amount (e.g., CALL SIGN, ABEAM, GEAR, FUEL STATE, WET, 130 POUNDS, SKID ON / OFF)

   b. Dry
      i. No water is aboard or water not selected

Common Errors:

1. Making an incorrect call.
2. Not understanding definitions of “wet” or “dry.”

Corrections for Errors:

1. Establish and maintain good habit patterns for performing checklists.

Source Documents: FOB Stage Brief, VSTOL LSO NATOPS
Name: Waveoff

Purpose: The waveoff can occur for several different reasons, usually as a result of an unsafe approach or fuel weight exceeding aircraft capability to RVL / VL.

Description of Procedures:

1. Any waveoff initiated by the controlling LSS or Bogue tower is mandatory and shall be acknowledged. The pilot can also initiate a waveoff if he feels the approach is unsafe. Any aircraft with a fuel weight exceeding RVL / VL capability shall be told "EXPECT HEAVY WAVEOFF" by paddles at the abeam position and water will NOT be selected. Fly a normal pattern, to include intercepting a 3° glide-slope, until reaching the Key. Do not select hoverstop. Do not select nozzles greater than 60 degrees. At the key, initiate a waveoff and call "WAVING OFF." If a JPT or RPM corresponding to "2 LEGS" of the PMI is reached at or above 60 KCAS during an approach to landing, a waveoff shall be initiated and reported.

2. Waveoff procedures remain the same from the FAM stage.

Common Errors:

1. Not following proper procedures.

 Corrections for Errors:

1. N/A

Source Documents: VSTOL LSO NATOPS
Name: Precision RVL

Purpose: The RVL during an FOB evolution very similar to the FAM stage. Further clarification for Forward Operating Base landings are contained in NATOPS.

Description of Procedures:

1. The turn to downwind is flown at 8-10 units AOA. Fly to an abeam distance of 0.8-1.0 NM at 600' AGL. On downwind fly 8-10 units AOA at 25° nozzles or greater and adjust your heading to maintain 0.8-1.0 NM abeam track over the ground. Prior to your abeam position complete the landing checklist, ensuring nozzles are at 60°, flaps to STOL and perform a water check, if required. Make your abeam call to paddles. Ensure you have sufficient performance using the following squadron SOP RVL capabilities:
   a. NATOPS: 60 KTS VL+ 3100 pounds
   b. RP SOLO: 60 KTS VL+ 2000 pounds

2. Extend off the abeam to produce a groove length of 3500' (0.6 NM). This will be your Key position or the point at which attitude and nozzles are set for landing. This will be a different sight picture than you are used to. Remember to begin your timing abeam your intended point of landing, which will usually be the end of the carrier box at Bogue Field.

3. As you begin your descent off the 180, a combination of stick and power reduction should be used to establish a 2° glide-slope and AOB as required to arrive at the 90° position at 450' AGL. At the 90° position, reset the glide-slope to 3°. As you reach the 45° position your altitude should be 375' AGL. Continue your glide-slope looking to "Key" on runway centerline 3500 feet prior to the touchdown point at approximately 325'. With wings level, vane centered and landing attitude set, select 68-73° nozzles (based on headwind) and pick up 60 KTS groundspeed.

4. Start your descent when 4° on the pitch ladder in the HUD intercepts your intended point of landing. This is the desired descent point, approximately 2000' (0.3 NM) prior to touchdown. At this point hold your attitude constant (witches hat on or slightly below the horizon) and reduce power slightly to begin your descent. Put the velocity vector on the intended point of landing. This is where your 5° glide-slope is established. After the attitude is set, control the rate of descent with power while scanning lineup, groundspeed (in the HUD), and angle-of-attack (15 units AOA maximum). Visually assess glide-slope with reference to the HUD and intended point of landing. Adjust power as necessary to maintain a 5° glide-slope. Adjust nozzles as necessary to maintain 60 KTS ground speed

5. While on glide-slope, keep the aircraft on runway centerline. Optimum rate of descent for a 5° RVL is 500 FPM. If there is any crosswind present, a wings level crabbed approach should be flown using smooth rudder to assist the aircraft in its natural alignment just prior to touchdown.
NOTE

When rudder input is required to align the nose of the aircraft with the runway, a power addition will normally be required since the aircraft is now flying in an “out of balance condition” and using bleed air to assist. Failure to add power or to take out crab prior to touchdown can result in an increased ROD just prior to touchdown and nose to drop causing the aircraft to "wheelbarrow" on rollout

6. At touchdown, select idle, allow the aircraft to settle on the runway and smoothly apply full brakes. When tracking straight and with rudder pedals centered, engage NWS. Selection of idle at touchdown is mandatory to keep the aircraft from power bouncing or “wheel-barrowing.” When comfortably tracking straight down the runway, the nozzles should be reset to 10° and the water switch selected to OFF (if armed).

7. With anti-skid set to ON, caster mode is selected. Pressing the stick button produces LO gain.

NOTE

HI gain steering is undesirable above 20 KTS ground speed

Common Errors:

1. The tendency on your first RVLs will be long in the groove. Remember to base your turn off your intended point of landing, not the end of the runway. While flying the 5° glideslope to touch-down, don't make a play for the intended point of landing that requires large power reductions. A large power reduction in close to make a "play" for the intended point of landing will cause a large rate-of-descent and subsequent bounce that is difficult to control. If the aircraft is at 15 units AOA a power increase or attitude reduction must be applied to reduce the AOA and you will have to accept landing long.

2. Letting lineup drop from scan.

Corrections for Errors:

1. Follow proper pattern altitudes, abeam distance, and timing for base turn.
2. Refer to FAM stage for more errors and correction for errors.

Source Documents: VSTOL LSO NATOPS, NATOPS
Name: Taxiing On Bogue Field

Purpose: To move the aircraft safely from the hot refueling area to the hold short area.

Description of Procedures:

1. In addition to the NATOPS “Taxiing” discussion and checklist, read the MCAS Air Operations Manual for local taxiing SOPs. When exiting the runway, nozzles will be a 0°, flaps in cruise and stabilator trim set at 4° nose down. Taxi speed should be slow and controlled, approximately 2-3 KGS. Hot NWS is used for taxi. Once clear of runway, safe ejection seat, open canopy and remove oxygen mask if desired. Strictly adhere to plane captain’s signals to the fuel pits and water tower.
2. Once complete with fuel and water, taxi up to the hold short position. Assure aircraft is ready for takeoff using takeoff checklist. Then report “UP AND READY” to paddles.

Common Errors:

1. Not selecting 0° nozzles
2. Not selecting flaps to cruise
3. Not selecting stab trim 4° nose down
4. Not selecting Hot NWS
5. Taxiing too fast
6. Not setting parking brake and ANTISKID - ON with personnel near A/C
7. Not configuring aircraft for takeoff before “UP AND READY” call

 Corrections for Errors:

1. Ensure aircraft is in proper taxi configuration.
2. Always be aware of where your jet exhaust is pointed.
3. Always be aware that FOD is everywhere.
4. Always ensure parking brake set and ANTISKID - ON with personnel near aircraft.

Source Documents: NATOPS, MCAS Air Ops Manual, VMAT-203 SOP
Name: Maximum Performance STO

Purpose: When maximum end-speed in a short distance, and / or distance to clear a 50’ ADL obstacle is critical, a max-performance STO shall be utilized.

Description of Procedures:

1. Complete "one-finger" checks to include pitch carets to 14. This should be completed before taking the runway for takeoff. If you have not been cleared for run-ups, when in position for takeoff and one-finger checks complete, report "(AIRCRAFT SIDE#), 1 FINGER," at which time the LSS will reply "(AIRCRAFT SIDE #), CLEARED FOR 2 FINGER / 5 FINGER RUN-UPS FOR THE STO."

   Execute engine accel checks. If wet, set water switch to T/O and reset RPM to 60%; place nozzle lever to STO-stop and check flap programming, nozzle angle, and duct pressure; place nozzles to 10°. With accel checks complete, report "(AIRCRAFT SIDE#), 2 (OR 5) FINGERS." LSS will reply "(AIRCRAFT SIDE#); CLEARED TO LAUNCH."

2. When cleared for takeoff, add full power, holding brakes until tires begin to skid (notice aircraft creeping forward), then release brakes. At NRAS, select nozzles to STO-stop. After liftoff, rotate the witch’s hat to the pitch carets, and nozzle-out to maintain climb angle. If more climb angle is needed for terrain clearance, increase climb angle by adjusting nozzle rate, maintaining attitude - not to exceed 15° AOA.

   **WARNING**

   Large nose-pitch rates must be avoided in V/STOL flight, because available tailplane and reaction control pitch authority may be insufficient to prevent AOA from rapidly increasing above the point where pitch control is lost.

Common Errors:

1. Not performing two/five-finger checks properly.
2. Launching without clearance.
3. Adding full power with nozzles at STO stop.
4. Not holding the brakes until tire skid.
5. Holding the brakes too long and blowing the tires on STO.
6. Over correcting line-up during launch (PIO).
7. Pulling the power to idle instead of the nozzle lever to 60° at NRAS or nozzle rotation line.

Corrections for Errors:

1. Establish and maintain good habit patterns for performing checklists.
2. Follow the proper launch officer signals and LSS directions.
Name: Bogue Departures to Cherry Point

Purpose: Bogue departures RTB, VFR or IFR to recover Cherry Point.

Description of Procedures:

1. Aircraft departing Bogue Field will contact Bogue tower or ground control prior to departure for an IFF code to return to Cherry Point. After launch, comply with local course rules and contact Cherry Point approach for GCA, TACAN, or vectors to the initial for the break.

2. **Hold down fuel.** "Hold down" fuel will be that fuel which the aircraft will be allowed to takeoff for another trip around the pattern, wave-off at the ramp, and safely execute a BINGO profile to a divert. Hold down fuel will be defined by the LSS. Minimum fuel abeam will be 1200 pounds. Hold down fuel may be increased by the LSS due to weather conditions.

3. **Diverts.** Primary divert field for Bogue will be MCAS Cherry Point where the BINGO fuel is 1.0, based on the NATOPS bingo profile for a clean aircraft. Secondary divert field is MCAS New River where the BINGO fuel is 1.1, based on the NATOPS bingo profile for a clean aircraft.

4. **Signal BINGO.** When given "SIGNAL BINGO," immediately conduct a bingo profile in accordance with the AV-8B / TAV-8B NATOPS. If on Tower frequency, paddles will provide the bingo profile information as a back-up.

5. **Signal RTB.** When given "SIGNAL RTB," return to home base in accordance with local course rules. Minimum fuel for RTB is 3000 pounds for day VFR and 3500 pounds for IFR or night.

Common Errors:

1. Not completing after take-off checklist on RTB.
2. Leaving anti-skid system and exterior lights off.

Corrections for Errors:

1. N/A

Source Documents: Cherry Point Course Rules Brief, FOB Stage Brief
Name: FOB Emergency Procedures

Purpose: To correct or compensate for aircraft malfunctions and emergencies in an FOB environment.

Description of Procedures:

1. Procedures are in accordance with NATOPS.

Common Errors:

1. Not accurately following emergency procedures
2. Not accurately assessing the type of emergency that has occurred

Corrections for Errors:

1. Know immediate action items, and how they might be affected by the FOB environment.
2. Assess emergency correctly before taking action. (no fast hands)

Source Documents: NATOPS
Field Carrier Landing Practice Stage

Name: Case 1 Recovery

Purpose: Familiarize with Case 1 recoveries to ship.

Description of Procedures:

1. Case 1 procedures - utilized when weather is 3000’ MSL / 5 NM or better.

Source Documents: V/STOL LSO NATOPS
**Name:** FCLP Communication  

**Purpose:** To understand and comply with proper LSO terminology  

**Description of Procedures:**

1. LSO terminology is located in the VSTOL LSO NATOPS.

<table>
<thead>
<tr>
<th>AIRPORT TREND</th>
<th>TRANSMISSION</th>
<th>MEANING</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>“PADDLES CONTACT”</td>
<td>LSO ASSUMES CONTROL</td>
<td>N/A</td>
</tr>
<tr>
<td>FAST/SLOW ON APPROACH OR DECEL</td>
<td>“YOU’RE FAST/SLOW”</td>
<td>SELF-EXPLANATORY</td>
<td>ADJUST POWER/NOZZLES/ATTITUDE TO ESTABLISH PROPER CLOSURE</td>
</tr>
<tr>
<td>HIGH/LOW ON APPROACH OR DECEL/HOVER</td>
<td>“YOU’RE HIGH/LOW”</td>
<td>SELF-EXPLANATORY</td>
<td>ADJUST POWER/ATTITUDE FOR PROPER ALTITUDE</td>
</tr>
<tr>
<td>AIRCRAFT IN LDG POSITION/CLEAR OF OBSTACLES</td>
<td>“CLEARED TO LAND”</td>
<td>CLEARED TO LAND</td>
<td>LAND</td>
</tr>
</tbody>
</table>

**Informative Calls**

<table>
<thead>
<tr>
<th>AIRPORT TREND</th>
<th>TRANSMISSION</th>
<th>MEANING</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIFTING LEFT OR RIGHT OF APPROACH CENTERLINE</td>
<td>“YOU’RE LEFT/RIGHT”</td>
<td>AIRCRAFT LINEUP IS L/R OF APPROACH CENTERLINE</td>
<td>CORRECT LINEUP</td>
</tr>
<tr>
<td>AIRCRAFT SETTLES</td>
<td>“DON’T SETTLE /DON’T GO LOW”</td>
<td>AIRCRAFT WILL GO BELOW GLIDESLOPE</td>
<td>ADD POWER/CHECK SINK RATE</td>
</tr>
<tr>
<td>AIRCRAFT CLIMBING</td>
<td>“DON’T CLIM/DON’T GO HIGH”</td>
<td>AIRCRAFT WILL GO ABOVE GLIDESLOPE</td>
<td>REDUCE POWER, STOP CLimb, OR INCREASE SINK RATE</td>
</tr>
<tr>
<td>STAGNATION ON DECEL OR VL</td>
<td>“KEEP IT COMING”</td>
<td>SELF-EXPLANATORY</td>
<td>RE-ESTABLISH PROPER CLOSURE OR RATE OF DESCENT</td>
</tr>
<tr>
<td>FAST</td>
<td>“SLOW IT DOWN”</td>
<td>SELF-EXPLANATORY</td>
<td>ADJUST NOZZLES/ATTITUDE TO ESTABLISH PROPER CLOSURE</td>
</tr>
<tr>
<td>AIRPORT TREND</td>
<td>MANDATORY IMMEDIATE RESPONSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SETTLING ON</strong></td>
<td><strong>TRANSMISSION</strong></td>
<td><strong>MEANING</strong></td>
<td><strong>RESPONSE</strong></td>
</tr>
<tr>
<td><strong>APPROACH OR</strong></td>
<td>&quot;A LITTLE POWER&quot;</td>
<td>AIRCRAFT WILL GO LOW OR LAND HARD</td>
<td>CORRECT WITH POWER</td>
</tr>
<tr>
<td><strong>INCREASING RATE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OF DESCENT ON VL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SINKING (ON (APPROACH) OR</strong></td>
<td>&quot;POWER&quot;</td>
<td>AIRCRAFT IS LOW OR WILL LAND HARD</td>
<td>ADD POWER</td>
</tr>
<tr>
<td><strong>Very Fast Rate of</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Descent on VL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>YAWNING/ROUGH</strong></td>
<td>&quot;CENTER THE VANE/BALL&quot;</td>
<td>SLIDESLIP IS BUILDING, AIRCRAFT OUT OF RELATIVE WIND</td>
<td>REDUCE SIDESLIP</td>
</tr>
<tr>
<td><strong>ATTITUDE CONTROL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ATTITUDE TOO</strong></td>
<td>&quot;ATTITUDE&quot;</td>
<td>NOSE TOO HIGH/LOW</td>
<td>REESTABLISH CORRECT ATTITUDE</td>
</tr>
<tr>
<td><strong>HIGH/LOW</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DRIFT DURING VL</strong></td>
<td>&quot;CHECK FORWARD/BACK/LEFT/RIGHT&quot;</td>
<td>AIRCRAFT DRIFTING DURING VL</td>
<td>STOP RATE OF DESCENT, CORRECT FOR DRIFT, CONTINUE WITH LANDING</td>
</tr>
<tr>
<td><strong>AIRCRAFT BEYOND</strong></td>
<td>&quot;&quot;WAVEOFF&quot;</td>
<td>WAVEOF APPROACH</td>
<td>EXECUTE WAVEOFF</td>
</tr>
<tr>
<td><strong>SAFE LIMITS DURING</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>APPROACH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WRONG</strong></td>
<td>&quot;CHECK GEAR/FLAPS&quot;</td>
<td>SELF-EXPLANATORY</td>
<td>COMPLY</td>
</tr>
<tr>
<td><strong>CONFIGURATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ROUGH AIRCRAFT</strong></td>
<td>STABILIZE&quot;</td>
<td>STABILIZE HOVER</td>
<td>ESTABLISH A STEADY HOVER</td>
</tr>
<tr>
<td><strong>CONTROL IN HOVER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N/A</strong></td>
<td>&quot;HOVER&quot;</td>
<td>UNSAFE CONDITIONS DEVELOP DURING VL</td>
<td>ADD POWER/REESTABLISH 50-FOOT HOVER</td>
</tr>
<tr>
<td><strong>AIRCRAFT OUT OF</strong></td>
<td>&quot;(CALL SIGN), EJECT&quot;</td>
<td>EJECT</td>
<td>EJECT</td>
</tr>
<tr>
<td><strong>CONTROL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SETTLE ON ACCEL</strong></td>
<td>1. (STO) &quot;STOP THE NOZZLES&quot; (VTO) &quot;HOVER STOP&quot;</td>
<td>NOZZLE OUT TOO FAST, STOP SETTLE WITH NOZZLES</td>
<td>STOP NOZZLE OUT. IF NO EFFECT, SELECT STO/HOVER. STOP.</td>
</tr>
<tr>
<td><strong>FROM STO/VTO</strong></td>
<td>2. &quot;LIMITERS&quot;</td>
<td>TRIP LIMITERS</td>
<td>FULL THROTTLE, TRIPPING LIMITER</td>
</tr>
<tr>
<td></td>
<td>3. &quot;EJECT&quot;</td>
<td>EJECT</td>
<td>EJECT</td>
</tr>
<tr>
<td><strong>OVER-ROTATION</strong></td>
<td>&quot;&quot;GET YOUR NOSE DOWN&quot;&quot;</td>
<td>NOSE HAS ITCHED UP EXCESSIVELY</td>
<td>FULL FORWARD STICK, REDUCE NOZZLE ANGLE BUT NO LESS THAN 20°</td>
</tr>
<tr>
<td><strong>DURING STO</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VISIBLE ENGINE OR</strong></td>
<td>1. &quot;ABORT&quot;</td>
<td>1. ABORT TAKEOFF</td>
<td>1. PERFORM NATOPS SHIPBOARD ABOARD</td>
</tr>
<tr>
<td><strong>MECHANICAL</strong></td>
<td>2. &quot;EJECT&quot;</td>
<td>2. EJECT</td>
<td>2. EJECT</td>
</tr>
<tr>
<td><strong>FAILURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Imperative Calls (Sheet 1 of 2)**
<table>
<thead>
<tr>
<th>AIRPORT TREND</th>
<th>TRANSMISSION</th>
<th>MEANING</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIRCRAFT DEVIATES EXCESSIVELY FROM STO/TRAMLINES DURING STO</td>
<td>“LINEUP”</td>
<td>CORRECT TO STO/TRAMLINE</td>
<td>APPLY APPROPRIATE RUDDER</td>
</tr>
<tr>
<td>SMOKE FROM MLG DURING STO</td>
<td>“OFF BRAKES”</td>
<td>RELEASE BRAKES</td>
<td>RELEASE BRAKES</td>
</tr>
<tr>
<td>SLOWER THAN NORMAL ACCELERATION DURING STO DECK RUN</td>
<td>1. “ABORT”</td>
<td>1. ABORT TAKEOFF</td>
<td>1. PERFORM NATOPS SHIPBOARD ABORT</td>
</tr>
<tr>
<td>2. “POWER/ LIMITERS”</td>
<td>2. FULL POWER/ LIMITERS OFF</td>
<td>2. ADD FULL POWER/ TRIP LIMITER</td>
<td></td>
</tr>
<tr>
<td>3. “EJECT”</td>
<td>3. EJECT</td>
<td>3. EJECT</td>
<td></td>
</tr>
<tr>
<td>IMPROPER OR OUT OF CONTROL VTO</td>
<td>“IDLE”</td>
<td>REDUCE THROTTLE TO IDLE</td>
<td>SELECT IDLE</td>
</tr>
<tr>
<td>N/A</td>
<td>“SUSPEND”</td>
<td>STOP LAUNCH SEQUENCE</td>
<td>SELECT IDLE UNLESS TAKEOFF ROLL HAS COMMENCED</td>
</tr>
</tbody>
</table>

Imperative Calls (Sheet 2 of 2)

Common Errors:
1. Not knowing proper LSO terminology
2. Not using the proper terminology

 Corrections for Errors:
1. Study and understand LSO terminology
2. Use proper terminology

Source Documents: VSTOL LSO NATOPS
Name: FCLP DECEL / VL

Purpose: The course rules to and from Bogue during the FCLP stage is the same as during the FOB stage. The VL is conducted the same as during the FAM stage, with the following exceptions:

Description of Procedures:

1. Groove
   a. The altitude in the groove shall be 300-325' AGL. The proper groove length is 0.5 NM (3000-3500').
   b. Intercept and fly a 3° glide-slope and arrive abeam the landing spot at 120' AGL. Transmit "HOVER-STOP" after hover-stop selection. Paddles will reply with "ROGER HOVER-STOP, CHECK WATER SWITCH, SPOT X," or "FOULED DECK," or "EXPECT HEAVY WAVEOFF."

2. Decel
   a. An offset approach is used for VFR recoveries, although over-the-stern approaches may be conducted when circumstances dictate. For offset approaches, the pilot shall decelerate down the port side of the ship, one plane-width from the edge of the ship.
   b. The decel closure rate should allow the aircraft to be stopped in a controlled manner abeam the landing spot. Typically, paddles will clear you to cross early if the closure rate is under control. In this case, do not cross until at a 45° position off the landing spot.

   c. The altitude abeam the landing spot shall be no less than 120' AGL, due to FOD considerations. Once the aircraft has crossed the deck edge, you are cleared to 50' AGL.
   d. Use a descending cross directly to the landing spot for a 50' AGL hover, reference the HPI and tramline for position.

3. VL
   a. "Check" calls are used by paddles to position the aircraft over the landing spot. If given a check-call, move the aircraft 10'. If given a second check-call, move another 10'. On the third check-call, move until paddles calls "Stabilize."
   b. When cleared to land, paddles will call "CLEARED TO LAND," and "IDLE" at touchdown.
   c. Once cleared to land, strive to place your head over the intended landing with the main landing gear on the tramline.
   d. Upon touchdown, reduce power to idle, apply brakes, select nozzles aft and water switch to OFF (if required). Report fuel state and water quantity.

   **NOTE**
   Use of braking-stop during the decel requires an additional 2-3% RPM, and increases workload.
e. After landing, movement of the aircraft is controlled by the launch officer or LSO.

Common Errors: Refer to FAM stage errors

1. Not scanning hover position indicator during cross, crossing aft (early).
2. Trundling during decel and cross.
3. Not trimming the aircraft.
4. Not flying the aircraft to touchdown (letting nose drop).
5. Not following proper deck procedures after landing.

Corrections for Errors: Refer to FAM stage corrections for errors

1. Maintain proper scan during cross; fly to the HPI and stop above the tramline.
2. Adjust timing off the abeam position in order to arrive in the groove at the proper key.
3. Trim the aircraft! Trim, trim, trim, scan, relax.
4. Fly the aircraft all the way to touchdown; do not allow a drift to develop.
5. Once on deck, follow the proper deck procedures; idle, brakes, nozzles aft, water switch off, “FUEL AND H₂O STATE”, follow taxi instructions.

Source Documents: V/STOL LSO NATOPS, NATOPS
Name: FCLP Deck Procedures

Purpose: Deck procedures for the FCLP stage are designed to introduce shipboard deck procedures.

Description of Procedures:

1. All evolutions on the LHA facility will be treated as shipboard operations. Taxi and all launches / recoveries will be under positive LSO control. All movement on the LHA deck and launches will be under the control of the LSO. If available a launch officer will be used to direct aircraft and conduct aircraft shipboard launch signals.

2. Taxi: All aircraft entering the LHA deck will give the LHA tower an "UP AND READY" call prior to taxiing onto the deck. When ready to enter the LHA deck, call "MARS (AIRCRAFT SIDE#), UP AND READY, (FUEL STATE), (WATER QUANTITY)." The proper configuration while on the LHA deck will be: STOL flaps; canopy closed and locked, external lights off, and anti-skid off; strapped-in, with the seat armed; and oxygen mask on. All taxiing shall be at a slow and controlled pace under positive control of a taxi director or LSO (from the simulated Tower). Any incorrect deck procedures noticed by the LSO will be fined. Minor infractions (lights, improper communications) will be minimal fines ($1.00). Severe infractions such as incorrect aircraft configuration or engine accel checks will be fined heavily.

Common Errors:

1. Forgetting to arm the ejection seat.
2. Forgetting to select STOL flaps.
3. Forgetting to turn off exterior lights.
4. Forgetting to close canopy.
5. Taxiing too fast ($1.00 per "SLOW IT DOWN" call from Paddles).
6. Not calling up and ready.
7. Transmitting while other aircraft in the groove ($2.00).

Corrections for Errors:

1. Follow the proper deck procedures.
2. Perform checklist.

Source Documents: V/STOL LSO NATOPS
Name: Max Performance STO from LHA deck

Purpose: The STO from the LHA deck is essentially the same as the Max performance STO during the FOB stage, except for the following:

Description of Procedures:

1. **Lineup:** The aircraft shall be aligned in the middle of the tramline, with the nose tire on the distance marker. Care shall be taken to ensure the nose tire is centered and low gain steering is engaged (skid off). The minimum distance for STO operations is 300 feet. All STOs will be conducted with 0°, 0°, 2° ND trim, and nozzles according to aircraft VRST display.

2. **Takeoff checks: WITHOUT LAUNCH OFFICER**
   a. Trim check
      i. Trim verify to within 0.1°
      ii. Set trim to 0°, 0°, 2° ND
   b. Complete one-finger checks as per NATOPS
   c. Pilot: "MARS (SIDE #), 1 FINGER"
   d. LSO: "ROGER 1 FINGER; CLEARED RUN-UPS"
   e. Conduct engine acceleration check
   f. If wet, set water switch to T/O and reset RPM
   g. Place nozzles to STO STOP and hold
   h. Conduct duct pressure, nozzle, and flap checks
      i. Nozzles to 10°
   j. Pilot: “MARS (SIDE #), 2/5 FINGER”
   k. LSO: "ROGER 2 (OR 5) FINGER, CLEARED TO LAUNCH"
   l. Takeoff: Apply full power, and hold the brakes until the tires skid, then release.
      i. Note maximum RPM and water flow if required.
      ii. If the aircraft deviates from the tramline, do not attempt to correct back to the tramline immediately or PIO may occur. Instead, a correction should be made so the aircraft arrives at the nozzle-rotation-line with the nose tire on the tramline.
      iii. Rotate the nozzles briskly to the STO-stop at the nozzle-rotation-line.
      iv. At bow exit, set the proper STO attitude - This is achieved when the depressed attitude symbol (witches-hat) is maintained between the pitch carets and the 5° pitch bar. After a positive rate-of-climb is established, commence an accelerating transition.

3. **TAKEOFF CHECKS: WITH LAUNCH OFFICER**
   a. Trim check
      i. Trim verify to within 0.1°
      ii. Set trim to 0°, 0°, 2° ND
      iii. Launch O: gives trim signal to pilot, checks vertical stabilator and will give a thumbs up if trim is correct.
b. Complete one-finger checks as per NATOPS
   i. Pilot: Thumbs-Up, 1 finger complete to Launch Officer
   ii. Launch O: one-finger run-up signal

c. Conduct engine acceleration check

d. If wet, set water switch to T/O and reset RPM

e. Place nozzles to STO STOP and hold

f. Conduct duct pressure, nozzle, and flap checks

g. Launch O: check nozzles and flaps and signal (2) Thumbs-up to pilot

h. Nozzles to 10°
   i. Launch O: signal two-(or five-)finger run-up signal
   ii. Pilot: Acknowledge 2 or 5 fingers
   iii. Launch O: check tramline clear, salute pilot, touch deck to signal launch
   iv. Takeoff: Equal to paragraph 2.n of this section.

i. STO abort: Depending on the launch distance, an abort decision during a STO must be made very early in the run. The chances of a successful abort diminish rapidly after brake release.

Common Errors:

1. Refer to FAM stage errors

Corrections for Errors:

1. Refer to FAM stage corrections for errors

Source Documents: V/STOL LSO NATOPS
Name: Heavy Wave-off

Purpose: To successfully execute a heavy wave-off

Description of Procedures:

1. Procedures are in accordance with LSO NATOPS and Heavy Wave-off procedures
2. Any aircraft with a fuel weight exceeding RVL / VL capability shall be told "EXPECT HEAVY WAVEOFF" by paddles at the abeam position and water will NOT be selected. Fly a normal pattern, to include intercepting a 3° glide-slope, until reaching the Key. Do not select hover stop. Do not select nozzles greater than 60 degrees. At the key, initiate a waveoff and call "WAVING OFF." If a JPT or RPM corresponding to "2 LEGS" of the PMI is reached at or above 60 KCAS during an approach to landing, a waveoff shall be initiated and reported.

Common Errors:

1. Selecting nozzles greater than 60 degrees.
2. Selecting hover stop

Corrections for Errors:

1. Do not select nozzles greater than 60 degrees

Source Documents:
LSO NATOPS, FOB FSG
Heavy Wave-off Procedures,
Name: NORDO Approach

Purpose: To maintain non-verbal communication between the LSO and pilot to safely recover the aircraft during a lost communication situation.

Description of Procedures:

1. During the FCLP stage you will perform a simulated NORDO approach to gain familiarity with the procedures in the event of an actual NORDO situation. During the simulated and actual NORDO approach, continue to make all the proper calls “in the blind.” Do not sacrifice flight safety during a “simulated” evolution. If anything is unclear ask questions.
2. By using light signals (similar to standard tower light signals) the LSO can clear the aircraft to continue the approach, land, add power, waveoff or divert.
3. The LSO will use light signals to communicate with the lost-COMM aircraft. Comply with the following:
   a. Continue in the FCLP pattern - Fly a normal approach
   b. First green light - Roger hover-stop
   c. Subsequent green lights - Power (On the third consecutive cut light, the limiters shall be tripped.)
   d. Abeam the landing spot you are cleared to cross, if the spot is open (no signal from the LSO).
   e. Steady green light in the hover - Cleared to land
   f. Flashing Red light - Wave off
   g. Alternating red / green - BINGO
   h. Fly the aircraft, handle the emergency, make calls in the blind. Remember, the runway will be available if needed for actual emergencies.

Common Errors:

1. Not scanning the lights during a simulated NORDO approach - taking own waveoff unnecessarily.
2. Not understanding light signals.
3. Not responding to light signals.

 Corrections for Errors:

1. Know the light signals for a NORDO approach and be prepared to execute the approach.

Source Documents: V/STOL LSO NATOPS
Name: FCLP Emergency Procedures

Purpose: To make good timely decisions involving aircraft emergencies

Description of Procedures:

1. Procedures are in accordance with VSTOL LSO NATOPS, and NATOPS.
2. Recovering an emergency aircraft in a shipboard or simulated shipboard (FCLP) environment requires some special consideration due to the fact that all recoveries aboard a ship must be a VL. The good news is that at Bogue Field there is a runway (albeit a short one) right next to the LHA deck and MCAS Cherry Point is only 15 miles away so you could easily fly any emergency back to home.
3. The list of emergencies that have specific implications in the FCLP environment are listed below. They will be reviewed at every FCLP flight brief; you should think through them ahead of time and come up with a sound course of action for each. If you have any questions on any of them, discuss them with an LSO.
   a. Electrical failures
   b. Landing gear malfunctions
   c. Brake failure
   d. No lift off on STO
   e. Loss of thrust
   f. Dual DECS failure (EFC warning light) or loss of engine control or RPM fluctuation during VL
   g. Abort
   h. Over rotation on STO
   i. Fire (FIRE light)
   j. NORDO approach

Common Errors:

1. Not accurately following emergency procedures.
2. Not accurately assessing the type emergency that has occurred.

Corrections for Errors:

1. Know immediate action items for all emergencies.
2. Assess emergency before reacting too quickly (no fast hands).

Source Documents: VSTOL LSO NATOPS
NATOPS
Formation Stage

Name: Section Taxi / Marshal Procedures

Purpose: Safely and expeditiously taxi with FOD avoidance.

Description of Procedures:

1. **Taxiing:**
   a. Always taxi with a FOD avoidance mindset. You are not the only aircraft on the airfield any more. Think about where your nozzles are pointing and will point when you move your aircraft.
   b. When following other aircraft, maintain a 1000' minimum separation. Two ways to determine 1000' are: 1 - (pick two objects 1000' apart, say the distance remaining boards, and put the two aircraft at that separation) and 2 - keep the aircraft in front of you smaller than the VV wings. They are 30 mils in width and a Harrier has a wingspan of about 30' (1mil at 1000' = 1').
   c. You can taxi behind stationary aircraft at 90° TCA or greater. Give yourself enough distance. Common sense applies.
   d. Out of the line, closest to the hangar taxies first. If you’re beak-to-beak, taxi in order of call sign. (MARS-22 will taxi before MARS-23).
   e. Whenever you are ready for takeoff your landing light will be on. Whenever you have stopped taxiing (w / no intent to continue to taxi) or are doing checks, your landing light will be off. During daylight taxiing in and out of the line will be done with landing light off.

2. **Marshalling:**
   a. Heading to the warm up area will be exactly like in FAMs. If Lead has taxied first, he will make it evident on which side of his aircraft he wants you. He will park his aircraft in the corner of the warm-up area leaving you no option, but to park on the correct side. If you are the first to taxi, head for the middle of the edge of the warm-up area, perpendicular to the takeoff runway. Lead will come up on the correct side.
   b. Complete the takeoff, combat, miscellaneous checks to include a yardstick check (ensure TACAN is boxed on the AMPCD or PROX is colonized on the ODU to receive DME information in the HUD) and set the default cards. Complete your one-finger checks. Once all checks are complete, examine the aircraft next to you for leaks or damage. Ensure you are both configured the same. If Lead’s position lights are off, have yours off. AUTO flaps have no aileron droop; STOL flaps have aileron droop. Once satisfied, the last member in the flight turns his landing light on and passes the “up and ready” signal with a thumbs-up, up the line.
3. **Taxiing to the runway:**

   In section there are three ways to taxi to the runway: section taxi, Lead crosses in front of Wing, and Lead / Wing kiss off.

   a. When taxiing in section, ensure your intakes are in front of Lead’s cold nozzles. This will put you in an acute position on Lead. Lead will “pat you aboard.” Follow Lead’s movement utilizing brakes and power as necessary to maintain position. Turns away will require slightly more power and turns into will require more brakes. Once the section is about to enter the runway, Lead will kiss you off. Taxi your aircraft to be centered on your half of the runway. Lead will continue to taxi just enough to allow you to center up on the runway and pull up to have your intakes forward of Lead’s cold nozzles.

   ![Diagram 1](image1.png)

   b. Lead crosses in front of Wing. Lead will start to taxi straight ahead and then turns across your nose heading to the runway. Once Lead turns and taxies away, you can start to taxi to your position by ensuring you have 90° TCA.

   ![Diagram 2](image2.png)
c. Lead / Wing kiss off. Lead will “pat you aboard” and start to taxi. After both aircraft start moving, Lead will kiss you off and continue to taxi in position. You do the same by heading to your position. Ensure you keep your intakes ahead of Lead’s cold nozzles until you have separated enough.

Common Errors:

1. Not taxiing to the long position as dash last.
2. Positioning on the wrong side of runway.
3. No tail pipe courtesy.
4. Incorrect COMM.

Corrections for Errors:

1. Position on the numbers for the last aircraft.
2. Lead will take downwind side of runway, this means Dash 2 and Dash 4 are on the upwind side.

Source Documents: N/A
Name: Section CTO

Purpose: Maintain IFR parade for low ceilings.

Description or Procedures:

1. Section CTOs will begin from a line abreast position. Minimum lateral separation of one wingspan, and your intakes forward of Lead's cold nozzles. Once in position, each member of the flight will secure their landing light and you will pass the one-finger signal to Lead. Once Lead sees that you are ready, Lead will call for takeoff, if not already received.

2. Once tower has cleared the flight for takeoff, Lead will visually pass the two-finger run-up signal. At this point, conduct your engine run-ups in accordance with NATOPS. When complete with your engine run-ups, turn on your landing light and pass the two-finger signal to Lead.

3. When ready for takeoff, Lead will nod head forward (preparatory), then aft (command). As Lead's head hits the headrest, he will release his brakes and then smoothly add full power (checking top-end rpm exactly like in FAMs). Lead will then assess any trends and make a power adjustment as required by reducing to 100-105%.

4. Select full power, check top end RPM, and adjust power as necessary to maintain position. Maintain an acute parade bearing and remain centered on your side of the runway. Prior to liftoff Lead will give the “go-fly” signal. You should match Lead’s attitude during liftoff, raise the gear on Lead’s head nod, and nozzle-out. Ensure your aircraft is clean, and then position your aircraft in parade.

Common Errors:

1. Over-rotation on CTO / losing sight.
2. Taking the lead.
3. Sucked from the start.

 Corrections for Errors:

1. Don’t over rotate
2. Fly off Lead

Source Documents: Video: CTO, NATOPS
Name: Individual STO from the Stream Position

Purpose: To reduce FOD potential during section take-off.

Description of Procedures:

1. All members of the flight will taxi to the runway using FOD avoidance procedures (i.e. parade taxi, tailpipe courtesy). Lead will proceed up the runway far enough to ensure a minimum of 1000' or takeoff roll plus 300' whichever is greater (or in accordance with current SOP) between aircraft. Dash-last will indicate in position and ready for run-ups verbally, “4, 1 FINGER”, and visually by securing his landing light. Dash-3 and -2 will repeat the same step in reverse order to indicate in position.

2. Once Lead has received visual / verbal concurrence of all in position, he will call for takeoff. Upon clearance for takeoff Lead will state over COMM 2, (COMM 1 if any aircraft is single radio) “MARS-11 FLIGHT, RUN ‘EM UP.” At this time the entire flight will do their acceleration checks. Once complete, Dash-last will initiate ready for takeoff verbally, “-4, 2 FINGERS” over COMM 2, (COMM 1 if any aircraft is single radio) and visually by turning “ON” his landing light. Dash-3 and -2 will repeat the same steps in reverse order.

3. Once Lead has received verbal / visual confirmation of all members ready for takeoff, he will state “MARS-11, ROLLING,” and execute an individual STO. As lead’s aircraft leaves the ground Dash-2 will call “MARS 12, ROLLING,” and execute an individual STO. Each remaining aircraft will make a “ROLLING” call and then initiate their take-off when the preceding aircraft has left the ground. Due to the increased interval between the aircraft Lead will reduce power to 105% RPM after safely airborne to allow the trailing aircraft excess power to rendezvous. Additionally, the trailing aircraft should take advantage of any turns by getting on the inside to help close the interval with geometry. To avoid unrecognized closure, ensure that no aircraft are inside your HUD field-of-view.

Common Errors:

1. Not commencing ACCEL checks when Lead says, “RUN ‘EM UP.”
2. Not executing take-off roll at proper interval.
3. Boresighting any member of the flight.

Source Documents: NATOPS, MAG-14 SOP
Name: Section Stream STO

Purpose: To facilitate expeditious join-ups.

Description of Procedures:

1. Procedures are similar for individual STO from the stream position. All members of the flight will taxi to the runway using FOD avoidance procedures (i.e. parade taxi, tailpipe courtesy). Lead will proceed up the runway far enough to ensure a minimum of 1000' or takeoff roll plus 300' whichever is greater (or as current PIF dictates) between aircraft. You will indicate in position and ready for run-ups verbally, “2, 1 FINGER”, and visually by securing your landing light.

2. Once Lead has received visual / verbal concurrence, he will call for takeoff. Upon clearance for takeoff Lead will state over COMM 2, (COMM 1 if any aircraft is single radio) “MARS-11 FLIGHT, RUN ‘EM UP.” At this time do your acceleration checks. Once complete, call ready for takeoff verbally, “2 (or 5) FINGERS” over COMM 2, (COMM 1 if any aircraft is single radio) and visually by turning “on” your landing light.

3. Once Lead has received verbal / visual confirmation he will call “MARS-11, ROLLING, ROLLING, GO.” Execute a simultaneous / individual STO. Climb slightly above and to the outside of Lead’s aircraft to avoid its jet wash. Expect Lead to perform a flatter accelerating transition than previously seen in FAM so you can fly above his jet wash. To avoid unrecognized closure, ensure that the lead aircraft is not inside your HUD field-of-view.

Common Errors:

1. Not commencing ACCEL checks when Lead says, “RUN ‘EM UP.”
2. Not selecting full power when Lead says, “ROLLING, ROLLING, GO.”
3. Boresighting any member of the flight.
4. Over rotating and losing sight of Lead.

Source Documents: NATOPS,
Video / Audio from –2 position of SSTO
Name: Takeoff Rendezvous

Purpose: To safely and expeditiously join up after takeoff.

Description of Procedures:

1. Two types of rendezvous may be used: circling rendezvous and running rendezvous. There are many situations (takeoff, changing formation, off target, etc.) when a combination of circling and running rendezvous is required. Although the dynamics will present a different geometric picture than you are used to, application of the basic rendezvous procedures described in the following paragraphs will get you aboard safely and expeditiously. At VMAT-203, all rendezvous' will be carried out VMC at 300 KIAS, or as briefed, and nozzles will not be used to affect any rendezvous in VMAT-203, until TVC sortie is complete.

2. Circling rendezvous: The takeoff rendezvous will employ the circling rendezvous technique to the maximum extent possible. All aircraft, when safely airborne, will maneuver to the inside of Lead’s radius-of-turn and execute a normal circling rendezvous on bearing line. Special attention must be given to maintaining sight and proper separation on aircraft joining in front of you (if in division). Do not place the lead under the VV. Daytime closure shall not exceed 50 knots, 25 knots once on bearing, less than 15 knots in close. Nighttime closure shall not exceed 25 knots, or no more than 15 knots on bearing. All aircraft will join from the inside of the turn. If still in a turn, cross under to assume an echelon position. If Lead rolls wings level prior to all members joining the flight, the remaining members will change to a running rendezvous. Once all members of the flight are joined, Dash-2 will balance the formation. If runway or departure requirements warrant something different, the takeoff rendezvous will be as briefed.

3. See Running Rendezvous:

Common Errors:

2. Exceeding closure limits.
3. Going through Lead’s jet wash.

Corrections for Errors:

1. Keep Lead outside the airspeed & altitude boxes in the HUD.
2. Scan airspeed.

Source Documents: N/A
Name: Parade Formation

Purpose: Administrative control of a formation for IFR or when viewed from the ground.

Description of Procedures:

1. This formation will normally be used when operating within Class D Airspace, in instrument conditions, and at any time the formation will be viewed critically from the ground. By definition, it is a formation with limited maneuverability and lookout capability. The entire job of maneuvering the formation rests with Lead, who is very restricted and must be smooth. All speed brake, gear, flap, and nozzle configuration changes will normally be signaled by Lead.

2. Position: The parade position is flown by the wingman aligning his head with the Lead’s aileron / flap hinge line. The wingman is very slightly stepped-down on the Lead, which puts the Lead’s wingtip in line with the bottom of his fuselage, and places the wing landing gear over avionics panel door 60L or 60R. Wingtip clearance shall be no less than 6 feet. In division, the formation is a combination of two sections, in which the wingmen fly a parade position identical to that flown in section formation. Normally divisions will not fly in echelon for extended periods of time; rather the flight will be balanced. Every attempt should be made not to turn into a division echelon. The positions are shown in NATOPS.

3. Turns: While flying in parade formation, turns may be performed using either of two techniques – VFR Parade or IFR Parade. VFR parade is maintained by rolling about the individual aircraft’s axis, where IFR parade consists of rolling about Lead’s axis. When using the first technique, the aircraft’s large intakes make it impossible to keep Lead’s head in view and, therefore, visual signals between aircraft are not possible. For this reason, instrument-wing is preferred with two aircraft. Using instrument-wing formation, the wingman always maintains a fixed wing position, riding up on turns away, and down on turns into the wingman. All parade turns in VMAT-203 should be flown in instrument-wing formation unless briefed differently. All turns in division balanced parade should be VFR parade turns. All turns in division fingertip should be IFR parade turns.

Common Errors

1. Flying Blue Angel parade or too far from Lead.
2. Over controlling minor corrections, not trimming A/C.
3. Poor mission cross-check time.

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Visual Signals

Purpose: To facilitate communication between aircraft in a COMM-out environment.

Description of Procedures:

1. Know how to pass the following signals by hand and arm (day) or light (night): HEFOP signals, passing the lead, cross under wingman, cross under section, fuel, B&R, level off, climb, descend, turn left / right, speed brake, gear, nozzles / flaps, take combat spread, take cruise, come aboard, land, need VL, kiss off.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Cross Under

Purpose: To change sides in a formation.

Description of Procedures:

1. Cross unders in the AV-8B are similar to those in other aircraft, and should be smooth, controlled maneuvers. Unlike the T-45, where you performed a 3-step "square" cross under, they are executed in one fluid motion.
2. The wingman should reduce power slightly and smoothly go sucked, while descending to a position that ensures adequate clearance from Lead’s aircraft and jet-wash. A minimum separation of one-half aircraft-length nose-to-tail should be maintained while crossing under Lead’s aircraft. Once on the other side, the wingman will add power to achieve proper bearing line while climbing to parade position. The maneuver should resemble an oblique U from the parade position on one side of lead’s aircraft to the other.

Common Errors:

1. Not leaving enough step down and entering Lead’s jet wash, coming up into position prior to crossing Lead’s wing and entering Lead’s wing vortices.

Corrections for Errors:

1. N/A

Source Documents: N/A
Name: Lead Change

Purpose: To change Lead.

Description of Procedures:

1. To pass the flight lead, Lead will tap his forehead then point to you. To accept the lead, tap your forehead and point directly forward. The lead change has not occurred until it has been accepted. The lead change may also be accomplished utilizing the radio.

2. The new wingman will now take a slight cut away (about an additional ½ wingspan) and reduce power. Wing will slowly move aft until intercepting the bearing line then add power to move into parade position.

Common Errors:

1. Reducing power when accepting the Lead.
2. Not anticipating power addition to intercept bearing.

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Cruise Formation

Purpose: Administrative formation allowing more maneuverability than parade.

Description of Procedures:

1. The cruise position allows for increased flight maneuverability and lookout capability. It may be used to reduce the workload on the flight members.
2. Position: The wingman’s position is within a 120° cone astern Lead, with a minimum of one-aircraft-length nose-to-tail. The 120° cone lies approximately behind the lead aircraft’s wing leading edge. The wingman’s power setting should remain relatively constant while maneuvering within the assigned area. In turns exceeding approximately 30° AOB and for other than a short duration, wingmen should slide to the inside of the turn. Avoid working the airplane into a hole by trying to conserve too much power and maintaining position only with bearing. In the event the wingman finds himself sucked on the inside, he should simultaneously add power and pull up on the bearing line to close. If inside the turn and acute, he should simply fly to the outside of the turn, and move back in when nose-to-tail separation is satisfactory. If outside and going sucked, he should add a little power and fly to the inside of the turn. When Lead rolls wings-level and has stopped his maneuvering, Dash-2 should slide to the outside edge of the cone (to Lead’s wing-line) so he can be seen by Lead. In general, Dash-2 should always be able to see Lead’s head.
3. Restrictions: There are no restrictions on the amount or severity of maneuvering that may be performed in cruise, with the exception that large power changes should never be made by Lead. Normally, the wingman (or Dash-3) will position himself to the inside of the turn.

Common Errors:

1. Flying a sucked position where Lead cannot see you.
2. Getting spit out of turns.
3. Not enough step-down when crossing under.

Corrections for Errors:

1. When not maneuvering fly a position that is forward on the 120° cone. This will make it easy for Lead to see you and pass any signals.

Source Documents: NATOPS
Name: Running Rendezvous

Purpose: Join aircraft in an expeditious manner.

Description of Procedures:

1. A running rendezvous is a join-up from trail position. Lead's airspeed is important, and must be briefed. The wingman should establish an overtaking airspeed, being careful not to overshoot during the final portion of the rendezvous (maximum 50 knots excess airspeed, initially). Relative motion is difficult to discern when approaching from a trail position; therefore, the wingman will displace his aircraft laterally (approx. 500') to gain aspect on Lead or other joining aircraft. As you approach the bearing reduce airspeed slightly to arrive on bearing line with no more than 25 knots closure. The wingman will then maintain his aircraft on bearing line and complete the rendezvous to parade position. In division running rendezvous, the flight will join as briefed, giving special attention to separation on all aircraft ahead of you. At no time should you place any aircraft under the VV. By offsetting Lead between the HUD and canopy bow, you will have adequate lateral separation.

2. At night closure is 25 knots in trail, 15 knots on bearing.
3. **Running rendezvous overrun.** In the event that closure is not under control during the final phase of the running rendezvous, an “overrun” will be performed. This is accomplished by:
   a. Lowering the nose to increase vertical separation
   b. Selecting idle and speed brake
   c. Maintaining lateral separation from the lead aircraft
   d. Transmit “MARS-XX, OVERRUN.”
   e. Allow Lead to pass by until re-intercepting the bearing line for the rendezvous.

**Common Errors:**

1. Excessive closure.
2. Placing Lead in HUD field-of-view.
3. Under running vice “over running.”
4. Losing sight of Lead.

**Corrections for Errors:**

1. N/A

**Source Documents:** NATOPS
Name: Break-Up & Rendezvous

Purpose: Practice joining a flight using the CV rendezvous technique

Description of Procedures:

1. Circling rendezvous: The circling rendezvous is the rendezvous portion of the carrier breakup & rendezvous exercise. The entire exercise will be covered here. The flight shall be positioned in echelon so the appropriate hand signals can be passed. It is important that the lead aircraft maintain a pre-briefed altitude and airspeed throughout the exercise.
   a. The Lead will pass the breakup & rendezvous signal to his flight. Add full power and turn using 4 G’s or 10° AOA. He will continue this turn through 180°. After delaying for 4 sec (inside turn circle), or 8 sec (outside turn circle), Dash-2 will commence a similar maneuver, in order to end up in-trail of the lead aircraft; Dash-3 will delay 4 sec and commence a similar maneuver, followed by Dash-4. Once Dash-4 is in-trail of the flight, he will transmit “FOUR IN-TRAIL.” The Lead will then commence a rendezvous turn at 300 KTS.
   b. The entry into another aircraft’s turn circle can be easily identified utilizing the canopy and external horizon. If an aircraft is outside the turn circle, you will notice the lead aircraft aspect is changing accompanied with a slight drift across the canopy in the direction of the turn. This usually occurs outside of 2 NM for a 300 knot, 30° AOB turn. Upon turn circle entry, the lead aircraft’s aspect will stabilize with a noticeable increase in the line-of-sight (LOS) rate across the canopy in the direction of the turn. This is much easier to recognize from a stabilized position (close to wings level in a slight lead or lag on Lead). This works well if the A/A TACAN is inop or you’re unaware of the lead aircraft, airspeed, turn rate and radius.

2. Rendezvous inside the turn circle: (< 2 NM in trail). It is important that each wingman continue straight ahead until Lead bears 30° relative to his nose. Once the aforementioned is obtained, roll into a 60° AOB turn, pulling toward the inside of Lead’s turn radius. If the wingman turns immediately after Lead, he will simply be flying on Lead’s turn-circle and will require an excessive power and airspeed advantage to join. After Lead passes back through the wingman’s 12 o’clock position, the bank angle should be reduced to avoid an excessive heading change and over shooting the bearing line. Wingmen should use enough power to gain a 25-knot speed advantage to expedite the rendezvous inside the turn circle. As the rendezvous bearing is attained, adjust the bank angle to maintain bearing line. The bearing line is defined as looking up the leading edge of the inboard wing, having the vertical stab on the outboard wingtip or by placing Lead in the “triangle” formed by the canopy bow and the glare shield with fuselage alignment.
   a. To correct an “acute position” (forward of the bearing), reduce your AOB and reduce power if required. This will allow Lead to fly out in front, which places you back on bearing. To correct for a “sucked position” (aft of the bearing), increase your AOB and pull towards Lead’s bearing. A power addition may be required.
b. When corrections are made from an acute or sucked position, remember that as bearing line is re-intercepted, the fuselages must be re-aligned to prevent large overshoots. By freezing the lead aircraft at a relative position in the canopy, movement off the bearing line can be easily detected and corrected during the rendezvous. If a member of the flight is slow to get aboard, the aircraft following him will join in cruise and complete the rendezvous in cruise formation on the slow member of the flight, crossing under the slow member of the flight as he crosses behind Lead. The Lead shall be kept on the horizon, to affect a level rendezvous.

c. Take step-down at one-aircraft-length separation, cross to the outside and resume IFR parade.

d. In the event that an underrun becomes necessary:
   i. Lower the nose
   ii. Level the wings
   iii. Select idle
   iv. Speed brake out
   v. Pass below and behind Lead’s aircraft
   vi. Transmit “MARS-XX UNDERRUN.”
   vii. When stabilized on the outside of the turn and cleared by Lead, reestablish the final portion of the rendezvous inside Lead’s turn, and complete the join.

3. **Rendezvous outside the turn circle:** (> 2 NM in trail). This will initially require Dash-2 to fly a pure pursuit vector on Lead until he is inside Lead’s turn circle at which time he will analyze where he is on Lead’s bearing line. If he is forward of the bearing line, he will need to lag Lead’s aircraft by rolling wings-level or taking a cut away from Lead. If he is on the bearing line, then a turn to gain fuselage alignment will be necessary. If he is aft of the bearing line, then a “pull to the bearing” will be needed. With the bearing line established, proceed as described in paragraph 2. The intent for this breakup and rendezvous is to show the RP a high aspect rendezvous.
4. **Night rendezvous**: Night rendezvous shall be carried out in VMC. The following procedures will be used:
   a. Airspeed is 300 KIAS.
   b. Altitude as briefed by Lead.
   c. Trailing aircraft will call “VISUAL” when lead aircraft is identified. If a circling rendezvous is required, the lead aircraft shall call and commence a port or starboard 30° AOB turn.
   d. Trailing aircraft will close slightly below Lead’s altitude with lateral separation, and call “LIGHTS”, “SMASH OFF” and / or “DIM” as required.
   e. Maximum closure in-trail is 25 knots.
   f. Maximum closure once on-bearing is 15 knots.
   g. There will be NO mission crosschecks completed during any night rendezvous when closer than the cruise position, until stabilized in the parade position; all your attention will be on completing the rendezvous safely.

5. **Night breakup & rendezvous practice**: 
   a. “Breakup & rendezvous” will be performed in the same manner as day, with the following additions:
      i. Lead will turn his anti-collision lights on just prior to the breakup.
      ii. Lead will transmit “LEFT” or “RIGHT” to indicate direction of turn.
   b. Bearin line on a night rendezvous is difficult to discern. Using the taillight, wingtip light, and anti-collision light; place the anti-collision light one-third of the distance from the wingtip light to the taillight. At approximately one-half mile you will be able to pick up the strip lighting. At this point, align Lead’s wingtip light with the strip light on top of his aircraft, just aft of the canopy. Once in close, your anti-collision light will illuminate Lead’s wing, allowing you to complete the rendezvous visually.

**Common Errors:**

1. Not maintaining sight.
2. Not scanning ABCs.
4. Not seeing turn circle entry.
5. Not seeing bearing.
7. Not under running when needed.
8. Starting cross under too far out.

**Corrections for Errors:**

1. N/A

**Source Documents**: NATOPS
Name: Section Battle Damage / Ordnance Checks

Purpose: To confirm aircraft integrity and ordnance status of all flight members prior to return to base.

Description of Procedures:

1. Procedures are in accordance with Air NTTP.

Common Errors:

1. Not “FENCE-ing out” prior to joining in close proximity to other aircraft.
2. Not using proper signals for lead change.
3. Poor basic airwork while flying as Lead.
4. Not closely checking other aircraft (i.e. not seeing “hung” bombs, loose fasteners, etc.)

Corrections for Errors:

1. Perform your Tacadmin checks again prior to join up; ensure all weapons are deselected and all armament switches are SAFE (ALE-39/47 is often forgotten).
2. Watch the visual signals carefully, especially for the lead change; there can be no ambiguity about “who’s on first.” If something is unclear, ask on the radio.
3. Fly the heading and altitude that Lead gives you at the lead change. If the flight is in a descent or a turn during the lead change, Lead will tell you what the level-off altitude or roll-out heading should be; fly it.
4. Be deliberate when performing a visual inspection of the other aircraft. Lead is going to make decision about the recovery based upon your input from the inspection. Don’t pass bad / unsafe gouge.

Source Documents: Air NTTP
Name: Formation VFR Break Maneuver

Purpose: Transition from tactical airspeeds to the landing configuration in an expeditious manner.

Description of Procedures:

1. All aircraft, whether in formation or as a single-ship, will follow the same break procedures as in FAM stage. The break interval will be two seconds - any increase in the interval to be briefed by Lead. The break shall be a level 4G or 10° AOA turn, with no more than 10° AOA on downwind. Once established on downwind and less than 250 knots, the gear will be lowered and 25° nozzles selected; do not select greater than 25° nozzles until abeam. The remainder of the checklist remains the same. Lead will make a normal abeam call: “MARS 21, ABEAM, GEAR, RVL.” If cleared to land as a flight, Dash-2, -3, and -4 will make the following calls: “MARS-22, GEAR, MARS-23, GEAR, MARS-24, GEAR.”

Common Errors:

1. Being on the wrong side.
2. Delaying too long.
3. Slicing / ballooning the turn.
4. Not matching Lead’s pull.
5. Waiting too long for landing checklists.
7. Selecting greater than 25 nozzles prior to the abeam.

Corrections for Errors:

1. N/A

Source Documents: NATOPS, VMAT-203 SOP
Name: Formation Approach Procedures

Purpose: Practice section flying during the recovery phase.

Description of Procedures:

1. Dirty-up procedures for all day section approaches are identical, regardless of the type landing planned. The standard NATOPS gear signal, when acknowledged by the wingman, will be followed by a head-nod from Lead. When Lead’s head touches the headrest, lower the landing gear. At approximately 1-2 miles prior to intercepting the glide slope, Lead will indicate 25° nozzles by giving three “nods” with a clenched fist, followed by a number of fingers to indicate nozzle angle desired. At Lead’s head-nod, both aircraft will lower nozzles and check duct pressure, then select flaps to STOL. The approach is flown at 8° AOA by Lead to preclude a wingman at higher gross weights being above 10 units AOA. Avoid flying in the 165 knots area in order to stay out of aileron droop.

2. After breaking out and acquiring the runway environment, the wingman should detach, on Lead’s signal, by placing the nozzles to hover-stop to gain adequate separation. The wingman should hold hover-stop until reaching approximately 8° AOA and then nozzles as required for the appropriate landing (avoid overshooting 10° AOA). If performing an RVL or VL, water checks will be performed prior to the key. The lead aircraft will remain at the approach nozzle angle for at least 5 sec for separation, continue with the approach, and carry out an individual landing. The wingman should not fly below the Lead’s altitude during the approach.
   a. **Tower downwind:** Ensure you are on the appropriate side so Lead can turn downwind first. Once upwind, Lead will kiss you off and turn downwind. Wait until Lead is 45-60° off your heading before turning downwind to establish appropriate interval.
   b. **Missed approach:** Lead will indicate a missed-approach by giving the “go fly” signal with his hand and slowly adding approximately 10-15% RPM. It is imperative that the wingman match Lead’s power as close as possible. With a positive rate-of-climb, Lead will signal for the gear. On Lead’s head-nod, raise the landing gear, select AUTO flaps, and nozzle-out.
   c. **Night section approach:** The same procedures apply for transition to the landing configuration, except it will be done verbally over COMM 2. Taking separation or lead turning down wind will be initiated by lead turning on his anti-collision light and position-lights to full bright. Separation can also be accomplished via the radio.

Common Errors:

1. Flying too close / too far.
2. Missing hand arm signals.
3. Being too late / early during configuration changes.
4. Wingman not prepared to assume the Lead.
Corrections for Errors:

1. N/A

Source Documents: VMAT-203 SOP
Name: Section Emergency Procedures

Purpose: To safely recover an emergency aircraft using a wingman and any other available assets to assist with the recovery.

Description of Procedures:

1. Procedures are in accordance with VMAT-203 SOP for Flight Operations.
2. NATOPS has very specific procedures for telling you what to do with your own aircraft if you have an emergency. When you are flying in formation and have a wingman to assist with emergencies your chance for successful recovery of the emergency go up significantly if good crew coordination is used between the flight members. Wingman can provide invaluable assistance like performing a visual inspection of the aircraft or reading out checklists and procedures. To fully take advantage of this resource, however, we need standardized procedures that state the responsibilities and duties of flight members during an emergency or the wingman could just be getting in the way and creating more confusion than assistance. The VMAT-203 SOP for Flight Operations states the roles of each aircrew in general terms and also gives specific standards for situations that are most likely to be encountered. In instances that are not covered in the SOP, good CRM and sound judgment are mandatory.
3. You must study and be well-versed in the standards of the Flight SOP so you know what is expected of you because if an emergency does occur there may not be time or the capability to discuss roles and responsibilities so they need to be ingrained in your head.

Common Errors:

1. Not using CRM to accurately diagnose and then correct the problem.
2. Not knowing the roles and responsibilities for section emergencies.

Corrections for Errors:

1. Be an active participant in the flight. No “sand-bagging”… use CRM principles to identify and resolve problems whether they are caused by aircraft malfunctions, weather, etc.
2. Study NATOPS and the Flight SOP.

Source Documents: NATOPS, VMAT-203 FLTSOP
Advanced Aircraft Handling Stage

Name: Nozzle Deflection Training

Purpose: Nozzle deflection training will be conducted to teach the aviator what the cockpit indications are of normal engine operations with nozzles deflected during wingborne flight.

Description of Procedures:

1. IAW TVC straight and level procedures found in AA syllabus.

Common Errors:

1. Improper / incorrect scan of engine instruments.

Corrections for Errors:

1. Scan EDP for nozzle position, note short lift datum RPM on EDP (113.5 %), note 15 second caution light, scan EDP for high duct pressure, note increasing AOA with decreasing airspeed in level flight, and increase in pitch sensitivity.

Source Documents: AV-8B NATOPS
Name: Tactical Administration (tacadmin) Checks

Purpose: To provide procedures for preparing the aircraft and systems for combat operations in hostile territory. This section provides an abbreviated description only. Reference the current Air NTTP 3-22.3-AV8B Ch 3 Tactical Administration - Tactical Administration Checks paragraph and Return to Force (RTF) paragraph for a full description of the procedures below.

Description of Procedure:

1. FELPG-F is an acronym used as a memory device when performing tacadmin checks.
2. F – Flight Environmental Assessment. Provides an opportunity for flight leads to assess environmental factors that could prevent or modify the plan of execution.
3. E – Expendable Check. The Comm-in expendable check is SOP at VMAT-203.
4. L – LAT/LAW/PUC Checks.
6. G – G-WARM. Students should target 360-380 KCAS, not to exceed 0.75 IMN. When flying the TAV-8B, students should target 4 Gs during both turns of the G-warm. A negative-G check may be conducted at the discretion of the flight lead.
7. F – “FENCED in, Tapes on”
8. FENCE out. Read Return to Force paragraph in current Air NTTP 3-22.3-AV8B.

Common Errors:

1. Excess/improper comm. during expend check.
2. Not maneuvering to a proper position for expendable check.
3. Not resetting correct PUC.
4. Calling “Speed L/R” prior to trimming yaw at 360-380 KCAS.
5. Not appropriately applying G/AOA during G-Warm.
6. Not correctly setting up stores for planned release.

 Corrections for Errors:

1. No response is required if expend check produces expected results.
2. Maneuver to an abeam-acute position that allows the flight to observe the expendables.
3. Set PUC up in JMPS prior to brief. Recheck PUC is set for planned release and colonized during CWAIVER checks. Recheck PUC is set during LAT checks.
4. Select V/STOL Master Mode during accel. Continuously trim ball during accel and reduce throttle to establish 360-380 KCAS. Ensure ball is centered before reselecting NAV Master Mode and reporting “speed L/R” to your flight lead.
5. Target smooth symmetrical pull to 4G or 10 units AOA on first 90 degrees of turn. When flying an AV-8B (B-bird), target 12-15 units AOA and max expected G for the sortie (not to exceed 5.5 G).
6. Set weapon options during CWAIVER checks. Recheck weapons are correctly set-up for planned release during PLACE checks.

*Source Documents:* Air NTTP
Name: Slow Speed Departure

Purpose: To demonstrate departure characteristics from controlled flight and proper NATOPS Out-of-Control Flight procedures.

Description of Procedures:

1. The PUI will commence this maneuver at 250 KCAS and 15,000’. Set full power and pull 90° nose up utilizing a 12-15 unit AOA pull. Passing 100 KCAS retard the throttle to idle and attempt to maintain a pure vertical flight path.
2. After the departure, initiate NATOPS recovery procedures and transmit “KIO, BALLISTIC” to ensure other flight members understand a departure has occurred.
3. Neutral controls are defined as rudder pedals centered, lateral stick (ailerons) centered and longitudinal stick at 0° stabilator position. Recovery is indicated when the aircraft has accelerated to greater than 150 KCAS, AOA has decreased below 15 units and the aircraft has no apparent sideslip rate.
4. Upon recovery, add power as required to capture 300-380 KCAS while smoothly initiating a 15 unit AOA pull to the horizon. In certain flight regimes and configurations the aircraft may not achieve 15 units AOA prior to exceeding the lift limit, characterized by wing drop. If wing drop occurs, make the pull to the horizon at the lift limit instead of 15 units AOA, to avoid a second departure.
5. All power additions after a departure should be slow and made referencing the JPT and RPM to determine proper engine response.

Common Errors:

1. Not knowing NATOPS Out-of-Control procedures.
2. Not knowing maneuver procedures.
3. Pulling in excess of 15 units to the vertical.
4. Not retarding the throttle to idle at 100 KCAS.
5. Not applying power as required to capture ~300 KCAS, thus leading to excessive altitude loss (fast) or a second departure (slow and/or too much AOA).
6. Not targeting 15 units AOA / lift limit pulls for recovery leading to a second departure or excessive altitude loss.
7. Not transmitting appropriate COMM.

 Corrections for Errors:

1. Study and chair-fly the NATOPS OUT-OF-CONTROL/SPIN/FALLING LEAF RECOVERY procedures so they are second nature. It is not good enough to just be able to recite the procedures verbatim from NATOPS. You need to be able to perform the procedures instinctively while being thrown around in the cockpit.
2. Know the indications of departure recovery and the proper control inputs to maintain control of the aircraft while bringing it back to level flight with minimum altitude loss.

Source Documents: NATOPS
Name: Accelerated Stall (High Speed Departure)

Purpose: To demonstrate High Speed Accelerated stall characteristics from controlled flight and proper NATOPS Out-of-Control Flight procedures.

Description of Procedures:

1. The PUI will commence this maneuver at 0.85 IMN and 25,000’. When cleared to execute the maneuver, perform an unloaded roll to approximately 120° AOB. Once the AOB is set, simultaneously pull full aft stick while quickly rolling through the aileron high speed stop to full lateral stick deflection opposite the initial roll direction. The maneuvering tone will likely sound as the AOA exceeds 9 units. The aircraft will initially respond to the full aileron input but will violently depart opposite the aileron input as the aircraft is approaching wings level.

2. These procedures will be performed in the simulator only; the aircraft WILL have a high-speed departure in this regime with even mild control inputs. After the departure, initiate NATOPS recovery procedures and transmit “KIO, DEPARTURE” to ensure other flight members understand a departure has occurred.

3. Neutral controls are defined as rudder pedals centered, lateral stick (ailerons) centered and longitudinal stick at 0° stabilator position. Recovery is indicated when the aircraft has accelerated to greater than 150 KCAS, AOA has decreased below 15 units and the aircraft has no apparent sideslip rate.

4. Upon recovery, add power as required to capture 300 KCAS while smoothly initiating a 15 unit AOA pull to the horizon. In certain flight regimes and configurations the aircraft may not achieve 15 units AOA prior to exceeding the lift limit, characterized by wing drop. If wing drop occurs, make the pull to the horizon at the lift limit instead of 15 units AOA, to avoid a second departure.

5. All power additions after a departure should be slow and made referencing the JPT and RPM to determine proper engine response. Be aware of how the engine is performing after a departure, especially at high-speed. Depending upon the severity of the post-stall gyrations a compressor stall is likely. Be prepared to execute your NATOPS procedures for a compressor stall and airstart while also performing the out-of-control recovery procedures.

Common Errors:

1. Not knowing NATOPS OCF procedures.
2. Not knowing maneuver procedures.
3. Not retarding the throttle to idle upon departure.
4. Not applying power as required to capture 300-380 KCAS on the recovery, leading to excessive altitude loss or a second departure.
5. Not targeting 15 units AOA / lift limit pulls for recovery leading to a second departure or excessive altitude loss.
6. Not transmitting appropriate COMM.
Corrections for Errors:

1. Study and chair-fly the NATOPS OUT-OF-CONTROL/SPIN/FALLING LEAF RECOVERY procedures so they are second nature. It is not good enough to just be able to recite the procedures verbatim from NATOPS. You need to be able to perform the procedures instinctively while being thrown around in the cockpit.
2. Know the indications of departure recovery and the proper control inputs to maintain control of the aircraft while bringing it back to level flight with minimum altitude loss.
3. Know your compressor stall indications and the emergency procedures for both a compressor stall and an airstart. Think about how you will have to incorporate these procedures into your departure recovery.

Source Documents: NATOPS
Name: AOA / Energy Management Drill

Purpose: Develop a seat of the pants feel for AOA sensitivity and control to manage aircraft energy state

Description of Procedures:

1. The PUI will start this maneuver at 10,000' and 300 KCAS. When cleared by the instructor roll into approximately 70° AOB, and then increase backstick pressure while increasing power. Unlike many other maneuvers where you select full power and then execute the maneuver, it is important to initially roll into the turn and add back stick pressure as you are adding power to maintain 300 KCAS constant. Increasing back stick pressure will require increasing throttle to maintain 300 KCAS, until you get to full power. This will prevent you from accelerating 20-30 KCAS as you would if you selected full power prior to the roll into the turn, which would increase the amount of time and fuel required to perform the drill.

2. Note the AOA that maintains 300 KCAS level; depending upon aircraft type, configuration and fuel weight this is typically between 10.5-12.5 units AOA. Increase back stick pressure slightly to increase AOA 1 unit above the 300 KCAS sustained AOA. Allow the airspeed to bleed to 280 KCAS. At 280 KCAS reduce the AOA to 1 unit less than the 300 KCAS sustained AOA. Allow airspeed to increase back to 300 KCAS. At 300 KCAS reset the initial AOA to maintain 300 KCAS.

Common Errors:

1. Not establishing a steady state constant AOA turn at 300 KCAS.
2. Over-controlling AOA when trying to change it by only one unit.

Corrections for Errors:

1. Take time to establish a steady state condition in the initial 300 KCAS turn otherwise all follow-on maneuvering in this drill will be invalid.
2. Remember AOA sensitivity increases as AOA increases so at relatively moderate to high AOA small amounts of stick displacement will yield large effects on AOA. Think of it as changing the pressure on the stick instead of actually moving the stick to control the AOA.

Source Documents: AV-8B NATIP, NATOPS
Name: Slow speed / high AOA drill

Purpose: To demonstrate slow speed / high AOA maneuvering.

Description of Procedures:

1. Altitude: 15,000 feet, Airspeed: 250 knots;
2. Full power, 10 unit pull to 40 degrees nose up.
3. Passing 150 knots, reset attitude to maintain 120 knots (approximately 15 degrees nose high). At 120 KCAS, the AOA will be approximately 20 to 23 units and aircraft climbing slightly in moderate buffet.
4. Perform straight and level flight and turns in both directions (attempt to prevent roll hesitation, roll reversal, or auto roll).
5. The wind vane should be monitored to ensure no sideslip buildup occurs.
6. Coordinated use of the aileron and rudder will be required to maintain aircraft control.
7. Initiating turns will require slight reductions in aft stick pressure to prevent excessive AOA excursions. AOA above 25 units without TVC will normally lead to a departure. Rapid AOA excursions can be stopped by momentarily releasing aft stick pressure and re-applying appropriate force (this is known as "pumping the stick").

Common Errors:

1. Not knowing maneuver procedures.
2. Allowing sideslip buildup thus leading to departure
3. No monitoring AOA / airspeed while maneuvering aircraft
4. Flying incorrect HUD master mode.
5. Not coordinating use of aileron and rudder resulting in excessive sideslip and departure.

Correction for Errors:

1. Review the maneuver procedures.
2. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
3. AOA / airspeed must be incorporated into scan to prevent excessive AOA and departures.
4. Flying in Reject 1 or 2 will not display AOA greater than 20 units.
5. Coordinate use of flight controls to ensure excessive sideslip and departure does not occur. Slow speed flight requires substantially more rudder input to maintain controlled flight.

Source Documents: NATOPS, Air NTTP
Name: Turn Rate Drill

Purpose: Develop an understanding between AOA, turn rate, and aircraft energy state.

Description of Procedures:

1. The PUI will start this maneuver at 10,000' and 300 KCAS. When cleared by instructor start a full power, level turn at targeted AOA for 180° of turn (perform three level turns targeting 10, 12 and 15 units AOA, respectively). At completion of turn call airspeed out to instructor who will inform you how long the turn took to complete. The next turn will be at full power, approximately 45° nose low, lift limit pull for 180° to demonstrate the conversion of altitude (potential energy) to maintain airspeed (kinematic).

Common Errors:

1. Not starting on parameters.
2. Not maintaining targeted AOA, altitude or nose attitude.

 Corrections for Errors:

1. Be smooth with AOA, often just changing pressure on the stick instead of actually moving the stick can change the AOA by a unit or more.

Source Documents: AV-8B NATIP, NATOPS
Name: Hard Turns

Purpose: Demonstrate proper energy sustaining turn technique in 3-dimensions by applying AOA awareness on the Ps=0 line, varying G application to maintain constant airspeed and mild plane-of-motion (POM) changes under constant G.

Description of Procedures:

1. Unloaded Rolls: The proper roll / turn technique is to properly clear the direction of turn, apply full power while simultaneously bunting the nose slightly forward to use a seat of the pants feel of ~ 0-1 G. This will allow the aircraft waterline and velocity vector to be fairly similar. The roll rate should be mild and smooth to set the desired POM. Once the POM is set, ensure the roll rate is stopped prior to initiating any backstick application.

2. The PUI will execute four total Hard Turns.
   a. Starting at 15,000 feet and 300 KCAS, when cleared by the instructor, the PUI will initiate a full power unloaded roll to 70-80° AOB to stay level on the horizon. Once the POM is set, back stick pressure should be expeditiously yet smoothly be applied to establish the AOA / G combination that maintains the starting airspeed. The maneuver will require slight AOB variations to manage the AOA and G to hold a level, 300 KCAS turn. The maneuver will be terminated by the instructor after completing approximately 180 degrees of turn. The next turn will again be at 15,000 feet but the starting airspeed is increased to 380 KCAS. Execution is exactly the same as the first turn.
   b. The next two turns are performed at 5,000 feet to show the effects on both performance and aircraft controllability caused by the increased dynamic pressure due to descending to a lower altitude. The first turn will again be conducted at 300 KCAS. When cleared by the instructor, the PUI will initiate a full power unloaded roll to 70-80° AOB to stay level on the horizon. Once the POM is set back stick pressure will expeditiously yet smoothly be applied to establish the AOA / G combination that maintains the starting airspeed. The maneuver will be terminated by the instructor after completing approximately 180 degrees of turn. For the next turn airspeed is increased to 380 KCAS. Execution is exactly the same as the previous turn. As expected the aircraft turn performance will be increased at lower altitudes. This will be apparent to you in the cockpit as being able to achieve a higher G loading than at 15,000 while maintaining the target airspeed.
   c. The EM diagrams show that at 15,000 feet and 300 KCAS we will achieve approximately 2.5 G in an energy sustaining (Ps=0) Hard Turn at about 10-12 unit AOA. Increasing airspeed to 380 KCAS at 15,000 feet will yield approximately a 3.0 G Hard Turn at 10-12 units AOA. At 5,000 feet a 300 KCAS Hard Turn will be at about 3.5 G and 12-13 units AOA and a 380 KCAS Hard Turn will be about 4.0-4.5 G. When performing Hard Turns in the TAV-8, be careful not to exceed the aircraft G limit, especially on the 380 KCAS / 5,000 foot
turn. If in a TAV-8 you reach 4.5 G sustained and the airspeed is increasing, reduce power slightly to maintain no more than 4.5 G and the assigned airspeed, rather than pull more than 4.5 G at full power to try to maintain the assigned airspeed.

Common Errors:

1. Rough BAW in setting POM.
2. Accelerating excessively prior to initiating pull.
3. Improper deck awareness.
4. Improper G / AOA application and unable to manage airspeed.

Corrections for Errors:

1. N/A
2. Scan airspeed while making the transition of setting POM and G application a smooth and progressive maneuver.
3. Utilize Deck Transition procedures by scanning altitude and relation to nose attitude.
4. PUI shall ensure IMN never exceeds 0.78 IMN

Source Documents: AV-8B NATIP, NATOPS
Name: Medium Altitude Break Turns

Purpose: Develop proper techniques for the execution of a break turn.

Description of Procedures:

1. The PUI will start these maneuvers at corner speed, 380 KCAS (or 0.75 IMN, whichever is lower) and 20, 15 or 10 thousand feet. When cleared by the instructor, perform an unloaded roll to approximately 70-80° AOB and then select full power while adding back stick pressure to execute a level, lift limit turn for 180° of heading change. The airspeed should decrease while performing the level break turn.

2. The primary cockpit reference for turn performance and the lift limit is AOA. Unfortunately, AOA can significantly lag with high onset rates so when establishing turn performance, AOA / G onset should be smooth and progressive. Additionally, the pilot must be attuned to the seat of the pants indications of the lift limit: wing rock and/or pitch hesitation and heavy buffet. The maneuvering tone is also an aural indication that the current AOA / IMN combination is approaching a possible departure.

3. From the EM diagrams and NATOPS Figure, “Maneuvering Characteristics with 100 Percent LERX,” we determine the maximum allowable instantaneous turn performance at corner speed as depicted below.

<table>
<thead>
<tr>
<th>Instantaneous Turn Performance</th>
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<tbody>
<tr>
<td>20K</td>
</tr>
<tr>
<td>AOA  10-14 units</td>
</tr>
<tr>
<td>G    3.8</td>
</tr>
<tr>
<td>Turn Rate 9.5 deg/s</td>
</tr>
<tr>
<td>15K</td>
</tr>
<tr>
<td>AOA  12-15 units</td>
</tr>
<tr>
<td>G    4.6</td>
</tr>
<tr>
<td>Turn Rate 11 deg/s</td>
</tr>
<tr>
<td>10K</td>
</tr>
<tr>
<td>AOA  15-17 units</td>
</tr>
<tr>
<td>G    4.9</td>
</tr>
<tr>
<td>Turn Rate 12 deg/s</td>
</tr>
</tbody>
</table>

4. At the completion of 180° of turn the PUI will unload and roll out while calling airspeed and maximum G in the break turn to note energy bleed. The instructor will inform the PUI of the time required to turn 180° to assess turn rate performance.

5. The break turns will then be repeated using a 20-30° nose low plane of motion to sustain better instantaneous turn performance throughout the turn. When cleared by the instructor, perform an unloaded roll to 110-120°. Ideally, you will be able to achieve full power in the nose low plane of motion while maintaining or even bleeding airspeed. However, due to the altitude, power setting and POM the wing will not be able to generate enough lift (and the corresponding drag) to prevent the aircraft from accelerating. If the airflow over the wing is allowed to go supersonic (approximately 0.78 IMN) the aircraft will be able to pull even less AOA due to the
instability caused by the shock wave formation. The reduction in AOA will allow the airspeed to increase even more, further decreasing the available AOA. This compounding cycle of increasing IMN and decreasing AOA will allow the aircraft to quickly accelerate well above critical Mach where it is inherently unstable and highly prone to departure. To prevent this, on the 20 and 15 thousand foot nose low break turns the throttle should initially be reduced at the initiation of the break turn to ensure that the aircraft does not accelerate to greater than 0.78 IMN prior to the AOA onset. As the AOA is increased the power should be judiciously advanced only as required to sustain the airspeed without accelerating. Again, on the completion of the turn, unload and roll back to wings level and recover back to the horizon. Remember to call you airspeed and maximum G to assess energy. An increase in turn performance should be seen as the aircraft is better able to maintain kinetic energy while flying at the same AOA that was practiced in the level break turns previously or by flying at a higher AOA and G for while bleeding energy in a similar manner as was performed in the level break turns. This will be apparent to the pilot in the cockpit as greater sustained G while not bleeding airspeed as quickly if at all.

Common Errors:

1. Loaded rolls / overriding high-speed stops.
2. Use of rudder.
3. Pulling into maneuvering tone or wing rock.
4. Getting fast in the nose low break turns.

Corrections for Errors:

1. To achieve the best roll rate you must unload, set the vector, smoothly apply G to lift limit. Smooth G application does not imply that the aircraft cannot be flown at high G-loading or aggressively. Remember that aggressiveness is a mindset not a measure of how far or fast you deflect the control surfaces. Smooth pilots can be aggressive because they have complete control of the aircraft. We are trying to avoid “snatching” G on the aircraft.
2. It is not recommended to use any rudder above 0.5 IMN. Use of rudder / sideslip is prohibited by NATOPS above 0.8 IMN.
3. Maneuvering tone or wing rock is an indication that the Dep Res system is saturated and departure is imminent. PUI must immediately reduce AOA until indications subsides. Again if you are being smooth with your AOA application this may merely require you to relax some back stick pressure. If you are being rough on the controls this may require an aggressive unload to prevent the aircraft from departing (assuming it has not already done so due to your “ham-fist.”
4. Maintain airspeed no faster than 380 KCAS / 0.78 IMN. If pulling nose low on the lift limit allows the aircraft to accelerate, either decrease the nose low plane of motion or reduce the throttle.

Source Documents: Air NTTP
Name: Deck Transitions

Purpose: To develop proper techniques for selecting and executing an energy rate or positional deck transition.

Description of Procedures:

1. This maneuver will be performed two times, once to perform an Energy Rate Deck Transition (ERDT) and then to perform a Positional Deck Transition (PDT).
2. Deck transitions will be start at 10,000 feet AGL and 325 KCAS. When cleared by the ACTI, perform an unloaded roll to establish a full power, 20-30° nose low plane of motion hard or break turn to the specified deck transition. The 30-20-10 rule will be used to transition to a level hard turn just above the hard deck.
3. At completion of deck transition the PUI should be slightly above the hard deck to deny any nose low maneuvering for the bandit.
4. Two types of deck transitions may be performed:
   a. Energy Rate Deck Transition (ERDT) – Target 12-13 units AOA and execute in accordance with Air NTTP.
   b. Positional Deck Transition (PDT) – Target 15 units AOA and execute in accordance with Air NTTP. Adhere to training rules for minimum airspeed and maximum AOA below the soft deck.

Common Errors:

1. Late application of 30-20-10 rule followed by a rolling pull to wings level in an attempt to not go through the hard deck.
2. Pulling into maneuvering tone or wing rock.
3. Incorrectly applying 30-20-10 rule and either leveling off well above hard deck and giving bandit maneuvering room or hitting the hard deck.
4. Poor airspeed / AOA control for specified deck transition.

Corrections for Errors:

1. Apply 30-20-10 rule to level off 300-500 feet above the hard deck.
2. Maneuvering tone or wing rock is an indication that the DEPRES system is saturated and departure is imminent. PUI must quickly relax the AOA until the indications subsides.
3. ERDT: Assuming that airspeed is within the sustained rate band between 12-13 units AOA will maintain that airspeed / sustained turn rate.
4. PDT: Flying more than 13 units will bleed energy while allowing a decrease in turn radius down to 150-170 KCAS just above the hard deck. Below 150 KCAS the turn radius increases rapidly (bad for maintaining a positional advantage). For a two circle flow, allowing the airspeed to bleed off below 250 KCAS will cause the sustained turn rate to decrease.

Source Documents: N/A
Name: Aerobatics

Purpose: The purpose of aerobatics at VMAT-203 is to develop confidence and familiarity with the AV-8B conventional flight characteristics.

Description of Procedures:

1. Perform aerobatics, to include overheads, between 5000’ - 17,000’.
2. Conduct a 180° clearing turn prior to commencing the aerobatics.
3. Check AUTO flaps, lap belts snug, NAV bag stowed, and begin with mild maneuvers, (aileron rolls, wingovers, and barrel rolls.) The maneuvers are no different from what you learned in the training command. Look outside the HUD for situational awareness. For the aileron roll pull the velocity vector to 10° nose up prior to commencing the roll in order to rollout on the horizon. The nose tends to fall through approximately 10° in the course of a 360° roll. Be careful not to override the aileron High Speed Stops (HSS).
4. Overheads: Before beginning the overheads, develop your situational awareness by looking at your EHSD, HUD, and outside the cockpit. Know where your G and AOA readouts are. Note your current heading and reciprocal heading in the EHSD. Look for land / cloud “gouge” that will help with setting up your maneuvers. All overheads will be commenced between 5000’ and 8000’ MSL to avoid breaking the 17,500’ MSL R5306A range ceiling.
   a. After clearing your flight path, add full power and at 400 KCAS commence a 4 G pull-up. Maintain 4 G’s until intercepting 12-15 units AOA. Take care not to exceed 15 units AOA over the top, (this may require relaxing back-stick pressure.)
   b. As the aircraft accelerates down the backside, maintain 12-15 units AOA until intercepting the 4 G profile. If you reach 400 KCAS prior to pulling the nose back to the horizon reduce the throttle to maintain 400 KCAS until starting back up into the vertical. Be smooth and deliberate.
   c. Complete a loop followed by a ½ Cuban Eight then an Immelman and finish with a Split S. When approaching 40° nose low on the ½ Cuban Eight stop the pull and roll upright to achieve a 45° dive. The recovery from the 45° dive should begin approximately 3500 feet prior to the maneuver start altitude. As airspeed approaches 400 KCAS in the dive reduce the throttle to maintain 400 KCAS until starting back up.
   d. Likewise on the Immelman, at 10° before the horizon stop the pull then roll upright. On the Split-S pull the nose up to 10° before rolling inverted. Minimum airspeed to start the Split S is 200 kts and do not begin the maneuver at less than 15k.

Common Errors:

1. Flying the aircraft out of the area laterally or vertically.
2. Not looking outside the cockpit for visual references (maintaining wings level).
3. Poor “G” and AOA control.
4. Excessive AOA on the top of overhead maneuvers.
5. Loss of situational awareness during the squirrel cage.
6. Floating the turn in the Split-S.

**Corrections for Errors:**

1. Look outside! Do not stare at the HUD.
2. Smooth application 4 G’s to intercept 12-15 units AOA.
3. Expect forward stick pressure will be required while inverted to control AOA on overheads.

**Source Documents:** N/A
Name: 3 G Weave

Purpose: To develop the skill to maneuver the aircraft while under moderate G with a 3D rolling maneuver.

Description of Procedures:

1. This maneuver is a building block for some of the more dynamic tactical maneuvers you will fly later in the syllabus. It requires that you “finesse” the aircraft through multiple axes of control inputs while maneuvering 3 dimensionally.

2. The PUI will begin this maneuver at 10,000’ and 370 KCAS. When cleared, the PUI will begin by initiating a full power, level, 3 G turn to approximately 30 degrees of heading change. Approaching 30 degrees of heading change, the PUI will initiate a SMOOTH loaded roll “over the top” to reverse back to approximately 90° AOB in the opposite direction while maintaining 3 G.

3. The aircraft will climb during the loaded reversal. By continuing the roll until approximately 90° AOB the velocity vector will smoothly track back towards the horizon. As the velocity vector approaches the horizon, smoothly reverse the roll back “over the top” while maintaining 3 G to approximately 90° AOB in the opposite direction again. The 3 G weave is made up of a series of these rolling reversals.

CAUTION

In the TAV-8 be careful to not roll past 90° AOB in the reversals so you do not violate the TAV-8 Prohibited Maneuvers NATOPS limit of “Rolling maneuvers in excess of 180° at more than 1g.”

4. Initially the aircraft may accelerate with full power at 3G (especially the TAV-8). Reduce the throttle if necessary to maintain the airspeed at approximately 380 KCAS. After the aircraft has performed several iterations of the weave and has climbed several thousand feet the airspeed will begin to decrease even at full power. The maximum allowable airspeed for this maneuver is 420 KCAS. The minimum maneuver airspeed is 320 KCAS

5. The maneuver will be terminated after 4-5 weaves, if the maximum or minimum airspeed is reached or when the instructor calls “terminate.” To “terminate” the maneuver the PUI will perform an unloaded roll to wings level and then recover to the horizon

Common Errors:

1. Relaxing the pull, easing the G or performing unloaded reversals.
2. Roll reversal rate too aggressive for DEPRES.
3. Bleeding airspeed excessively.
4. Rough or “steppy” execution of the maneuver.
Corrections for Errors:

1. Maintain a constant 3 G throughout this maneuver. Remember cockpit G will vary as a function of plane of motion. Also, remember that as you move the power the G will vary as well, unless compensated for with stick corrections; decreasing power will decrease G, requiring more back stick to maintain a constant 3 G; increasing power will increase G, requiring a back stick decrease.
2. Set a smooth reversal rate and be aware of roll hesitation or wing drop.
3. This maneuver should be smooth and progressive using 3 G during the entire execution and maintaining 370 KCAS.

Source Documents: Air NTTP, NATOPS
Name: Terminate

Purpose: To cease aircraft maneuvering where safety of flight is not a factor.

Description of Procedures:

1. “Terminate” is used for procedural errors, where safety of flight is not a factor. The response to a “terminate” call will be an immediate roll to wings level, a level off at present altitude or climb to comfort level if below it, and verbal acknowledgement.

Common Errors:

1. N/A

Correction for Errors:

1. N/A

Source Documents: Air NTTP
Name: “Knock-It-Off”

Purpose: To cease aircraft maneuvering for safety considerations where the immediate response shall be a climb-to-cope.

Description of Procedures:

1. Following a “KNOCK-IT-OFF” (KIO) call all aircraft shall immediately roll wings-level, execute a lift-limit pull (in the TAV-8 target 4 G) to the pre-briefed climb-to-cope (CTC) altitude. This maneuver should be followed with verbal acknowledgement but should not be made until the aircraft is safely maneuvered away from the terrain in a positive FPA towards the CTC altitude. A verbal concurrence is required by all aircraft by “C/S, KNOCK IT OFF.”

Common Errors:

1. Talking prior to maneuvering the aircraft.

Corrections for Errors:

1. Priorities when flying low should remain aviate first with terrain avoidance and then communicate when mission tasking allows. You need to maneuver first like you life depends on it… because it may.

Source Documents: Air NTTP
**Name:** 250 KCAS Loop

**Purpose:** Introduce aircraft handling in the slow speed environment with the nose near vertical.

**Description of Procedures:**

1. At VMAT-203 this maneuver will begin at 12,000 feet and 250kcas. Once PADS are set the instructor will give the command to “execute.”

2. At this time, you will select full power and commence a 4g/10 AOA pull into the vertical. As airspeed decays, intercept a 12-15 unit AOA profile. As the nose comes through 70 degrees nose high an AOA increase of up to 20 units is permitted. At no time should the AOA exceed 25 units. IOT not exceed this limitation some forward stick may be required.

3. Target AOA for the backside of the maneuver should be 12-15 units until intercepting a 4g profile until wings level. Don’t focus on recovering at a specific altitude. Your attention needs to remain on maintaining the appropriate AOA throughout.

**Common Errors:**

1. Not knowing the procedures.

2. Allowing sideslip to build up thus leading to departure.

3. Not monitoring AOA/airspeed while maneuvering the aircraft

4. Not maintain wings level through the vertical thus inducing sideslip and potential for departure.

** Corrections for Errors:**

1. Study the procedures and know them cold.

2. Scan the wind vane and incorporate it into your scan pattern to ensure that excessive sideslip buildup does not occur.

3. Coordinate the use of flight controls to ensure excessive sideslip and departure does not occur. Slow speed flight requires substantially more rudder input to maintain controlled flight.

**Source Documents:** NATOPS Chap 11 and 18
Tactical Formation Stage

Name: General Standards

Purpose: To define section and division tactical formation standards.

Description of Procedures:

1. At VMAT-203, TACFORM maneuvering will be flown at 0.7 M for medium altitude and 450 KCAS for low altitude (below 5000' AGL).
2. All turns will be conducted at 4 G or 10 units AOA, whichever comes first. It should be assumed that all turns are conducted at full power. If this causes the jet to accelerate in the turn, the power must be reduced. It is not wise, however, to select lower initial power settings as higher altitudes or heavy ordnance will slow the jet dramatically at power settings less than full power. During the high altitude sortie, turns will be conducted at full power and constant KCAS or IMN instead of G or AOA.
3. At low altitude, mil power should allow the jet to maintain a fairly level constant speed turn. At medium altitude the wingman may lower the nose to preserve maneuvering airspeed. The wingman is always responsible for staying in position.
4. As a corollary to this last statement, it must be emphasized that the wingman is always responsible for de-confliction from Lead. No matter what his nose attitude or altitude, Wing's first responsibility is not hitting Lead. It is generally assumed the wingman will clear above and / or behind the flight lead in all maneuvers. If the geometry of a turn or aircraft performance dictates otherwise, the wingman should clearly transmit his intentions.
5. In the tactical formation stage, Lead will signal his intention to maneuver in one of two ways: COMM-in and COMM-out. COMM-in turns will be executed over the radio by Lead transmitting his full call-sign, the type of turn, direction if appropriate, and optionally, a reference heading: "MARS-21, CHECK LEFT, 150." The wingman's response will be his full call-sign: "MARS-22." The wingman's response will be considered the command of execution (i.e. the Lead will not begin to turn without hearing it).
6. COMM-out turns are signaled by wing flashes, or by Lead's jet turning. It is the wingman's responsibility to catch the Lead's signals and to maneuver appropriately to regain combat spread. As we shall see, there are some rules of thumb that should shrink your decision matrix considerably.

Common Errors: N/A

Corrections for Errors: N/A

Source Documents: N/A
Name: Formation G Awareness Maneuver

Purpose: To check G-suit functionality, aircraft handling characteristics, personal G tolerance, and to practice straining maneuvers of all formation members in an expeditious manner.

Description of Procedures:

1. Procedures are in accordance with Air NTTP and NATOPS.
2. Review the G Awareness Maneuver description in the current Air NTTP 3-22.3-AV8B. Your procedures for what you do with your aircraft remain the same here. The difference is that now you have to perform the maneuver concurrently with other aircraft in close proximity. This can be accomplished safely if a standard procedure is followed (all aircraft have to do the same thing at the same time) and you listen to the turn direction.
3. The standard formation for a section G awareness maneuver is defensive combat spread. In division the standard formation is fluid four. Lead will normally execute the maneuver into Dash 2 in section and into the second section in division.
4. Remember the first turn of the maneuver is targeting 4 G and the second turn should target the maximum G expected for the flight, typically 5-6 G with a clean aircraft (target 4 G for both turns in a TAV-8B).
5. Between the turns, there is normally a pause to allow all participants to assess the results of the 4 G turn prior to initiating higher G. This may include rechecking the sideslip indicator, if less than desirable handling qualities were experienced; and assessing personal G tolerance. Later in the syllabus you will also incorporate some specific weapon and systems checks in after the first turn so get in the habit of pausing here. That being said, you must maintain the correct airspeed. If you forget to reduce the throttle out of the first turn you will at a minimum disrupt the formation and could potentially accelerate the aircraft to the point that it will experience shock induced flow separation while you are trying to perform the second pull at greater than 0.75 IMN.
6. The second turn is normally in the opposite direction of the first so that the flight ends up on the initial heading. However, due to range constraints, environmental conditions, etc. Lead may opt to perform the two turns in the same direction to complete the maneuver in the opposite direction it was initiated from… listen before maneuvering.

Common Errors:

1. Not unloading to 0 G when altitude permits.
2. Not reducing power while trimming zero sideslip and getting faster than 380 KCAS / 0.75 IMN.
3. Not properly trimming the aircraft.
4. Conducting a loaded roll while rolling into and out of turns.
5. Setting inappropriate POM and bleeding or gaining airspeed.
6. Exceeding 90 degrees of heading change on first pull.
7. Losing sight / SA during second half of turn.
8. Not applying appropriate G / AOA during the maneuver.

**Corrections for Errors:**

1. Initiate maneuver in NAV master mode and unloading smoothly to 0 G in order to reduce induced drag.
2. Utilize a quick scan to begin pulling power back as it approaches 360 KCAS so as not to exceed 380 KCAS or 0.75IMN (RPM will be around 95% for this airspeed).
3. Remember as the airspeed increases the control power increases so you should not hold the rudder trim switch down. Just apply short clicks on the switch until the sideslip is zeroed.
4. Set POM by unloading the aircraft and rolling, and then stop the roll rate prior to inputting back stick.
5. Utilize G / angle of bank combination to maintain airspeed while limiting POM changes to less than 10 degree increments.
6. Reference initial heading prior to beginning the maneuver.
7. At 90° of heading change, unload to 0-1 G, roll out and assess g-suit functioning, aircraft handling characteristics, and personal G-tolerance. Visually clear the turn in 2nd turn direction, followed by and unloaded roll into the second 90° turn.
8. Reference original heading and begin to scan horizon then vertically for wingman.
9. Be smooth and progressive with back stick application to determine aircraft performance capability. Watch for the signs of an impending departure, wing rock, heavy buffet and/or maneuvering tone and reduce G / AOA if any of these are encountered while performing G Awareness maneuver.

**Source Documents:** Air NTTP, NATOPS
Name: Fighter Wing

Purpose: To provide ease of control while maintaining mutual support

Description of Procedures:

1. Medium altitude fighter wing is a formation that allows extreme maneuverability and ease of control. In essence, Lead can turn or maneuver at will, with no preemptive calls and Wing will simply fly off Lead. The proper position is 2000-3000' abeam, 2000-3000' nose-to-tail (0.4-0.5 slant range), 1000-3000' altitude split, in the cone 30-60° aft of abeam. The 30-60° cone is important so Lead can maintain sight of Wing with relative ease. Any further aft and Lead will need to wing dip or maneuver his aircraft to see Wing. Wing will maintain position off Lead by utilizing turn circle geometry. This means as Lead turns, Wing will maneuver to get on Lead’s turn circle, maintain position until the turn is just about complete, and then float to the opposite side resetting fighter wing.

2. Turns into Wing will cause the wingman to delay his turn until lead is a second or two from disappearing under Wing’s canopy rail. Wing will then role in the direction of turn, start his pull, pick up and place Lead on the opposite canopy rail and fly on Lead’s turn circle. Approaching the desired heading, Wing will float the turn to the outside and reset the Fighter wing position.

3. Turns away from Wing will require Wing to turn when Lead turns. Wing will pull to Lead’s turn circle and maintain position until approaching the desired heading. As Lead rolls out on the new heading, Wing will continue to pull, temporarily go belly up and reset the Fighter wing position on the inside of the turn.

4. Low altitude fighter wing: At low altitude, below 5000’, fighter wing will be flown co-altitude.

Common Errors:

1. Not pulling enough and getting spit out.
2. Pulling too much and losing sight.
3. Delaying turns and getting spit out.
5. Violating altitude contract.
6. Letting airspeed drop out of scan.

Corrections of Errors:

1. Fly to place Lead in the correct position throughout turn.
2. Anticipate turns and Lead’s position.

Source Documents: Air NTTP
Name: Defensive Combat Spread

Purpose: Basic formation utilized to provide mutual support, formation control and target mechanics.

Description of Procedures:

1. Medium altitude defensive combat spread: This will be the primary combat-spread formation flown in VMAT-203. The formation is 0.7-1.0 NM separation, 90° bearing and 1000-3000' altitude separation. This formation is easy to manage and provides good visual mutual support. It should be employed in a high or unknown threat environment when good visual mutual support is required. This formation should be employed to the maximum extent possible. Following the formation stage, this will be the default formation for the majority of your section flying.

2. To deploy to combat spread, Lead will either “push” you out to combat spread (indicated by Lead using a pushing motion with his hand and arm, with his palm outboard) or say “TAKE COMBAT SPREAD ON THE RIGHT (LEFT)” As Wing, you will take a cut away from Lead, add full power and fly to the briefed position (hi or low). Once at the appropriate abeam distance, reset you’re heading to match Lead. The proper look from your cockpit will be 90° left or right. That means your neck will be somewhat straining to keep a visual on Lead. If you are comfortable looking at Lead you are probably sucked. If you are looking over your shoulder, you are probably acute.
   a. To fix a sucked position, add power, bunt the nose and use altitude to accelerate back into position (not an option at low altitude). Once on proper bearing, reset your altitude split.
   b. To fix an acute position, either add power to maintain maneuvering speed and pull nose up or take a cut away to stop downrange travel. If you are fast, power additions may not be required. Reset the proper abeam distance once re-established on Lead’s bearing.

3. To join from combat spread, Lead will signal that he wants Wing to join in parade by porpoising the aircraft or verbally over the radio, “CLEARED TO PARADE (OR CRUISE).” Dash-2 will take a slight turn into Lead and place him on or slightly above the horizon (on the horizon if below 1000’). A slight power addition may be necessary. Perform a CV / running rendezvous and watch for lateral closure since aspect will be minimal.

4. Low altitude defensive combat spread: At low altitude, below 5000’, defensive combat spread will be flown co-altitude.

Common Errors:

1. Flying acute / sucked.
2. Flying too high / low.
3. Flying too near / far.
4. Over controlling power.
Corrections for Errors:

1. Keep your scan going so you can fly at the correct altitude, airspeed, and complete all you mission task without creating large position deviations.
2. When position deviations are noted, make the appropriate magnitude corrections… small deviations = small corrections or you will over-control your position keeping

Source Documents: Air NTTP
Name: Offensive Combat Spread

Purpose: Basic offensive formation utilized to provide mutual support, formation control and to engage aerial targets.

Description of Procedures:

1. This formation has many distinct advantages that lean more towards countering air threats. This formation is also used in a known or low threat environment. This formation accepts some degradation in visual mutual support in order to present a more offensive posture. The basic formation is 1.0-1.5 NM separation, 90° bearing and 3000-5000' altitude separation. It provides weapons separation at the "merge", reduces potential for visual detection of both aircraft, and reduces the chance of both aircraft being engaged by a single threat. Low visual mutual support is a result, in turn high SA is a requirement.
2. Entering and maintaining offensive combat spread is identical to defensive combat spread.

Common Errors:

1. Flying acute / sucked.
2. Flying too high / low.
3. Flying too near / far.
4. Over controlling power.
5. Losing sight.

Corrections for Errors:

1. Maintain or get back into position.

Source Documents: Air NTTP
Name: Deployed Echelon

Purpose: Standard Night Formation

Description of Procedures:

1. Deployed echelon is primarily used for night and night systems and similar to the Fighter Wing formation in its controllability, maneuverability, and flexibility. The Deployed Echelon position is 0.7-1.2 slant range (DME), 60-70° aft of bearing and 1000' stepped up or down. Maneuvering in deployed echelon is exactly like Fighter wing.

Common Errors:

1. Not pulling enough and getting spit out.
2. Pulling too much and losing sight.
3. Delaying turns and getting spit out.
5. Violating altitude contract.
6. Letting airspeed drop out of scan.

Corrections for Errors:

1. Fly to place Lead in the correct position throughout turn.
2. Anticipate turns and Lead’s position.

Source Documents: Air NTTP
Name: Check Turn

Purpose: The check turn is a turn of less than 30° designed to change the heading of the formation or re-dress the formation.

Description of Procedures:

1. A check turn is used to maneuver the section 0 - 30° off reference heading.
2. Check turns are unusual in that they are the only tactical maneuvering turns which provide no built-in geometric fix. In other words, unlike other turns, check turns will put the aircraft out of position unless the wingman does something about it.
3. Check turns are initiated by Lead transmitting, "CALLSIGN, CHECK LEFT / RIGHT." Lead may include the number of degrees to turn or the new reference heading but is not required to do so. The wingman's response is his full call sign which will be considered the command of execution.
4. COMM-out check turns won't be signaled. Lead will simply turn to his new heading, while the wingman will be expected to maneuver back into combat spread.
5. Lead's turn should normally not be aggressive so that the wingman has the full maneuvering potential of his jet to regain position.
6. Regardless of how the turn is signaled, the wingman must be proactive to minimize the effect of the turn and regain position. Making immediate corrections will reduce the time Wing is out of position.

   a. Check turns into wingman
      i. Just like being on the inner lane of a track, the wingman will have a shorter distance to travel than Lead so he will tend to get acute. The Wing should counter this with an aggressive S-turn maneuver similar to that used to fix an acute in combat spread. This turn can be performed either in the horizontal or in the oblique in order to slow downrange travel, convert airspeed to altitude, or both. As Lead rolls out and the aircraft drops back to bearing, the wingman should lower his nose as necessary to regain airspeed then adjust the abeam distance if required.
      ii. As in fixing an acute in combat spread, Wing should avoid the temptation to reduce power or get excessively slow. Not only does it make the wingman vulnerable, getting slow also tends to drop the aircraft sucked unless the acceleration is timed just right.

   b. Check turns away from wingman:
      i. Check turns away puts the Wing in just the opposite position as check turns into. The wingman is traveling the longer distance, which will leave him sucked. Knowing this will happen; the wingman should judiciously cut some of the corner off the turn and lower his nose to gain additional airspeed. When the wingman is almost on bearing, he should smoothly raise his nose and bleed off excess airspeed to regain altitude.
      ii. The wingman should avoid anticipating bearing line, or pulling up too aggressively thereby stagnating or falling backed sucked.
iii. Conversely, the wingman should also avoid gaining excessive airspeed on
the correction which will result in either going acute or forcing Wing to execute
a rapid pull up. This generally results in the same condition as above. About
100 kts of closure should do as a reference point.

Common Errors:

1. Mistaking a check turn for a wing-flash during COMM-out.
2. Over compensating and turning too much / too little.

Corrections for Errors:

1. Follow Lead.

Source Documents: Air NTTP
Name: NAV Turn

Purpose: NAV turns are designed to maneuver the section in heading changes of 30-60°.

Description of Procedures:

1. NAV turns are used to maneuver the section from 30 - 60°.

2. The NAV turn will be initiated by Lead transmitting, "CALLSIGN NAV LEFT / RIGHT." The wingman's response is his full call sign which shall serve as the command of execution.

3. COMM-out NAV turns are initiated in a similar manner as the shackle.
   a. For turns into Wing, Lead will turn to the new heading.

4. When Lead rolls out, the wingman should turn into the Lead and reverse as necessary to come out in spread.
   a. In turns away from Wing, Lead will essentially control the wingman's jet. First, Lead will wing-flash to initiate the wingman's turn.
      i. Wing should then roll out when Lead turns.
      ii. As Lead reverses and rolls out on his new heading, Wing should align to Lead and adjust for spread as necessary.

5. NAV turns, as previously mentioned, can either be into or away from the wingman.
   a. NAV turns into Wing strongly resemble out of position shackles where the wingman is acute.
      i. On execution, Lead will turn 30 - 60° into Wing.
      ii. To the astute wingman, Lead's rollout will be an obvious indication of a NAV turn. When Lead rolls out, Wing should execute a small turn as necessary to fly 70 - 80° to Lead's flight path and pass ahead of Lead. It is more important to pass in front of Lead than to achieve the 70-80° track crossing angle.
      iii. As the wingman crosses Lead's flight path, he should time the reversal as necessary to come out in combat spread on the opposite side.
   b. In NAV turns away from Wing, the wingman will be required to do much less maneuvering. On the other hand, he will need to be heads up to catch Lead's intentions.
      i. On execution Wing turns into Lead 30-60°. Wing will roll out on assigned heading or when Lead initiates turn into Wing.
      ii. Lead will then turn to the new heading after the pass. The wingman should then align headings with Lead and adjust for spread.

Common Errors:

1. Confusing NAV turns with other un-called turns.
2. Not understanding the geometry.
4. Not seeing Lead roll out.
5. Not seeing Lead start his turn indicating Wing to roll out.

**Corrections for Errors:**

1. Know the geometry.
2. Be attentive.

**Source Documents:** Air NTTP
Name: TAC-Turn

Purpose: The TAC-Turn is the foundation of all other turns, and is designed to turn the section approximately 90° for navigation or threat engagement.

Description of Procedures:

1. The TAC turn will be initiated by Lead transmitting, "CALLSIGN TAC LEFT / RIGHT." The wingman's response is his full call sign, which shall serve as the command of execution.
2. COMM-out, the Lead initiates the TAC turn with a turn or a wing-flash.
   a. On TAC turns into the wingman, Lead will turn towards the new heading.
      i. When the wingman can just peer down Lead's intakes, Wing should begin his own turn to align with Lead.
      ii. On TAC turns away from the wingman, Lead will wing-flash to get Wing turning.
   b. Wing should assume a 90° turn as he will roll out before Lead. The wingman should adjust as necessary once Lead rolls out on the new heading.
3. As we have said, TAC turns are the foundation of all other tactical turns. In fact ANYTIME the Lead initiates a COMM-out turn, the wingman should initially assume it's a TAC turn.
   a. For TAC turns into the wingman, Lead will turn first.
      i. If COMM-in, the Wing will be notified of the Lead's intention to TAC turn. If COMM-out, Lead will simply start turning towards Wing. The fact that Lead's nose has turned more than 60° and is coming to bear on Wing should indicate that Lead is calling for a TAC turn and not a NAV turn.
      ii. Whether COMM-in or COMM-out, the wingman should delay his turn until he is looking down the Lead's intakes; i.e. until Lead's nose is just about to come to bear on Wing. He should then add mil power and execute his own 4 G / 10 unit level turn to match Lead's heading.
   b. In TAC turns away from the wingman, the wingman should execute his 4 G / 10 unit turn as soon as he responds to Lead's transmission or as soon as Lead has completed his wing-flash.
      i. Since Lead will still be turning when the wingman rolls out, Wing should assume a 90° turn, particularly if COMM-out.
      ii. As Lead rolls out on the new heading, the wingman should expeditiously strive to regain spread and align to Lead's new heading.

Common Errors:

1. Nose slice in turns intended to be level.
2. Not understanding the geometry.
4. Pulling greater / less heading change than Lead.

**Corrections for Errors:**

1. Know the geometry.
2. Be attentive.

**Source Documents:** Air NTTP
Name: Cross-Turn

Purpose: The Cross-Turn is used to maneuver the section approximately 180° for threat engagement / disengagement, holding, or route timing adjustment.

Description of Procedures:

1. The cross turn is initiated by Lead transmitting, "CALLSIGN, CROSS TURN." The wingman's response is his full call sign which will serve as the command of execution. Note that altitude contracts are implied and not transmitted as in the Training Command.

2. The COMM-out cross turn is initiated by a wing-flash and is initially similar to a shackle.
   a. Unlike TAC or NAV turns, the Lead will immediately begin his turn into Wing as Wing starts turning.
   b. Instead of rolling out after 45° as in a shackle, Lead and Wing will turn for a full 180°.

3. As with in place turns (next discussion), cross turn execution leaves relatively little to interpretation.
   a. Upon Lead's transmission or wing-flash, the wingman should immediately begin his mil power turn. Any delay Wing makes in commencing this turn will put him behind and unable to catch up for the remainder of the maneuver.
   b. The wingman should fly his best 4 G / 10 unit turn. Since the maneuver is predicated on both aircraft making identical turns, any sloppy air work will translate directly into being out of position when the cross turn is complete.

4. On the other hand, the wingman should remember that this maneuver is designed to allow both aircraft to "clear their six." The wingman should avoid becoming so fixated in his HUD that he never looks outside the cockpit.
   a. Midway through the cross turn, Lead and Wing will meet 180° out. The wingman is expected to clear above and/or to the outside of Lead.
   b. The geometry of the cross turn has one characteristic that should be mentioned. Due to the aircraft's close lateral separation and the turn radius of the Harrier, cross turns will usually result in the aircraft coming out wide abeam.

5. Since the wingman knows that he will come out wide, he should continue to pull past the reference heading for 10 - 30° to drive back to the proper abeam distance. Wing should realize that an aggressive turn into Lead will require a greater airspeed to prevent him from getting sucked as he regains combat spread. When he arrives at the proper spread position, he then may reset his heading and airspeed to match Lead.

Common Errors:

1. Not establishing early de-confliction.
2. Accepting wide abeam out of turn.

Corrections for Errors:

1. Establish obvious de-confliction early, or transmit intentions over radio.
2. Anticipate need to fix wide abeam out of turn.

Source Documents: Air NTTP
Name: In Place Turn

Purpose: The In Place Turn allows the section to maneuver approximately 180° for threat engagement / disengagement, holding, or route timing.

Description of Procedures:

1. The in place turn will be initiated by Lead transmitting, "CALLSIGN, HOOK LEFT / RIGHT." The wingman’s response is the full call sign which will serve as the command of execution.

2. COMM-out in place turns are only done into Lead.
   a. In place turns are initiated with a wing-flash.
   b. Lead turns away from Wing as soon as Wing starts turning. This should be a dead giveaway that Lead is calling for an in place turn.

3. Compared to other turns, in place turns are relatively easy to perform. From combat spread, the execution of a good 4 G / 10 unit turn should ensure being in position at the completion of the turn.
   a. In place turns into the wingman
      i. Wing will have little to look at other than his instruments and his airspace. A properly flown turn will serve him best to come out in position. For this reason, these turns typically come out much better than in place turns away from the wingman.
      ii. The wingman should be wary of fixating his eyes on the HUD to the detriment of his lookout doctrine, terrain clearance, and de-confliction.
   b. In place turns away from the wingman, Wing can gauge his turn by comparing it to Lead's, which should be a mirror image of his own.
      i. In particular, when the section is 90° through the turn, the wingman should be able to look right up Lead's six.
      ii. If Lead appears to be "inside" the wingman's turn, then Wing should pull harder; get his nose down for better turn rate, or both.

4. Care should be exercised by the wingman to avoid pulling into buffet and / or bleeding off his maneuvering speed, which will only result in him being more sucked, not less.
   a. If Lead appears to be "outside" the wingman's turn, then the wingman may relax his pull very slightly to avoid coming out acute.

5. Extreme care must be taken by Wing not to float his turn into the Lead's airspace while simultaneously going belly up. Lead will be blind on Wing for at least the first half of this turn and possibly longer resulting in a high midair potential. If Wing even suspects that he is encroaching on Lead's airspace, he should accept coming out acute and fix his position after the completion of the maneuver.
Common Errors:

1. Nose slice in a turn that was intended to be level.
2. Inside aircraft pulling too hard and outside aircraft pulling too light, resulting in both aircraft in the same airspace out of the turn.

Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: Shackle-Turn

Purpose: The Shackle-Turn can be used to adjust the formation, change sides for Wingman and Lead, adjust for threat and weapons employment, establish proper bearing or abeam distance, or provide an opportunity to check 6.

Description of Procedures:

1. The shackle will be initiated COMM-in by Lead transmitting, "CALLSIGN, SHACKLE." The wingman's response is his full call sign which shall serve as the command of execution.
2. COMM-out shackles are initiated by Lead by making use of a wing-flash to get the wingman to turn.
   a. Lead's wing-flash is a signal to Wing that he should begin turning.
   b. Lead will turn once he observes Wing's aircraft is turning.
   c. The wingman will key off Lead's aircraft to roll out and reverse to reference heading, redressing the section in the process.
3. If the section is in combat spread
   a. The wingman should commence a 4 G / 10 unit turn towards Lead until 45° off the reference heading.
   b. Wing will cross flight paths with Lead and must de-conflict by altitude (Wing's responsibility) while clearing his six o'clock position.
   c. Wing should turn back to reference heading after approximately the same number of seconds it took to get to the merge.
4. If the section is out of combat spread, the shackle becomes somewhat more difficult but also more critical.
   a. If the section is wide, then the procedures remain the same except that both aircraft will not extend past the merge for the same length of time it took to get to it. Generally, three seconds is a good starting time for the delay. This time will vary somewhat depending on whether the section is in offensive or defensive combat spread and the speed of the aircraft.
   b. If the wingman is acute or sucked, the geometry becomes more dynamic. The acute jet should turn more than 45°, thus slowing his downrange travel. He must not turn too far to avoid going sucked in the process. In general, the acute jet should not cross the sucked jet's flight path at an angle of greater than 90°.
   c. On the other hand, the sucked jet needs to increase his downrange travel to catch up with the acute jet. In extreme cases, the sucked jet may just check turn to ensure he crosses the other aircraft's flight path and drive to position. Remember, the wingman has an altitude contract and is responsible for de-confliction.
Common Errors:

1. Nose slice in turns intended to be level.
2. No, or late reversal.
3. Improper de-confliction.

Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: COMM-Out Rule-Of-Thumb

Purpose: To establish an easy to remember building block approach to maneuvering COMM-out

Description of Procedures:

1. These turns will typically be performed on a known route. That means all aircraft, not just Lead, will know when the turns are coming. Free NAV is the exception, not the norm.
2. If Wing does not know the intentions of Lead until after the turn is initiated, use the Rule-of-Thumb listed below:
   a. If you see a wing-flash, turn into Lead.
   b. Always assume the turn into Lead to be a 90° TAC-Turn unless:
      i. Lead immediately turns into Wing (The turn is either a Cross-Turn or a Shackle-Turn).
         (1) If Cross-Turn, Lead will continue his turn.
         (2) If Shackle-Turn, Lead will roll out after approximately 45°.
      ii. Lead immediately turns away (The turn is then a Hook-Turn)
      iii. Lead turns after Wing has turned 30-60° (The turn is a NAV-Turn)
   c. If Lead turns into Wing without a wing-flash, the turn is either a TAC-Turn or a NAV-Turn.
      i. If the turn is a NAV-Turn, Lead will roll out after 30-60° of heading change.
   d. The only COMM-Out Turn not performed is a HOOK-Turn into the wingman.
   e. Mic clicks and / or radio transmissions are not the norm, but the exception.
   f. Generally, "Free NAV" will not be performed. Ideally, these turns will be performed on a NAV Route or by using pre-briefed turn points.

Common Errors:

1. Not looking at Lead.
2. Mistaking one turn for another.

 Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: High Altitude Maneuvering

Purpose: To introduce section tactical formation at high altitude

Description of Procedures:

1. Flight will climb in cruise / parade formation to 20-30,000 feet.
2. A lead change will be initiated and then the IP will fall back to a chase position on the RP. The IP will direct the RP where to fly the aircraft while being chased with directive heading, altitude and speed calls. The RP will maintain awareness on range boundaries and will turn as required while providing a notice to the IP that a turn is to be initiated (“MARS 22, TURNING LEFT”).
3. When directed by IP (“PUSH FOR SPEED”) the RP will accelerate to 0.7 IMN and then report “MARS 22, SPEED AND ANGELS.”
4. The IP will then direct the RP to conduct a series of 90° and 180° turns by saying, “LEFT/RIGHT 90/180.” The RP will respond with callsign, “MARS 22”, and then perform the turn.
5. Upon turn initiation, roll into approximately 60-70° AOB and THEN select full power while increasing aft stick pressure to approximately 8 units AOA. This will prevent you from accelerating above “maneuvering” Mcrit (approximately 0.78 IMN) prior to gaining sufficient AOA to prevent the aircraft from accelerating.
6. The goal is to fly a full power, level, constant 0.7 IMN turn. You will only be able to attain 2-3 G, depending on your altitude, if you fly a constant speed turn. The AOA where the aircraft first enters light buffet is typically where your constant speed occurs. Expect at these altitudes that this will occur at 7.5-10 units AOA.
7. After the RP has demonstrated proficiency at flying constant 0.7 IMN turns, the flight will change lead again and then deploy to Defensive Combat Spread and then Offensive Combat Spread to practice all section formation tactical turns.
8. Formation tactical turns at high altitude will be full power, level 0.7 IMN turns, just like when chased.

Common Errors:

1. Allowing the IMN to exceed “maneuvering” Mcrit.
2. Pulling too hard and bleeding below 0.7 IMN.
3. Not flying a good Wing position.

Corrections for Errors:

1. Establish the AOB and then select full power while apply the back stick pressure to maintain a constant airspeed. Also remember that for a constant altitude the KCAS will not change for given airspeed. So once you have 0.7 IMN set, look at the KCAS that corresponds to it and use that to reference whether the aircraft is accelerating or decelerating.
2. Fly a constant IMN / KCAS.
3. Try to catch deviations while they are small, within your MCT constraints, because at higher altitude you have less maneuverability and less thrust to use to correct deviations.

**Source Documents:** NATOPS, Air NTTP
Name: Division Taxi / Marshal Procedures

Purpose: Safely and expeditiously taxi a division of aircraft with FOD avoidance.

Description of Procedures:

1. Taxiing:
   a. Always taxi with FOD avoidance.
   b. Maintain a 1000' minimum separation.
   c. You can taxi behind stationary aircraft at 90° TCA or greater. Give yourself enough distance. Common sense applies.
   d. Out of the line, closest to the hangar taxies first. If you’re beak-to-beak, taxi in order of call sign. (Mars-22 will taxi before Mars-23).
   e. Whenever you are ready to taxi, taxiing or ready for takeoff, your landing light will be on. Whenever you have stopped taxiing (w / no intent to continue to taxi) or are doing checks, your landing light will be off.

2. Marshalling:
   a. Regardless who taxies first, the flight should marshal perpendicular to the active runway in flight order with the lead aircraft farthest from the runway.
   b. When pulling into marshal, all flight members should be able to see the lead pilot. This means that –2 should lineup slightly aft of abeam with –3 abeam lead and –4 slightly acute on –3 so he can see in front of –3’s nose to lead.
   c. Complete the takeoff, combat, miscellaneous checks to include a yardstick check (ensure TACAN is boxed on the AMPCD or PROX is colonized on the ODU to receive DME information in the HUD) and set the default cards. Complete your one-finger checks. Once all checks are complete, examine the aircraft next to you for leaks or damage. Ensure you are both configured the same. If Lead’s position lights are off, have yours off. AUTO flaps have no aileron droop; STOL flaps have aileron droop. Once satisfied, the last member in the flight turns his landing light on and passes the Up and Ready signal with a thumbs-up, up the line.
3. **Taxiing to the runway:**
   a. In division, Lead and subsequent aircraft will cross in front of the remaining aircraft following the "section cross in front of wing" procedures.

   ![Division Stream STO Diagram]

   b. When runway length is a concern, Lead may chose to line up the division with Dash-3 and -4 abeam each other in the long position (or the approach end of the runway), and Lead and Dash-2 abeam each other, 1000' from the second section. Check-ins, remain the same as in the stream STO. Once the acceleration checks are complete, Lead initiates the takeoff roll by saying, “MARS-11 IS ROLLING.” Lead will give the kiss-off signal to Dash-2, release his brakes, roll 500', then add full power and execute a normal STO. As Lead’s aircraft breaks the deck, Dash-2 will announce “MARS-12 IS ROLLING” select full power and execute a normal STO. On Dash-2’s rolling call, Dash-3 will give the kiss-off signal, release his brakes, roll 500’, then add full power, and execute a normal STO. As Dash-3’s aircraft breaks the deck, Dash-4 will select full power and execute a normal STO.

   ![Division Line Abreast (2x2) Diagram]
Common Errors:

1. Not taxiing to the long position as dash last.
2. Positioning on the wrong side of runway.
3. No tail pipe courtesy.
4. Incorrect COMM.

Corrections for Errors:

1. Position on the numbers for the last aircraft.
2. Lead will take downwind side of runway, this means Dash 2 and Dash 4 are on the upwind side.

Source Documents: N/A
Name: Division Balanced Parade

Purpose: This formation will normally be used when operating within Class D Airspace or navigating the airways.

Description of Procedures:

1. See NATOPS for a diagram and description of the formation.
2. This formation is similar to Division Fingertip except with Dash-3 leaving a “space” for Dash-2. All turns in division balanced should be VFR parade.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Division Fingertip

Purpose: This formation can be used when operating within Class D Airspace, in instrument conditions, and at any time the formation will be viewed critically from the ground.

Description of Procedures:

1. See NATOPS for a diagram and description of the formation.
2. This formation allows for a slightly easier platform to fly off. The only difference between Division Echelon and Division Fingertip is that Dash-3 & -4 are on the opposite side as Dash-2 and Dash-3 is flying parade directly off of Lead. All division fingertip turns are IFR parade.

Common Errors:

1. See basic parade errors.

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Division Echelon

Purpose: This formation will normally be used when operating within Class D Airspace and at any time the formation will be viewed critically from the ground.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. Dash-2 will fly parade position off Lead, Dash-3 will fly parade off Dash-2 and Dash-4 will fly parade position off Dash-3. Keep in mind that Dash-2 will set the “tone” for the flight. Flying too tight of a parade position off of Lead, will not allow Dash-3 a proper platform off which to fly. As for Dash-3 and -4, aligning of the previous aircrafts helmets, will ensure a symmetrical smooth look to the formation. Also, as Dash-3 or -4, looking “through” the previous aircraft to Lead, will help you to fly a more stable position. This does not mean solely referencing Lead without regard for the aircraft directly in front of you, but to take into account your position in relation to that aircraft, yet still fly a relatively stable platform.

Common Errors:

1. Matching every movement of aircraft directly in front of you.

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Division Cross Under

Purpose: To move the second section to the other side of the formation.

Description of Procedures:

1. From echelon formation, when the Leader signals for a wingman cross under, Dash-2 will simply execute a standard cross under. Dash-3 will then move into Dash-2’s vacated position, flying parade on Lead. The resulting formation is fingertip. Dash-4 simply flies the standard parade position on Dash-3 throughout the evolution. From echelon formation, when Lead signals a section cross under, Dash-3 (second section leader) will execute the standard cross under, but will maintain his nose-to-tail distance on Dash-2 until he has 6’ of lateral separation on Lead. Dash-3 will then move forward and up into parade position on Lead. Dash-4 will simply execute a standard cross under on Dash-3, pacing it so that it will be completed as Dash-3 completes his maneuver.

2. From fingertip, when Lead signals a wingman cross under, Dash-3 must move aft and out from Lead to allow space for Dash-2 to move into his position. Dash-2 will simply execute a standard cross-under once he sees that space is clear. The resulting formation is the echelon. Dash-4 will simply maintain his position on Dash-3. From fingertip formation, when Lead signals a section cross under, Dash-3 will drop straight back until he has proper nose-to-tail distance on Dash-2. He will then cross under, maintaining this distance until he is to the outside of Dash-2 with 6’ of lateral separation. He will then move forward and up into parade position on Dash-2. Dash-4 will execute a cross under on Dash-3, again timing it so that he will complete his cross under at the same time as Dash-3.

Common Errors:

1. Dash-3 not making sufficient room for Dash-2 to cross under between Lead and the second section.
2. Dash-4 not maintaining alignment by keeping Dash-3 constantly between Lead and Dash-4’s aircraft during section cross under.

Corrections for Errors:

1. N/A

Source Documents: N/A
Name: Division Running Rendezvous

Purpose: To join the flight after take-off or a separation.

Description of Procedures:

1. Procedures are in accordance with NATOPS.
2. After Take-off Running Rendezvous:
   a. The following procedures only apply when the on-course heading after take-off is less than 45° from the take-off heading, otherwise the circling rendezvous technique described in basic formation should be used.
   b. On take-off Dash 2, maintain your side of the runway for the join-up. Dash 3 and 4 will join on the opposite side of the formation as Dash 2, with Dash 4 outside of the formation from Dash 3 to keep all members of the formation in sight on the same side of your canopy. Dash 4 must use caution to avoid jet wash right after take-off when crossing to the outside position from Dash 3. After all aircraft are joined-up, Dash 3 will choose which side of the formation the second section is going to fly on. Dash 2 should note which side of the formation the second section has selected and “auto-balance” the formation if not already on the side opposite the second section.

3. After Separation Running Rendezvous:
   a. Dash 3 will call the side that the second section will rendezvous on Lead; Dash 4 will fly conduct a running rendezvous on Dash 3 outside the formation from Lead. Dash 2 will “auto-balance” as necessary and complete the rendezvous on the opposite side.
   b. Other than that the procedures remain similar to what is described above and what was taught in basic formation for a section running rendezvous.

4. If at any time excessive closure develops on any aircraft in front of you in the formation, execute an Over-run as taught in basic formation. Stay on your assigned side of the formation and maintain sight of all aircraft that are supposed to be in front of you in the formation while performing the Over-run. If Dash 3 Over-runs, Dash 4 needs to keep sight on both Lead and Dash 3 and maintain adequate lateral separation from both as Dash 3 decelerates to move back onto the bearing from Lead.

Common Errors:

1. Dash 2 taking excessive time to complete rendezvous.
2. Dash 4 setting up rendezvous to the inside of Dash 3 instead of outside.
3. Over-run.
Corrections for Errors:

1. Fly the correct closure up to and on the bearing.
2. Keep all aircraft in front of you in sight while conducting the rendezvous.

Source Documents: Air NTTP
Name: Division Cruise

Purpose: Administrative control and added flexibility from Finger tip or balanced formations.

Description of Procedures:

1. See NATOPS for a diagram and description of the formation.
2. In a formation of three or more aircraft, Dash-3 will be designated the second section Leader. It is the responsibility of Dash-2 to balance the formation whenever the flight is straight-and-level. Don't be spring-loaded to change sides - wait a moment until you are sure Dash-3 is not going to reposition his section. When maneuvering as a division, Dash-2 flies off Lead, and Dash-4 flies off his section Leader. Dash-3 will fly off Lead and allow sufficient maneuvering room for Dash-2. Position reference points for Dash-2 and -4 are the same as in section.

Common Errors:

1. Same as section administrative cruise

Corrections for Errors:

1. N/A

Source Documents: NATOPS
Name: Division Box

Purpose: Provides good mutual support between sections within the division. This is a good defensive formation to fly in a high or unknown threat environment.

Description of Procedures:

1. See Air NTTP for a diagram and description of the formation.
2. This formation is flown by four aircraft. The Lead section flies a normal defensive combat-spread, and the second section does the same at 1.0 to 2.5 NM in trail. Turns are performed in section. An “offset box” can be flown by offsetting the second section by approximately 3000' to one side. Altitude contracts are identical to those in Division Fluid Four and for the same reasons.
3. All calls are initiated by Lead to his wingman. For example: “MARS-21, TAC-RIGHT”, “Dash-2 responds, “MARS-22” and they execute the TAC-Turn. Dash-3 follows Lead’s cues and restates the same intentions to his section. The turn is initiated at the same point as the Lead section. This will typically occur anywhere from 4 to 12 seconds after Lead’s call. “MARS-23, TAC-RIGHT”, Dash-4 responds “MARS-24.” All turns can be performed from Division Box / Offset Box.

Common Errors:

1. Dash-4 not keeping sight of Lead’s section.
2. Standard section errors.

 Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: Division Deployed Echelon

Purpose: Provides a good balance of mutual support with ease of maneuver and de-confliction. This is the standard division night tactical formation.

Description of Procedures:

1. The formation definition is the same as section deployed echelon with additional distance / altitude de-confliction. Dash 3 must remain outside 1.5 NM from Lead to provide 0.3 NM buffer with Dash 2. All flight elements should maintain separate sanctuary altitudes to ensure de-confliction. The Lead section will normally have Base altitude (Lead) and Base - 1K (Dash 2), with the second section stacked high at Base + 1K (Dash 3) and Base + 2K (Dash 4).

Common Errors:

1. Not pulling hard enough in turns and getting “spit out.”
2. Pulling too hard in turns and going blind.
3. Delaying turn too long and getting “spit out.”
5. Poor airspeed control.
6. Not maintaining correct altitude and range from other formation members.
7. Losing sight of other formation members.

Corrections for Errors:

1. Fly to place Lead in the correct position throughout turns.
2. Keep other formation members in sight throughout all maneuvers.
3. Maintain a scan of airspeed, altitude, distance to other formation members, AOA and velocity vector. Don’t let your scan break down and fixate on one thing.

Source Documents: Air NTTP
Name: Division Wedge

Purpose: This formation is both a defensive and offensive formation. It can be flown using either 3 or 4 aircraft.

Description of Procedures:

1. See Air NTTP for a diagram and description of the formation.
2. Using this formation, the division Leader does the navigating; the section Leader (Dash-3) and wingman (Dash-4) fly as a section following the division Leader, while providing mutual support.
3. This formation is similar to Division Offset box except Dash-2 flies Fighter Wing off his Lead. Any turns in Division Wedge are assumed to be 90° unless called. Lead may give a reference heading or degrees of turn for all other turns. In that case, Lead may say: “MARS-21, RIGHT 180, REFERENCE 210”, Dash-2 will remain silent since he is flying Fighter Wing. Dash-3 shall initiate his respective turn after the appropriate delay with, “MARS-23, HOOK RIGHT OR CROSS-TURN.” Dash-4 will respond “MARS-24.” Both wingmen will fly their respective turns in their respective positions.

Common Errors:

1. Dash-2 responding with MARS-22.
2. Dash-4 losing sight.

 Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: Division Fluid Four

Purpose: A division formation that provides a good balance of mutual support and maneuverability / flexibility.

Description of Procedures:

1. See Air NTTP for a diagram and description of the formation.
2. Outstanding control and maneuverability are provided, while allowing the greatest flexibility for transition to other formations, attack positions, or “commit” scenarios. This inherent flexibility gives a division the capability to provide immediate attacks and maintain good starts on pop-up or short-range commits, while keeping each section in the same radar resolution cell. This will be the primary and default division formation flown at VMAT-203.
3. This formation is flown by 3 or 4 aircraft. Lead and Dash-3 fly a normal defensive combat-spread position. Dash-2 and Dash-4 fly Fighter Wing off their respective Leads.
   a. At medium altitude, the division Leader will establish a de-confliction plan. For ground attack roles, the second section will be stacked high, looking for ground threats. That means –3 will be 1000' above Lead and –4 will be 1000' above –3. Dash-2 will be stacked 1000' below Lead. In an air-to-air roll, the second section will be stacked low, looking up for air-to-air threats. The air-to-ground role will be the standard at VMAT-203. All turns should be level at their contract altitude. If an aircraft has all other aircraft in sight he may leave his contract altitude after the turns are complete to maneuver back into position.
   b. At low altitudes, all aircraft will be at the same altitude. This means, all aircraft must maintain sight of the other three aircraft. Dash-3 and -4 must provide positive de-confliction from Lead’s section or broadcast their intentions. All turns should be level unless de-confliction dictates otherwise.
   c. All calls are initiated by Lead to his section leader with the word “Flight” following the call sign. For example: “MARS-21 FLIGHT, TAC-RIGHT”, “Dash-3 responds, MARS-23.” The wingmen need only to maneuver their aircraft with respect to their Lead’s aircraft as though they are in section. No COMM is required from the wingmen. All turns can be performed from Division Fluid Four.

Common Errors:

1. Dash-2 and Dash-4 not keeping sight of the other section.
2. Standard section Fighter Wing errors.

Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: Division Formation Transitions

Purpose: The changing of formations in flight will be used to fill either a tactical or administrative requirement. Expeditious maneuvering and correct positioning are critical to maintain flight integrity and tactical effectiveness.

Description of Procedures:

1. The default division formation at VMAT-203 will be the Fluid Four. All transitions will be directed by the division Lead, and the section leader will be required to maneuver as necessary to obtain correct positioning. The actual maneuvering that takes place during each transition will be thoroughly briefed by the Flight Lead. The following discussion will show one way to transition to the various formations.

2. Transition from Fluid Four to Box / Offset Box: When deploying from Fluid Four to Box / Offset Box, Dash-2 simultaneously lowers his nose to gain an airspeed advantage over Lead and takes a cut away from Lead. Dash-2 uses airspeed and altitude to arrive in a combat spread position on Lead. Dash-3 will pump the section 90° turn into Lead as Dash-3 crosses Lead’s flight path, he will return to the original heading (striving to split Lead and Dash-2). Dash-4 will arrive almost in trail of Dash-3 after the pump. As Dash-3 returns to the original heading, Dash-4 will match Dash-3’s turn to arrive in a combat spread position on Dash-3. To return to Fluid Four, Lead will “pump” into Dash-2. The second section leader (Dash-3) will continue on his present course. Dash-4 will turn towards Dash-3 and maneuver to arrive in Fighter Wing. As Lead crosses Dash-3’s nose, he will call for his section to pump in the opposite direction (i.e. turn back to the original heading). Out of the resume turn, Dash-2 will use angles and altitude to position his aircraft in Fighter Wing on Lead. Lead may check turn the division as necessary to expedite a mutually supportive formation.
3. **Transition from Fluid Four to Division Wedge:** When deploying from Fluid Four to Division Wedge, Lead and Dash-2 maintain their present course. The second section will pump into the lead section. Dash-4 will arrive almost in trail of Dash-3 after 90° of turn. As Dash-3 crosses the lead section’s flight path, Dash-3 and -4 will pump in reverse direction. Dash-3 and -4 should arrive in a defensive combat spread with 1.0-2.5 NM separation between the Lead sections. The Lead will check turn the division as necessary to expedite the positioning. To return to Fluid Four from Division Wedge, Dash-4 will join on Dash-3 as described in the section transitions section. Lead will call a 90° turn in the direction of Dash-3. As the lead section is approaching the second section, Dash-3 must maneuver the second section to match the turn of Lead to arrive at a combat spread position. Out of the turn, Lead will check turn the division as necessary to expedite a mutually supportive formation.

4. **Transition from Fluid Four to Division Wall:** When deploying from Fluid Four to Division Wall, Dash-2 and -4 will use altitude and power to gain an airspeed advantage over Lead and Dash-3 respectively. They will take a slight cut away from their respective Lead, maneuvering to arrive in a defensive combat spread outboard on their respective Lead. To return to Fluid Four from Division Wall, Dash-2 and -4 will join on their respective Leads as described in the section transitions section. For significant heading changes while deployed in division wall, the division will need to be collapsed to fluid four then returned to division wall once established on the new heading.

5. **De-confliction:** While flying in section, the wingman is always responsible for de-confliction and collision avoidance. This is accomplished in TACFORM by the wingman creating an obvious separation of aircraft during crossing flight path maneuvers, exaggerating your intentions. In division, the second section Leader is responsible for division de-confliction (i.e. between the sections). Dash 2 and 4 are responsible for section de-confliction (i.e. within their section). During tactical maneuvering the second section Leader will ensure de-confliction by horizontal and
vertical separation between sections. All flight path intentions must be made perfectly clear during maneuvering involving crossing flight paths.

**Common Errors:**

1. Not anticipating turns.
2. Not flying off of Lead.
3. Not keeping Lead section in sight.

**Corrections for Errors:**

1. N/A

**Source Documents:** Air NTTP
Name: Division Battle Damage / Ordnance Checks

Purpose: To confirm aircraft integrity and ordnance status of all flight members prior to return to base.

Description of Procedures:

1. Procedures are in accordance with Air NTTP.
2. The division Battle Damage / Ordnance Checks for a four aircraft division are straightforward; each section do a standard section check. With a “light” division (only 3 aircraft) it needs to be very clearly understood who is going to perform the check on who and when. Air NTTP lists the standard for a 3 aircraft check. Any deviations from this need to be briefed thoroughly.

Common Errors:

1. Not “FENCE-ing out” prior to joining in close proximity to other aircraft.
2. Not using proper signals for lead change.
3. Poor basic airwork while flying as Lead.
4. Not closely checking other aircraft (i.e. not seeing “hung” bombs, loose fasteners, etc.)

Corrections for Errors:

1. Perform your Tacadmin checks again prior to join up; ensure all weapons are deselected and all armament switches are SAFE (ALE-39/47 is often forgotten).
2. Watch the visual signals carefully, especially for the lead change; there can be no ambiguity about “who’s on first.” If something is unclear, ask on the radio.
3. Fly the heading and altitude that Lead gives you at the lead change. If the flight is in a descent or a turn during the lead change, Lead will tell you what the level-off altitude or roll-out heading should be; fly it.
4. Be deliberate when performing a visual inspection of the other aircraft. Lead is going to make decision about the recovery based upon your input from the inspection. Don’t pass bad / unsafe gouge.

Source Documents: Air NTTP
Name: Division VFR Break

Purpose: The safe and expeditious VFR recovery of a division of aircraft.

Description of Procedures:

1. No later than the initial Lead will position the flight in Echelon Left or Right, as appropriate for the Break direction. Lead will set the power to approximately 85-90% at the initial for approximately 350 KCAS in the Break and then will stop moving the throttle to allow the wingmen to stabilize in position. Dash 2 sets the interval for Parade formation and in the Break. The standard Break interval is 3 seconds for 3 aircraft and 4 seconds for 4 aircraft, although Lead may brief something different based upon the pattern traffic and landing requirements.

2. The key to a professional-looking and safe VFR Break is to have all aircraft do the exact same procedures at the correct timing. This will make the Break uniform and will establish a consistent interval on the downwind that not only looks good but also makes it easy for all aircraft in the division to keep sight of one another.

3. At the appropriate position over the field Lead will “kiss off” the flight, initiate a level 4 G / 10 unit AOA Break and then select idle and speed brake out. At the appropriate interval Dash 2 will initiate the exact same Break. Dash 3 and 4 will follow at the interval set by Dash 2.

4. Once below 250 KCAS and wings level on the downwind, select gear down, nozzles 25°, flaps STO / AUTO (as appropriate). Abeam the intended point of landing select 60° nozzles (or as appropriate for you type of landing).

5. Lead will request landing clearance for the flight. Assuming tower clears the entire flight to land from Lead’s request, at the abeam position Dash 2-4 will simply state, “MARS XX, GEAR DOWN.” You must carefully listen to Tower’s landing clearance to ensure that the flight has been cleared to land so you make the proper call at the abeam.

Common Errors:

1. Dash 2 flying Parade too tight.
2. Dash 3 and 4 not matching the Break interval set by Dash 2.
3. Not flying a level 4 G / 10 unit AOA Break.
4. Selecting greater than 25° nozzles prior to the abeam position.

Corrections for Errors:

1. Execute procedures exactly as they are listed here at the correct time / interval.
2. Fly the correct Break G / AOA.
3. Don’t descend in the Break.
4. Listen to the landing clearance and respond appropriately. Dash 3 and 4 will match Dash 2’s “Abeam” call as appropriate, based upon Tower’s clearance and intended landing point.

Source Documents: NATOPS
Navigation Stage

Name: Visual and system navigation

Purpose: Define the requirements and standards for navigation.

Description of Procedures:

1. Low-level navigation is a means of funneling yourself, with ever increasing accuracy, to a point where you can find your assigned target. Arriving at the proper time and in a position to accurately deliver ordnance is obtained by optimizing geographical reference and aircraft navigation systems.

2. The Navigation stage for the AV-8B replacement pilot is designed to introduce high and low-level systems navigation and practice systems management. A review of basic DR navigation will serve to back-up the INS and will be used in case the INS fails.

3. Precise mission planning will greatly reduce pilot workload during the navigation sortie. The Joint Mission Planning System (JMPS) will be used for Navigation stage events and will greatly assist the RP in all aspects of preflight planning. A properly loaded mission card, properly prepared route map, and a smart pack are required for all events. Intensive preflight planning is the best way to ensure success in the Navigation Stage.

4. E-CHUM will be utilized to confirm route obstructions.

5. Remember that navigation sorties are the building blocks for more advanced strike training. The navigation portion of advanced missions is taken for granted, as the pilot will be more concerned with tactical considerations.

Common Errors:

1. Not properly preparing for navigation events.

Corrections for Errors:

1. N/A

Source Documents: N/A
Name: Preflight Planning – Airspeed and Altitude Selection

Purpose: To select airspeed and altitude for the planned route.

Description of Procedures:

1. Any appropriate ground speed may be used which allows adequate fuel for recovery with SOP fuels. Speeds normally used are 420, 450, or 480 KGS. At no time is it acceptable to fly less than 400 KIAS in the low level environment.
2. When selecting the ground speed at which you will fly your route, there are some factors that must be considered. Select an airspeed that gives you an adequate threat reaction capability without excessive fuel burn. The ground speed selected must allow you the ability to catch up if you are behind, are forced to react to a threat, or any other outside factor. If the route is in an area of high elevation, care must be taken not to fly at speeds slower than 400 KIAS to allow for low altitude air start.
3. In order to maximize fuel efficiency, NATOPS max range profiles, as flown in the FAM and INST stages, should be flown to and from the training route. Plan for the highest logical altitude to and from the route. Take into account type of flight plan IFR / VFR, distance, and weather for the en route portion. Published VRs will be planned and flown at the minimum altitude for the route IAW AP-1B. Routes will be flown at a minimum of 500 feet AGL or in accordance with current operating directives including the current bird avoidance policy.

Common Errors:

1. Not following AP-1B altitude restrictions
2. Poor decision making on en route altitude selection.

Corrections for Errors:

1. Reference the AP/1B for route structure restrictions.
2. Plan for what you expect to fly that day. Do not plan to fly VFR at 17,500’ if the weather is 5000’ overcast.

Source Documents: AP/1B, Air NTTP
Name: Waypoint Selection and Data Entry

Purpose: To select waypoints for route planning purposes and ensures correct data entry.

Description of Procedures:

1. All sorties at VMAT-203 will be planned on the JMPS, which will allow for easy transfer of waypoint data into the aircraft via the mission card. All pilots should be familiar with manual data entry, in the event the mission card load cannot be transferred.

2. AP-1B delineates waypoints and route structure for Military Training Routes (MTR). The JMPS MTR function automatically populates these waypoints. The waypoints may be moved to prominent landmarks to aid in navigation if the new waypoint remains within the route structure. When moving waypoints, do not select airports, towns or noise sensitive areas as new points. When entering waypoints from a map, such as the IP or target, it is important to ensure the datum is the same on both the map and in the planning station.

3. All low level routes should be planned to have an opportunity to update the INS in the event you are flying with an inoperable GPS. Coordinates for waypoints that will be used to perform an update should be derived from the most accurate source available, such as 5 meter imagery from JMPS. An accurate waypoint coordinate is essential to a good system update.

Common Errors:

1. Entering an IP from a NAD-27 datum chart into the JMPS system as a WGS-84 coordinate.

2. Not planning for an INS update

Corrections for Errors:

1. Always ensure you cross check your waypoint datum during planning.

2. Though our GPS system is very reliable, always have a plan to update without the use of the GPS.

Source Documents: NATOPS, AV-8B NATIP, JMPS lessons, Air NTTP
Name: Preflight Planning - Fuel

Purpose: To plan and fly a MTR to arrive at the IP +/- 500#’s of planned fuel.

Description of Procedures:

1. As with any jet aircraft, fuel consumption at low altitude is high in the AV-8B. This shall be taken into account during preflight planning. A high-altitude leg, to a low-level route, to another high leg home (HI-LO-HI profile) will maximize the tactical range of the AV-8B. Strict adherence to climb schedules, optimum cruise Mach, and descent point is imperative for a HI-LO-HI profile. NATOPS contains performance charts to aid you in determining an approximate fuel flow based on aircraft weight, drag index and altitude. The JMPS will automatically calculate fuel consumption during preflight planning. This system greatly simplifies preflight planning, but the pilot needs to be familiar with the charts as well.

2. JMPS will allow for a climb to altitude and a descent to a low level altitude in the same leg as long as the distance between level-off points is sufficient to be at your planned altitude. If the distance between waypoint level off’s is not sufficient in order to be level, at your planned altitude, you may need to add a "descent / climb point" as necessary for JMPS calculations. This point, which is for planning purposes only, will allow you to enter a climb to the en route altitude followed by a descent to the first low level point. Failure to do this will cause the fuel figures to be artificially high on paper and lower than expected in flight.

3. Significant fuel figures need to be planned, briefed, and understood. In addition to the Air NTTP fuel figures, use JMPS to figure MFR and EFR fuels for each point along the route.
   a. **MFR** - the minimum fuel required to complete the route and arrive at the abeam position with SOP fuel remaining. Ensure that weather is taken into account when determining the SOP fuel reserves. The JMPS platform preferences has this fuel set at 1200 pounds.
   b. **EFR** - estimated fuel remaining based on JMPS fuel planning figures.
   c. **TIGER** – Enough fuel to enable the flight to fight into the target area, kill it, and disengage based on the expected threat.
   d. **JOKER** – The fuel state, above Bingo, at which separation / bug-out / event termination should begin. In training, unless the training objective is to fly a tactical egress, Joker will be the fuel state at which the flight will terminate the tactical portion of the mission and rejoin to assume an administrative profile for the planned recovery.
   e. **BINGO** - Fuel state at which flight member must proceed along established routing under a maximum range profile, whether rejoined as a flight or not. At Bingo, aircrew should check their VRST page and determine if they need to execute a NATOPS bingo profile, proceed direct, or declare an emergency. In training, unless otherwise briefed, BINGO will be the fuel state at which the flight will terminate the tactical portion of the mission, select the desired waypoint of landing, and assume a VFR max range (16,500 / 17,500 MSL) profile to execute a straight-in, full stop landing as a single ship.
4. When using JMPS remember the difference in the initial fuel load for the T-bird. Good figures to use are 7000 lbs for the B and 6500 for the T-bird.
5. Your fuel figures should constantly be monitored along the route. Your actual fuel should be compared to the EFR at each point. If during the flight you notice that your actual fuel is below your EFR, start to look for a possible reason and take corrective actions as required.

**Common Errors:**

1. Failure to add a “level off point” from home plate to the entry point, if necessary.
3. Not ensuring JMPS data accuracy.
4. Not flying a precise profile.

**Corrections for Errors:**

1. Include increases in fuel reserves due to weather when entering “required fuel” in the JMPS.
2. Review the data JMPS calculates. Make sure fuels, altitudes and speeds make sense.
3. Fly precise profiles. A perfect plan executed poorly is worthless.

**Source Documents:** Air NTTP, NATOPS Performance Charts
Name: Preflight Planning – Chart Preparation

Purpose: To establish chart preparation requirements

Description of Procedures:

1. The pilot will prepare the route chart on a 1:500,000 (TPC) chart with the associated checkpoints and required information labeled. Additionally, the IP-TGT area will be prepared on a 1:50,000 chart or 5 meter gridded imagery reduced to 50% scale if imagery is available. Charts should be printed from the JMPS Area chart or Strip chart print feature as appropriate. The charts will contain pertinent information that will aid in navigation and target identification, and provide emergency divert information. The Air NTTP defines the following required symbols for your maps and charts:
   a. Waypoints: Points should be easily identifiable from the air, and be within the route structure.
   b. Initial Point (IP): A well-defined point, visually distinguishable, that is used to accurately position the aircraft for the ordnance run to the target. Generally, it is the last visual checkpoint used by attack aircraft prior to the target-run and should be approximately one minute or approximately 8 to 12 NM prior to the target and clear of anticipated threat. This point needs to be plotted on a 1:50,000 chart. Use this UTM grid for JMPS waypoint insertion
   c. Target (TGT)
   d. Egress Control Point (ECP): A well-defined geographical point, outside the enemy air defense area, used for control of egress from the target. For administrative purposes at VMAT-203, plan for a point approximately 8-12 NM from the target. The mission does not end at the target - Most combat losses occur after ordnance delivery. Plan a good egress route and fly it.

2. Items to be included on the map:
   a. Hazards to flight and altitude restrictions clearly marked in red.
   b. Heading and distance from each checkpoint to a suitable (5000 feet hard surface) emergency divert field in blue.
   c. TACAN channel, Approach / Tower frequency, and LAT / LONG or waypoint number for each divert field depicted along route.

3. Doghouse information is an optional addition to the route chart but not commonly used in the Harrier community. This same information will be available to you in the form of a Navigation card. Some or all of the following information may be put in the doghouses if you wish.
   a. Magnetic heading from each checkpoint to the next.
   b. Minimum fuel to continue with planned route and RTB with SOP fuel.
   c. Open block for real time at each checkpoint.

4. A common tool used is the ALPHA string overlay. At each waypoint place and alpha string in white stating WYPT name, ETE, EFR / MFR. This information will transfer
to the map in the aircraft and will assist in turn point fuel and timing assessment.
EX: A 6+11 4.5/3.9

5. The Air NTTP Target Sketch will be followed for the 1:50,000-target chart. This sketch does not need to depict a target attack, as the air-to-surface stage will not normally have been completed. Complete as much of the sketch as is possible for your stage.

6. In the event that JMPS does not have imagery of the IP to Target then go to either http://terraserver.homeadvisor.msn.com or http://earth.google.com/ websites to pull satellite imagery of your IP and target. Click on the map until you find the resolution scale you are looking for. By selecting “image information” the software will provide a LAT and LONG gridded image. This a great tool for map study.

7. The mission card will only transfer map overlays to the aircraft, the drawings made on the round during preflight planning will not transfer. Failure to prepare the map or overlay plan for a simulator or flight will result in a MANDATORY UNSAT.

Common Errors:

1. Inadequate target area imagery or sketch.
2. Failure to bring both charts. This is an automatic unsatisfactory.

Corrections for Errors:

1. Refer to the Air NTTP for items to be included on the target area sketch.

Source Documents: Air NTTP
Name: Navigation Card

Purpose: To describe NAV card

Description of Procedures:

1. JMPS cards are designed to increase a pilot's SA. The Air NTTP allows for the navigation card in any appropriate Briefing Card slot. The navigation card organizes timing and fuel data that is normally in doghouses on the chart. This gives the pilot the same information in an easier to use format.

2. Most pilots will include the waypoint number and name, heading, distance, timing, EFR and MFR. Below is an example of the Air NTTP NAVCARD that can be found in the JMPS mission cards.

```
PT   HDG/DIST   ETE   ALT   EFR/MFR
0-NKT 240/41.1   6+11   17000   7.0/4.3
1-123 A 350/12.3   1+38   1000    5.8/3.2
2-123 B 021/17.7   2+22    500    5.5/2.9
3-123 C 058/14.5   1+56    500    5.2/2.5
4-124 D 111/12.7   1+42    1000    4.8/2.2
5-IP   092/ 9.8    1+18    1000    4.7/2.0
6-TGT  210/ 8.3    1+07    1000    4.6/1.9
7-ECP  290/15.5   2+04    6500    4.1/1.5
0-NKT      29
```

Common Errors:

1. Incorrect data entry and JMPS planning.

Corrections for Errors:

1. QA the plan.

Source Documents: Air NTTP
Name: Briefing Requirements

Purpose: To establish briefing requirements.

Description of Procedures:

1. Pilots shall arrive at the brief with a 1:500,000 scale chart for the route and a 1:50,000 or 5 meter imagery scale chart for the target area. In addition to a FAM Stage smart pack, navigation cards with the appropriate fuel, time, and route data are required. A mission specific Navigation card shall also be included in the Brief 3 slot. Any obstruction or restriction on the route shall have an overlay inserted on the moving map. E-CHUM will be reviewed to confirm route obstructions.

2. A flight plan should be filed prior to the brief. Weather for the route can be requested via the DD-175 in the remarks section. Weather for the planned route must remain at 3000 / 5 or better.

3. If flying locally, the route will be designated on the daily flight schedule, and scheduled by Operations. If you are flying the route as part of a cross country, it is your responsibility to schedule the route at a time that will fit into your plan. The student is responsible for confirming the route has been scheduled correctly.

4. All briefings will be conducted in accordance with the Air NTTP Briefing Guide. Routes will be flown in accordance with NATOPS, FARs, OPNAVINST 3710.7, FLIPs, Wing and Group Orders, and VMAT-203 SOP. Briefs will also include the following mission specific items:
   a. Chart preparation (1:500,000 & 1:50,000)
   b. Color JMPS chart (required for IP to review overlay planning)
   c. Chart study
   d. Accuracy of checkpoints (IP and RP will check accuracy of waypoints)
   e. INS update plan with accept / reject criteria IAW Air NTTP
   f. IP
   g. Target as an offset of the IP
   h. Egress Control Point (ECP)
   i. ETA calculated for each point along the route
   j. Route restrictions
   k. Hazards to flight
   l. Emergency airfield and Bingo data
   m. Low level emergency considerations

Common Errors

1. Inadequate preflight prep. Specifically, not having the appropriate charts.
2. Not filing a flight plan prior to the brief.

Corrections for Errors

1. Ensure adequate effort is dedicated to preflight prep. Reference the FSG and Pocket Tactical Checklist briefing guide to ensure all items are addressed.
2. Prepare a flight plan prior to the brief and have your IP review and sign it. This will ensure you have a DD-175-1 prior to your walk time.

Source Documents: FLIP AP/1B, Air NTTP
Name: Low Level Start Point

Purpose: Describe procedures for entering a MTR

Description of Procedures:

1. As you start your maximum range profile descent to the MTR, perform an environmental assessment to include ceilings, visibility and sun angle. This is a good time to validate your INS by designating the waypoint and confirming its position on the ground using the designation diamond in the HUD FOV.

2. Plan to start the route on time but realize that starting early (less than 30 sec) is considerably easier to correct than starting late. Scale selection is a technique item. De-centered 100 NM ZOOM or 25 NM scales are most useful with the course line for the first leg of the route dialed in for situational awareness on how to enter the route.

3. Contact the nearest FSS on 255.4 and check on the route with call sign, number and type of aircraft, VR route number, entry point and time, exit point and time, and route speed. If unable to establish two-way communication with the FSS, broadcast in the blind. Descending through 4500 feet AGL, the LAW should be heard. Reset the LAW for the appropriate altitude using the 10% rule and select RADALT in the HUD. Ensure completion of the TACADMIN checklist prior to route entry. The G-warm should be completed either above 10k MSL, prior to route entry if in a MOA or Restricted Area, or within the route structure. Once within the defined route width and altitude, you may accelerate to the desired ground speed. Monitor 255.4 and squawk 4000 while flying the route.

Common Errors:

1. Getting behind aircraft due to several tasks that need to be accomplished in the descent.

2. Arriving at the start point early and then starting the route late.

3. Unable to start decent at desired time due to ATC.

Corrections for Errors:

1. Give yourself enough time to complete the administrative tasks. Completing as much of the TACADMIN checklist as possible at altitude, and calling the FSS early will help you complete all tasks prior to entering the route.

2. Chair fly the route entry and have an understanding of the effects on timing of holding prior to route entry.

3. Contact ATC prior to your descent point and tell them when you will want to descent. “CENTER, MARS 01 WOULD LIKE A DESCENT IN 10 MILES”

Source Documents: Air NTTP, AP-1B
Name: Visual Navigation Techniques

Purpose: Describe the techniques to be used to visually determine location and apply corrections while navigating along a flight route.

Description of Procedures:

1. In the event of system degradation or as a backup to your systems you must have the skill to navigate using visual techniques. This is nothing more than dead reckoning just as performed in the training command. Done by association of the chart to the real world outside the aircraft or simply turning on time if no reference can be made.

2. Route points on key terrain features will greatly assist in maintaining SA and keeping you on course because they are easily identifiable and provide a good reference point to cross-check your system navigation.

3. Visually interpret the landmarks that can be seen outside to the moving map, map or chart being used for reference will provide a sanity check to position keeping.

4. Realize that in most instances if the aircraft systems are degraded to the point that you are dead reckoning then the mission will most likely be aborted. However, in a combat situation you will still be required to egress from hostile territory and if you have lost your wingman you will need to fly precise routing to prevent becoming a fratricide statistic as you try to penetrate friendly air defenses on your RTB.

Common Errors:

1. Not selecting identifiable terrain as checkpoints on the route.
2. Not performing a good map, chart and imagery study prior to the brief and during the brief.

Corrections for Errors:

1. Selecting identifiable terrain as checkpoints on the route.
2. Perform a good map, chart and imagery study prior to the brief and during the brief.

Source Documents: N/A
Name: Chart, Map and Imagery Interpretation

Purpose: Describe chart, map and imagery interpretation

Description of Procedures:

1. By conducting a good study of your planning products during pre-flight planning and the flight brief you will greatly increase your situational awareness on the route. Take note of all hazards, significant terrain features and funneling features. Spend additional time ensuring that you are visually familiar with the ingress from IP to Target taking special note of any funneling features that might assist you in finding your IP and Target in the event that your systems become degraded or your situational awareness is low.

Common Errors:

1. Preparing planning products but not using them to their potential.

Corrections for Errors:

1. Study your maps, imagery and your timing / fuel plan so that you are familiar with them, rather than just creating them so you have met a briefing requirement.

Source Documents: Air NTTP
Name: Visual Checkpoint Identification

Purpose: To visually acquire a checkpoint.

Description of Procedures:

1. The easiest method to visually acquire a checkpoint, turn-point, target, etc. is to designate it with the INS or a sensor and then fly to place the designation in the HUD field of view. If fuel, formation, timing, etc. prevent placing the designation in the HUD the steering arrow, cross-referenced to the range to the designation displayed in the HUD and familiarity with your route can help you direct your visual scan to the point's location.

2. Remember that if you are using CS/T and you do not have an NSEQ route programmed, designating a point other than the point to which the TOT is for, the CS/T will re-compute the speed to the designated point which will make you appear that you are very early.

Common Errors:

1. Not designating the point when appropriate to obtain sight of it.
2. Forgetting the effect that designating a point has on CS/T (w/o NSEQ boxed) and attempting to incorrectly get back “on time.”

Corrections for Errors:

1. You should never blindly follow a navigation reference. By cross-referencing real-time, time-to-go and CS/T with your visual and system navigation you will be able to maintain SA and accurately determine your location and timing.
2. Program an NSEQ Ingress and Egress string with your target being the last point along your Ingress string.
3. Box NSEQ on your EHSD and ensure that you have the appropriate TOT entered. This will ensure you have accurate timing along the route.
4. Execute an Alpha check and systems check with Lead.

Source Documents: NATOPS
Name: Turn Technique

Purpose: To describe turn technique

Description of Procedures:

1. Outside 15 NM:
   a. Validate INS performance visually. Designate the waypoint and determine if an update will be required. Adjust flight path to ensure over flight of point. (Do not keep the waypoint designated.)

2. One minute out:
   a. Project arrival time and fuel
   b. Compare projected arrival time / fuel against chart / Nav card
   c. Note turn direction and roll out heading
   d. Clear the map for obstructions

3. 2 NM prior to turn point:
   a. If an overfly update is required, select UPDT
   b. Acquire turn point and adjust flight path for over flight

4. At turn point:
   a. If updating - press OVFLY
   b. WINC to next waypoint.
   c. Clear turn direction.
   d. Select full power, unload, roll, and pull 4 G's or 10 units to roll out on HUD heading bug

5. After roll out:
   a. If updating - accept or reject error based on appropriate thresholds
   b. Adjust power, speed and ground track as necessary

6. Repeat steps 1-5 approaching the next point. Remember - Scroll, Turn, Manage, Adjust.

Common Errors:

1. Trying to do too much at the waypoint.
2. Applying improper turn technique.
3. Not adhering to the appropriate MCT both while straight and level and in a turn.

Corrections for Errors:

1. Take care of administrative tasks before you are right over the waypoint. For example, fuel states can be projected 1 minute out by subtracting your fuel flow from the current state.
2. Always add full power and pull 4 G’s or 10 units.

Source Documents: Air NTTP
Name: Corrections for Timing and Fuel

Purpose: Describe timing and fuel consumption corrections

Description of Procedures:

1. You should have a contingency plan to cover the actions you can take if you get off your timeline or below your fuel plan. Though most of these corrections focus on the route, the same corrections can and should be made on the en route portion as well. Also remember, for each decision made to adjust timing will effect fuel consumption and vice versa. Obviously JMPS does not account for timing adjustments.

   a. Early:
      i. Slow down, but no less than 400 KCAS.
      ii. Extend at the next point. (Stay within the route structure)
      iii. 90 / 180 / 360° turns. (Stay within route structure)
      iv. Rolex time.
      v. Combination of above.

   b. Late:
      i. Enter the route at a different entry point, or plan to exit early. Know alternate entry and exit points.
      ii. Adjust your speed and/or altitude if on the high leg.
      iii. Cut a corner(s) to reduce your distance to go. Stay within the route structure.
      iv. Rolex time.
      v. Combination of above.

2. Remember, you must stay within the MTR structure, so be familiar with the MTR. Ensure you enter the MTR on a designated entry point and exit at a designated exit point. Use a Rolex as a last resort. If a decision to Rolex is made, Rolex to a common sense real time (i.e. 10 minutes is easier math than 7 minutes and 47 seconds). BOTTOM LINE: The key to successful timing is a good start, so stay ahead of the jet, and have an idea for correction options.

Common Errors:

1. No plan for timing adjustments.
2. Poor plan for timing adjustments and wasting fuel.
3. Trying to rapidly correct for an early condition instead of allowing time to for the correction to take effect. Only mildly cutting corners to correct for a late condition vice aggressively using all route structure IOT take advantage of the turning room provided (use the delta function of the course line).

Corrections for Errors:

1. Study the proper corrections and chair fly the event to think through the corrections and how they must be applied.
2. Remember the ultimate goal is to be at the target on time. If you can nail the timing, fuel and speed at every single one of your turn points that is great. However, of greater importance is to make smart corrections to ensure that you make your TOT. It would be a wiser choice to recognize a late situation early and fly the entire route 10 knots faster than planned than to fly 100 knots fast on the one leg trying to immediately fix the timing.

3. Aggressively cut corners to correct for a late condition while ensuring that you stay within the route structure.

4. Identify alternate entry and exit points in planning, discuss them in the brief and use them for contingencies.

Source Documents: N/A
Name: IP to Target

Purpose: To describe the procedures for transition from ingress navigation setup and mindset to target attack.

Description of Procedures:

1. Conduct MWSS procedures upon passing over the IP. These procedures will be covered in-depth in the air-to-surface stage and are found in the Air NTTP. During the portion of the flight between the IP and the ECP your attention should be focused outside the aircraft on target acquisition and threat lookout.

Common Errors:

1. Not directly over-flying the IP if an update is required.
2. Not updating the INS at the IP, if required.
3. Not knowing procedures for an Overfly update.
4. Failure to conduct good preflight study of target run.

Corrections for Errors:

1. N/A

Source Documents: Air NTTP
Name: Time-on-Target

Purpose: To navigate to arrive at the IP within + / - 20 seconds of pre-planned time.

Description of Procedures:

1. At VMAT-203 timing will be evaluated at the IP. We strive for + / - 20 seconds to stress management of the systems in a training environment.
2. In an actual strike, our package would be given a "vulnerability window" (VUL window). This will be a time window that our portion of the strike package "owns." It will normally be anywhere from a 2 to 5 minute window. This window allows us to time to the IP where our attention is turned to threat reaction, target acquisition, and weapon delivery. If we have hit our IP on time, we can assume that we will be in our VUL window. In fact, a 60 kt difference in planned airspeed verses actual airspeed would result in only an 11 second difference from a 12 NM IP. We will plan to hit the target during the early portion of the window, which then allows threat reaction and reset options without being outside our VUL window.
3. Successfully arriving at your target on time starts well before you enter the route. Brief on time, walk on time, and takeoff on time. As soon as you get airborne, start working on your timing. At level off, calculate when you will be at the first point, and start to make corrections early. Early corrections allow for fuel conserving corrections.
4. There are many methods in which the AV-8B pilot can use in order to arrive at the IP within the TOT window.
5. The method that will be utilized while at VMAT-203 is real time. Using real time eliminates the system limitations of CS / T. Real time must be known not only for the target and IP, but also for each point along the route regardless of timing method utilized in flight. All real times should be calculated utilizing JMPS. CS / T can still aid in arriving at the entry point or as a backup on the route. The AV-8B pilot can cross check real time with time-to-go to the next waypoint shown in the AMPCD and easily compute whether you are early, late, or on time to arrive at the next point.
6. Command speed time (CS/T) should be used to back up real time. In utilizing CS/T there are several techniques. Each method has benefits and limitations. You must be thoroughly familiar with the system and its limitations to successfully use CS/T. One possibility is to use CS/T to get you to the start point of your route at your push time. This is accomplished by deselecting NSEQ and selecting and designating the first point on the route as the steer to point. Select CS/T and enter the required push time as the TOT. This method will get you to the entry point at your push time, however, you will then need to select your NSEQ string for the route, and enter the TOT for the actual target or IP. You will lose the real time in the HUD as you pass your push time at the entry point.
7. A second method is set your NSEQ string and TOT for your actual target TOT. This will give you nearly accurate speeds to fly while on the route; but it will not account IF you planned for an increase in airspeed at the IP. This will cause your CS/T not to match at each point along the route until you hit the IP.
8. A third technique you may use is entering your NSEQ string and TOT to the IP; the target can't be an offset of the IP for this method to work. This will give you accurate speeds while on the route and should get you to the IP on time. Then simply fly the planned ground speed from the IP to the target assuming that you will arrive at the actual target within an acceptable vulnerability window. The drawback is your EHSD will now show the IP as the terminal waypoint.

**Common Errors:**

1. Errors in JMPS planning.
2. Inadequate understanding of timing system used.
3. Not flying your plan, (i.e. not accelerating at the IP)
4. Poor time management prior to takeoff.

** Corrections for Errors:**

1. Review your JMPS plan. Ensure you have not mistakenly planned to fly a leg of the route at 42 knots vice 420 knots.
2. Fly the entire route at one airspeed. If you plan for an airspeed increase at the target use CS/T to the IP only.
3. Thoroughly understand the time system and its limitations.
4. Your timing for the route starts at the brief. Make sure you walk, start, and takeoff on time.

**Source Documents:** Air NTTP
Name: Recovery – RTF procedures

Purpose: To describe recovery procedures

Description of Procedures:

1. Route: Be deliberate and fuel conscious when exiting the route. Fly the most direct route possible to the appropriate airfield. Be cautious not to violate any restricted airspace.
2. Profile: Max range. Take advantage of your energy package. Coming off the route, select full power, pull the nose up and trade your excess airspeed for a fuel conserving higher altitude. Initially pull the nose of the aircraft up to at least 45°. Approaching 300 KIAS, unload to an attitude capable of maintaining a 300 KIAS climb. Maintaining VMC, climb to the highest appropriate VFR cruising altitude. Intercept your max range profile. Squawk 1200.
3. ATC procedures: Once you determine your position, contact the appropriate ATC facility and proceed to a higher IFR altitude or simply request monitors if close to your destination. When you talk to ATC tell them who you are, where you are and what you want. Remember the center frequencies are published on Low Altitude En route Charts. It’s a good idea to note these during the preflight planning process.

Common Errors:

1. Inefficient climb profile.
2. Not knowing the ATC frequency to contact when coming off the route.
3. Poor ATC communications coming off the route.
4. Entering IMC conditions without IFR clearance from ATC

Corrections for Errors:

1. Be aggressive, the quicker you get to altitude, the quicker you can pull the power back and get on a max range profile.
2. Preflight planning will determine the proper ATC facility to talk to coming off the route. It will also give you and rough estimate on how you will describe your position when coming off route (TACAN radial / DME)
3. Make your communications simple, concise and straight forward.

Source Documents: N/A
Name: Data Transfer Procedures

Purpose: To describe Data Transfer Procedures

Description of Procedures:

1. Transfer of the mission data from the mission card to the Mission Systems Computer SMC is accomplished in the same manner as before:

   MENU – EHSD – DATA – DTX / OLX

   or

   MENU - SDAT - DTX / OLX / GPSX

2. The GPS page is a subset of the SDAT page although. The function of the TFER page is to handle Waypoints, Mark points and Target points, and it provides functionality for the transfer of target data into target points to employ Joint Direct Attack Munitions (JDAM).

Common Errors:

1. Failure to ensure that mission card is loaded via JMPS and transfers properly.

Corrections for Errors:

1. Check for “OK” to appear next to the DTX and OLX options after the data transfer is complete. If fault codes appear you can attempt to DTX again. If that does not work check the BIT 1 display for any DSS or AMU bit codes. Also attempt to reseat the mission card in the receptacle. If none of the above work, then write down any BIT codes that appear and begin entering necessary mission data by hand.

2. Confirm overlays, waypoints, and comm. has transferred as expected.

Source Documents: NATOPS, NATIP
Name: Waypoint / Mark Point / Target Point / Null Point Options

Purpose: Description of Waypoint / Mark point / Target point Options

Description of Procedures:

1. The software provides for 60 waypoints (0-59), 10 mark points (0-9) and 5 target points (0-5). Quick Access QA must be used to change between point types.

2. Target points have been added for JDAM functionality. They contain additional data called JDAM target data associated with them that is primarily pertinent to JDAM deliveries. When a TGTP

3. Null Points are simply waypoints, mark points or target points that have a null flag set true on the Mission Planning system. WYPT 0, MKPT 0 and TGPT 0 cannot be null points. When stepping through route points on the EHSD page, null points are skipped. A null point can be converted to a non-null point by accessing the point on the EHSD DATA page or the TFER DATA page.

4. An offset can be created that has zero range, but an elevation that is different than the waypoint’s elevation

5. The waypoint offset range and bearing can be entered to the nearest thousandth of a nautical mile (0.001 NM) or meter and hundredth of a degree (0.01), respectively.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS, NATIP
Name: Quick Access

Purpose: Quick Action is a feature to increase your ability to navigate through the increased number of points.

Description of Procedures:

1. Depression of the up or down arrow on the right side of the EHSD display, or the WINC button for greater than 0.8 seconds will cause entry into the quick access (QA) mode. There are two types of quick access sessions. Steer-to-point (STP) quick access can be initiated using the WINC button or the up and down arrows on the EHSD and EW pages. Point-of-interest (POI) quick access can be initiated by using the up and down arrows on the WYPT Data page, NSEQ Data page, TFER page, or any of the six different VRST pages.

2. STP QA is used to change the steer to point on the EHSD page and therefore the steering cues in the HUD. POI QA is used to change the point on the non-EHSD page that is used to initiate the QA session.

3. Regardless of which session you are in, the ODU will display WYPT, MKPT or TGPT will be displayed in ODU windows 1, 2 and 3 respectively. NSEQ will be displayed in window 4 (NSEQ will be displayed only during a STP QA session), and TOT in window 5 (TOT will be displayed only if the current point is either target point 1-4 or the terminal point in a sequential, ingress, or egress string).

4. Selecting the NSEQ option toggles NSEQ on the EHSD page. If a system designation exists TGPT will default to colonized; and 0 will be presented in the scratchpad when a STP QA session is initialized. If a system designation does not exist, the current STP will be displayed on the scratchpad. Quick accessing a point that is not in the NSEQ string when NSEQ steering is selected will cause NSEQ to become deselected. A quick access session will time out after 15 seconds of inactivity

5. A technique to get out of QA without waiting for it to time-out is to press the Comm. 1 or Comm. 2 channel knob which takes control of the UFC away from the QA, thereby disabling it.

Common Errors:

1. N/A

 Corrections for Errors:

1. N/A

Source Documents: NATOPS, NATIP
Name: Steer-to-Point Options / Point-of-Interest Options

Purpose: Describe the Steer-to-Point/ Point-of-Interest Options

Description of Procedures:

1. The Steer-to-Point is the steering reference selected on the EHSD which is defined as the waypoint, mark point or target point number between the up and down arrows on the AMPCD (PT 13). When a non-TACAN STP is within the HUD FOV, a circle represents the STP position unless it is designated, in which case a diamond represents it. The re-attack symbology always references the system designation (e.g. Waypoint designation, HUD designation). Since the current system designation is always target point zero (T0), steering and range to the system designation can be obtained by selecting T0.

2. The STP can be changed by pressing the up/down arrows on the AMPCD, using the WINC button or by activating the Quick Access function.

3. When DESG is boxed, either STP or TGT will be displayed next the DESG box legend. STP is displayed when the designation is the STP. If something other than the steer-to-point is designated (e.g. HUD designation), TGT is displayed next to the DESG box legend.

4. If you want a system designation to become the STP you may either or QA to T0 or depress the WINC button or up or down arrow for greater than 0.8 seconds which makes T0 the STP.

5. Remember that the STP is where the heading bug is taking you even though you may have some other system designation.

6. Point-of-Interest is nothing more than the waypoint, mark point or target point (or offset) that is displayed on the Waypoint Data page. Changing the POI does not change the STP.

Common Errors:

1. N/A

Corrections for Errors:

1. N/A

Source Documents: NATOPS, NATIP
Name: Command Speed / Time Options

Purpose: CS/T functionality.

Description of Procedures:

1. **CS/T is independent of the designation.**
2. When there is an NSEQ string CS/T timing is only though the points, not the offsets of those points; except for the final point’s offset.
3. Since target points have TOTs in the target point data, the system CS/T will use them, if valid, as system TOT. If it is the terminal (TERM) point in a sequential string or the last point in a non-sequential string. The system is capable of maintaining up to eight different TOTs: \( \text{TOT}_1, \text{TOT}_2, \text{TOT}_3, \text{TOT}_4, \text{TOT}_{\text{tp-nseq}}, \text{TOT}_{\text{tp-seq}}, \text{TOT}_{\text{hp}}, \text{TOT}_{\text{sys}} \). This method is not suggested at this point in your training.

Common Errors:

1. Not familiar with the CS/T functions.

 Corrections for Errors:

1. Review the differences in the CS/T function and programming.

Source Documents: NATOPS, NATIP
Aerial Refueling Stage

Name: Aerial Refueling Mission Planning

Purpose: Describe the procedures required to prepare for and plan an air-to-air refueling evolution.

Description of Procedures:

1. Operations will normally have the “Tanker SPINS” available after coordinating with the unit providing aerial refueling. The doctrinal publication for AAR track information is the AP-1B. This should be referenced in addition to the Ops provided SPINS. Pertinent information from the SPINS and AP-1B include:
   a. Tanker callsign
   b. Aircraft type
   c. AAR track location
   d. AAR timing
   e. Fuel available for offload
   f. A/A TACAN, IFF and communication frequencies

2. Include this on the AAR card inserted as an option in the ADMIN cards in JMPS.

3. Additionally, the AAR Track may be graphically depicted on the EHSD in the AV-8B by drawing threat rings (symbol size 150, cyan) at the two ends of the AR Track with a radius of 3 NM (approximate KC-130 turn radius at refueling airspeed and bank angle). Then draw two lines (also cyan) tangent to the two threat rings along the AAR Track axis (see Air NTTP for details). The AAR track overlay should look like:

![AAR Track Overlay Diagram]

Common Errors:

1. Not checking the SPINS / AP-1B.
2. Not including all the information on the SPINS in the JMPS mission plan.

Corrections for Errors:

1. Check with Operations the day prior to aerial refueling operations to obtain the SPINS to conduct mission planning.

Source Documents: NATIP, Air NTTP, AP-1B
Name: Aerial Refueling Ground Procedures

Purpose: Describe the procedures for checking the aerial refueling probe prior to flight.

Description of Procedures:

1. Prior to launching on an aerial refueling mission, the pilot will preflight his aircraft IAW NATOPS. In addition, the pilot will initiate "four-finger checks" prior to calling for taxi. "four-finger checks" consist of extending the probe, thus allowing the plane captain to check for leaks, smooth extension and retraction, and probe tip condition.
2. The pilot should ensure the READY light illuminates when the A / R switch is in the OUT position and the probe is extended and locked. For night aerial refueling, also check that the probe light illuminates when the probe is extended. While the plane captain is checking the probe your hands should be up in the air just like in final checks. The READY light should extinguish when the probe is fully retracted.

Common Errors:

1. Not doing the “Four-Finger Checks” prior to taxi.
2. Manipulating controls / systems while plane captain is checking the probe.

Corrections for Errors:

1. Ensure all checklist items are completed.
2. Hands should remain above the canopy rail during four-finger checks.

Source Documents: NATOPS
Name: Random Rendezvous Procedures

Purpose: Describe the random rendezvous procedures on the KC-130 during a standard aerial refueling mission.

Description of Procedures:

1. After takeoff and check-in on tanker common, the tanker will direct you to the assigned altitude and position relative to the refueling operation. The tanker commander is designated the Refueling Air Commander (RAC). As such, he is responsible for the air refueling operation, and his commands, when directive in nature, require mandatory compliance.

2. Several types of tanker rendezvous exist for the KC-130; each is described in the ATP-56(B). Although pilots should be aware of the different types of rendezvous, we will execute a modified RV Delta (Point Parallel) Rendezvous at VMAT-203. The receiver will proceed to the tanker track, 1000' below AAR altitude (where the refueling platform will be). The normal random rendezvous pattern is a left hand pattern with twenty-five nautical mile legs. Comm will be established with the tanker once established in the working area.

3. Once communications are established with the tanker, confirm the altimeter setting along with the tanker's altitude. The tanker commander should then confirm his position by referencing a TACAN cut along with their present heading. At this point, the flight will attempt to gain a visual. With a visual, the flight is cleared to join below and on a left 45-degree bearing line from the tanker. Keep in mind the airspeed range for refueling for the KC-130 is 210-230 KIAS (normally 230 KIAS if tanker is able). Maintain good formation keeping as briefed by the flight Lead until established at left observation. Your flight Lead will brief this rendezvous in detail during your flight brief.

4. Multiple receivers will maintain echelon formation on the preceding receivers, which will be in a position to view the tanker's aft observer window for EMCON signals.

Common Errors:

1. Flying co-altitude with the tanker.
2. Not maintaining good formation on Lead and getting spit out in the turn to parallel the tanker’s course.
3. Excessive closure on the tanker join-up and overrunning the flight Lead.

Corrections for Errors:

1. Confirm the tanker's altitude and down a minimum of 1000' until visual, then maintain step down on the tanker.
2. Maintain pre-briefed formation (don't fly a “loose” formation which will make you more prone to be "spit out."
3. Tanker airspeed will normally be 230 KIAS (or as indicated in the SPINS). Maintain a maximum of 50 KTS closure.

Source Documents: ATP-56(B)
Name: En route Rendezvous Procedures

Purpose: Describe the en route rendezvous procedures on the KC-10 during a standard air-to-air refueling mission.

Description of Procedures:

1. If refueling from a strategic tanker such as the KC-10, pilots should be familiar with the different strategic tanker rendezvous procedures in the ATP-56(B). These include the point parallel rendezvous and en route rendezvous. During initial training, an en route rendezvous may be conducted due to strategic tanker airfield locations.

2. The en route rendezvous with the KC-10 is not unlike the random rendezvous with the KC-130, but does have some minor differences. Primarily, the flight plan will include an ARIP and an ARCP. These two waypoints designate the entry point to the aerial refueling track and allow for a common control point for all receivers. The flight will establish communications with the tanker; confirm altimeter setting and altitude and proceed to the ARIP at the assigned altitude (normally 1000 ft below tanker altitude). After reporting the ARIP, the flight will normally be cleared to the ARCP and advised to gain sight of the tanker. Once in sight, the flight will report visual and be cleared for tanker join. The final portion of the join up procedures are the same as with the KC-130 keeping in mind the KC-10 will normally be from 275-300 KIAS. Receivers should proceed to an observation position.

Common Errors:

1. Flying co-altitude with the KC-10.
2. Not setting 29.92 in altimeter if tanker above FL 180.
3. Excessive closure on the tanker join-up.

Corrections for Errors:

1. Confirm the tankers altitude and step up or down a minimum of 1000 ft.
2. Set proper altimeter setting.
3. Tanker airspeed will normally be 275 KIAS. Maintain a maximum of 50 kts closure.

Source Documents: ATP-56(B)
Name: Aerial Refueling Communication Procedures

Purpose: Describe the communication procedures for air-to-air refueling.

Description of Procedures:

1. All receivers shall monitor the AR Primary frequency, supplied in the SPINS, to conduct a rendezvous, at minimum 20 minutes prior to their ARCT. The refueling air commander (RAC), upon initial radio contact, may assign the receiver flight Lead a specific IFF mode and code and air-to-air TACAN channel. Refer to Part 1, Annex 1A of the ATP-56B, for a complete list of AAR Terms and Definitions.

2. Communication between tanker and receiver will be maintained during rendezvous and air refueling at all times. Once receivers will make initial communication with the tanker, they will provide their call signs, ETA (minutes late or early from scheduled ARCT) and altitude. The tanker in return will advise the receivers of their call sign, altitude and any change from the original ARCT (minutes late or early).

3. Required communication calls from the time the receivers are cleared to join the tanker to leaving the tanker are listed below. Additionally, be ready to pass your aircraft BUNO while in the observation position.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Tanker</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleared to join tanker</td>
<td>“MARS-XX, CLEAR JOIN”</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>Observation position</td>
<td>----</td>
<td>“MARS-XX, LEFT OBSERVATION, NOSES COLD, SWITCHES SAFE”</td>
</tr>
<tr>
<td>Astern position</td>
<td>“MARS-XX, CLEAR ASTERN (L/R)”</td>
<td>“MARS-XX, L/R ASTERN”</td>
</tr>
<tr>
<td>Tanker ready</td>
<td>“MARS-XX, CLEAR CONTACT (L/R)”</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>Refuel complete</td>
<td>----</td>
<td>“MARS-XX, SATISFIED”</td>
</tr>
<tr>
<td>Disconnect</td>
<td>“MARS-XX, DISCONNECT”</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>Reform position</td>
<td>“MARS-XX, GO REFORM”</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>Leave tanker</td>
<td>“MARS-XX, CLEAR TO LEAVE”</td>
<td>Acknowledge</td>
</tr>
</tbody>
</table>
Common Errors:

1. Not entering appropriate IFF codes.
2. Not selecting air-to-air TACAN.
3. Making incorrect voice reports.
4. Not knowing your aircraft BUNO #.

Corrections for Errors:

1. Select appropriate IFF and TACAN as directed by the tanker.
2. Study the required comm calls prior to the flight.
3. BUNO is located on a placard below standby instruments.

Source Documents: ATP-56(B)
Name: Observation Position

Purpose: Describe the observation position and required communications when established.

Description of Procedures:

1. As described in the rendezvous portion of the Aerial Refueling lecture, you will be cleared onto the refueling track 1000 ft below the tanker altitude until you gain sight of the tanker. When you have the tanker in sight, perform an appropriate rendezvous. You will then be cleared to the "observation" position.

2. This position is located left, below and outboard and behind the tanker’s wingtip, well clear of the refueling operation. The position should be such that during EMCOM operations, the tanker’s aft observation window is viewable. Once established in the observation position, complete the aerial refueling checklist and report "CALL SIGN, LEFT OBSERVATION, NOSE COLD, SWITCHES SAFE." Be prepared to pass your BUNO number as well.

3. Below is a diagram of the Observation, Astern and Reform positions.
Common Errors:

1. Not knowing your BUNO number.
2. Assuming an observation position too far away from tanker.

Corrections for Errors:

1. BUNO is located on a placard below standby instruments.
2. Use air-to-air TACAN distance of 0.2 - 0.3 DME from tanker.

Source Documents: ATP-56(B)
Name: Aerial Refueling Checklist

Purpose: Define the aerial refueling checklist.

Description of Procedures:

1. The air refueling checklist must be completed prior to reaching the astern position, and should be completed while in the observation position.
2. This checklist includes:
   a. Master Arm: OFF
   b. A / R Switch: Place A/R switch to OUT and check for illumination of READY light.
   c. Probe Light: As desired.
   d. Airspeed: Maintain 190-300 KIAS.
   e. AOA: Within safe operating limits. 13° maximum.
   f. Flaps: CRUISE, (STOL flaps may be used to maintain AOA below 13°). The use of AUTO flaps is prohibited for initial drogue engagement; authorized once "in the basket." Note: Switching from CRUISE Flaps to AUTO Flaps must be done prior to AOA increasing above 5 units.
   g. AFC: Engage if desired.
   h. VISOR: Down.
   i. RADAR: SIL
3. If waiting in the Observation position for your turn to refuel, consider completing the checklist with the exception of extending the probe and selecting CRUISE / STOL flaps, which increases your drag and fuel flow, until it is your turn to refuel. Be sure to complete these two steps prior to departing the observation position for the appropriate astern position.
4. One critical step that is not directly stated in the checklist but is implied is to trim the aircraft. Extending the probe significantly increases the drag on the left side of the aircraft. Use the VSTOL master mode sideslip indicator or the heads down sideslip indicator to trim the ball center. You may also need to re-trim the aileron after extending the probe. Do not forget to re-trim the aircraft after refueling is complete.

Common Errors:

1. Attempting contact in AUTO Flaps.
2. Leaving speed brake out from join up.
3. Forgetting to trim the aircraft.

Corrections for Errors:

1. Ensure aircraft is in the proper configuration and trimmed by completing the A/R checklist.

Source Documents: ATP-56(B)
Name: Astern Position

Purpose: Describe the astern position and required communications.

Description of Procedures:

1. Now established in the observation position with the air refueling checklist completed, you are awaiting clearance from the tanker to proceed to the astern position.

2. Once cleared by the tanker, move from the observation position to the astern position. This is defined as a position 10-15 ft aft of the drogue, with the probe in line both horizontally and vertically with the drogue, the aircraft trimmed, and no closure rate. For a single hose aircraft such as a KC-10 or KC-130 with only one hose deployed, this will be unambiguous. For two hoses deployed, such as on a KC-130, you will move from left to right, to the far right hose if you are the first aircraft to proceed from the Observation position to the Astern position (Right Astern in this case). The second aircraft will move to the Left Astern position once the first aircraft is safely established in the Right Astern position. Ensure you pass below and behind the tanker and drogue to avoid wake turbulence. This is especially important behind the KC-10. Once established, report "MARS-XX, LEFT / RIGHT ASTERN." The tanker will then clear you for drogue engagement.

Common Errors:

1. Assuming an astern position too far aft of the tanker at a level altitude and encountering wake turbulence.
2. Developing a closure rate within 10 ft of the drogue prior to being cleared to contact.

Corrections for Errors:

1. When transitioning from the observation to the astern position, maintain sufficient vertical separation to avoid wake turbulence from the tanker and drogue.
2. Do not attempt to engage the drogue until cleared to do so.

Source Documents: ATP-56(B)
Name: Drogue Engagement

Purpose: Describe procedures and techniques for drogue engagement.

Description of Procedures:

1. Once in the astern position and cleared for contact by the tanker, select the drogue as the primary reference point for alignment during the approach. A good visual reference point for initial positioning is the drogue placed above the angled portion of the HUD combining lens with 10 ft of separation. Ensure the tanker’s amber ready light is illuminated.

2. It is important to scan the KC-130 refueling pod as well as aircraft for proper closure and fine-tuned alignment corrections in close. Smoothly increase power to establish an optimum 3-5 knot closure rate on the drogue. Maintain a primary scan on the refueling pod and aircraft while keeping the hose / drogue in your peripheral vision as closure begins. This will prevent you from "chasing the basket" and reduces PIO.

3. As the drogue passes the canopy bow, scan should be transitioned directly to the drogue, which should now be abeam your left shoulder aligned with the refueling probe. Fly the probe to the drogue until a successful "plug" is made. It is imperative to maintain the 3-5 knot closure at this point until contact and a successful "plug" is made. A reduction or termination in closure will result in "fencing" with the drogue as it oscillates in close proximity to the nose of the aircraft due to bow wave effect. An excessive closure rate can lead to violent hose whip following contact with the drogue, which will increase the likelihood of aircraft or probe structural damage. Once contact has occurred, report "contact" to the tanker.

4. Vertical alignment is maintained with the stick and horizontal alignment can be maintained with the rudder. Because the AV-8B probe is shoulder mounted, any alignment corrections made by rolling the aircraft with aileron input will cause probe movement in both the horizontal and vertical planes.

Common Errors:

1. Improper initial setup either too close or too wide abeam the drogue.
2. Improper closure on the drogue.

Corrections for Errors:

1. Set up in the proper position and maintain 3-5 knots closure.
2. Use small corrections in both attitude and power.

Source Documents: ATP-56(B)
Name: Drogue Missed Approach Procedures and Abort Criteria

Purpose: Define the reasons and procedures for aborting drogue engagement.

Description of Procedures:

1. A bad approach to the drogue should be aborted and the astern position reestablished rather than trying to "salvage" the approach. To abort an unsalvageable approach to the drogue, simply reduce power and back the aircraft away from the drogue commensurate with the 3-5 knot closure rate.

2. Missed approach criteria include, but are not limited to:
   a. Excessive Closure - Excessive closure can cause hose whip and resultant probe tip damage. Excessive closure followed by a "missed plug" can result in drogue being partially or totally ingested by the engine, or being entangled between the canopy and refueling probe. It should be emphasized that 5 kts is the maximum take-up reel response the tanker can handle.
   b. Not enough closure - Not enough closure will result in fencing with the drogue due to the bow wave effect. Continuing to fence could result in PIO resulting in canopy to drogue contact.
   c. Probe Not Aligned - The greatest danger is misalignment both horizontally and vertically between the aircraft and probe. The possibility of ingesting a drogue down the intake exists. Other dangers included canopy strikes, loss of AOA probes and pitot / static tubes, and entanglement of the refueling probe and hose.
   d. Not Trimmed Up - This condition requires more "finesse" as the jet is flying in an out of balance condition; pilot workload increases dramatically.
   e. Rimming or Lipping - refers to a partially but not fully engaged refueling probe. By rimming, the connotation is that the refueling probe is partially engaged with the drogue but has failed to travel up the drogue to the coupling. Once the probe and drogue separate, the resultant "whip" action could cause drogue / canopy contact and possible canopy failure. The only acceptable course of action if this condition occurs is to discontinue the approach, reestablish the astern position and re-attempt the approach.
   f. PIO - Remember that formation and closure is relative the aerial refueling platform and not the drogue. Anticipate drogue movement due to airstream and the bow wave created around the AV-8B. Resist the urge to fly formation off the basket as this will only aggravate pilot induced oscillations.

Common Errors:

1. Aborting laterally vice aft.
2. Not trimming the ball.
3. Making a play for the drogue on a bad approach.
Corrections for Errors:

1. Be patient ("don't tank angry") and take time to setup the proper approach from the safety of the astern position. If the approach does not look correct then get back to astern position to fix deviations. Don't make in close "plays" for the drogue.
2. If your A/R probe breaks the vertical plane of the drogue, you have missed the basket. Execute your missed approach procedures.

Source Documents: ATP-56(B)
Name: Aerial Refueling

Purpose: Describe the procedures for refueling while engaged with the drogue.

Description of Procedures:

1. After successful engagement, stabilize your closure to maintain the hose between the minimum and maximum extension positions. Once stabilized, pick visual reference points on the tanker and fly formation off of it. Try not to focus on just one point. Airflow off the tanker and continuous gross weight increase as fuel is received will require you to re-trim the aircraft.
2. Check the probe and drogue to be sure that fuel is not venting. Light fuel venting may correct itself after a few seconds. Heavy venting will require you to disconnect and try another engagement. Light venting for more than 10-15 seconds will also require you to disconnect.
3. Monitor the fuel on-load to be sure that you are receiving fuel on both sides of the fuel system. Check your fuel state prior to drogue engagement to be aware of your starting point. Even if you are receiving fuel on both sides a minor asymmetry may develop. As long as it does not exceed a few hundred pounds, refueling can continue because it will balance as the tanks fill. If a large asymmetry develops, you will have to disengage and attempt to balance it using NATOPS procedures.
4. When aircraft fuel is full or proper state reached, transmit “MARS-XX, SATISFIED.” You will then be cleared to disconnect.

Common Errors:

1. Not stabilizing after engagement and either falling out of the drogue or getting too close to the tanker.
2. Not continuously trimming after stabilized.
3. Allowing a large fuel asymmetry to develop.

Corrections for Errors:

1. Fly formation off the tanker and trim to relieve control forces.

Source Documents: ATP-56(B)
Name: Drogue Disconnect Procedures

Purpose: Describe procedures for drogue disconnect after refueling is complete.

Description of Procedures:

1. Disengagement is accomplished by reducing power and backing out at a 3-5 knot separation. Care should be taken to maintain the same relative alignment on the tanker as upon engagement (remember the initial sight picture during engagement). Be especially careful not to disconnect too high and/or lined up left. Disconnecting too high will make the drogue whip down underneath the nose of the aircraft making it difficult to maintain sight. The drogue could potentially hit the bottom of the nose as it oscillates back up. Lining up left will cause the drogue to whip right on disconnect directly into the side of your canopy or fuselage, causing canopy failure or fuselage damage forward of the intake which will likely FOD the engine. It requires approximately 420 ft-lbs of force to de-couple from the drogue; this will cause a little yaw as the required force is obtained.

2. Stabilize in the astern position and retract the refueling probe. The LEFT and RIGHT advisory lights extinguish when the probe is fully retracted or the PRESS position is selected.

Common Errors:

1. Not aligning hose with refueling pod, causing hose whip after separation.
2. Excessive drift aft while attempting to disconnect.

Corrections for Errors:

1. Maintain hose alignment and a steady, controlled 3-5 knot aft drift.

Source Documents: ATP-56(B)
Name: Reform Position / Departure from Refueling Track

Purpose: Define the proper reform position and departure procedures after tanking is complete.

Description of Procedures:

1. Prior to disengagement, the tanker will clear you to the reform position. The reform position is defined as a position stepped up, outside the right wingtip of the tanker and slightly aft of the tanker's wing-line. Once clear of the drogue, maneuver your aircraft to the right reform position while maintaining sight and clearance from other aircraft already positioned. Once established, ensure probe is retracted, flaps are placed back to AUTO, and the aircraft is re-trimmed. The LEFT and RIGHT full advisory lights will go out with the probe in. Continue to maintain separation from the refueling evolution until all aircraft are complete and in the reform position.

2. If waiting in the reform position for another aircraft to finish refueling, do not fly excessively sucked on the tanker or your Lead. You should be slightly aft of abeam as the other aircraft disconnects from the drogue. This will prevent the heavyweight aircraft from having to pull excessive power and get dangerously slow to move aft of your wing-line and cross-under to the outside of the reform formation.

3. Once the receiver element is rejoined, the flight will be cleared to leave through the top of the AAR block and cleared to switch radio frequencies to resume the flight's mission.

Common Errors:

1. Not drifting aft and outside of tanker and encountering wake turbulence.
2. Not returning the flaps to the AUTO position.
3. Not re-trimming the ball.
4. Flying sucked in the reform position.

Corrections for Errors:

1. Maintain above and slightly aft within 0.2-0.3 DME with tanker if you are the first to the Reform. If you are joining on another aircraft already in the reform then cross-under and fly the briefed formation. Do not fly a sucked or "loose" position.
2. Ensure aircraft configuration is changed appropriately after tanking.

Source Documents: ATP-56(B)
Name: Aerial Refueling Emergencies and Actions

Purpose: Define the primary tanking emergencies and immediate actions.

Description of Procedures:

1. EMERGENCY BREAKAWAY: Anytime when directed by the tanker, or with any internal problem such as a TANK light, execute an emergency breakaway. Reduce power and make an immediate disengagement. Re-establish the astern position or as the tanker directs. Disengagement should be at the normal 3-5 knot speed.

2. SHATTERED CANOPY: Should the canopy and drogue make contact and shatter the canopy get clear of the tanker, put Cherry Point on the nose, declare an emergency and execute your boldface canopy explosion inflight procedures. Anytime there is canopy damage of this nature the possibility of FOD damage to the engine exists, hence the need for a VNSL. With the canopy system damaged / shattered it will be very difficult if not impossible to maintain / hear radio communications with either your flight Lead or ATC, therefore, expect Lead to join on you and handle communications. Lower your seat to minimize windblast and be prepared for ejection.

3. HOSE WHIP OR DEAD HOSE: Should you encounter a take-up reel malfunction where a noticeable sine wave develops, an emergency breakaway should be accomplished. Any delay in backing out and away from the drogue could result in drogue / probe damage, loss of probe tip or a separation of the drogue from the hose when the sine wave reverses direction towards the drogue assembly. Should the latter occur and the drogue remains on the probe, you will be committed to RTB in that configuration. Put the aerial refueling switch to the PRESS position, minimize airspeed (below 300 KCAS) and execute a slow landing.

4. TANK WARNING LIGHT: Emergency breakaway from the tanker. At the same time, transmit “MARS XX, satisfied” to stop fuel flow and prevent any further over-pressurization.

5. FUEL TRANSFER LIGHTS: Occasionally, a left or right fuel transfer light will illuminate during air refueling. Internal fuel will still be available to the center tanks through siphoning action. Should the left or right transfer light illuminate select feed on fuel panel and confirm feed groups full and steady. Monitor both feed groups for a possible fuel split.

6. PROBE FAILS TO RETRACT: Cycle the A/R probe switch and then place it back to the IN position. RTB and do not exceed 300 KCAS. If a TRANS light comes on, place the A/R switch to PRESS.

7. IFR ON TANKER: Prior to entering IMC, the tanker will give a two minute warning when possible. If penetration occurs while engaged, maintain engagement until directed otherwise by the tanker. Should lost sight occur, disengage and pick up an IFR scan. Establish communications as soon as possible and de-conflict accordingly.

8. LOST COMM WITH TANKER: Non-NORDO aircraft will inform the tanker of the NORDO aircraft. With transmitter only failure, the NORDO aircraft will comply with tanker direction if able. With receiver failure, NORDO aircraft will comply with ALDIS
lamp signals. If communication by these means becomes a problem and fuel is not required for training requirements, the non-NORDO aircraft shall make the call and direct NORDO aircraft to join via hand and arm signals and RTB.

9. NO FUEL FLOW: If fuel does not flow after engagement, ensure you have the hose / drogue in the correct refueling range and look for a green light on the tanker. If this does not remedy the problem, notify the tanker and follow their instructions. Expect to be directed to disengage and re-engage. If the probe is not engaging properly, do not try to “ram it in” by exceeding the 3-5 knot closure. If fuel still does not flow, proceed to right reform and await further instruction.

Common Errors:

1. Not being familiar with potential emergencies during air-to-air refueling.

Corrections for Errors:

1. Study NATOPS and mentally prepare for both the normal and emergency procedures that apply to air refueling.

Source Documents: ATP-56(B), AV-8B-NATOPS
Threat Countertactics Stage

Name: Threat Brief

Purpose: To familiarize the student with threat anti-aircraft systems and create a standardized briefing format to be utilized by replacement pilots.

Description of Procedures:

1. The RP will be prepared to discuss threat systems outlined in the FSG sortie brief section on all tactical events. The RP will use the following format to conduct the brief:
   a. Threat Characteristics
   b. General description of system with key identifying features (if any)
   c. General operating characteristics
   d. Maximum range and altitude
   e. Minimum range and altitude
   f. Max effective range and altitude
   g. Effect of terrain
   h. Employment techniques of threat nation
   i. RWR and/or visual indications and guidance flight path
   j. Pre-emptive maneuvers to defeat / deny threat engagement
   k. Reactive maneuver(s) to survive threat engagement
   l. Effectiveness of chaff, flares or jammer on threat system.

2. The threat brief should be condensed into a five-minute format. The intent of the brief is to have the student brief the threat and not read from gouge notes.

3. Foreign students going through the course will utilize the threat database loaded on the training system for threat information. This information is derived from Jane’s. US students will utilize the AFTTP 3-1 Threat Manual to derive brief information. The IPs will be able to discern the difference between the two publications.

Common Errors:

1. Threat brief too detailed in characteristics and lacking substance in what really matters to the pilot.
2. Relying on gouge cards and not reviewing material thoroughly to speak intelligently on subject.

Corrections for Errors:

1. Think about the threat from an operator perspective. It is nice to know that a threat operates at a certain GHz but it might be a little more important to know when and how it can be employed, what you’ll see and how to stay alive against it.
Source Documents:

AFTTP 3-1 Threat Countertactics Manual (Threat Database for foreign students).
NATIP
ALR-67 Users Manual, Air NTTP
Name: ALE-39/47 Setup and Employment

Purpose: To train pilots on most current expendables programming and HOTAS using loads that simulate fleet representative load outs.

Description of Procedures:

1. The following expendable loads will be used at VMAT-203 to teach fundamental HOTAS representative of Harrier fleet standards. The actual standard expendable loads programming are classified and are listed in the Air NTTP TAC Notes. Pilots need to be familiar with these loads and when they should be used.

2. The expendable loads at VMAT-203 will be designated P1-3. Loads P1-3 will replicate the SELs in HOTAS and are unclassified as they are symbolic for teaching proper HOTAS and not actual combat loads or programs. Actual SELs will be coded only and not actually loaded in the aircraft.

3. The loads will be programmed and verified during the CWAIVER checks. The procedures for programming the ALE-39/47 are located in lesson (16L-06 - ALE-39/47 Countermeasure Dispensing System) and NATIP.

4. The quantity of each expendable are set in the armament control panel (ASCM) in the main wheel well and cannot be manipulated after start up. During preflight, open the ASCMI door to ensure the proper codes have been input and then toggle the expendable reset switch down once. After start up, only expendable bingo and programs can be altered via the CMDS page.

5. At the briefed point and time (and within the range boundaries in training), the Lead of each element initiates the expendable check. Comm-In Expend checks are the standard at VMAT-203.
   a. Self Expend Checks.
      i. As soon as possible after takeoff, ensure “S” selected for each type of expendable on the CMDS page and UP selected on the EXP switch.
      ii. Position cockpit mirrors to allow observation of the dispense.
      iii. Select forward, aft, then left on the expendables dispense switch and ensure that each expendable dispenses per the SEL.
   b. Comm-In.
      Comm-in expend checks will be initiated at a pre-briefed point in the flight. Tac Wing will collapse the formation to ensure that the expend check is observable for both the Tac Lead and the Tac Wing. Select RWR on the expendable (EXP) switch. Tac Lead will transmit “RAZOR 11, EXPEND CHECK” and will expend a single flare, chaff, and jammer in that order—no radio call is required for each dispense event. Note the inventory countdown on the CMDS page. If correct dispensing is observed, the Tac Wing then conducts the check using the same procedures. If incorrect dispensing is observed, the Tac Wing reports what was observed on the radio (e.g., “NEGATIVE FLARE,” followed by Tac Lead expending another flare). This check requires the flight to have a tactical frequency on one radio. If unable, perform comm-out procedures.
c. Comm-Out.
   i. As soon as possible after takeoff, ensure “S” selected for each type of expendable on the CMDS page and AUTO selected on the EXP switch.
   ii. Lead will give wingman a “cocking gun” hand signal, then perform a single head nod to signal the beginning of the check.
   iii. Lead will dispense a single flare, chaff, and jammer in that order.
   iv. The wingman will pass one thumbs up for each correct dispense and a thumbs down for an incorrect dispense, e.g., a thumbs up for good flare, then a thumbs down for no chaff, and then a thumbs up for a good jammer.
   v. The wingman will then follow the same procedures as Lead to complete the expend check.
   vi. If the expendables do not dispense IAW the SEL, radio comm may be required to troubleshoot.

d. Upon completion of the expend check, select AUTO on the EXP switch and set the appropriate dispensing mode (P, M, or G) on the CMDS page.

Common Errors:

1. Unfamiliar with expendables loads.
2. Unfamiliar with expendables programming.
3. Unfamiliar with number of exposure events supported by the given SEL.
4. Expend check conducted not IAW the Air NTTP.
5. Expendables not used correctly.
6. Expendables switch not turned on.

Corrections for Errors:

1. Execute the expendables check IAW the Air NTTP.
2. Proper execution of CWAIVER and FELPG-F checks.

Source Documents:  
NATIP, Air NTTP  
Lesson (16L-06 – ALE-39/47 Countermeasure Dispensing System), TOPGUN, CY 2008
F= STUF
FLARE
C=CHAFF (RR129 OR
144)
J=STUF
FLARE

P1 AIR TO SURFACE (20 FLARE)

TOP LEFT AFT

TOP RIGHT AFT

C: N/A
F: S
J: P:2/1
A: F:S
J:S

P2 TCT (40 CHAFF/10 FLARE)

TOP LEFT AFT

TOP RIGHT AFT

C: 3/.1
F: S
J:
N/A
A: F:S
J:S
P3 ACM (20 FLARE)

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C: N/A
F: 2/1
J: N/A
A: F:S
J: S
Name: ALR-67 Setup and Employment

Purpose: To check the functionality and utilize the ALR-67.

Description of Procedures:

1. The ALR-67 is a vital part of an AV-8B pilot’s ability to survive in combat. Knowing the information passed over the multiple screen displays is vital to deciphering whether the system is operating correctly.
2. To setup the ALR-67, select the ECM push tile on either AMPCD. Select mission specific PRIORITY, OFFSET and LIMIT un-boxed and ECCM boxed on the AV-8B II+. Select the BIT push tile, adjust volume as necessary, and ensure a successful BIT IAW NATIP, Air NTTP, and the ALR-67 User’s Manual. If any RWR BIT codes are seen on the aircraft BIT2 display then select SPCL on page 1 of the ECM BIT and write down the 3 X 4 code display to debrief Avionics.

Common Errors:

1. Not understanding proper bit symbology.
2. Not recognizing failure codes on various BIT pages.
3. Not allowing proper warm-up time prior to initiating bit.
4. Not un-boxing SPCL prior to initiating bit.
5. Failure to ensure proper system set-up.

Corrections for Errors:

1. Study NATIP and Air NTTP and understand symbols to be displayed on BIT pages.
2. Run BIT multiple times if there is a question about a possible failure.
3. Allow proper system warm-up prior to initiating a BIT.
4. Ensure SPCL is unboxed prior to initiating BIT.
5. Know your systems and ensure proper set-up.

Source Documents: NATIP, Air NTTP
Name: ALQ-164 Setup and Employment

Purpose: To check the functionality and employment of the ALQ-164 Defensive Electronic Countermeasure (DECM) Pod.

Description of Procedures:

1. ALQ-164 self-test is a check of the control processor, system interface (with ALR-67), various antennas and receivers associated with the ALQ-164, and overall system operation.
2. The BIT procedure has multiple phases. First it tests the system to ensure the cockpit caution light indications are working in conjunction with the ALQ-164. The second portion of the test will determine whether the ALR-67 is working in concert with the DECM Pod.
3. One of the MISC cards on JMPS is the ALQ BIT and should be loaded on the DSU for reference on any event with the DECM pod.
4. ALQ BIT Card:
   a. ALQ-STBY CWNOGO/PNOGO 3MIN CW JAM 4SEC
   b. ALQ-BIT CWNOGO/CWJAM FLASH
      CW NOGO OUT CW JAM 4SEC
      PJAM FLASH X3 THEN OUT 45SEC
      PJAM ON STEADY BIT COMPLETE
   c. ALQ-OFF FOR 1 MIN
   d. ALQ-BIT 126/162 ON RWR PAGE2
   e. ALQ-STBY (AS BEFORE)
   f. ALQ-BIT (AS BEFORE)
   g. ALR-BIT (AS BEFORE)
   h. ALQ-RCV CWJAM ON- MSN CRIT FAIL
      CWNOGO ON- MSN DEGRADE (162)
      CWNOGO FLASH- POWER SUPPLY (162)
      PNOGO ON- PWR SUP/FLASH- OT (126)

Common Errors:

1. Not allowing enough time for proper system warm-up.
2. Not understanding the symbols / failure codes on various ALR-67 BIT pages.
3. Not understanding caution and advisory lights and associated times present during ALQ-164.

Correction for Errors:

1. Allow proper warm-up and shutdown times for ALR-67 and ALQ-164 systems.
2. Read aforementioned pages and understand symbols / failure codes on ALR-67 BIT pages.
3. Know and understand caution and advisory lights present during ALQ-164 BIT.

**Source Documents:** N/A
Name: Threat Reaction Matrix

Purpose: To plan a flight’s reactions to threats.

Description of Procedures:

1. A threat reaction matrix is a tool that allows the section / division Leader to make preplanned decisions based on RWR indications and operating profiles.

2. A threat reaction matrix varies substantially depending on whether the threat location is known or unknown. Also included in this decision matrix are situations, which require the division, section or individual A/C to continue on the attack, reset, abort, or jettison the ordnance and abort, in order to save the A/C and fight another day. A sample threat reaction matrix for RF SAMS is below:

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3. Once the range known or unknown matrix is completed and reset, abort, and jettison criteria are defined, some other factors need to be considered. Ideally we would like to keep the flight together as much as possible for mutual support, but at some point it may be necessary to react as singles based on threat, allowable risk, or mission phase. De-confliction between flight members must be planned and well understood by all pilots. We can accomplish de-confliction utilizing altitude, timing, geometry, or a combination of these, depending on mission specifics.
Common Errors:

1. Not thoroughly preparing a game plan and trying to "shoot from the hip."
2. Not reacting to threat indication displayed from A/C systems or outside agencies.
3. Failing to react or communicate with pre-planned brief.
4. Not adhering to de-confliction contracts.

Correction for Errors:

1. Preparing early, studying the threat capabilities and determining when to continue, reset, abort or jettison given the threat indication. Know E-pole distances and reaction decisions prior to the brief.
2. Adhere to planned threat matrix.

Source Documents: MAWTS AV-8B Courseware, TOPGUN, Air NTTP
Name: Threat Countertactics

Purpose: To deny or defeat surface-to-air threat systems.

Description of Procedures:

1. Procedures are in accordance with Air NTTP; AFTTP 3-1 Vol 2; and TOPGUN.
2. As you can see by the sources listed above any discussion on threat countertactics is going to be classified and as such cannot be discussed here in significant detail.
3. The maneuvers that you will need to be familiar with as described in one or all of the above sources are:
   a. Lean
   b. Beam
   c. Level-S
   d. Guns 3D / 3G Weave and Jink (pre-emptive and reactive)
   e. SAM Weave
      i. The procedures for the SAM Weave are classified and in accordance with Air NTTP, however, the following unclassified information is provided to help you better understand and correctly apply classified information:
         (1) While maintaining a constant G the airspeed is controlled with the aircraft plane-of-motion. The aircraft plane-of-motion throughout this rolling maneuver is controlled by the roll rate. If the aircraft is decelerating towards your minimum maneuver airspeed, then you need to get the nose farther below the horizon. To do this increase the roll rate during the reversals which will force the aircraft to go more nose low and allow energy addition. If the aircraft is accelerating towards the maximum allowable airspeed; decrease the roll rate as the nose is traveling up, or simply reduce the throttle slightly.
         (2) Upon “terminate”, the PUI will unload, roll to wings level, and then recover to the horizon. The maneuver should be terminated if airspeed exceeds the minimum or maximum limit, or at the discretion of the IP. The minimum altitude while performing this maneuver is 5000 AGL.

Common Errors:

1. Classified

Corrections for Errors:

1. Classified

Source Documents: Air NTTP, AFTTP 3-1 Vol 2, TOPGUN
Name: Jettison Criteria

Purpose: To establish criteria / parameters based on allowable risk, threat analysis, and aircraft performance that dictate if and when to jettison aircraft stores.

Description of Procedures:

1. Procedures and requirements for jettison criteria are in accordance with Air NTTP.
2. Once jettison criteria have been met, maneuver aircraft to wings level attitude and jettison stores via emergency jettison or stores jettison, as applicable. If aircraft is in maneuvering / defending flight, pilot must ensure aircraft is in a safe flight regime (i.e., upright) in order to ensure safe ordnance jettison from aircraft.

Common Errors:

1. Not jettisoning stores in accordance with jettison criteria.
2. Not jettisoning stores in a wings level / upright attitude.

Corrections for Errors:

1. N/A

Source Documents: Air NTTP
**Name:** Threat Countertactics Communications

**Purpose:** To effectively utilize JCOMM Brevity during Threat Reaction

**Description of Procedures:**

1. Effective communication is a key ingredient for successful mission execution. A basic understanding of the threat helps to minimize communications and results in clear and precise information transmitted to the flight.
2. All transmissions should begin with full call signs, be no more then 3 - 5 seconds in duration, and be clear and concise; all calls should be directive then descriptive. Examples and definitions are listed in the TOPGUN Manual and Air NTTP.
3. Remember while effectively communicating, you also are maneuvering your aircraft.
4. COMM Terms:
   - Abort
   - Notch (direction)
   - Break (direction)
   - Defending (direction)
   - Green
   - Mud
   - Naked
   - Resume
   - Sam (direction)

   - Cease action / attack / event / mission
   - Aircraft is in a defensive position. Maneuver with reference to an air-to-air threat.
   - Perform an immediate maximum performance turn in the indicated direction.
   - Aircraft is in a defensive position and maneuvering with reference to a surface-to-air threat.
   - Direction of no known enemy threats.
   - RWR ground threat displayed with no launch indications.
   - No RWR indications.
   - Resume last route / mission.
   - Visual acquisition of a SAM in flight or a SAM launch should include position.

**Common Errors:**

1. Talking and not turning your aircraft.
2. Transmissions greater than 3 - 5 seconds in duration.
3. Incorrect use of JCOMM Brevity.

**Corrections for Errors:**

1. N/A

**Source Documents:**

- Air NTTP, AFTTP 3-1 Vol 2,
- TOPGUN,
- MCRP 3-25B Multi-service Brevity Codes
Name: Maneuvers and Communications Drill

Purpose: To practice JCOMM Brevity during Threat Reaction during S/TCT 1351/1352

Description of Procedures:

1. Lead will initiate the drill by passing the wingman the TAC Lead and then the wingman will maneuver to the briefed run in line at the briefed altitude at 360 knots in NAV master mode.

2. Sequence (cardinal directions may vary):
   a. M11: “MARS 12, EXECUTE LEAN WEST.”
      M12: “MARS 12, LEAN WEST, MUD # NORTH.”
      M12 executes lean.
   b. M11: “MARS 12 EXECUTE NOTCH WEST.”
      M12: “MARS 12 NOTCH WEST, MUD # NORTH.”
      M12 executes beam.
   c. M11: “MARS 12, EXECUTE LEVEL S WEST.”
      M12: “MARS 12, LEVEL S WEST, MUD # NORTH.”
      M12 executes level S.
   d. M11: “MARS 12 EXECUTE WEAVE WEST.”
      M12: “MARS 12, DEFENDING WEST, MUD # NORTH.”
      M12 executes weave.
   e. M11: “MARS 12, RESUME.”
      M12: “MARS 12, NAKED, RESUME.”
      M12 resumes, i.e., turns back to the target.
   f. M11: “MARS 12 EXECUTE GUNS WEAVE.”
      M12: “MARS 12 DEFENDING WEST, AAA NORTH.”
      M12 executes 3D / 3G weave.
   g. M11: “MARS 12, RESUME.”
      M12: “MARS 12, NAKED, RESUME.”
      M12 resumes, i.e., turns back to the target.
   h. M11: “MARS 12, EXECUTE GUNS JINK.”
      M12: “MARS 12, DEFENDING WEST, AAA NORTH.”
      M12 executes guns jink.
   i. M11: “MARS 11 TERMINATE.”
      M12: “MARS 12 TERMINATE.”
      M12 turns back to the IP, climbs to the pre-briefed altitude and saunters.

Common Errors:

1. Talking and not turning your aircraft.
2. Transmissions greater than 3 - 5 seconds in duration.
3. Incorrect use of JCOMM Brevity.

**Corrections for Errors:**

2. N/A

**Source Documents:**  
Air NTTP, AFTTP 3-1 Vol 2,  
TOPGUN,  
MCRP 3-25B Multi-service Brevity Codes
Air-to-Surface Stage

Name: Air-to-Surface Planning

Purpose: Construct an air-to-surface game plan that is tactically sound based on a threat and environmental conditions. In addition, the plan shall adhere to the AV-8B Air NTTP planning guidelines.

Description of Procedures:

1. The AV-8B Air NTTP defines the steps required for standardized planning.
2. The following items will be prepared and brought to every air-to-surface event (simulator or flight). Failure to do this is an automatic UNSAT for the event:
   a. Weaponeering. Utilize WARP to weaponeer a load based on the description listed in the ordnance section for each event. Refer to the weaponeering discussion in this chapter for specific details.
   b. Chart. A 1:50,000-scale chart for the event will be prepared. Utilize 1:250,000-scale charts if the target area is too large to fit on a 1:50,000-scale chart. Regardless of chart size used, the chart will have the proper symbology and colors listed in the Air NTTP. Ensure target coordinates from the chart or gridded imagery are entered into the waypoints for the DSU / mission card load. It is imperative you ensure the JMPS datum matches the chart. Imagery will be used to complement the chart when available. At a minimum use the 5m CIB on JMPS. Check with local Intel source or target folder to see if anything more detailed is available.
   c. For all AS / MECH / CAS events, target overlays (1:50,000-scale) will be constructed, on clear plastic laminate sheets, for briefing attack geometry and de-confliction. Refer to Air NTTP for specifics.
   d. PAR. The PUI will submit an EOTDA worksheet to the weather office in the target area mechanics stage. The weather office requires several hours to work the EOTDA worksheet to create a predicted acquisition range. The following information will be derived:
      i. A sensor prediction will be created for all applicable systems (i.e. DMT, FLIR, etc).
      ii. The sun / moon geometry will also be briefed with respect to the run in heading.
   e. Weather
      i. Winds aloft from the surface to the highest planned Z diagram.
      ii. Any significant weather in the target area.
   f. Threat Brief. Prepare the threat brief as outlined in Threat Countertactics Briefing lesson utilizing the squadron format. AFTTP 3-1 Threat Countertactics Manual will be used as the reference document. Foreign students will utilize the threat database created at 203 as the source document.
Board. All A/S events will have the board prepared as outlined in the figure below.

3. FSG Brief Items. In addition to the above items, PUIs will be expected to be familiar with all brief items for the event.

**Common Errors:**

1. Improper target elevation or map datum.
2. Lack of flight cards per Air NTTP to include printed copies for brief.
3. Inadequate navigation / waypoint plan for raked range sorties.
4. Poor or non-existent map preparation.
5. Lack of imagery.
6. Inaccurate target coordinates.
7. Lack of overlays for target area tactics and CAS sorties.
8. Incorrect DSU / AMU Mission card load / DATUM.
9. Not planning for environmental factors in the target area (winds, sun / moon angle, EOTDA / PAR).
Corrections for Errors:

1. Weaponeering must be prepared for the ordnance load delineated in the FSG and on the flight schedule. The primary means for weaponeering is WARP. The secondary means is via the attack profile worksheets in the AV-8B NATIP.

2. Prepare to brief weaponeering using the briefing guide in the pocket Air NTTP. Ensure thorough briefing of all general and specific notes that pertain to each load.

3. Charts will be prepared for all air-to-surface sorties IAW the Air NTTP:
   a. Ensure accurate target coordinates and correct DATUMs are used.
   b. Make overlays with planned attack profiles, per the Air NTTP for all target area tactics and CAS sorties.

4. ADMIN and BRIEF cards with the appropriate Z diagrams will be prepared per the Air NTTP and loaded in the DSU / AMU Mission card for all sorties, as well as brought to the brief for all aircrew in the flight.

5. All raked range sorties (simulator and aircraft) require at a minimum an IP, target and ECP.

Source Documents: Air NTTP
Name: Weaponeering

Purpose: Maximize the effects of the ordnance carried on the aircraft while maintaining safe release parameters.

Description of Procedures:

1. Air-to-surface releases will be planned utilizing WARP. This does not alleviate the need for the PUI to be intimately familiar with all limitations and restrictions of the ordnance that will be carried. If WARP is not available PUIs must be capable of deriving weapon delivery data using the weaponeering worksheets. Utilize the following weaponeering guidelines as default parameters for all events unless specified elsewhere.

2. The following weaponeering standards apply:

<table>
<thead>
<tr>
<th>All conventional weaponeering will be planned using 5 seconds of tracking prior to checkpoint and 5 seconds of tracking after checkpoint.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ingress Airspeeds:</strong></td>
</tr>
<tr>
<td><strong>Ingress Altitude</strong></td>
</tr>
<tr>
<td>Raked range</td>
</tr>
<tr>
<td>Transition profile low</td>
</tr>
<tr>
<td>Transition profile high</td>
</tr>
<tr>
<td><strong>Pattern Airspeeds</strong></td>
</tr>
<tr>
<td>45° Pattern</td>
</tr>
<tr>
<td>All other patterns</td>
</tr>
<tr>
<td><strong>Delivery Airspeeds</strong></td>
</tr>
<tr>
<td>Free fall bombs</td>
</tr>
<tr>
<td>Forward firing ordnance (Gun and Rockets)</td>
</tr>
<tr>
<td><strong>Delivery Altitudes – Free fall bombs</strong></td>
</tr>
<tr>
<td>45°</td>
</tr>
<tr>
<td>30° “Tactical”</td>
</tr>
<tr>
<td>30° “Weather Back-up”</td>
</tr>
<tr>
<td>10° Low drag</td>
</tr>
<tr>
<td>10° High drag</td>
</tr>
<tr>
<td>Pop-up attacks</td>
</tr>
<tr>
<td><strong>Delivery Altitudes – Forward firing ordnance (Gun / Rockets)</strong></td>
</tr>
<tr>
<td>20°</td>
</tr>
<tr>
<td>20°</td>
</tr>
<tr>
<td><strong>Ordnance release interval</strong></td>
</tr>
<tr>
<td>Mk-76 / LGTR</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>HE or HE inert</td>
</tr>
<tr>
<td>Rockets (LAU-10)</td>
</tr>
</tbody>
</table>
3. The PUI will be prepared to brief weaponeering on every event after SAS-1402. This will require information other than the Z-diagram. The Air NTTP contains the weaponeering brief format, which should be used to prepare and conduct the brief portion. Minimum ripple single, ripple pairs and maximum stick length will be included in all Z-diagrams (milliseconds and feet).

4. Ordnance loadouts should be briefed as per the FSG sortie descriptions. In the case of Mk-76s, the PUI should weaponeer a notional loadout of Mk-82 TP with BSU-33 fins and FMU-139 tail fuzes.

5. LAW and PUC Calculations. There are situations when a pilot may want more conservative profiles and dive recoveries such as during initial training events and times when the least restrictive profile and recoveries are desired. As a result of these considerations, there are several different techniques for calculating the LAW and PUC. The ANTTP offers a recommended formula for LAW/PUC calculation based on combat weapons employment, and this differs from the method used while at VMAT-203. The VMAT-203 SOP for LAW and PUC is as follows:

a. LAW: For medium altitude deliveries, the **LAW will be set to the number given in the NTRP 3-22.4-AV8B Minimum Fuze Arming Altitudes tables based on the planned ordnance and fuzing, dive angle, release airspeed, 4G dive recovery, and off target maneuver.** This number is usually the highest (most conservative) of terrain or frag avoidance, but not always. Sometimes the minimum altitude for the fuze to arm is listed in the table, because that number is higher than the frag or terrain avoidance number. Values are taken from the 4G tables vice 5G tables because the TAV-8B off-target maneuver targets a 4G recovery, and 4G table numbers are more conservative than the 5G table numbers. For low altitude ingress, the LAW will be used for terrain avoidance per the LAT rules of conduct. LAW for GAU-12 deliveries will be set to the minimum "CEASE FIRE ALT (FT)" given in the NTRP 3-22.4-AV8B Delivery Data tables based on planned projectile type, airspeed, and flight path angle.

b. PUC:
   i. For single weapon deliveries the **PUC = minimum release (AGL) + target elevation – 4G altitude loss in dive. While in the air-to-surface stage, set the PUC for single weapon releases.**
   ii. For multiple weapon deliveries the **PUC = minimum release (AGL) + altitude loss for the stick + target elevation – 4G altitude loss in dive. When weaponeering for the Mech, CAS, and AI stages, set the PUC for multiple weapon releases, normally the longest stick of the reactive weaponeering matrix on the z-diagram.**

5. Minimum release, or Z-min, is the highest of frag, terrain avoidance, or fuzing numbers based on the planned ordnance and fuzing, dive angle, airspeed and 4G recovery. It is the lowest altitude that a bomb may be released to ensure weapon fuzing and allow survival / safety of the aircraft and pilot.
Common Errors:

1. Improper minimum intervals or maximum authorized stick length for multiple weapons release.
2. Not calculating the worst-case stick length for the planned load and reactive weaponeering table.
3. Not correctly calculating PUC or LAW.
4. Not correctly programming PUC or LAW (into DSU or AMU Mission card).
5. Not calculating worst-case asymmetry.
6. Forgetting to adjust stick length based on ITER load.
7. Forgetting to adjust weaponeering profile for target elevation.
8. Forgetting to adjust maximum stick length for target elevation.
9. Utilizing the wrong charts in AV-8B NATIP.
10. Not properly specifying planned ordnance load on top of Z-diagram card.
11. Using another PUI’s plan without being familiar with it.

Corrections for Errors:

1. Review and be thoroughly familiar with your weaponeering. If you have questions, ensure you sanity check your plan off an IP prior to the brief.

Source Documents: AV-8B NATIP,
Name: Air-to-Surface Briefing

Purpose: Establish procedure for A/S briefing format.

Description of Procedures:

1. PUI will be responsible for briefing a specific threat system that is applicable to the event. The PUI should be prepared to brief these threats IAW the guidance set forth in the TCT stage.
2. PUI will be responsible for briefing the planned weaponeering diagram, maximum asymmetry, the limitations imposed by specific weapons loadouts, and all applicable notes, remarks, or other restrictions required to safely deliver the specified ordnance. A comprehensive list of required briefing items is detailed in the MAWTS-1 briefing / de-briefing guide.

Common Errors:

1. Not briefing the capabilities of the threat system in relation to the AV-8B.
2. Briefing the weaponeering limitations to a notional loadout vice the actual loadout to be carried on the jet.
3. Not familiar with the source document for weaponeering a specific weapon.

Corrections for Errors:

1. Ensure that the threat is compared to the capabilities and systems of the Harrier.
2. Ensure the weaponeering covers the actual loadout on the aircraft.
3. Ensure familiarity with the AV-8B NATIP.

Source Documents: AV-8B NATIP, Air NTTP
Name: Weapons Preflight

Purpose: Establish procedures for the preflight inspection of ordnance carried on the AV-8B aircraft.

Description of Procedures:

1. Procedures in accordance with AV-8B NATIP, Air NTTP Tactical Pocket Guide (TPG)
2. Conduct preflight checks:
   a. Check ordnance and fuzing (if applicable).
   b. Check gun (if applicable).
   c. Ensure the fasteners on the SMC access panel in main wheel well are horizontal and the panel is secured (give it a “tug check”).

Common Errors:

1. Not using or referencing the Air NTTP Pocket Guide to properly preflight ordnance.
2. Not familiar with ordnance or fuze type for a specified load.

 Corrections for Errors:

2. Familiarity with ordnance and fuzing. Confirm loadout with Ordnance prior to brief, if necessary.

Source Documents: AV-8B NATIP, Air NTTP
Name: Arm / De-Arm Procedures

Purpose: To arm or de-arm ordnance for air-to-surface sorties.

Description of Procedures:

1. Arming:
   a. Free fall ordnance: An ordnance Marine will arm the aircraft CADs once you are strapped in prior to engine start
   b. Forward firing ordnance: Arming and de-arming will be done in the appropriate area on the airfield (CALA) in accordance with the local Airfield Operations Manual.
   c. During any arming evolution your hands will be held above your head in clear view for the ordnance supervisor running the arming procedure.

2. De-Arming
   a. Aircraft will be “safed” prior to entering the line area. The Airfield Operations Manual describes the de-arm areas.
   b. The Ordnance supervisor will ask you to display your hands. During any de-arming evolution your hands will be held above your head in clear view for the ordnance supervisor running the de-arming procedure.
   c. An Ordnance Marine will then safe the stores and carriage equipment.
   d. The Ordnance Supervisor will signal you to select STOL flaps and nozzles to 40° to safe the ALE-39/47 and will then ask you to display your hands.
   e. After ALE-39/47 is safed, the Ordnance Supervisor should signal you to return to cruise flaps and 10° nozzles before returning control of your aircraft to the plane captain for brake checks and watering. If not, ensure you signal the plane captain and receive approval prior to moving the nozzles and flaps.

   **WARNING**

   The potential for injury to one of the maintenance Marines is high during the de-armling, hot brake check and watering evolutions if positive control of the aircraft control surfaces and awareness to ground personnel location is not maintained. There have been mishaps and quite a few near-misses due to a communication break down and lack of awareness with Marines in close proximity to the aircraft. You, as a Marine officer, must look after the safety of our Marines. If there is any doubt about whether it is safe to move a control surface or the location of any of the personnel around your aircraft, stop the evolution and get the plane captain’s attention to clarify.

3. Hot Refueling
   a. No aircraft will hot refuel with hung bombs.
b. If your aircraft had any expendables you are prohibited from refueling even though they are all expended.

c. No aircraft will refuel with gun malfunctions or with any ammunition remaining in the gun.

d. You are allowed to hot refuel with “unexpended” inert ordnance as long as the stores have been “safed.”

**Common Errors:**

1. Conducting checklist items while being armed.
2. Not being familiar with airfield layout and arm / de-arm procedures. Any questions must be clarified in the brief.

**Corrections for Errors:**


**Source Documents:**  
VMAT-203 SOP, MCAS Air OPS Manual, AV-8B NATIP, Air NTTP
Name: Combat Checklist (C-WAIVER) and Miscellaneous Checks

Purpose: To ensure aircraft systems and weapons are programmed and operational prior to flight. These checks should be conducted as soon as possible after engine start to ensure ordnance or maintenance malfunctions are found before taxi (preferably started in the line).

Description of Procedures:

1. The Air NTTP describes the steps to be performed. This following section amplifies that verbiage.
2. C - Clock set for UTC time. Combat thrust (as required by engine performance)
3. W - Weapons
   a. Select Menu, Stores- verify planned load out and fuzing on LOP
      NOTE: While on the ground the gun will not be selected
   b. Box TONE
   c. Colonize SITE and enter site angle
   d. Box STRS- program delivery mode, quantity, multiple and select fuze option on ODU for store type
4. A - AVIONICS / ARBS and FLIR
   a. Menu DMT, verify FLTR and NITE unboxed (unless desired)
   b. Verify DMT code 1688 and LST in NAR scan
   c. Menu BIT; DBST (BIT 2 display), conduct BST check
      NOTE: Procedure in the NATIP
   d. Castle FWD when complete
   e. Castle Right for FLIR
      i. Select FLRM
      ii. Check cuer programming
      iii. Select gray scales and adjust brightness and contrast so you see 8 shades of gray
      iv. DAT AMPCDs adjust AMPCD brightness and contrast
      v. DAT displays
      vi. If at night, Castle down for RASTER FLIR, adjust shades of gray; castle down
      vii. Select REJ and ensure MAN unboxed
5. I - IFF
   a. Verify 3C code of Lead
   b. Run Mode I program
   c. Colonize Mode 4
6. V - VRS- Local and record or remote, stby, run
7. E - ECM
   a. ALE-39/47
      i. Set all to SINGLE
ii. Verify planned load out for expendables (reverse loaded)
iii. Verify planned program for each expendable and the “ALL” programs IAW VMAT-203 expendables plan

b. ALR-67
   i. Bit after warm-up period (3 minutes). Note any gripes
   ii. OFST, LIM unboxed
   iii. PRI- N
   iv. Turn off if not utilizing on event to prevent from getting desensitized to tones

8. R - RADALT
   a. Program LAW-ON
      i. Set per brief
      ii. Program PUC for fusing
      iii. Select GPS unless system CYRPTO or ALMANAC not loaded
      iv. Deselect Bomb if release greater than 2000 AGL
      v. GPWS – as desired

9. MISC
   a. Waypoints
      i. Confirm WAYPOINT DATA
      ii. Adjust NSEQ string if required
      iii. Check MAP defaults
      iv. Set design eye
      v. Lights check
      vi. APU / GTS as required
      vii. A/A TACAN colonize PROX

Common Errors:

1. Failure to conduct all of checks as listed above
2. Failure to properly set up VRS and select “REC” or “RUN” prior to takeoff.
3. Failure to verify expendable programming and select singles (S) for each expendable type in preparation for the expendable check.
4. Failure to conduct DMT Boresight check and ARBS system set-up.
5. Failure to set default cards in Night Attack aircraft.

Corrections for Errors:

1. Deliberately complete the C-WAIVER Checklist prior to take off.

Source Documents: Air NTTP, NATOPS, AV-8B NATIP,
Name:                                 Weapon System Programming

Purpose:                              Understand weapons programming of multiple aircraft variant components.

Description of Procedures:

1. Review the AV-8B NATIP.
2. Regardless of variant or OFP there are two primary ways to select and program weapons: via the ASCMI or by selecting the weapon on the stores page and then programming via the UFC/ODU or a combination of the two like selecting the weapon on the stores page and then programming on the ASCMI. You must, however, understand that based upon the aircraft variant and OFP that the programming is going to different components. The distinction is critical at VMAT-203 where we have the largest number of variant / OFP variables of any AV-8B squadron. There are certain stores configurations that can only be carried on specific OFP aircraft and there are certain programming options that can only be done via the UFC/ODU.
3. Remember in specific OFPs, you must enter the stores type, fuze, etc. into the WMC via the LOP on the STRS display.
4. Because of the multi-variant / OFP options it would be difficult to list every programming sequence and potential error. Below is the most common weapon system programming errors or unusual displays with symptoms and corrections:

<table>
<thead>
<tr>
<th>Symptom / Unusual Display</th>
<th>Error</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weapon Inhibit Cue (hashmarks in the HUD)</td>
<td>No weapon or fuze selected</td>
<td>Select appropriate weapon or fuzing for weapon (other than SAFE will remove Weapons Inhibit)</td>
</tr>
<tr>
<td>Weapon will not release Flashing weapon mode legend in HUD SAFE displayed on EHSD</td>
<td>Master Arm - OFF</td>
<td>Turn Master Arm - ON</td>
</tr>
<tr>
<td>Pull-up Cue touches velocity vector well before planned minimum release altitude</td>
<td>Invalid PUC</td>
<td>Set PUC for proper delivery profile. This error typically occurs in the raked range pattern when changing from a steeper delivery angle to a shallow one.</td>
</tr>
<tr>
<td>Weapons Inhibit Cue</td>
<td>Manual Control Knob - (other than NORM)</td>
<td>Return Manual Control Knob to NORM position</td>
</tr>
<tr>
<td>Weapon Inhibit Cue</td>
<td>Selective Jettison Select Knob – (other than SAFE)</td>
<td>Return Selective Jettison Knob to SAFE position</td>
</tr>
<tr>
<td>No Attack symbology</td>
<td>NAV Master Mode (don't laugh, it's been done before)</td>
<td>Select A/G master mode</td>
</tr>
<tr>
<td>Symptom/ Unusual Display</td>
<td>Error</td>
<td>Correction</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Upon pressing pickle button, CCIP symbology disappears momentarily and is replaced with AUTO symbology and weapon does not drop</td>
<td>In certain delivery profiles and wind conditions the Computed Impact Point can be outside the HUD FOV causing the CCIP cross to be reflected. If unrecognized, when you pickle the HUD symbology will change to AUTO after a small delay until the AUTO delivery is complete or the pickle button is released.</td>
<td>Recognize the reflected CCIP cross and hold the pickle button down once the reflected CCIP cross is on the target until the AUTO delivery is complete.</td>
</tr>
<tr>
<td>A/G Mode HUD symbology is not centered in the HUD</td>
<td>High crosswind condition</td>
<td>Change run-in heading to reduce crosswind if HUD symbology is offset so much that portions are not visible.</td>
</tr>
<tr>
<td>No Attack symbology in AUTO</td>
<td>Target not designated in AUTO</td>
<td>Designate target or switch to CCIP mode if valid designation does not exist or execute Point Blank Bomb Pickle. Also realize that even with target designated you will not have an ASL in the HUD until the azimuth to the designation is less than $11^\circ$.</td>
</tr>
<tr>
<td>Weapon Inhibit Cue Flashing WPN FAIL on EHSD</td>
<td>Weapon / WMC Fault</td>
<td>Check SMSFF page to determine fault or failure. Selecting SMSFF page will clear WPN FAIL and, depending on the fault, will also remove inhibit cue.</td>
</tr>
</tbody>
</table>
Common Errors:

1. Incorrectly programming weapons.
2. Not recognizing cause of unusual displays and incorrectly assessing a weapon system failure.
3. Unable to enter weapon, fuze and expendables loads into WMC.

Corrections for Errors:

1. Review weapons programming in aircraft using the UFCS, ODU, and ASCMI.
2. Be familiar with system and environmental influences on bombing system to correctly diagnose failures vs. unusual displays.
3. Review procedure for entering stores load into WMC.

Source Documents: AV-8B NATIP
**Name:** Heavyweight Ordnance Departure and Recovery

**Purpose:** To review heavyweight STO procedures and recoveries.

**Description of Procedures:**

1. NATOPS describes the procedures for conducting a STO. Heavy weight STOs are identical to those procedures but a few items must be considered with higher takeoff weights:
   a. Ensure VRST data is correct for load carried.
   b. Ensure temperature is correct on the VRST page.
   c. Consider what your actions will be if you have to abort or perform an immediate landing prior to taking the runway (over max gross landing weight, high NRAS speed, etc).
   d. Takeoff checks and Acceleration checks are the same.
   e. At NRAS, pull the nozzles to the STO stop in a firm manner but slightly slower that you would in a “clean” aircraft.
   f. “Unstick” the aircraft.
   g. Center the vane, set the attitude and maintain wings level.
   h. Ensure to nozzle out at a rate that keeps the VV above the horizon (may be slower than normal).
   i. Clean up as normal.

2. Heavy Ordnance Recovery
   a. If you have hung heavyweight ordnance in the training area, attempt to jettison if fuel permits.
      i. Do not selective jettison any lightweight training ordnance ITER loads (MK-76, LGTR).
      ii. With LGTRs, it is important that you dirty up in the range since these stores typically fall off if hung when the gear is lowered.
      iii. Do not perform BDA checks under an aircraft with hung ordnance.
   b. Adjust weight as required by dumping fuel.
   c. The flight Lead will inform ATC that you will be performing a hung ordnance approach.
   d. Fly local course rules for the recovery attempting to avoid the populated areas.
   e. Plan on running the motor 4° C hotter for each 10,000 of asymmetry (do not plan to VL on the numbers on a “JPT-limited” hot summer day).

**Common Errors:**

1. Nozzle rates that are too quick resulting on being hung up in ground effect or a dangerous settle on takeoff.
2. Wrong VRST data.
3. Unfamiliar with jettison procedures
Corrections for Errors:

1. Deliberately complete all checks and procedures per NATOPS and local course rules.

Source Documents:   NATOPS, MCAS Air Ops Manual, 
                    VMAT-203 SOP
Name: Tactical Administration (tacadmin) Checks

Purpose: To provide procedures for preparing the aircraft and systems for combat operations in hostile territory. This section provides an abbreviated description only. Reference the current Air NTTP 3-22.3-AV8B Ch 3 "Tactical Administration - Tactical Administration Checks" paragraph and "Return to Force (RTF)" paragraph for a full description of the procedures below.

Description of Procedure:

1. FELPG-F is an acronym used as a memory device when performing tacadmin checks.
2. F – Flight Environmental Assessment. Provides an opportunity for flight leads to assess environmental factors that could prevent or modify the plan of execution.
3. E – Expendable Check. The Comm-in expendable check is SOP at VMAT-203.
4. L – LAT/LAW/PUC Checks.
6. G – G-WARM. Students should target 360-380 KCAS, not to exceed 0.75 IMN. When flying the TAV-8B, students should target 4 Gs during both turns of the G-warm. A negative-G check may be conducted at the discretion of the flight lead.
7. F – “FENCED in, Tapes on”
8. FENCE out. Read "Return to Force" paragraph of Air NTTP 3-22.3-AV8B.

Common Errors:

1. Excess/improper comm. during expend check.
2. Not maneuvering to a proper position for expendable check.
3. Not resetting correct PUC.
4. Calling “Speed L/R” prior to trimming yaw at 360-380 KCAS.
5. Not appropriately applying G/AOA during G-Warm.
6. Not correctly setting up stores for planned release.

Corrections for Errors:

1. No response is required if expend check produces expected results.
2. Maneuver to an abeam-acute position that allows the flight to observe the expendables.
3. Set PUC up in JMPS prior to brief. Recheck PUC is set for planned release and colonized during CWAIVER checks. Recheck PUC is set during LAT checks.
4. Select V/STOL Master Mode during accel. Continuously trim ball during accel and reduce throttle to establish 360-380 KCAS. Ensure ball is centered before reselecting NAV Master Mode and reporting “speed L/R” to your flight lead.
5. Target smooth symmetrical pull to 4G or 10 units AOA on first 90 degrees of turn. When flying an AV-8B (B-bird), target 12-15 units AOA and max expected G for the sortie (not to exceed 5.5 G).
6. Set weapon options during CWAIVER checks. Recheck weapons are correctly set-up for planned release during PLACE checks.

Source Documents: Air NTTP
Name: Air-to-Surface Tactical Communications

Purpose: To communicate effectively and concisely in a tactical environment.

Description of Procedures:

1. Tactical communication is structured to achieve three results:
   a. COMM Brevity - transmissions are short and concise yet convey the required information.
   b. Priority- this means we do not talk unless there is a reason.
   c. Proper operation of systems- this means utilizing the correct radio for reception and transmission.

2. VMAT-203 air-to-surface communication standards
   a. Assumptions in the target area:
      i. Always reference the target and use 8-point sub-cardinal heading unless directed otherwise by flight Lead.
      ii. Your standard assumptions per the Air NTTP are “VISUAL, NO JOY, NAKED, AND CLEAN.” This means you see your Lead / wing (except post separation in a standard target attack where you are assumed BLIND), you do not see the target, are not illuminated by a threat radar.
      iii. Once an “IN” call has been made, no one will communicate unless they are threat reacting or an emergency / unsafe condition occurs. Format for the “IN” call: “MARS-22 IN NE.” VMAT-203 does not use “HOT” or “COLD.”
      iv. A “WINCHESTER” call will be made only once.
      v. If performing a practice ordnance delivery maneuver with no intention of actually dropping ordnance then call DRY: “MARS-22 IN EAST, DRY.”
      vi. Once the “OFF” call has been made, necessary communication can resume. “OFF” calls will be made once your off target maneuver is complete, you have a “TALLY”, and you have returned to your briefed sanctuary altitude.

   b. It is assumed you are blind off target. There is no need to tell Lead. You can expect Lead to give you a call describing position to the target then a bearing distance and relationship on your canopy if it’s required for a rejoin. Example:
      • “MARS-22, OFF NORTHWEST”
      • “MARS-21, NORTHWEST 3”
      • Then if additional COMM is required: “MARS-21, 12 O’CLOCK, 2 MILES, TEN HIGH.”
      • “MARS-22 VISUAL”
      • If you are visual: “MARS-22, OFF NORTHWEST VISUAL”

   c. J-COMM brevity listed in MCRP 3-25B Multi-service Brevity Codes will be used to the maximum extent possible.
   d. Fuel calls of Tiger, Joker, and Bingo will be made until the flight Lead acknowledges your fuel state.
Common Errors:

1. Not using full call sign.
2. Early / late or not making “In” call.
3. Early / late or not making “Off” call.
4. Not using sub-cardinal directions or referencing the target for target area COMM.
5. Poor SA as to your position about the target and giving the wrong sub-cardinal direction from the target.
6. Poor J-COMM.
7. Transmitting on the wrong frequency.

Corrections for Errors:

1. Always use full call sign.
2. Make “In” call just prior to initiating adaptive roll-in maneuver.
3. Do not make “Off” call until conditions have been met per briefed contracts.
4. Perform a good pre-flight map study of target area to pick out visual reference points for orientation around the target area. Also use the centered AMPCD display to determine sub-cardinal position from target.
5. Use sub-cardinal directions referencing the target for “In,” “Off,” and position calls.
6. Use appropriate J-COMM.
7. Ensure you are conducting target area COMM on briefed frequencies and think about which radio to make the appropriate calls on.

Source Documents: Air NTTP, MCRP 3-25B
Name: Actions at the Initial Point (IP)

Purpose: To configure the aircraft for air-to-surface ordnance delivery.

Description of Procedures:

1. Review Air NTTP.
2. In VMAT-203, for all raked range sorties, the Master Arm switch will be in the OFF position until rolling out of the "IP-Inbound" turn. The aircraft may be armed-up after the IP-Inbound turn. Once off-target, the master arm switch will be returned to OFF and MWSS checks reviewed prior to roll-in on the subsequent pass. This procedure also applies to forward-firing ordnance.
3. **M**- Master Arm. Verify on or as briefed.
4. **W**- Weapon. Verify Q/M/I as required and fuze set INST or D1
5. **S**- System A/G MM. Designation: STP and DESG/STP. Map scale as required. Verify course line (as required). Check HERRS/VERRS (this will be an important check as you progress through the syllabus and especially when employing PGMs).
6. **S**- Sensors. TV / FLIR as required. Verify HUD symbology correlates with cascade plan (i.e. RCIP, GCIP, BCIP).

Common Errors:

1. Not completing the "MWSS" Checklist and a WOF (optional).
2. Mismanagement of Master Arm switch.

Corrections for Errors:

1. Deliberately complete the "MWSS" Checklist at the IP.
2. Select Master Arm switch on once established in the raked range pattern and prior to roll-in.

Source Documents: Air NTTP
Name: WOF Update / Designation

Purpose: To establish procedures for WOF update / designation.

Description of Procedures:

1. Procedures in accordance with AV-8B NATIP.
2. The WOF function was designed to update the INS and configure the aircraft for attack during low altitude ingress with a single button push. With the evolution in tactics and weapons and the integration of GPS in the navigation systems of the aircraft, the relevance of the WOF function has been significantly reduced.
3. It is unlikely that you will tactically ingress low enough to update the baro-plane off the RADALT and a tight GPS-INS coupling will likely have a smaller position error than even a low altitude overfly update. Don’t forget that even if you are flying with the INS mode in NAV you can still perform a GPS update, assuming the aircraft has good GPS signal reception and the HPE and VPE are within tolerances.
4. Your target must be an offset of your waypoint at the IP for it to be designated.
5. The last thing the WOF will do for you is select the A/G master mode and the last selected weapon program, however, if you have done your CWAIVER checks correctly just selecting the A/G master mode button will have the same effect. So for the sake of consistency it is better to just do the MWSS checks at the IP.
6. Having said all of the above, if you ever execute a low altitude ingress with a bad GPS and a easily identifiable IP with the target as an offset then do not forget that you should use the WOF function to update your INS and baro-plane to provide you the best target location and HAT for a BARO delivery assuming that your RADALT, DMT / RDR are also inoperative or providing invalid data.

Common Errors:

1. Not understanding the conditions in which a WOF is required / available.
2. Not understanding accept / reject criteria during INS overfly update portion of WOF.
3. Not flying directly over WYPT during WOF update.

Corrections for Errors:

1. Review accept / reject criteria for system updates.
2. Fly directly over WYPT desired for most accurate update.

Source Documents: NATIP, Air NTTP, NATOPS
Name: Pattern Entry

Purpose: To transition the flight into the raked range pattern.

Description of Procedures:

1. Review the academic lessons.
2. The planned raked range profile can be a left or right hand pattern. PUIs should endeavor to see both a right and left hand pattern before completion of basic air-to-surface training. Circumstances (range space, etc...) may preclude execution of the planned pattern direction, so it is important to remain flexible for pattern direction.
3. The standard de-confliction for raked range sorties is climb off target to Z-1000 feet until visual on your interval or until geographically de-conflicted, at which you can climb to Z altitude. This contract begins with the spacer pass and is continued throughout the raked range pattern.

Common Errors:

1. Not completing Tacadmin Checks prior to the IP and entering the pattern without systems (map scale / mode) properly set up.
2. Not completing actions at the IP (MWSS), entering the pattern in the “NAV” Master Mode.
3. Not assessing the designation on ingress to the target or visually acquiring target prior to initial pull to downwind.
4. Poor formation for target overfly.
5. Not trimming rudder at release airspeed while overflying the target.
6. Setting incorrect interval for initial pull to downwind.
7. Losing sight of interval.
8. Not achieving good pattern parameters on first downwind.

Corrections for Errors:

1. Deliberately complete all appropriate checklists prior to IP. The recommended map scale is the 25 NM scale with de-center selected prior to entering the pattern, and the 13 NM scale with center selected while in the pattern. The course line should be selected according to planned run-in heading / clearing pass.
2. Complete MWSS actions at the IP.
3. Time interval for downwind using the clock in your HUD.
4. Scan the target through your HUD during ingress to the target to visually acquire the target and verify the position of the target designation.
5. Scan on or near the horizon for your interval. If required, call “Blind” on the target frequency and de-conflict with your interval in altitude.
6. Fly a disciplined profile and intercept good pattern parameters by the time you are abeam the target.
7. Check the winds aloft at pattern altitude compared to briefed winds and adjust your
pattern approaching the roll in appropriately.

Source Documents:
Name: Raked Range Pattern

Purpose: To attain proper, pre-briefed altitude, airspeed and distance from the target in order to position the aircraft at a good start position for the roll-in.

Description of Procedures:

1. Medium and low altitude raked range patterns will be derived from the Z-diagrams produced with the information provided in the Weaponeering portion of the FSG. All raked range patterns will resemble the racetrack orbit, with 3NM abeam distance, and an Initial Point (IP) turn at 5NM for 20, 30, and 45 degree patterns, and a 4.5NM IP turn in the 10 degree pattern. Specific distances for each pattern should be referenced from the Weapons Delivery Procedure Part 2 lesson. Bombing performance will be assessed according to the following parameters:

2. Pattern control:
   a. Airspeed within 15 KTS
   b. Altitude within 200 ft
   c. Attack cone distance within 0.2 NM
   d. Appropriate tasks complete after pattern parameters are established
   e. Effective, standardized communication
   f. Corrections to reoccurring trends

3. Adaptive roll-in:
   a. Target no less depressed than the minimum delivery FPA + TPA
   b. Target no more depressed than the maximum delivery FPA + TPA
   c. Effective J-Hook procedure
   d. Expendable use or simulation

4. Tracking technique:
   a. TPA is set correctly no later than checkpoint altitude
   b. Straight path tracking within 0.2 G

5. Error analysis:
   a. Pipper is on target or VV on ASL at release
   b. Steady state release parameters
   c. T&R standards met for accuracy

6. Recovery:
   a. G application follows ordnance release
   b. Proper amount and onset rate of G
   c. Off target maneuver correct.
   d. “Master Arm” secured after off target maneuver
   e. Adherence to de-confliction plan
7. Appropriate tasks to complete after pattern parameters are established
   a. Check fuel, expendables, and weapon status (“powder state”)
   b. Record hits
   c. MWSS checks prior to roll-in

Common Errors:

1. Not flying parameters in pattern (altitude, airspeed and distance from the target).
2. Fixating on the HUD or AMPCD in the pattern, not scanning outside of aircraft to
   establish roll-in sight picture.
3. Failure to correct pattern based on deviations from previous runs.
4. Not selecting planned weapon delivery mode prior to roll-in in accordance with
   cascade plan.
5. Not selecting “Master Arm – ON” prior to initiating roll-in.

 Corrections for Errors:

1. Ensure you are flying proper parameters prior to completing non-critical mission
   tasking (i.e. WRD data, checking STORES page, etc).
2. Select “Master Arm – ON” prior to making “IN” call.
3. Scan on or above the horizon for your interval.

Source Documents: Air NTTP
8L-23B “Weapon Delivery Procedures Part 2”
RAKED RANGE PATTERN

Off Target
- Locate Interval
- Communication
  "MARS 11, OFF EAST"

Abeam
- 3.0 NM
- Basic Airwork
- Record Hits (As Req’d)

Checkpoint
- Stop slewing
- Cascade – as required
- FPA – Freeze

Base Leg
- Set track line to intercept attack cone
- SS Aft x 2 – TV
- Capture
- Slew-sweeten aimpoint
- Cage / uncage as required

Add Leg
- 5 DME (20°, 30°, 45°)
- 4.5 DME (10°)
- Hard turn to base leg
- Comm: "MARS11 INBOUND"

Downwind
- Interval
- Stores-check
- EXP-check
- Fuel
- WRD (As Req’d)
- MWSS

Roll-In
- Roll-in / adaptive roll-in
- TPA – set
- Abort criteria – assess
- Throttle – adjust
- Expendables
- Comm: "MARS11 IN SOUTH"

Track
- Tracking / ASL-check
- Aimpoint – slew / validate
- Tracking / ASL – recheck

Attack (ROE Met)
- Pickle
- Pause
- Power
- Pull
- Program

Off Target
- Locate Interval
- Communication
  "MARS 11, OFF EAST"
Name: Adaptive Roll-in

Purpose: To transition from the start position, defined in terms of altitude, airspeed, distance and aspect from the target, to wings level, steady state tracking.

Description of Procedures:

1. Procedures are in accordance with Air NTTP.
2. After committing the aircraft nose low to the target, delivery parameters are very difficult to modify. The adaptive roll-in allows for corrections for deviations from a good start in order to initiate tracking wings level at or very near planned delivery parameters.
3. Adaptive roll-in corrections

<table>
<thead>
<tr>
<th>Delivery Angle</th>
<th>Altitude equal to 0.1 NM ACD</th>
</tr>
</thead>
<tbody>
<tr>
<td>45°</td>
<td>750 feet</td>
</tr>
<tr>
<td>30°</td>
<td>450 feet</td>
</tr>
<tr>
<td>10°</td>
<td>200 feet</td>
</tr>
</tbody>
</table>

4. Wind corrections. The aircraft’s computed delivery systems account for winds by moving the HUD symbology to make you displace the aircraft to release the weapon offset the appropriate distance so that through the weapon’s time of fall it gets “blown” onto the target. This assumes that the pilot flies the aircraft to arrive at the “wind-adjusted release point” with acceptable parameters on the aircraft.
   a. In crosswind conditions this is apparent to the pilot by the HUD symbology being off-center and by a slight angle of bank being required to hold the symbology on the target or the VV on the ASL. As long as the AOB does not exceed 15° then no further corrections to the roll-in point are required. Unfortunately you won’t know if you need more than 15° AOB until you are steady state in the tracking portion of your bombing run when it is too late to correct for winds by moving the roll-in point. The good news is the crosswind component required to move the roll-in point even 0.1 NM for a crosswind is greater than 160 KTAS for all of the standard delivery profiles that are flown in VMAT-203. If crosswinds exceed this magnitude from roll-in to release, consider changing the run-in heading (within the range regulations) to decrease the crosswind component or subtract 0.1 NM from the ACD to account for the longer ground track that will be flown while “arcing” to the wind-adjusted release point. Note, however, that with winds of this magnitude you will limited to AUTO deliveries only because the crab angle required to aim for the wind-adjusted release point will have the target off the side of the HUD. (Also ask yourself why you are flying, let alone trying to bomb in Category 5 hurricane force winds).
b. With a range wind component (headwind or tailwind) the HUD symbology will also be adjusted to make the pilot release the ordinance aimed upwind. The problem is that while flying to the upwind release point the aircraft is being blown by the wind into either a shallower (headwind) or steeper (tailwind) dive angle. With the standard 10 seconds of track time, adjust the ACD by 0.1 NM for every 35 KTAS of head or tail wind component. So for example if dropping on the 500 foot bullseye at BT-11 you will make a 275° run-in heading. On a typical NC winter day it is not uncommon to see winds out of the west at 75 knots. If this occurred you would adjust your roll-in to account for the headwind by using an ACD 0.2 NM closer than your planned no-wind ACD (remember a headwind tries to blow you shallow in the dive).

5. Adaptive roll-in performance standards:
   a. Target no less depressed than the minimum delivery FPA + TPA.
   b. Target no more depressed than the maximum delivery FPA + TPA.
   c. Effective J-Hook maneuver.
   d. Aircraft aligned with target after roll out.

Common Errors:

1. Not initiating the roll-in from a good start position.
2. Fixating on the HUD during the roll-in.
3. Pulling in an incorrect plane of motion, resulting in the velocity vector either too far below or above the target after roll-out.
4. Not pulling to the attack cone prior to initiating pull-down to target.
5. Not selecting full power for the roll-in.
6. Poor airspeed control after roll-out (typically fast in high angle deliveries and slow in low angle deliveries).
7. Not “max performing” aircraft during pull-down by pulling to “mild buffet.” Too weak of a pull allows the aircraft to accelerate and eats up valuable tracking time and airspace.
8. Under or overshooting the target laterally on roll-out.
9. Loaded rolls.

Corrections for Errors:

1. Fly a disciplined pattern to arrive at a good, consistent start position.
2. After initiating roll-in, scan head out to acquire target and establish correct plane of motion.
3. Assess airspeed immediately after roll-out and make the appropriate power correction (typically requires “standing up” the throttle for high angle deliveries).
4. “Max perform” the pull-down by selecting full power and pulling to “mild buffet” (10 to 12 units) to maximize turn rate and minimize radius to preserve valuable tracking time.
5. Stop the VV just prior to arriving under the target, unload the aircraft and roll-out. The increase in lift due to increasing airspeed and rolling wings level will cause the VV to climb 1-2° towards the target during the roll-out.

6. Unload the aircraft prior to both the roll-in and the roll-out. This will allow for a more precise roll-in.

**Source Documents:** Air NTTP
Name: J - Hook Maneuver

Purpose: A procedure incorporated into the adaptive roll-in to place the aircraft in a position to use the VV to designate a target.

Description of Procedures:

1. Procedures in accordance with Air NTTP.
2. The J-hook maneuver will be used on all the raked range pattern sorties for training standardization, regardless of aircraft type flown. The intent is to teach an aircraft maneuvering skill, target designation technique and proper HOTAS.
3. As an option, you may choose to undesignate once you are “tally” the target to de-clutter the HUD or to lay down a new designation if it would be easier to create a new one via the velocity vector than to try to slew a poor quality existing designation. However, remember that if you undesignated prior to roll-in you will lose the range to the target in the HUD (important information for trying to nail the attack cone).
4. Do not confuse the J-Hook maneuver with merely rolling-in undesignated. The J-Hook is a flight profile that you fly regardless of whether or not you are designated to allow yourself to have options as to how you will designate the target. If you undesignate at or prior to the roll-in then you must designate the target with the velocity vector (DMT or INS) using the J-Hook maneuver. If you roll-in designated and fly the J-Hook maneuver you will have the option to accept the existing designation and sweeten it as required or to reject the existing designation (undesignate) and designate with the velocity vector.

Common Errors:

1. Not pulling plane-of-motion below target, resulting in target being below VV after roll-out.
2. Pulling plane-of-motion too far below target, using up valuable tracking time prior to designation.
3. Over or undershooting the target laterally on roll out.
4. Undesignating the target without a “tally.”

Corrections for Errors:

1. Position VV approximately 1° below the target at roll out, at the 6 o’clock of the target, let the VV track up to the target and designate.
2. Stop the VV prior to arriving under the target, unload the aircraft and roll-out. Unload the aircraft when the target arrives at an imaginary line connecting the top of the alirspeed and altitude boxes in the HUD, then roll-out. The increase in lift due to increasing airspeed and rolling wings level will cause the VV to continue 1-2° towards the target during the roll-out.

Source Documents: Air NTTP
Name: Designate Surface Targets for Attack

Purpose: To establish procedures for designating surface targets for A/S weapons employment.

Description of Procedures:

1. The procedure for designating surface target is in accordance with the AV-8B NATIP.
2. The type of sensor or system that is used to designate a surface target is dependent upon the aircraft variant flown and the sensors onboard. At a minimum you should place an INS designation on the target to provide you steering cues and a reference in the HUD to scan about to acquire a visual on the target. Also, if the designation is on the target, regardless of sensor mode, you will also have the tactical option to "dive toss" the bomb if the threat requires it.
3. With the Night Attack aircraft, your preferred designation will be a DMT lock exactly on the target, allowing you to perform an AUTO delivery. Remember that there is an acceptable criterion for designations not on the target but still good enough to deliver CCIP off of a DMT lock. When trying to achieve a DMT/TV designation remember you need to make a decision about the quality of the existing designation after you pull it into the HUD FOV. If the designation requires more than a "no-action bump" or two to get it on the target then undesignate and re-designate with the VV off the J-Hook Maneuver.
4. With the TAV-8B, there are no sensors so your only option is an INS designation. Use the same criteria for accepting / rejecting the designation as previously discussed.

Common Errors:

1. Not applying the correct designation plan / HOTAS based on aircraft type.
2. Inability to use systems available to designate a surface target.
3. Not having a back-up plan if designation is deemed invalid.
4. Not maneuvering the aircraft to allow target designation with the velocity vector.

 Corrections for Errors:

1. Maximize systems use by developing a sensor timeline.
2. Have thorough knowledge of all available sensors and methods for designating a surface target.
3. Develop a cascade plan.
4. Ensure aircraft is flown to optimize sensor timeline.

Source Documents: Air NTTP
Name: Target Placement Angle

Purpose: One of the most critical factors in “reticle placement” tracking is setting the proper target placement angle. This angle, when set correctly prior to the checkpoint, ensures that the planned release altitude will be attained. It is the core principle that our tracking technique is based on.

Description of Procedures:

1. Procedures in accordance with Air NTTP.
2. Performance Standards:
   a. TPA set within 2 seconds after roll-out.
   b. TPA maintained ± 0.5° until checkpoint altitude.

Common Errors:

1. Not setting correct target placement angle.
2. Not setting target placement angle prior to checkpoint.
3. Setting TPA prior to checkpoint altitude during straight path to straight path tracking.
4. Not transitioning to straight-path tracking at the checkpoint.

Corrections for Errors:

1. Meticulously set and use slight forward stick pressure to maintain target placement angle prior to checkpoint.
2. Scan altitude and be prepared to transition to straight-path tracking at checkpoint altitude.

Source Documents: Air NTTP
Name: Basic Conventional Weapons Delivery (BCWD)

Purpose: To perform computed deliveries without integrating a specific sensor into the basic dive delivery technique.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP.
2. In your initial training in air-to-surface weapon delivery here at VMAT-203 it is important to have you fly a precise and consistent pattern, roll-in and tracking to release. As you will soon see, with a tightly coupled INS / GPS and valid target elevation, if you are smooth and precise in your weapon delivery techniques you will have a very tight CEP. It will get even better if you can consistently fly the same smooth and precise deliveries while integrating the primary height above target sensor for the aircraft variant you are flying. So we will initially fly non-sensor (BCIP / GCIP) deliveries to build solid delivery techniques. In follow-on sorties we will make you better by adding a sensor to those techniques, however, not at the expense of the flying a good delivery profile.

Common Errors:

1. Wrong datum in aircraft.
2. Incorrect target coordinates and elevation.
3. Not performing an accurate baro-plane update prior to a BCIP delivery when delivery altitude and ingress altitude allows one.
4. Poor basic conventional weapons delivery techniques.

Corrections for Errors:

1. Ensure proper pre-flight mission planning and correct systems usage for delivery.
2. Perform baro-plane update at desired release altitude and airspeed.
3. Perform proper reticle placement bombing techniques based on designation method and tracking technique.

Source Documents: Air NTTP, AV-8B NATIP
Name: ARBS / TV Designation

Purpose: To designate the target with the ARBS / TV in the Night Attack aircraft for target tracking and height-above-target information during high angle deliveries.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP.
2. Performance Standards:
   a. Initial TV designation within 300 feet of target. This will typically equate to the inner ring of a bulls-eye.
   b. Proper utilization of cascade plan to arrive at best HAT available by Checkpoint altitude.
3. Cascade Plan
   Prior to roll-in undesignate and castle aft twice on the sensor select switch resulting in TV sensor mode.
   a. Roll-in
   b. J-Hook and designate the target utilizing straight path tracking.
   c. If designation is not on the target slew until checkpoint altitude.
   d. If designation on target, upgrade to auto via the cage / uncage button.
   e. If TV designation is greater than 2 degrees depressed from the VV and within the wings of the VV you can use the ARBS for the height above target sensor and drop the weapon CCIP.
   f. If the TV designation does not meet the criteria above undesignated via the nose wheel steering button and drop CCIP GCIP, RCIP, or BCIP.

Common Errors:

1. Poor DMT boresight resulting in difficulty designating target.
2. Performing an INS designation vice an ARBS / TV designation.
3. Not actuating the sensor select switch aft twice to ARBS / TV instead of ARBS / LST.
4. Poor designation assessment.
5. Spending too much time getting designation or slewing / sweetening.
6. Slewing below checkpoint altitude.
7. Performing curvilinear tracking instead of straight path.
8. Attempting to lock target with insufficient contrast.
9. Not accounting for shadowing of vertical targets, resulting in ARBS / TV lock on shadow, vice target.

Corrections for Errors:

1. Perform DMT bore sight during Combat Checks (C-WAIVER) on deck.
2. Check for proper mode (TV) in the upper left corner of the DMT / EHSD display and check for dot in VV to ensure ARBS / TV is selected prior to designating the target.
3. Plan for environmental considerations to include the effects of sun angle and shadowing on ARBS / TV designation.

Source Documents: Air NTTP, AV-8B NATIP
Name: LST Designation

Purpose: To use the ARBS laser spot tracker function to derive height above target.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP.
2. On Night Attack aircraft an LST designation is the only automatic designation. It requires laser illumination of the target by an airborne or ground based laser designator.
3. With a laser code entered a single castle aft will enter LST search mode about a system designation.
4. When LST acquires laser energy it will lock on to the target and should be used as the HAT source. With the target between the cross hairs on the AMPCD the pilot has the option of handing this designation off to the TV with a single castle aft.
   a. Performance standards: Correct laser terminology on all deliveries.

Common Errors:

1. Improper laser code entered.
2. Improper LST scan selected.
3. Not selecting LST mode of ARBS.
4. Not recognizing LST symbology in the HUD.
5. Not performing TV handoff of LST designation when able.
6. Not planning for “laser basket” based or designator-to-target line.
7. Attempting to get laser lock outside of PAR for the LST.
8. Not recognizing laser spillover and thus dropping on a bad designation.

Corrections for Errors:

1. Ensure proper laser code is entered.
2. Ensure proper LST scan is selected and appropriate waypoint is designated (as applicable).
3. Review AV-8B NATIP for proper HUD symbology.
4. If target has sufficient contrast, hand off designation to TV by rocking back once then verify the ARBS / TV lock head-down. Often a TV lock is preferred because it will have less jitter / movement than a laser spot. (This should not be conducted when delivering laser-guided bombs).
5. Incorporate PAR for the LST and the associated HOTAS into sensor timeline.
6. Verify that the LST spot is on the target heads-down on the AMPCD. Cascade as necessary if it is not directly on the target.

Source Documents: AV-8B NATIP
Name: Point Blank Bomb Pickle

Purpose: Perform a target designation and AUTO weapon release with minimal track time.

Description of Procedures:

1. Review the AV-8B NATIP.
2. Select AUTO delivery mode and ensure there is no system designation prior to roll-in. Execute a J-Hook maneuver and place the VV on the target. Press and hold the pickle button. A designation will be placed over the target and AUTO symbology will appear. Set TPA and continue to hold the pickle button until release. **Remember, if this method is attempted in CCIP mode and the CCIP cross is within the HUD FOV, an inadvertent weapons release will occur!**
3. This method can be useful when an existing designation does not exist on a target that can be easily seen with the eye and a weapon delivery is to be attempted with minimal tracking time. An example of this type of scenario would be in a low altitude attack where a low ceiling denies the pilot the ability to fly the standard dive delivery pattern with 10 seconds of tracking time. Another example might be a medium altitude attack against a reactive target with threat in the target area that precludes the standard track time or a time-sensitive target that can be seen visually.

Common Errors:

1. Attempting the point blank bomb pickle method in AUTO mode with an existing designation.
2. Attempting the point blank bomb pickle method in CCIP mode potentially causing a significant miss.

Corrections for Errors:

1. Select A/G master mode and AUTO delivery mode with no existing system designation prior to rolling in for a point blank bomb pickle.

Source Documents: AV-8B NATIP
Name: Curvilinear to Straight-Path Tracking

Purpose: The preferred reticle placement tracking technique, most often used when a pilot is not required to maintain the velocity vector in the vicinity of the target for designation or designation refinement (T-Bird and Radar aircraft).

Description of Procedures:

1. Procedures in accordance with Air NTTP.
2. Roll-in
3. J-Hook
4. Establish and maintain TPA until checkpoint altitude. During acceleration, bunt slightly less than 1 G and maintain the target at a constant angle in relation to the velocity vector.
5. At checkpoint altitude maintain the current flight path angle until release. Smooth basic airwork is paramount during this phase of weapons delivery.
6. One technique to be considered to set and maintain accurate TPA is to activate the aiming carets. Aiming carets are activated by boxing SITE on the STRS page and entering the TPA mil setting into the UFC. Next colonize SITE in the ODU. This places aiming carets below the VV in the A/G master mode. The target can then be placed and held between the aiming carets to hold TPA.
7. Performance standards:
   a. TPA is set correctly and maintained within 2 seconds after roll-out
   b. Straight path tracking is maintained within $\pm 0.5^\circ$ of resulting FPA at checkpoint altitude.

Common Errors:

1. Not setting and maintaining correct target placement angle.
2. Not transitioning to straight-path tracking at checkpoint altitude.
3. Not maintaining proper straight-path tracking to weapon release.

Corrections for Errors:

2. Scan altitude and be prepared to transition to straight-path tracking at check-point altitude.
3. Strive to maintain a stable, steady state platform throughout the straight-path tracking. Ensure proper stabilator trim during tracking to alleviate any nose up or down pitch tendencies.

Source Documents: Air NTTP
Name: Straight-Path to Straight-Path Tracking

Purpose: A reticle placement tracking technique, most often used when a pilot is required to perform a target designation with the DMT (TV / CCIP, TV / AUTO).

Description of Procedures:

1. Procedures in accordance with Air NTTP.
2. Roll-in
3. J-Hook
4. Assess / slew. Once the target is designated, assess and sweeten the designation as necessary. Allow the VV to remain on the target, but do not worry about holding it in one place. Prior to reaching checkpoint altitude, set TPA. Once TPA is established, hold the resultant flight path angle until weapon release. Smooth basic airwork is paramount during this phase of weapons delivery.
5. If TPA is not set prior to checkpoint altitude, add an additional degree of TPA to compensate flying below the planned flight path angle above checkpoint. Failure to do this will result in low releases.
6. Performance standards:
   a. VV is maintained within 2° of the target during designation and follow-on slewing.
   b. Prior to checkpoint altitude the VV is pulled up to set TPA by checkpoint altitude.
   c. If TPA is not set by checkpoint altitude then at checkpoint altitude, TPA+1° is set.
   d. Straight path tracking is maintained within ± 0.5° of resulting FPA at checkpoint altitude

Common Errors:

1. Letting the VV drift too far above the target while heads-down.
2. Performing Straight-Path to curvilinear to straight-path tracking instead of straight-path to straight-path.
3. Not setting target placement angle prior to checkpoint altitude.
4. Slewing below checkpoint.
5. Not maintaining proper straight-path tracking to weapons release.
6. Not utilizing DMT during gun strafe or rocket deliveries.

Corrections for Errors:

1. Scan altitude and be prepared to terminate slewing and transition to heads-up straight-path tracking at checkpoint altitude.
2. Perform proper straight-path to straight-path tracking technique. Let the VV loiter in the vicinity of the target until checkpoint.
3. Meticulously set TPA prior to checkpoint or TPA plus 1° at checkpoint.
4. Strive to maintain a stable, steady state platform throughout the straight-path tracking. Ensure proper stabilator trim during tracking to alleviate any nose up or down pitch tendencies.
Source Documents: Air NTTP
Name: CCIP and Auto Releases

Purpose: To perform computed deliveries utilizing the primary height above target source for the specific aircraft.

Description of Procedures:

1. Procedures in accordance with AV-8B NATIP.
2. Aimpoint placement is critical for an optimum release. An optimal aimpoint is characterized by either precise pipper placement for CCIP deliveries or precise system designation for AUTO deliveries.
3. Corrections for lineup after roll-out need to be made as soon as possible. Larger corrections need to be made early. Any angle of bank present and weapon release will adversely affect sight picture and negatively affect accuracy.
4. CCIP employment: Endeavor to press the bomb-pickle button as the CCIP cross is on the target. Do not attempt to compensate for any perceived system inaccuracies.
5. AUTO employment: Ensure the VV is centered on the azimuth steering line at weapon release. Deviations will cause lateral impact errors. Press and hold the bomb pickle button until the release cue reaches the VV and subsequent weapon release.
6. Care must be taken when employing multiple weapons. Hold the pickle button until the last weapon is released from the aircraft. Failure to do so will result in unexpended or possibly hung ordnance.

Common Errors:

1. Not achieving and maintaining a steady state platform within 1 second prior to release.
2. Not holding bomb pickle button through entire release sequence for multiple weapon releases.
3. Excessive angle of bank at release.
4. Auto deliveries:
   a. Designation not on the target.
   b. VV not centered on ASL.
   c. Not pressing and holding pickle button until BFL touches VV.
5. CCIP deliveries:
   a. CCIP Cross not on target at release.

Corrections for Errors:

1. Ensure target designation is on the target prior to upgrading to AUTO.
2. Fly CCIP cross “pipper to bull” for release.
3. Perform proper reticle placement bombing techniques based on delivery mode and aircraft type. Cross winds must be planned on and accounted for.

Source Documents: AV-8B NATIP
Name: Considerations for Low Angle Deliveries

Purpose: Accurate and safe employment of low drag ordnance from low dive delivery angles.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP.
2. For planning purposes, VMAT-203 defines low angle deliveries as 10 and 20 degree deliveries.
3. When employing ordnance in low angle deliveries, consideration must be given to ensuring minimum release altitudes are adhered to as the margin of error is much smaller than high angle deliveries. Dudding ordnance and penetrating the fragmentation envelope is more likely.

Common Errors:

1. Not adhering to PUC resulting in low release and dudding ordnance.
2. Target fixation resulting in low or unsafe release and duded ordnance.
3. Improper off target maneuver for frag or threat avoidance.
4. RADALT not selected.
5. Poor basic conventional weapons delivery parameters.
6. Improper systems utilization during in-flight selectability.
7. Not adhering to tactical abort parameters.

Corrections for Errors:

1. Ensure all ordnance delivery restrictions and limitations are adhered to.
2. Avoid target fixation by developing proper scan for ordnance deliveries.
3. Ensure OTM procedures are understood and flown properly.
4. Ensure RADALT is selected with proper altitude warning set for terrain avoidance on recovery.
5. Perform proper reticle placement bombing techniques based on delivery mode and type of aircraft.
6. Ensure you program the correct weapon for release (e.g. 82H vs. 82L).
7. Brief and be aware your release altitude will be much closer to your min release altitude.

Source Documents: AV-8B NATIP, Air NTTP
Name: Low Angle Attacks with the 25mm Gun

Purpose: Accurate use of the GAU-12 25mm Gun.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP. The SOP Z diagram parameters for the gun are defined in the weaponing section of the FSG. The pattern profile will be a 20 degree raked range pattern with 5NM IP. The SOP at VMAT-203 for the PUC during gun employment will be setting it for a recovery of 1000 AGL. LAW for GAU-12 deliveries will be set to the minimum “CEASE FIRE ALT (FT)” given in the NTRP 3-22.4-AV8B Delivery Data tables based on planned projectile type, airspeed, and flight path angle.

2. Ensure you are thoroughly familiar with preflight, taxi and arming procedures. Once in the arming area on the appropriate heading, ensure the master arm is SAFE, engine is at idle, and nozzles are checked aft. Once signaled by the ordnance rep, hands shall be placed above the canopy rails until arming is complete. Remember; never select the gun on the STRS page at any point on the ground. You will return to this same spot at the end of the sortie to de-arm prior to taxiing to your line.

3. For all forward firing ordnance, the master arm switch will be armed after the IP-inbound turn and prior to roll-in. MASTER ARM – OFF shall be selected immediately after completion of the safe escape maneuver off target.

4. Be aware that your target designation and possibly VV will be occluded by the aiming reticle.

5. For a normal 0.5 to 1.0 second burst from safe release slant ranges, the cease fire recovery altitude / range is typically reached before the rounds have reached the target. Do not “press” the target waiting to see the impacts.

6. The nozzles have a tendency to “droop” down from the aft position during gun firing. This makes the aircraft very sensitive in nose up pitch. Be careful about over-stressing or departing the aircraft on the off target pull when recovering from a firing run. To prevent this, after you fire the gun, as you start to pull for the recovery, check the nozzles aft. This needs to be done quickly because any delay may place you into the frag envelope.

7. The off target maneuver will be a max performance “buffet” pull to the horizon, unload, followed by a 5 G level pull across the horizon (ensuring a minimum of 60° of heading change) to the left, then reset the plane-of-motion to resume a rate of climb to intercept your pattern altitude.

Common Errors:

1. Be familiar with the Airfield Operations Manual for ground procedures.
2. Improper airfield procedures (start / marshal / taxi / arm / de-arm) with forward firing ordnance.
3. Incorrect off target maneuver.
4. Not adhering to planned release parameters (open / cease fire ranges).
5. Insufficient recycle time for the gun between bursts.
6. Poor gun sight reticle placement.
7. Insufficient RPM to provide 60 PSI to pneumatic drive in high angle pattern.
8. Incorrect HAT source for strafing.
9. Failure to be familiar with gun restrictions in AV-8B NATIP.

**Corrections for Errors:**

1. Ensure proper off target maneuver for the 25mm Gun is performed to avoid ricochet, particularly for low altitude / low angle gunnery. Reference AV-8B NATIP for correct off target maneuver.
2. Allow one to two seconds for gun to recycle between trigger pulls. Preferably only use one deliberate trigger pull for approximately 0.5 to 1.0 second per pass.
3. Plan deliveries to include a power setting adequate to provide 60 PSI to pneumatic drive. Reference AV-8B NATIP for required throttle settings. Expect to be fast in high angle strafe due to required power setting.
4. Utilize RCIP or GCIP as appropriate based on planned open fire altitude and terrain.
5. Read the NATIP, 25mm Gun.

**Source Documents:** AV-8B NATIP, Air NTTP
Name: High Angle Rocket Deliveries

Purpose: Accurate and safe delivery of rockets from high angle dive deliveries.

Description of Procedures:

1. Procedures in accordance with Air NTTP and the AV-8B NATIP. The SOP Z diagram parameters for rockets are defined in the weaponeering section of the FSG. The pattern profile will be an extended version of the low altitude pattern for free-fall ordnance. The SOP at VMAT-203 for the PUC during rocket employment will be setting it for a recovery of 1000 AGL. LAW shall be for min release from the safe escape tables. At VMAT-203, rockets will be planned for release in singles.
2. Ensure you are thoroughly familiar with preflight, taxi and arming procedures, similar to as with the GAU-12.
3. Just like with the gun, the aircraft will typically reach the minimum recovery altitude while the rockets are still in flight, so do not “press” the target trying to watch the impacts.
4. Be aware that your target designation and possibly VV will be occluded by the aiming reticle.
5. Rockets are employed by pressing the bomb pickle button.
6. Rockets tend to shed a lot of “junk” when fired. Additionally, ingesting the exhaust plume from the rockets can cause a compressor stall, so immediately after firing the last rocket initiate the off target maneuver to displace the aircraft away from the plume and FOD potential.
7. For all forward firing ordnance, the master arm switch will be armed after the IP-inbound turn and prior to roll-in. MASTER ARM – OFF shall be selected immediately after completion of the safe escape maneuver off target.
8. The off target maneuver for rockets will be the same as for the free-fall ordnance returning to a raked range pattern (medium altitude off target maneuver).

Common Errors:

1. Improper airfield procedures (Start, Taxi, Marshal, Arm, De-arm).
2. Target fixation / pressing the target after delivery.
3. Poor basic conventional weapons delivery parameters.
4. Incorrect HAT source for delivery of rockets.
5. Attempting to fire rockets with the trigger.

 Corrections for Errors:

1. Be familiar with the Airfield Operations Manual for ground procedures.
2. Use proper instrument scan in combination with rocket delivery to ensure safe escape parameters are adhered to.
3. Ensure proper reticle placement techniques for rocket delivery are used.
4. Ensure greater than 2 degrees target depression for ARBS deliveries.
5. The pickle button is used to employ rockets in the AV-8B.
Source Documents: AV-8B NATIP, Air NTTP
Name: Raked Range Pattern off Target Maneuver / Recovery

Purpose: To transition the aircraft from the dive delivery to the desired follow-on flight conditions.

Description of Procedures:

1. Procedures in accordance with Air NTTP. At VMAT-203, the off-target jink maneuver is not utilized.
2. The OTM will be conducted before any communication is initiated unless a safety of flight issue arises.
3. The SOP medium altitude off target maneuver will be to target a 5G pull to the horizon. Ideally this would be a max performance maneuver pull to the onset of buffet, however we will target a 5G pull at VMAT-203, not to exceed the onset of airframe buffet (keep in mind when flying in the TAV-8B we will target no more than a 4G pull). As the nose passes through the horizon, ease slightly to target a 4G pull to dive angle plus 5° (30° degree dive = 35° climb). Begin a turn to downwind so as to arrive at the 3NM abeam position. During the off target maneuver for high angle patterns, airspeed may decrease rapidly. Target no less than 360 TAS during the off target maneuver.
4. Remember that as power is added the aircraft nose tends to pitch up. On high angle deliveries where the power is reduced or at idle in the dive delivery, care must be taken during the off target maneuver when G is set to avoid overstressing the aircraft or exceeding the lift limit. This technique for sequencing the “power” with the “pull” is especially critical in the TAV-8. If the pull is initiated to establish the off target maneuver G and then the throttle is advanced to full power, the G level will tend to increase 0.5-1.0 G above current which will place you very close to the aircraft’s G-limit. With the relatively low drag index of the TAV-8, if the power is set to full and then the G-onset is commenced the aircraft will accelerate dangerously close to the aircraft airspeed or Mach limit before the G and increasing FPA starts to decrease the airspeed again. Although the rule of thumb is to select full power and then initiate the pull, the two actually need to be done near simultaneously.
5. See the forward firing ordnance sections for OTM with those weapons.
6. Performance standard
   a. G application follows ordnance release
   b. Proper amount and onset rate of G
   c. “Master Arm” secured after OTM

Common Errors:

1. Pulling more or less than 5G’s when pulling the nose to the horizon (or pulling more than 4 G’s in TAV-8B).
2. Exceeding 4 G’s once VV passes the horizon.
3. Not pulling all the way to the planned dive angle plus 5° off target.
4. Not unloading the aircraft during the climbout.
5. Poor energy management in climbout.
6. Not securing Master Arm once safely established in the climb.

**Corrections for Errors:**

1. Smoothly apply back stick to a 5G pull (4G in TAV-8B), not to exceed the onset of buffet, until nose breaks the horizon.
2. Establish a 4 G pull after the nose breaks the horizon.

**Source Documents:** Air NTTP
Name: **Tactical Abort Parameters**

**Purpose:** Tactical abort parameters ensure that ordnance is delivered in a safe profile in order not to endanger the pilot or personnel on the ground, or dud a weapon.

**Description of Procedures:**

1. Procedures in accordance with Air NTTP.
2. In VMAT-203, tactical abort parameters are in accordance with the Air NTTP, with some added restrictions:
   a. A (valid) “Break X” is observed
   b. Minimum fuze arm time is exceeded (valid PUC on parameters)
   c. Minimum frag avoidance time is violated
   d. The aircraft apex is inside the MAP, or the preplanned FPA is exceeded by
      i. +/- 5 degrees for a 10 degree FPA
      ii. +/-7 degrees for a 20 degree FPA
      iii. +/- 10 degrees for a 30+ degree FPA
   e. *Dive angles greater than 5° steep
   f. Airspeed is greater than 50 KTAS fast
   g. Slewing below checkpoint

3. Remember, you are still within Tac Abort if you are 7 or 10 degrees shallow (for a 20 degree or 30+ degree FPA, respectively), but you are violating Tac Abort parameters anytime you are more the 5 degrees steep.
4. Tac Abort parameters shall be briefed from the Tactical Pocket Guide, not from memory.

**Common Errors:**

1. Slewing below checkpoint.
2. Releasing below planned Z min.
3. Releasing at greater than 50 KTAS fast.
4. Rolling in inside the MAP.
5. Releasing below PUC or RADALT tone.

**Corrections for Errors:**

1. Memorize and adhere to Tactical Abort criteria.
2. Understand and utilize adaptive roll-in procedures to remain within tactical abort criteria.

**Source Documents:** Air NTTP
Name: Off Target Rendezvous

Purpose: Rejoin the formation at the completion of the raked range pattern.

Description of Procedures:
1. Review the academic lessons.
2. The SOP off target rendezvous is a CV rendezvous at Z+1 altitude in pattern direction at 300 KCAS. A deviation from this may be briefed.

Common Errors:
1. Poor CV or running rendezvous caused by poor altitude, bearing, or closure control.
2. Poor formation skills.
3. Failure to “fence out” before rendezvous.

Corrections for Errors:
1. Remember the analogy you learned in Training Command about “putting on your admin hat.” During the tactical portion of the sortie you have been making large control inputs through the dynamics air-to-surface weapons delivery. To fly formation requires finesse and small, precise control inputs. Don’t forget to put on your “RTB hat.”
2. After coming off target from the last bombing run do your FELPG-F checks again en-route to the ECP or rendezvous point. Important items to remember are to ensure the master arm is safe, weapons are deselected, ALE and ALR are turned off, and select NAV master mode.

Source Documents:
Name: Analyze Weapons Effects

Purpose: To standardize the grading process & technique for air-to-surface events.

Description of Procedures:

1. Air-to-surface weapons effects will be graded on all events to a scored range or simulator. The FRS derives the data from an Excel spreadsheet created for this purpose (HITS). CEP about the MPI will be averaged for the total amount of ordnance expended. If a quantity greater than two was released the centric point will be used to plot the data. Care should be taken to correct for intentionally varying run-in headings. CCIP and AUTO modes will be averaged into a single CEP about the MPI. If you are proficient enough to use the AUTO delivery mode, a more accurate release, then your dispersion should be smaller. IPs will have discretion in grading due to aircraft system malfunctions.

<table>
<thead>
<tr>
<th>CEP about MPI</th>
<th>Description of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGTR / Precision weapon</td>
<td>Published dispersion of the training round</td>
</tr>
<tr>
<td>0-6.99 mr / Above Average</td>
<td>Exceeds aircraft / weapon design specs</td>
</tr>
<tr>
<td>7-10.99 mr / Average</td>
<td>Meets aircraft / weapons design specifications</td>
</tr>
<tr>
<td>11-13.99 mr / Below Average</td>
<td>Below aircraft / weapon design specifications</td>
</tr>
<tr>
<td>14mr or &gt; / Unsat</td>
<td>Lack of employment ability</td>
</tr>
</tbody>
</table>

2. RPs shall be introduced to the HITS program during AS ground school. At the discretion of the IP, RPs will be responsible for computing their CEP using the HITS excel spreadsheet following all sims / sorties. That data shall be provided to the IP for inclusion on the gradesheet.

3. MECH and CAS events may utilize ranges that do not have scoring due to the nature of the ordnance that is released. The IP will evaluate the effect on assigned target vice the CEP about the MPI. The release can also be validated stadiametrically utilizing the pipper placement for CCIP releases and the designation for AUTO deliveries. Based on the slant range to the target and known size VRS HUD data, it can be assessed whether the release falls into the aircraft and ordnance design specifications.

Common Errors: N/A

Corrections for Errors: N/A

Source Documents: N/A
Name: Jettison System

Purpose: To use the emergency jettison and selective jettison systems during an emergency or other contingency where jettison of external stores is required.

Description of Procedures:

1. Review the AV-8B NATOPS Manual and AV-8B NATIP. Ensure knowledge of the difference between emergency and selective jettison and the circumstances where each would be used.
2. To selectively jettison a store, select the appropriate station via the ASCMI (verify SEL in the respective station window), and push the red JETT button located in the selective jettison select knob. Care must be taken to ensure STOR is selected via the selective jettison select knob, or inadvertent release of an ITER will occur if STA is selected. With STOR selected, jettison is the same as in the STA position, except that all stores mounted on ITERs are released while retaining the ITERs. Remember, you are only authorized to selective jettison a maximum of two stores at a time from symmetrical stations.
3. Emergency jettison will release all stores with cartridges installed and suspension equipment from all BRU-36 bomb racks on stations 1 through 7.
4. Regardless of jettison system, all ordnance will be jettisoned in a ‘safe’ condition. However, there is no guarantee of inadvertent fuze arming (faulty ZRF solenoid) or detonation on impact.

Common Errors:

1. Not physically knowing where the emergency jettison button is located.
2. Unable to utilize the Armament Control Panel for selective jettison of stores or station.
3. Unfamiliar with what is being jettisoned when store or station is selected for selective jettison.
4. Not being familiar with or adhering to carriage and release limitations that apply to non-emergency jettison of external stores.

 Corrections for Errors:

1. Review references for function of selective jettison system.
2. Develop criteria for emergency versus selective jettison and criteria for what type of selective jettison for non-emergency situations.

Source Documents: AV-8B NATOPS, AV-8B NATIP
Name: Emergencies with External Stores

Purpose: To review considerations for handling emergencies while carrying external stores.

Description of Procedures:

1. The PUI will be familiar with and prepared to discuss the following emergency conditions for every air-to-surface event:

<table>
<thead>
<tr>
<th>Malfunction / Contingency</th>
<th>Source for corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hung / unexpended ordnance recovery</td>
<td>MCAS Air Ops Manual NATOPS</td>
</tr>
<tr>
<td>Hung LGTR</td>
<td>AV-8B NATIP NATOPS</td>
</tr>
<tr>
<td>Hung LGTR</td>
<td>MCAS Air Ops Manual NATOPS</td>
</tr>
<tr>
<td>Asymmetric Stores</td>
<td>NATOPS AV-8B NATIP</td>
</tr>
<tr>
<td>Gun malfunctions</td>
<td>AV-8B NATIP</td>
</tr>
<tr>
<td>Emergency and Selective Jettison</td>
<td>NATOPS AV-8B NATIP MCAS Air Ops Manual</td>
</tr>
<tr>
<td>Flameout procedures</td>
<td>NATOPS</td>
</tr>
<tr>
<td>NORDO</td>
<td>MCAS Air Ops Manual NATOPS</td>
</tr>
<tr>
<td>Degraded WMC</td>
<td>AV-8B NATIP</td>
</tr>
</tbody>
</table>

Common Errors:

1. Unfamiliar with the listed malfunctions / contingencies and the appropriate corrective action.
2. Unfamiliar with the dump target and local procedures.

Corrections for Errors:

1. Review the references and chair fly your actions and procedures to be taken in the event an emergency arises while conducting air-to-surface ordnance deliveries.
2. Review the local MCAS Air Ops Manual.

Source Documents: NATOPS, AV-8B NATIP, MCAS Air Ops Manual, VMAT-203 SOP
Name: Fuel Planning Considerations

Purpose: To introduce the student to fuel planning in the training environment.

Description of Procedures:

1. Fuel planning requires an assessment of numerous factors, to include distance, weather, drag index, type of recovery and routing restrictions, to name a few. A common technique for fuel planning is to use backwards planning beginning with a desired landing fuel quantity. Adding fuel required for various RTB procedures or considerations will assist in the calculation of Tiger/Joker/Bingo fuel states.

2. **Bingo**: The Air NTTP describes Bingo as “Fuel state at which flight member must proceed along established routing under a maximum range profile, whether rejoined as a flight or not. At Bingo, aircrew should check their VRST page and determine if they need to execute a NATOPS bingo profile, proceed direct, or declare an emergency.” Two techniques for Bingo fuel calculations exist. One method is to select a Bingo fuel state based on an actual Bingo profile to include aircraft configuration, drag index, winds, and distance to travel. This would be used in a combat situation. The second method is similar, but instead of an actual Bingo profile, it uses a planned RTB altitude, usually a maximum of 16,500’ MSL or 17,500’ MSL to avoid flying into Class-A airspace. A good rule of thumb for this profile is 100#/10nm for a 6.5 AOA administrative RTB. This would be used in a training situation. Although, we should be aware of our emergency Bingo fuel requirements, we should not put ourselves in that position in a training environment.

3. **Joker**: The Air NTTP describes Joker as “Fuel state above Bingo at which separation/bug-out/event termination should begin. The same threat considerations apply in the air-to-air threat arena. Joker fuel should allow for 2 minutes of sustained maneuvering, conducted within visual range (WVR) engagement and separate. In training, unless the objective is to fly a tactical egress, Joker will be the fuel state at which the flight will terminate the tactical portion of the mission and rejoin to assume an administrative profile for the planned recovery.” A technique for Joker fuel calculation involves backwards planning from the destination airfield.

4. **Tiger**: The Air NTTP describes Tiger as “Enough fuel and ordnance that will enable the flight to accept a “commit” (offensive air support [OAS]/anti-air warfare [AAW] mission). This means enough fuel to ingress into the target area from present position, engage the target, and egress out of the target area accounting for the expected threat.” In the training environment, Tiger is commonly set to allow for one more raked range pass, one more CAS 9-line, a five minute warning until Joker, or the fuel at which the flight must complete its last training objective or T&R requirement.

5. **Example 1**: Air-Air section flight utilizing the W122 Area 15-17. Furthest point away from destination = 80nm.

1200# at straight-in initial. If we hit BINGO at the furthest point, a straight-in requires less fuel.
+ 800# for 80nm, 6.5 AOA transit at highest VFR altitude, normal descent profile.
=2000# Bingo.
+ 300# Join up after complete. This varies with pilot experience, wx, number in flight, etc…
=2300# Joker.
+ 800# for 5min remaining to complete Training Objectives at expected average fuel flow.
=3100# Tiger.
In reality we are keeping track of our fuel state and KIO at Joker. We begin our RTB are <50nm out (worst case) when we reach Bingo fuel state. Though, we are probably closer. This allows fuel to execute the overhead and be abeam with at least 1200# IAW SOP.

6. Example 2. TAV-8B FAM flight to the R5306A (60nm furthest point) with 1x Hi-Tacan then tower downwind for landings.
1200# at straight-in initial.
+ 600# for 60nm, 6.5 AOA transit at highest VFR altitude, normal descent profile.
=1800# Bingo
1600# at pad for one last VTO accel to return
+ 200# re-position / cool down / run-ups
+ 800# decel VL
+ 600# roll-n-go
+ 800# hi Tacan
=4000# Joker
+ 500# for 5min remaining to complete Training Objectives at expected average fuel flow.
=4500# Tiger
As you can see, the Bingo was still calculated for and admin transit from the furthest point to destination excluding training objectives during the RTB and back at the field. However, Joker was backward planned with these Training Objective accounted for. Tiger should take into account the types of maneuvers and how much fuel flow they require. Five or ten minutes remaining is not a constant value from one flight to another.

Common Errors:

1. Incomplete or unrealistic fuel management numbers
2. Fuels that don’t have an associated meaning or a meaning that is not useful for the flight.

Corrections for Errors:

1. N/A

Source Documents: NTTP
Low Altitude Stage

Name: Low Altitude Brief Requirements

Purpose: Prepare for flights in the LAT environment.

Description of Procedures:

1. Chart: All RPs will bring a 1:250,000-scale map that is chummed with all obstructions and restrictions in the training area. This map should also have local diverts and their radio frequencies listed. The area boundaries should be identified with waypoints and a TACAN cut for entry / exit. RPs should be familiar with mean elevation and any prominent terrain in the area.

2. DSUs and AMUs: A loaded DSU or AMU is required for a simulators and flights. The DSU overlays will contain all the above-mentioned data from the map. RPs will use the Air NTTP as the standard. All flights and simulators will be planned to this standard regardless if the event is conducted in a TAV-8 or simulator. Classified maneuvers will require the student to review the procedures in the learning center from the classified publications.

3. LAT Standards: The following items will be briefed on every flight by the RP in addition to procedural knowledge of all the maneuvers to be performed:
   a. Low altitude
   b. Comfort level
   c. Minimum altitude capable
   d. Step down recovery
   e. Immediate recovery
   f. Maximum recovery maneuver
   g. Knock it off
   h. Terminate
   i. LAT assumptions
   j. Dive recovery rules.
   k. 10% rule for radar altimeter
   l. Terrain clearance tasks and mission tasks (CT and NCMT)
   m. MCT for “straight and level” and turns.

4. Communication. All communication from the IP will be acknowledged via a positive response from the wingman. IPs will brief in detail the communication standard for the LAT events. PUI must know dive recoveries rules “cold” and be able to repeat them easily for these events.

Common Errors:

1. Unprepared or incorrectly chummed maps.
2. Misunderstanding up the above definitions.
Corrections for Errors:

3. Use the E-Chum function of JMPS to ensure that you have the latest information.
4. Ask for help or clarification when a concept is not understood. The brief is not the place to confess that you do not understand a concept or maneuver.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Low Altitude Checklist

Purpose: Systems configured for Low Altitude operations.

Description of Procedures:

1. The environmental assessment, G-warm, and RADALT check should already be completed as part of the TACADMIN checks. The low altitude checklist portion consists of the following:
   a. Mask: On
   b. Visor: Down.
   c. Altitude select switch: RADALT
      **Make sure you hear the warning tone, see the warning light and see the “R” next to your HUD altitude readout**
   e. Ground proximity warning system (GPWS): Colonized
   f. A/A TACAN: Selected
   g. Video recording system (VRS): On

Common Errors:

1. Not completing checklist.
2. Late starting checklist, resulting in task saturation at start of route.
3. Not having systems set up to maximize SA / mission effectiveness prior to entering low altitude environment.

Corrections for Errors:

1. Start completing the Low Altitude checklist early, to allow enough time to complete the checks before entry into the low altitude environment.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Dive Recovery Rules

Purpose: Dive recovery rules provide a means to safely and rapidly descend to low altitude.

Description of Procedures:

1. Altitude and FPA combinations, which indicate when to begin your recovery to level flight.

<table>
<thead>
<tr>
<th>FPA</th>
<th>Recovery Alt (AGL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1600</td>
</tr>
<tr>
<td>20</td>
<td>1200</td>
</tr>
<tr>
<td>15</td>
<td>800</td>
</tr>
<tr>
<td>10</td>
<td>500</td>
</tr>
</tbody>
</table>

2. Assumptions:
   a. Airspeed-between 350-550 KTAS.
   b. Reaction time - 0.75 seconds.
   d. Terrain at recovery is flat. If terrain is rising, an early recovery must be executed.
   e. Valid for altitudes of 0 to 5000 AGL.

3. Comments:
   a. “Step down” recoveries are used to transition from higher dive angles to lower dive angles as you complete the recovery. This will smooth out the recovery as well as help you get into the low altitude environment quicker. “Step Down” recoveries-always starts with at least a 10° change in FPA from the 25 or 20 recoveries. For example if 20° nose down, at 1200 ft, pull the nose to 10° nose down until intercepting 500 ft, at which time you will recover to the horizon. Do not attempt to stop at all intermediate points.
   b. Recovery speeds greater than 550 KTAS can result in an unacceptably low-recovery altitude due to the high downward velocity vector
   c. Recovery speeds slower than 400 KTAS can result in an unacceptable low-recovery altitude due to a reduction in available G.
   d. In rising terrain, ALWAYS recover early. Attempt to predict if rising terrain will be a factor prior to executing the maneuver and avoid it if possible.
   e. For descending terrain, transition to a step down recovery paralleling the terrain slope. This is useful on the reverse slope of ridgelines.
   f. These rules are based on true airspeed. At sea level altitudes, there is very little difference between KTAS and KIAS / KCAS. However, at higher MSL altitudes, there can be a significant difference between the two airspeeds.
   g. If you are on the fast end of the airspeed range, increase “G” buildup rate or Lead recovery altitudes to reduce reaction time.
Common Errors:

1. Not knowing Dive Recovery Rules “COLD.”
2. Accelerating past 550 KTAS on recovery.
3. Being slower than 400 KTAS on recovery.
4. Not pulling enough “G” on recovery.

Corrections for Errors:

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: 50% Rule (Transition to Low Altitude)

Purpose: The 50% rule applies to high-to-low vertical transitions. The 50% rule will allow you to accomplish a turning roll-in of up to 90° of heading change and establish a safe descent FPA based on your pre-roll-in altitude.

Description of Procedures:

1. The maximum safe FPA for a 90 degree or less turning roll-in is 50% of the pre-roll-in altitude (AGL) in hundreds of feet, based on 5000 ft or less AGL altitude. For example, from 4000 ft you could execute up to a 90° turning roll-in, setting a 20° dive, then intercept dive recovery rules. Because the maximum dive angle for the dive recovery rules is 25°, the 50% rule only applies to roll-in altitudes of 5000 ft or less. If starting above 5000 ft, use 25° as your dive angle.

2. Typically pilots will start this maneuver from 4000 to 5000 ft AGL at 300 KIAS. This will require the throttle to be kept full until approaching the briefed LAT airspeed. At this point reset the throttle to maintain that airspeed.
   a. Perform an unloaded roll in order to set the proper plane-of-motion. This will be approximately 135 degrees of roll.
   b. Increase backstick pressure (increase “G”) in order to reach the desired negative FPA.
   c. Once the desired negative FPA has been reached perform an unloaded roll and hold wings level in the descent until intercepting the dive recovery rules.
   d. Utilize the Step Down technique in order to safely arrive in the low altitude environment.

3. Hints / Comments:
   a. Due to different roll-in techniques, this rule is not as precise as the dive recovery rules, but it does prevent gross misinterpretation of safe dive angles based on false perceptions of altitude.
   b. Know the dive recovery rules and maneuver the aircraft to a known FPA / dive recovery altitude combination for a wings level pull.
   c. If heading adjustments are required, conduct a level turn once you have arrived in the low altitude environment.
   d. Be prepared to reduce power as necessary to control airspeed-especially in 20° / 25° dive angles.
   e. The radar altimeter is the only acceptable altitude (AGL) reference.
   f. Note the steepness of the terrain that you are turning / descending into.

4 Instructional Communication:
a. LATI: “USING THE 50 PERCENT RULE TO THE LEFT, YOU ARE CLEARED TO COMFORT LEVEL, NO LOWER THAN 300 FEET.
b. PUI: “50 PERCENT RULE TO THE LEFT FROM 4,000 FEET, SETTING 20 FOR 12, READY.
c. LATI: “EXECUTE.”

Common Errors:

1. Steeper than desired FPA caused by improper application of 50% rule.
2. Not scanning terrain prior to or during maneuver.
2. Shallowing FPA prior to recovery altitude.
3. Not achieving proper “G” at recovery altitude.
5. Improper step down recovery procedure.
6. Roll-ins > than 90°.

Correction for Errors:

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Small Descent Rule-of-Thumb

Purpose: The small descent rule-of-thumb is used for descents of 500 AGL or less.

Description of Procedures:

1. The small descent rule-of-thumb states to make small descents or 500 AGL or less, use a negative flight path angle equal to the desired altitude loss in hundreds of feet.
2. For example, if you want to lose 300 AGL, use a negative 3°FPA and monitor the radar altimeter and visual cues for recovery. For a 200 AGL descent, use a negative 2° FPA. This simple rule-of-thumb works well up to the 5° descent, at which point the dive recovery rules take over.

Common Errors:

1. Using greater dive angle than the small descent rule-of-thumb allows.

Correction for Errors:

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name:  Level Turns

Purpose:  To discuss the procedures and techniques for executing level turns at low altitude.

Description of Procedures:

1. Visually clear the terrain and AMPCD map prior to starting the turn. Assess slope and determine if VV / nose position will have to be adjusted for rising terrain. Note the current heading and do the math to determine the roll-out heading. Take a moment to think through the mechanics of the maneuver (in particular ensure that you are turning in the correct direction).

2. Add full power, roll unloaded into the turn, and apply “G” passing through 30-45° AOB, depending on roll rate. Attain the desired “G” (10 units or 4 G's) while adjusting bank angle to hold level flight. Once established, adjust power to maintain airspeed.

3. The VV provides a rapid cue to detect a nose slice. If a nose slice is detected, it must be corrected immediately. It is corrected by first decreasing bank angle, and second, by increasing the “G.” If you try to correct the situation by just applying more “G”, you will accelerate your descent towards the ground.

4. Since TTIs are extremely small during low altitude turns (1-3 seconds), a rapid scan is required. The proper scan should move from HUD out to the canopy bow and back. In this way, aircraft position in relation to the horizon and upcoming terrain are scanned in the turn. (Provides 8 seconds of obstacle clearance in a turn).

5. Hints / comments:
   a. The VV is the most consistent cue to flight path angle (FPA) positions and rate of change. This should be the primary reference during the level turn. For rising terrain the velocity vector will have to be maintained above the horizon to remain at the same AGL altitude.
   b. The RADALT, depending on AOB during the turn, may not be useful. The VV may be the best source for determining climbs and descents.
   c. If you descend, reduce bank while maintaining current “G” and climb back to the original altitude. If climbing, adjust your G / AOB combination to stop the climb and return to a level flight path. Do not try to correct back down to the original altitude during a turn, wait until after you roll out.
   d. Do not attempt to perform mission tasks while in a level turn. There is no time available for mission crosscheck other than the 1 second scans of the airspace and terrain from the velocity vector to the canopy bow. If mission tasks require attention during a turn, you have two alternatives; rollout and complete tasks (preferred) or decrease bank / increase “G” and enter a climbing turn (this increases MCT to 2 seconds max). Turning and looking is extremely dangerous.
   e. When dealing with clearing vertical terrain, if a piece of terrain is moving back on the canopy, you will clear to the outside of that terrain. If the terrain is moving
forward on the canopy, you will clear it to the inside. If the terrain is not moving on the canopy bow, roll-out, and you will pass behind the terrain. If doubt exists, reduce AOB, increase G, and climb over the terrain.

6. Instructional Communication;
   a. LATI: “MARS 31, RIGHT 90.”
   b. PUI: “TWO”

Common Errors:

1. Not clearing turn / checking terrain.
2. Improper G / AOB combinations causing climbs or descents.
3. Not noticing and correcting nose slice immediately.
4. Looking while turning or exceeding 1 second MCT.
5. Loaded rolls into and out of turns.
6. Making a descending correction in a turn.

Correction for Errors:

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: 10° Rule

Purpose: The 10° rule allows for the safe execution of low-high-low maneuvers.

Description of Procedures:

1. The 10° rule is used in order to execute low-high-low maneuvers such as pop-ups and vertical jinks. Start your roll-out at or before a dive angle equal to your highest observed climb angle minus 10°, and start your pull-out at or before a time equal to the time you spent in the climb.
   a. The safety of the geometry allows for approximately a 50 knot faster average descent speed.
   b. This maneuver is valid for climb angles of 10 to 30 degrees.
   c. Due to the altitude lost during the dive, the inverted pull down “G” and rate must be equal to or greater than the pull up “G.”

2. Example:
   a. To perform a 20° vertical jink, set a +20° FPA, apply the appropriate delay, roll inverted, pull to negative 10° FPA (20° minus 10°), and begin your roll-out. The inverted pull down must be equal to or greater than the pull up. Due to the altitude lost during the dive, your pull-down maneuver must be at a greater rate (“G”) than your pull-up. During your roll to wings level your nose will fall an additional 2-3° depending on pilot technique. DO NOT allow your nose to fall more than 5° below your pre-computed (10° rule) dive angle.
   b. The safety of this maneuver is ensured because your descent is at least 5° less than your initial climb. More altitude is gained in the climb than is lost in the descent. You will recover at an altitude slightly greater than the altitude at which you started. The extra 2-3° of nose down attitude generated during your roll back to wings level is acceptable. Base your dive recovery on the next steepest dive angle, in this case 15°. Though you will recover on the next dive angle, do not bunt the nose to achieve it, simply fly the dive angle that resulted from your roll-out. In fact this extra dive angle should help you recover to “comfort level” faster. Most importantly is that the 10° rule prevents you from “burying your nose” when pulling down to a target.

Common Errors:

1. The inverted pull down is slower than the initial pull.
2. Airspeed in the dive exceeding dive recovery rule assumptions.
3. Pull down “G” less than pull up “G.”
4. Improper application of 10° rule.
Correction for Errors:

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Ridgeline Crossing

Purpose: To safely and expeditiously cross ridgelines while minimizing exposure to threats.

Description of Procedures:

1. There are three methods for negotiating ridgelines; utilizing natural breaks, the straight-ahead approach and the 45° angle off / parallel method described below:
2. Natural Breaks. The best way to negotiate a ridge is to perform a good map study during your preflight planning, find natural breaks, and fly through the gaps and passes. However, gaps and passes are often lines of communication (LOC) and may be saturated with the enemy defenses or visual observers (VIS OBS).
3. Straight Ahead. The simplest method is to approach the ridge straight-ahead, climb to clear it, and descend down the back slope. This task presents one of the biggest challenges for your low altitude maneuvering skills. You must determine when to pull up, avoid highlighting yourself over the top and decide when to recover on the backside. Additionally, these demands require perceptual judgments in the areas where your visual perception is the weakest (distance estimation).
   a. The first step is to determine when to start your climb. As a general rule, you can wait until the top of the ridgeline is about 3 - 5° above the horizon bars on your HUD. Now pull to place the VV 3° above the ridgeline. If you accomplish this at one mile from the ridgeline and hold that vector, you'll pass the top at 300 AGL.
   b. As the terrain begins to pass under the horizon bars, begin a gentle push in order to prevent excessive climb, and thus excessive exposure time once you have unmasked above the terrain.
   c. To descend, there are three options:
      i. A wings level bunt is the easiest, safest, and in many tactical cases, the best. It allows you to assess the backside for hidden ridgelines prior to committing your nose below the horizon. The bunt should be started as the top of the ridgeline falls to the bottom of the HUD. Use the radar altimeter for dive recovery and quickly pick up your dive recovery rules.
      ii. An over bank of 90 - 120° angle of bank is second option. It is a combination of an intentional over bank and nose slice to achieve a rollout dive angle for recovery.
      iii. An inverted pull is the last and most aggressive maneuver. It involves either an inverted turning pull or a pure inverted pull. Accomplish the inverted pull or inverted turning pull, stopping at negative 10°, and begin a standard dive recovery. When utilizing this method, be prepared to stop the pull quickly, rollout and recover. An extremely aggressive scan is required for safe employment of this maneuver.
4. **45° angle off approach / parallel.** In cases where your navigation will allow deviation or a threat in the rear quarter requires the maintenance of both terrain masking and minimum altitude, this approach is optimum.  
   a. As you approach the base of the ridgeline, a turn is accomplished to place your aircraft approximately 45° off axis in respect to the ridgeline. The aircraft is then flown up the side of the ridgeline utilizing the same pull up and recovery procedures described in the straight and level method.  
   b. This maneuver is comprised of a shallow climb, a level turn across the terrain, an over banking turn, a pull to the original direction, and finally a roll out and recovery down the backside.  
   c. If done properly, this method will provide the most indirect masking on the near side of the terrain, while at the same time providing the shortest exposure time across the top of the terrain.  

**Common Errors:**  
1. Pulling up late and trying to maintain low altitude up the face of the terrain. Results in “ballooning” over the top.  
2. Not crossing the top of the terrain in level flight. Starting the bunt or pull down late.  

**Correction for Errors:**  
1. It is critical to cross the terrain in a level flight path. This will minimize exposure to the threat. Proper mission planning will allow you to avoid crossing high peaks.  
2. It is better to start the pull up early than late. You will have direct masking from threats on the far side of the terrain and indirect masking from threats behind the aircraft.  

**Source Documents:** LAT Stage Briefs I – IV, Air NTTP
Name: Comfort Level (CL)

Purpose: Comfort level is defined as the lowest altitude at which the aircrew can accommodate task loading and maintain safe terrain clearance

Description of Procedures:

1. At comfort level a pilot can perform all required functions (lookout, navigation called / uncalled turns, and defensive turns) without feeling threatened by something he chooses to ignore: namely, the ground. CL is never a hard altitude. It will vary according to terrain, aircrew skill, degree of training, currency, and mission tasking in the low altitude environment.
2. Altitudes achieved are not criteria for success or failure. A pilot is never asked to perform at an altitude that he might feel incapable of achieving. He flies where he is comfortable whether that is 1000 AGL or 300 AGL.

Common Errors:

1. As a single seat pilot you must learn to recognize your comfort level. Some cues to operating below CL are:
   a. Missed communication.
   b. Continuously finishing maneuvers higher than start.
   c. Not completing cockpit tasks.

Correction for Errors:

1. N/A

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Climb-To-Cope

Purpose: Climb-to-cope (COC) is a climbing maneuver executed when situational awareness (SA) or mission performance is degraded.

Description of Procedures:

1. The CTC may be executed as an adjustment to CL or as a response to a “KNOCK IT OFF” call.
2. All aircraft shall roll wings level (decrease angle of bank and increase “G”) and perform a 4G climb above the CL to a predetermined altitude (usually 3000 - 4000 AGL).
3. Climb to cope altitudes should be a set MSL altitude that equates to 3000 - 4000 AGL. The altitude should be set above the highest terrain feature or obstruction in the training area (minimum safe altitude). This will keep you honest if you inadvertently go IMC or are working in mountainous terrain where the RADALT altitude varies considerably. You’ll have to caveat this with your training area limitations and not spill out of the top of the block.
4. The low altitude checklist will be verified complete prior to any return to the low altitude environment following a KIO.

Common Errors:

1. Confusing “KNOCK IT OFF” with “TERMINATE.”

Correction for Errors:

1. N/A

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Terminate

Purpose: To cease aircraft maneuvering while remaining in the low altitude environment.

Description of Procedures:

1. “Terminate” is used for procedural errors, where safety of flight is not a factor. The response to a “TERMINATE” call will be an immediate roll to wings level, a level off at present altitude, and verbal acknowledgement.

Common Errors:

1. Confusing “KNOCK IT OFF” with “TERMINATE.”

Correction for Errors:

1. N/A

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Knock It Off

Purpose: To halt training for all aircraft.

Description of Procedures:

1. When a dangerous loss of SA is recognized or a potentially hazardous circumstance develops, any flight member shall call for a KIO without delay. The response to a KIO is an immediate maneuver to wings level and a controlled climb to the briefed CTC altitude.
2. A verbal acknowledgement is required from all aircraft after the aircraft vector is away from the ground.
   a. LATI: “MARS 31, KNOCK IT OFF.”
   b. PUI: “MARS 32, KNOCK IT OFF.”
3. Training is stopped until the cause for the KIO has been adequately addressed and all aircrew concur on a course of action.

Common Errors:

1. Confusing “KNOCK IT OFF” with “TERMINATE.”

Correction for Errors:

1. N/A

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: LAT Rules of Conduct (ROC)

Purpose: To describe the LAT ROC.

Description of Procedures:

1. Refer to Tactical Manual Pocket Guide.

Common Errors:

1. N/A

Correction for Errors:

1. N/A

Name: Break Turns

Purpose: A last ditch maneuver to a threat. To practice the procedures for conducting aggressive horizontal defensive turns at low altitude.

Description of Procedures:

1. A break turn is an energy depleting turn at full power. This type of turn is generally used defensively or in preparation for follow-on defensive maneuvers where turn rate is the most important considerations at the expense of energy.
   a. LATI calls for a break turn in reaction to a simulated threat.
   b. Add full power.
   c. Set proper AOB and pull max “G” combination to maintain level or slightly climbing flight path (1 - 2 degrees). Do not allow nose to slice!
   d. Expend chaff and flares.
   e. Roll out after 60-90° of heading change.

Common Errors:

1. Improper “G” / AOB combination.
2. Improper control of FPA / nose low altitude.
3. Turning and looking.
4. Not recognizing factors that lead to a departure.
   a. Loaded rolls
   b. Wing rock
   c. Yaw

Correction for Errors:

1. For turns in excess of 4 G’s, a slight positive FPA (target 2°) is desired. The resultant altitude gain will be insignificant when compared to the added safety buffer.
2. If a level turn is required, do not attempt to turn and simultaneously look for the threat. All attention shall be given to flying a level turn and creating the necessary angles to negate / defeat the threat.
3. If the tactical situation requires you to observe a threat during the turn, set a positive FPA (2° minimum) and use 1-2 sec. looks followed by a reconfirmation of positive FPA.
4. Airspeed will degrade rapidly during this turn. Follow on maneuvers will be affected until maneuver airspeed is attained.
5. Do not roll and pull. Set angle of bank first and then set “G.”

Source Documents: LAT Stage Briefs I – IV, Air NTTP
**Name:** Minimum Altitude Capable (MAC)

**Purpose:** A defensive maneuver utilizing a high-speed and minimum altitude. MAC is currently performed only in the simulator.

**Description of Procedures:**

1. MAC is a single aircraft maneuver that will be chased by a LAT (I). Reset your RADALT using the 10% rule. With the LAT (I)’s approval, start a wings level descent using 1-2° FPA to the minimum attainable altitude (NLT 100 AGL). The maximum time at MAC should be 20-30 secs. When “RESUME” is called, begin a wings level climb back to comfort level (NLT 300 AGL). Use the same techniques for straight and level flight as were described in the Basic Maneuvers lecture. Remember there is no crosscheck time available at this altitude. All attention is given to TCT. Cross check the VV, VSI and RADALT for altitude control. Watch for subtle sloping terrain.

**Common Errors:**

1. Speed control.
2. Scanning too close to aircraft.

**Correction for Errors:**

1. Scan your instruments. Utilizing the “spoke scan” technique will greatly aid in your ability to detect deviations and make timely corrections.

**Source Documents:** LAT Stage Briefs I – IV, Air NTTP
Name: Errors Associated with Advanced Maneuvering

Purpose: To describe the three types of errors associated with vertical maneuvers.

Description of Procedures:

1. Dangerous errors. These are catastrophic errors associated with vertical maneuvering that will be graded “dangerous”:
   a. Pulling to a rollout flight path angle steeper than your highest observed climb angle minus 10°.
   b. Due to the altitude lost during the dive, your pull-down maneuver must be at a greater rate (“G”) than your pull-up. This is the most common error and potentially the most costly.

2. Performance errors. These errors in no way compromise safety, in fact, they increase the safety margin at the price of negatively impacting mission performance. Simply put, they limit your ability to use the full, safe maneuvering envelope of the aircraft.
   a. Pulling to a rollout flight path angle shallower than your highest climb angle minus 10°.
   b. Performing loaded rolls. This error will decrease the effectiveness of the maneuver by decreasing the amount of displacement the aircraft achieves.

3. Maneuver errors. In these cases, the maneuver was done properly, but it wasn’t the correct maneuver. These errors can occur in five ways:
   a. Pulling to an incorrect climb angle.
   b. Holding an incorrect climb delay.
   c. Rolling the wrong direction.
   d. Turning the wrong direction for the oblique jinks.
   e. Angle of bank too great / shallow.

Common Errors:

1. N/A

Correction for Errors:

1. N/A

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Vertical Jink

Purpose: The vertical jink is used to practice and demonstrate proficiency in controlling vertical maneuvering. The vertical jink is as a building block for the oblique jinks, threat reaction, and has many tactical applications.

Description of Procedures:

1. Clear the AMPCD map. Clear the terrain along the intended flight path and ensure on start parameters.
2. Throttle full power, then pull to and capture the planned or directed climb angle.
3. Hold the climb delay (if delay is desired / required). Note climb angle.
4. Roll inverted using an unloaded roll.
5. Pull through level flight to the flight path angle equal to your highest observed climb angle minus 10° (“10° rule”).
6. Roll upright using an unloaded roll. Do not allow the negative FPA to increase more than 5° during this roll. Adjust throttle to maintain airspeed.
7. Recovery using the dive recovery rules.

Instructional communication:

LATI: “MARS 32, 20 DEGREE VERTICAL JINK, 2 SECOND DELAY.”
PUI: “MARS 32, 20 DEGREE VERTICAL JINK, 2 SECOND DELAY; 20 UP, 10 DOWN, 15 FOR 8, READY.”
LATI: “EXECUTE.”

Common Errors:

1. Rapid pulls can make the HUD pitch lines difficult to read. Slow down the pull and read them or count the number above and below the zero pitch line.
2. The aircraft must be displaced for the maneuver to be effective.
3. Excessive “G” on pull up.
4. Oblique pulls.
5. Excessive airspeed on recovery.

Correction for Errors:

1. Reference the HUD for vertical pulls.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Straight Oblique Jinks (SOJ)

Purpose: To practice and demonstrate proficiency in controlling vertical maneuvering using the 10-degree rule. This jink provides a building block approach to threat reaction maneuvers and weapon deliveries.

Description of Procedures:

1. Clear the AMPCD map. Clear the terrain along the intended flight path and ensure on start parameters.
2. Throttle full power, pull to and capture the planned or directed climb angle.
3. Hold the climb delay (if delay is desired / required). Note climb angle.
4. Roll 135° right or left (as directed) using an unloaded roll.
5. Pull through level flight to the flight path angle equal to your highest observed climb angle minus 10° (“10° Rule”).
6. Roll upright using an unloaded roll. Do not allow the negative FPA to increase more than 5° during this roll.
7. Recover using the dive recovery rules.

Instructional Communication:
  LATI: “MARS 32, 20 DEGREE SOJ RIGHT, 2 SECOND DELAY.”
  PUI: “MARS 32, 20 DEGREE SOJ RIGHT, 2 SECOND DELAY; 20 UP, 10 DOWN, 15 FOR 8, READY.”
  LATI: “EXECUTE.”

Common Errors:

1. Rapid pulls can make the HUD pitch lines difficult to read. Slow down the pull and read them or count the number above and below the zero pitch line.
2. The aircraft must be displaced for the maneuver to be effective.
3. Excessive “G” on pull up.
4. Incorrect angle of bank on pulls.
5. Excessive airspeed on recovery.

Correction for Errors:

1. Crosscheck the HUD and horizon for proper angle of bank.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Turning Oblique Jink (TOJ)

Purpose: To practice and demonstrate proficiency in controlling vertical maneuvering using the 10-degree rule. This jink provides a building block approach to threat reaction maneuvers.

Description of Procedures:

1. Clear the AMPCD map. Clear the terrain along the intended flight path and ensure on start parameter.
2. Throttle full power, unload and roll 45° in the desired direction (left or right).
3. While maintaining 45° AOB, pull to and capture the planned or directed climb angle.
4. Hold the climb delay (if delay is desired / required). Note climb angle.
5. Roll to 135° AOB in the same direction using an unloaded roll.
6. Pull through level flight to the flight path angle equal to your highest observed climb angle minus 10° (“10° rule”). Adjust throttle to maintain airspeed.
7. Roll upright using an unloaded roll. Do not allow the negative FPA to increase more than 5° during this roll.
8. Recovery using the dive recovery rules.

Instructional Communication:

    LATI: “MARS 32, 20 DEGREE TOJ RIGHT, 2 SECOND DELAY.”
    PUI: “MARS 32, 20 DEGREE TOJ RIGHT, 2 SECOND DELAY; 20 UP, 10 DOWN, 15 FOR 8, READY.”
    LATI: “EXECUTE.”

Common Errors:

1. Rapid pulls can make the HUD pitch lines difficult to read. Slow down the pull and read them or count the number above and below the zero pitch line.
2. The aircraft must be displaced for the maneuver to be effective.
3. Excessive “G” on pull up.
4. Incorrect angle of bank on pulls.
5. Excessive airspeed on recovery.

Correction for Errors:

1. Crosscheck the HUD and horizon for proper angle of bank.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Reverse Oblique Jink (ROJ)

Purpose: The reverse oblique Jink is used to practice and demonstrate proficiency in controlling vertical maneuvering. The reverse oblique Jink serves as a building block for the threat reaction maneuvers and has many tactical applications.

Description of Procedures:

1. Clear the AMPCD map. Clear the terrain along the intended flight path and on start parameters.
2. Throttle full power, unload and roll 45° in the desired / direction (left or right).
3. While maintaining 45° AOB, pull to and capture the planned or directed climb angle.
4. Hold the climb delay (if delay is desired / required). Note climb angle.
5. Roll to 135° AOB in the opposite direction using an unloaded roll. This roll may be “underneath” or “over the top” as directed by the LAT (I).
6. Pull through level flight to the flight path angle equal to your highest observed climb angle minus 10° (“10° rule”).
7. Roll upright using an unloaded roll. Do not allow the negative FPA to increase more than 5° during this roll.
8. Recovery using the dive recovery rules.

Instructional Communication:

LATI: “MARS 32, 20 DEGREE ROJ RIGHT, 2 SECOND DELAY.”
PUI: “MARS 32, 20 DEGREE ROJ RIGHT, 2 SECOND DELAY,
UNDERNEATH; 20 UP, 10 DOWN, 15 FOR 8, READY.”
LATI: “EXECUTE.”

Common Errors:

1. Rapid pulls can make the HUD pitch lines difficult to read. Slow down the pull and read them or count the number above and below the zero pitch line.
2. The aircraft must be displaced for the maneuver to be effective.
3. Excessive “G” on pull up.
4. Incorrect angle of bank on pulls.
5. Excessive airspeed on recovery.

Correction for Errors:

1. Crosscheck the HUD and horizon for proper angle of bank.

Source Documents: LAT Stage Briefs I – IV, Air NTTP
Name: Guns Jink

Purpose: A pre-emptive or reactive maneuver to counter aimed AAA.

Description of Procedures:
1. Threat Countertactics Lecture, Air NTTP

Common Errors:
1. Not knowing procedures.
2. Not executing IAW brief or reference

Corrections for Errors:
1. N/A

Source Documents: Threat Countertactics Lecture, Air NTTP
Name: SAM WEAVE

Purpose: Reactive counter maneuver to SAM threat.

Description of Procedures:

1. Threat Countertactics Lecture, Air NTTP.

Common Errors:

1. Not knowing procedures.
2. Not executing IAW brief or reference.

Corrections for Errors:

1. N/A

Source Documents: Threat Countertactics Lecture, Air NTTP
Name: Level S

Purpose: Pre-emptive or Reactive Counter SAM threat.

Description of Procedures:

1. Threat Countertactics Lecture, Air NTTP.

Common Errors:

1. Not knowing procedures.
2. Not executing IAW brief or reference

Corrections for Errors:

1. N/A

Source Documents: Threat Countertactics Lecture, Air NTTP
Mechanics Stage

Name: Air-to-Surface Timeline

Purpose: To develop a schedule of events/cockpit tasks to acquire, designate, and attack a tactical target.

Description of Procedures:

1. The intent of the air-to-surface timeline is to break down the attack into a schedule of tasks that maximizes system and sensor capabilities based on the planning constraints. Information that is required to begin planning will include positional constraints (such as assigned airspace on the ATO or known threat locations), target characteristics (type, size, recent activity, etc), and environmental constraints (weather, winds, sun / moon angle). Building an air-to-surface timeline includes the following steps:

   a. Determine sensor / weapon performance
   b. Develop a schedule of events / cockpit tasks
   c. Plan and plot a route
   d. Identify key points

2. The first step is to determine sensor and weapon performance. There are many tools available to accomplish this. TAWS data and the sensor footprint planning spreadsheet are two examples and are discussed later in the chapter. Other tools include WARP, PMPT and JMEMS. With this information, you can begin to develop the schedule of events and cockpit tasks necessary to complete the attack. These tasks will depend on the type of attack being conducted (level entry, ramp down, pop up, etc), and the type of ordnance to be employed (GP bombs will require different tasks than a LGB supported by a Litening Pod. Once all required tasks have been identified, a route can be planned and an overlay can be constructed. Utilize the information from the planning restraints and the information gained from the attack analysis and sensor / weapon performance data to create the overlay. The overlay should include aircraft maneuvers, sensor / HOTAS functions and required communication calls. The last step is to identify key points in the attack. The attack will begin at the decision point (DP) which is the point at which the focus is entirely on the air-to-surface attack. The location of the DP will be dependent on the length of time necessary to accomplish all required tasks for the attack. The initial point (IP) will be at a location where MWSS checks are complete and the attack commences. If possible, the IP should be placed over a prominent terrain feature to build situational awareness. The completed overlay can be used during mission preparation and briefing to review the attack.
**Common Errors:**

1. Failure to conduct a proper mission analysis of: positional constraints, target, environment, sensors / weapons.
2. Failure to utilize planning tools available for building a thorough timeline.
3. Failure to include the appropriate information on the air-to-surface timeline.

**Corrections for Errors:**

1. A significant amount of time in the planning process needs to be devoted to mission analysis. The planning process should include detailed analysis of the target characteristics, weather conditions, operational constraints, sensor / weapon capabilities, etc. A proper mission analysis will generate requirements that can be satisfied in the planning process.

2. Before the air-to-surface timeline can be constructed, a thorough analysis must be conducted of the target area and weapon / sensor performance. Utilize all available planning tools and documents to build the timeline based on the information gained. Ensure that all maneuvers, pilot actions and communications are clearly depicted on the overlay.

**Source Documents:** Air NTTP
Name: Level Entry to High Angle Deliveries

Purpose: To effectively position the aircraft at an acceptable start for a high angle delivery.

Description of Procedures:

Review the reference lesson. The level entry to high angle delivery is the basis for standard section target area attacks. It builds upon the fundamentals learned in the air-to-surface stage of training. The level entry to a dive profile is designed to ingress to a target from an initial point (IP) at tactical airspeeds and then transition to a dive delivery to prosecute a target. The idea behind the level entry to a dive profile is to place the aircraft in a position on the attack cone that is familiar to the raked-range profiles. Once in this familiar position, you can then rely on the skills learned in the raked-range sorties to effectively put bombs on target.

Planning:

The planning for a level entry to a high angle delivery is simple and straightforward. For the simulator use the following SPINS:

a. East Coast
   i. Target: 500' Bull at BT-11
   ii. Ingress: 420 KTAS
   iii. Altitude: Apex altitude for the 45° and tactical 30 degree attacks

b. West Coast
   i. Target: Cactus West
   ii. Ingress: 420 KTAS
   iii. Altitude: Apex altitude for the 45° and tactical 30 degree attacks

c. Weapons
   i. MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   ii. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponizing matrix as the worst case scenario.
   iii. GBU-12 LGB / FMU-139

d. Reactive weaponizing per Air NTTP for Hard / Med / Soft, unitary and area targets.

For flights in the aircraft the target will depend upon the range. The IP should be a minimum of 8 NM from the target and if able should be a recognizable geographical feature. Sometimes due to range restrictions, this is not reasonable. The planned attack will be either the tactical 30 deg, or if weather is a factor, the weather 30 deg pattern. The 45 deg pattern will not be used for the actual aircraft sortie due to increased risk of high speed departure from asymmetry. Use WARP to create a Z diagram with the ingress altitudes and airspeeds as part of the diagram.
Execution:

The attack itself is very straightforward. Prior to arrival at the IP, complete your MWSS checks. The target should be designated with the course line drawn from the target to the IP. At the IP you will be at Z altitude and 420 KTAS with the target off the nose. Take note of the inbound heading. At 6 NM from the target, you will offset either left or right, depending on the desired roll-in heading, 15 deg from the inbound heading. At this point the target should be visible just to the right / left of the aircraft’s nose. If it is not, then there is not enough offset. Increase the offset until the target is in sight. Now the aircraft is in position to intercept the attack cone at a 45 deg squint angle. At this point you should be scanning altitude, airspeed, and distance from the target. It should be fairly easy to maintain altitude, but poor airspeed control is a common error (usually too fast). The other common error is now the distance to the attack cone is ticking down much more rapidly than in the raked range pattern, and it is easy to underestimate how the attack cone is approaching. While you are driving in to the attack cone, conduct an INS stare at the target with the TV. Remember that you cannot slew the designation unless it is in the HUD, but you can begin to evaluate if the designation is close to the target. Wait until in the dive to try and get a contrast lock with the ARBS in order to minimize the chances the ARBS locks up on something away from the target. With the target in sight and at approximately the ACD + 0.2, begin your roll-in. Remember that your ingress airspeed may be faster than your normal raked-range airspeed for a given dive angle (especially for the 45 deg delivery). Therefore, it will probably require pulling the power back earlier in the dive than what you are used to doing in the raked range pattern. In the case of the 45 deg delivery, it may require pulling the power off prior to even rolling in. Once at the roll-in, you are now in the familiar dive delivery profile learned in the raked-range phase of training. The dive delivery is performed exactly the same as the raked-range phase. Common errors here are getting behind the jet, rolling-in fast or late, forgetting to use the ARBS, not setting the TPA, and/or ignoring tactical abort parameters. Remember, the whole point to flying to the target is to actually put bombs on it. If you spend hours meticulously planning the flight, fight your way to the target, roll-in on time, and then miss the target, it is all for not. The off target maneuver is performed exactly the same as the raked range pattern.

Products:

Z diagram for tactical 30 deg (or weather 30 deg) and 45 deg delivery. Create an overlay that depicts the IP, target, attack cone, and flight profile. The overlay should look like Figure, Medium-Altitude Same Side Attack, of the Air NTTP, without the dash 2 aircraft.
UNCLASSIFIED

Medium Altitude Same Side Attack
Common Errors:

1. Failure to complete actions at the IP.
2. Late initiation of the air-to-surface timeline.
4. Failure to generate adequate angles off the target prior to roll-in resulting in a roll-ahead.
5. Poor start parameters (usually late to roll-in resulting in steep dive angle)
6. Poor basic dive delivery parameters.
7. Poor sensor management.
8. Poor target acquisition.
9. Poor off target maneuver.
10. Failure to pull to the designation diamond when no-joy on the target.

Corrections for Errors:

1. Careful attention must be given to completing actions at checkpoints on the air-to-surface timeline. During raked range sorties, DME to the target is much simpler to manage because the aircraft is arcing around the target. During the transition sorties, ingress is directly at the target causing the DME to decrease much more rapidly. It is very easy to lose track of the DME and roll-in late.
2. Plan and execute a logical sensor timeline / plan per Air NTTP.
3. Scan outside the aircraft. Use canopy code to establish and maintain tally of the target. Do not allow the DME to the target to fall out of the scan while searching for the target. If the target is not in sight at the roll-in point, pull to the designation diamond in the HUD.
4. Conduct a thorough chart / imagery study pre-flight. Look for key features in the target area that will help funnel the search into the target area. Ensure accurate target coordinates are entered. Use available sensors during the ingress to aid in target acquisition.
5. Focus on basic dive delivery techniques from start to weapons delivery.
6. Ensure proper recovery / off target maneuver is performed to rapidly return to vertical sanctuary.

Source Documents: Air NTTP
**Name:** Ramp Entry to Level Delivery or High Angle Delivery

**Purpose:** To efficiently transition from a high altitude ingress to an acceptable start for a medium altitude delivery.

**Description of Procedures:**

1. Review the reference lesson. The ramp entry to level or high angle delivery is a useful profile that maximizes sanctuary altitudes and sensor usage. The idea behind a ramp entry is to stay well above known threats (sanctuary) for as long as possible, then deliberately and methodically, utilizing onboard sensors, descend down to an altitude from which to conduct an attack. The planning and execution of a ramp entry to either a level or dive delivery are the same. The ramp to a level delivery is typically used for PGMs. The ramp to a high angle delivery can be used for PGMs, but is usually used with unguided weapons. At VMAT-203, we will use the ramp to a level entry for LGBs, and the ramp to a dive delivery for MK-82s/MK-76s.

**Planning:**

1. At VMAT-203 we will use the following SPINS for planning for a ramp profile:
   a. Ramp → 30 deg delivery
      i. Ingress: 20K AGL / 450 KTAS, 15º ramp to Z alt for 30º dive / 500 KTAS release. Add an additional 1 NM to the ACD when planning the ramp down. This additional mile will allow for some slop if you are late on your ramp down procedures.
   b. Ramp → 45 deg delivery
      i. Ingress: 28K AGL / 450 KTAS, 15º ramp to Z alt for 45º dive / 500 KTAS release. Add an additional 1 NM to the ACD when planning the ramp down. This additional mile will allow for some slop if you are late on your ramp down procedures.
   c. Ramp → Level
      i. Ingress: 20K AGL / 480 KTAS, 15º ramp to 15K AGL / 480 KTAS release. Add an additional 1 NM to BRP when planning the ramp down. This additional mile will allow for some slop if you are late on your ramp down procedures.
   d. Weapons
      i. MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
         1) Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
      ii. GBU-12 LGB / FMU-139

**Execution:**

1. With the ingress altitude and desired ramp angle determined, you need to determine what distance from the target to begin the ramp down so that you arrive at apex altitude at the attack cone for a dive delivery or ballistic release point (BRP) for a
level delivery. Since you know how much altitude to lose (Ingress Alt – Apex Alt) and the desired ramp angle, you can use the following look-up table and equation to determine the horizontal distance covered (in NM) to lose the altitude:

<table>
<thead>
<tr>
<th>Ramp Angle</th>
<th>Altitude Loss per NM</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°</td>
<td>530 ft</td>
</tr>
<tr>
<td>10°</td>
<td>1100 ft</td>
</tr>
<tr>
<td>15°</td>
<td>1600 ft</td>
</tr>
<tr>
<td>20°</td>
<td>2200 ft</td>
</tr>
</tbody>
</table>

Notes:
1. Distance will be in NM.
2. Add 1 NM to this distance to account for any profile deviations.

The distance from the target to begin the ramp down profile is the combined ramp to attack cone distance plus the attack cone distance (ACD).

Ramp Distance = Ramp to Attack Cone + ACD

One of the main planning considerations for a ramp profile is to initially place the target in the HUD total FOV, which affords the use of HUD symbology to help build target area SA and maximize sensor usage. The lower edge of the HUD FOV is approximately 17 deg below the waterline or 15 deg below the velocity vector in steady flight at tactical airspeeds. During target ingress the line of sight to the target or target depression angle will increase and eventually exceed these HUD FOV limits. As this occur the HUD symbology will become “HUD-limited” and no longer support the actual target location and cease to build target area SA. The target depression angle can be determined using the following formula:

\[
\text{Target Depression Angle}^1 = \arctan \left( \frac{\text{Aircraft Alt} – \text{Target Elev}}{\text{Distance to target} \times 6076} \right)
\]

Notes:
1. Depression Angle in degrees.

For target depression angle at the start of a ramp profile use the ingress altitude for aircraft altitude and ramp distance for distance to target.

If you determine that the target depression angle is less than 30 degrees (15 deg ramp + 15 deg HUD FOV) then you know that you should be able to see the target in the HUD when you begin the ramp profile. Once established in the 15 deg ramp and with the target in the HUD FOV this is the time to maximize sensor usage. Conduct
an INS stare at the target and slew the designation if necessary. While in the dive, it is important to keep your airspeed under control. If you maintain this ramp angle and head directly to the target, the target will once again disappear below the HUD FOV when the target depression angle exceeds 30 deg (15 deg + 15 deg).

Next we will select a checkpoint altitude to terminate sensor usage and transition to the next phase of the attack. A typical or reasonable checkpoint altitude is half way between the ingress altitude and the apex altitude. Leveraging the previous ramp down calculations we know this altitude corresponds with approximately half way between the ramp start point and the attack cone. If a different checkpoint altitude is desired its corresponding distance from the attack cone can be determined using the previous look-up table and equation.

**Checkpoint Distance = Checkpoint to Attack Cone + ACD**

Calculation of the depression angle is the same equation used earlier to determine the initial depression angle, while using the checkpoint altitude and distance for aircraft altitude and distance. With the checkpoint altitude, distance and depression angle known you are well prepared to identify the checkpoint during ramp profile execution and make a smooth transition to the next phase of attack.

If you are conducting a ramp to a dive delivery, the transition will require an appropriate offset angle so the aircraft arrives at the attack cone with the desired angle off the nose to the target. You can use the following equation to calculate the appropriate offset angle:

\[
\text{Offset Angle}^{1,2} = \text{ASIN}\left[\frac{\text{ACD} \times \sin(\text{Angle off the nose})}{\text{Checkpoint distance}}\right]
\]

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Offset Angle in degrees.</td>
</tr>
<tr>
<td>2. Typical angle off the nose is 45 deg.</td>
</tr>
</tbody>
</table>

The target will drift outside of our HUD FOV, but at this point you should be able to pick up the target area visually and possibly begin to break out the target itself. Once you offset you should be quickly approaching your apex altitude and ACD. Keep your altitude, airspeed, and distance to the target in your scan so as to arrive at the roll-in ready for the attack. The dive delivery will be conducted just as you did during the raked-range phase of training. Be sure to use the ARBS, set TPA, and adhere to the tactical abort parameters as these are commonly missed.

2. If you are conducting a ramp to a level delivery, more than likely you will level off at your apex altitude before the target disappears under the nose. However, once you level off, the target will now be below the HUD FOV. This is fine, as you are now
only about 1 NM from the BRP. Attention should now be on an accurate level release of the ordnance.

Products:

1. Z diagrams for 30 deg and 45 deg deliveries
2. Overlay to include:
   a. Initial point
   b. Target
   c. Attack cone
   d. Ramp down point
   e. Offset point (dive delivery)
   f. Ballistic release point (level delivery)

Common Errors:

1. Late initiating ramp down, resulting in a steep and fast profile.
2. Not planning for existing environmental conditions.
3. Failure to complete actions at the IP
5. Lack of checkpoints in ramp down.
6. Poor start parameters (usually late to roll in resulting in steep delivery).
7. Poor basic dive delivery parameters.
8. Weapons delivery with the speed-brake extended.
9. Poor sensor management or no sensor timeline.
10. Fixation in the HUD.
11. Poor target acquisition.
12. Poor off target maneuver.
13. Not knowing where the designation diamond will be in HUD at the start of ramp down and when it will exit the HUD FOV.

Corrections for Errors:

1. Careful attention must be taken to plan for environmental conditions to include PAR for sensors, winds aloft, sun and / or moon angle.
2. Scan airspeed during the profile. Control airspeed by manipulating power and speed brake as required (ensure it is retracted prior to roll-in).
3. Plan for a checkpoint to provide the opportunity to adjust your ramp schedule, adaptive roll-in, or other parameters approaching the attack cone. Ensure adequate attention is given to the appropriate adaptive roll-in based on your parameters.
4. Plan and execute a logical sensor timeline / plan per Air NTTP.
5. Scan outside the aircraft. Use canopy code to establish and maintain a tally and fly to a good start. Know when and where the target will be in your HUD FOV. Know when it will exit your HUD FOV.
6. Conduct a thorough chart / imagery study. Look for key features in the target area and scan around the designation for the target. Ensure accurate target coordinates are entered. Use available sensors during the ramp down to aid in target acquisition.

7. Focus on basic dive delivery techniques from the start to weapons delivery.

8. Ensure a proper recovery / off target maneuver is performed to rapidly return to vertical sanctuary.

Source Documents:
Name: Low Pop-Up to Low Angle Deliveries

Purpose: To transition from a low altitude ingress to the attack cone in a manner that minimizes exposure, while allowing enough time for target acquisition and accurate weapons delivery.

Description of Procedures:

Planning:

1. Review the reference lesson. The SPINS for the low altitude pop-up attacks are as follows:
   a. Ingress altitude:
      i. Simulator: 500’ AGL
      ii. Flight (with IP in T-Bird):
         1) 500’ AGL
         2) 1000’ if BASH is moderate
         3) Comfort level
   b. Ingress airspeed: 450 KGS
   c. Climb angle (pop): 20 deg
   d. Dive delivery: 10 deg / 500 KTAS release
   e. Weapons
      i. MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
      ii. Calculate PUC by using altitude loss in the dive dropping the max stick length as the worst case scenario.
   f. Reactive weaponeering per Air NTTP for Hard / Med / Soft, unitary and area targets.

2. Planning the low altitude pop attacks requires careful study of the target area and surrounding terrain in order to maximize the benefits of terrain masking. The IP should be a distinguishable geographical feature approximately 8-12 NM from the target. If this is not feasible due to range restrictions, then pick an IP 8 NM from the target at the desired run in heading.

3. WARP will calculate your pull-up point (PUP) as well as your pull-down altitude based on your ingress altitude and 10 deg dive delivery profile. Because you cannot instantaneously transition from a climb to a dive, if you wait until your Z diagram apex altitude to start your pull-down you will climb right through it. WARP therefore calculates for you when you should start that pull-down in order to apex at the Z diagram apex altitude. This is known as the pull-down altitude.

Execution:

1. Executing the pop attack starts prior to the IP. Ensure that the LAT and MWSS checks are complete. At the IP you should be at 500’, 450 KGS with the target off the nose. Take note of the ingress heading as you will use it to determine your
offset heading. At this point you should be focused on maintaining altitude and airspeed and keeping the target off the nose. At 6 NM, begin a 15 deg offset as determined by your original ingress heading. The offset should be in the direction you want to attack the target from. The 15 deg offset at 6 NM will put you at the attack cone with approximately a 45 deg squint angle. At your WARP determined PUP, begin a full power, 20 deg climb to the attack cone. As you unmask in the climb, you should be able to acquire the target area and possibly the target. In the climb, maintain a 20 deg climb while scanning your altitude and distance to the target. At your pull-down, altitudes overbank approximately 135 deg in order to place your lift vector just below the target. If you do not have the target in sight, use the target designation in the HUD. Be careful not to overbank too much and pull well below the target. Once you are in the dive, you should have the familiar 10 deg dive delivery sight picture learned in raked-range.

2. Off target you will perform a 20 deg straight-oblique jink with a 2 second delay in the same direction as the roll-in to recover your ingress altitude + 500 ft. Do not descend in the turn. If you need to turn for range or terrain, level off, and then begin the turn.

Products:

1. Z diagram for a low altitude pop attack
2. Overlay to include:
   a. IP
   b. Offset point
   c. Pull-up point
   d. Attack cone
   e. Target

Common Errors:

1. Not flying precise profile – late pull-up for the pop.
2. Ballooning through apex altitude.
3. Flying inside MAP.
4. Poor basic dive delivery parameters.
5. Poor execution of sensor upgrade / cascade game plan.
6. Target fixation.
7. Poor expendable usage.
8. Poor target acquisition.
9. Incorrect off target maneuver.

Corrections for Errors:

1. Fly planned profile and execute sensor timeline. Memorize profile during pre-flight prep. Incorporate key terrain that will mask against known threats and memorize
where key terrain features will be encountered during the various phases of the ingress and attack.

2. Do not fixate on target acquisition during pop-up at the expense of your profile. Tendency is to initiate pull-down late causing aircraft to balloon through apex altitude.

3. Perform chart / imagery study of target. Use key terrain, funneling features, available marks and target designation box in your HUD to aid in target acquisition. Commit target area attacks to memory.

4. Transition back to LAT environment off target, complying with briefed target area contracts.

Source Documents:
Name: Cruise Climb to Medium Angle Delivery

Purpose: To efficiently transition from a low altitude ingress to an acceptable start for a medium altitude delivery while maintaining sufficient energy to counter a threat during the transition.

Description of Procedures:

1. Review the reference lesson. At VMAT-203 cruise climbs will be planned using a 500’ AGL ingress at 450 KGS to a 400 KTAS climb to a 45 degree dive delivery. Plan a 30 degree weather backup pattern.

Common Errors:

1. Planning for too much “slop” in distance to climb, resulting in unnecessarily early unmask / climb point and early arrival at apex altitude.
2. Not planning for existing environmental conditions.
3. Failure to complete actions at the IP.
4. Energy management/airspeed control – too fast or slow.
5. Lack of check points in climb.
6. Poor start parameters (usually late to roll in resulting in steep delivery).
7. Poor BCWD.
8. Poor sensor management or no sensor timeline.
9. Fixation in the HUD.
10. Poor target acquisition.
11. Poor off target maneuver.
12. Poor RALT management.

Corrections for Errors:

1. Plan accurate climb distances based on WARP and aircraft performance charts.
2. Careful attention must be taken to plan for environmental conditions to include PAR for sensors, surface winds and winds aloft, and sun / moon angle. Plan a 30 degree weather backup.
3. Scan airspeed during the climb. Control airspeed by maintaining full power and adjusting nose position.
4. Plan for several checkpoints in the climb to provide the opportunity to adjust climb schedule, adaptive roll-in, or other parameters as required.
5. Approaching the ACD, ensure adequate attention is given to the appropriate adaptive roll-in based on your parameters.
6. Plan and execute a logical sensor timeline.
7. Scan outside the aircraft. Use the canopy code to establish and maintain a tally. Do not sacrifice a good start to acquire the target. If the target is not in sight at the roll-in point, pull to the designation.
8. Conduct a thorough chart / imagery study pre-flight. Look for key features in the target area and scan around the designation for the target. Ensure accurate target coordinates are entered.

9. Focus on basic dive delivery techniques from the start to weapons delivery.

10. Ensure proper recovery / off target maneuver is performed to rapidly return to vertical sanctuary.

11. Prior to unmask RALT will be used for terrain avoidance. After unmask reset RALT if required / as briefed.

Source Documents:
Name: Loft Delivery

Purpose: To effectively transition from a low altitude ingress to a lofted release followed by an expeditious return to the LAT environment.

Description of Procedures:

1. Review the reference lessons, Air NTTP, and NATIP. Loft deliveries at VMAT-203 will be planned using a 500’, 450 KGS ingress to a 38 degree loft delivery.

Planning:

1. Planning for a loft delivery is fairly straight-forward. Pick an IP that allows for the most advantageous use of terrain for masking. The IP should be at a minimum of 8 NM from the target. The profile is a straight line to the target from the IP. With your ingress altitude, airspeed, and delivery angle know you can calculate what distance you will expect to pull up using Table 8-154 in the NATIP. There are only tables for 200’, 5000’ and 10,000’ AGL ingresses, so use the 200’ table as it will be close enough. The table has data for 0’, 5000’, and 10,000’ MSL target elevations. You can interpolate if you like, but the differences in the results are minimal, and given that there is a 12% error built into the table, it is hardly worth the effort; therefore, pick the elevation that is closest to the actual target elevation. On your overlays include when you expect to begin your pull-up and when you expect to release.

Execution:

1. Flying the profile is very straight-forward. First complete your MWSS checks prior to the IP. As part of the MWSS checks, be sure that you are in the LOFT mode. To do this, select a weapon, then select AUTO as the delivery mode. Go back to the stores page and there should be a LOFT option, colonize it. You should see “LOFT” in the HUD on the right hand side. The system is now set up for a loft delivery. Now all you have to do is point at the target, fly your ingress profile, and wait for the jet to give you the loft delivery symbology. In the loft delivery mode, the PUC is now a 4G programmer. When the PUC begins its climb and it touches the VV, smoothly but quickly pull back on the stick to match the rate of climb of the PUC. It is common to get either ahead or behind of the PUC and it is difficult to smoothly get back on schedule. If you find yourself ahead or behind the PUC, make small, smooth adjustments with back stick pressure to try and get back on the profile. The smoother you are in the climb, the more accurate the hits will be. If you are not on the profile, the jet will still calculate what the release point should be based on the current profile, but the release angle may not be what you had planned.

2. Ensure that when you are flying the loft profile that you have LOFT in the right side of the HUD. If LOFT is not in the HUD, then you are in AUTO mode. This is a problem because the symbology for AUTO is the same as for LOFT and unless you
recognize it early, you will fly right past your PUP as the PUC never comes up. Also, a 45 deg angle of bank or greater will kick you out of LOFT and into AUTO. Therefore, it is a good idea to do your MWSS checks with the target off the nose so that you don’t have to turn much to begin the attack. Otherwise, you may inadvertently kick yourself out of LOFT and not realize it.

3. Off target is a rolling pull to egress the target area and get back down to your ingress altitude.

Products:

1. Overlay to include expected PUP and release point

Common Errors:

1. Inadequate pre-flight preparation.
2. Failure to properly setup the system.
3. Failure to correctly enter the aircraft release angle.
4. Failure to designate the target.
5. Failure to make corrections back to the azimuth steering line during the ingress / pull-up.
6. Initiating pull-up late.
7. Failure to set and maintain a 4G pull-up.
8. Incorrectly calculating pull-up point during pre-flight planning.
9. Failure to expeditiously transition back to the LAT environment after weapon release.

Corrections for Errors:

1. RP must have a thorough understanding of the weapon system, data input, and the symbology and tones associated with loft deliveries.
2. The loft profile requires a more precise release than most deliveries because of the complexity of the ballistic profile flown by the bomb. Small deviations at release (i.e. not centering up on the azimuth steering line at release) will result in much greater miss distances than traditional dive releases.
3. It is very important to transition expeditiously to 4Gs during the pull-up; otherwise the bomb release angle will be shallow.

Source Documents: Air NTTP, NATIP
Name: Reactive Weaponeering Matrix

Purpose: To maximize the effectiveness of available munitions during CAS and AR operations.

Description of Procedures:

1. Review the reference lesson; Air NTTP.

2. Reactive weaponeering is a method to enable attack pilots to select the proper weapon for the desired effects on a particular target in a reactive situation where detailed planning is not an option (i.e. CAS, Armed Reconnaissance). Targets are classified into sets and options are given to the pilot from which to select the proper weapon and program to optimize effects on target. In situations where time is critical reactive weaponeering charts can be used to aid in ordnance selection. When able, JWS should be used to select the appropriate weapon, number of weapons and aircraft required, fuze types and settings, release profile, and intervals.

3. Weapons are divided into two categories: unguided and guided.

4. Unguided reactive weaponeering
   a. Unguided reactive weaponeering weapons are divided into the following categories:
      i. MK-82 high / low drag
      ii. MK-83 high / low drag
      iii. CBU-99 / 100 high and low angle
   b. The weapon delivery for low drag ordnance is assumed to be a high angle (30/45 deg) delivery, 500+ knots.
   c. Targets are divided into target class and target size. Target class is further divided into hard, medium, and soft. Target size is divided into unitary or area targets.

5. Guided reactive weaponeering
   a. Guided reactive weapons are divided into the following categories:
      i. JDAM
      ii. Paveway II LGB
      iii. AGM-65E Laser Maverick
   b. The weapon delivery profile for a JDAM or an LGB is assumed to be a level delivery at 480 knots at 20,000 feet height above target.
   c. Targets are divided into five basic categories:
      i. Personnel.
      ii. Vehicles (stationary).
      iii. Moving vehicles.
      iv. Missile launchers.
      v. Structures.
Planning:

1. Unguided reactive weaponeering
   a. Reference one of the unguided reactive weaponeering charts that match your weapon and type of delivery, i.e. MK-82 low drag. Each chart is then divided into target class and unitary or area target. Pick the best program for each type of target class (hard, medium, and soft) and size for the weapon carried. The programs are listed in order of priority in relation to the calculated Pd (probability of damage) for that target class. Select the highest priority program for the weapons available. Next, select a legal interval that will put the stick length in, or as close as possible to in, the optimum stick length listed in the tables. If possible, make the interval the same for ease of inflight flexibility and pilot workload reduction. In some cases it will not be possible to select an interval within the optimum due to restrictions in NATIP. In these cases develop the stick length to get as close as possible to optimum within the release limitations. Once this is done, put the derived programs on the Z-diagram Weaponeering card. An example is shown below:

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Unguided Reactive Weaponeering Charts:

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<th>Release Pgm</th>
<th>Opt Stick Length</th>
<th>PRI</th>
<th>Release Pgm</th>
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### MK-82 High Drag

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<th>Release Pgm</th>
<th>Opt Stick Length</th>
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### MK-83 Low Drag

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<th>Opt Stick Length</th>
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<td>Q4 : M2</td>
<td>[188 - 211]</td>
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2. Guided weapon reactive weaponeering
   a. Guided weapons are, by design, more accurate weapons than unguided if used properly. This yields greater Pd against targets with less weapons required. There are three types of guided weapon categories, Laser Maverick, Paveway LGB, and JDAM.
   b. Target assumptions. There are five basic categories of targets used in the development of the guided weapon reactive weaponeering charts:
      i. Personnel.
      ii. Vehicles (stationary).
iii. Moving vehicles.
iv. Missile launchers.
v. Structures.
c. Weapon assumptions.
i. Delivery parameters: Level deliveries at 480 knots at 20,000 feet height above target
ii. Reliability: Assumes 0.98 reliability
iii. Configuration: Weapons are assumed to have an MXU-735 nose plug unless configured for airburst with a DSU-33. Electric tail fuzes (FMU-139). JDAM terminal impact angles are either 65 degrees or 85 degrees. V indicates a target detector, delay settings listed are I – INST, 1 to 10 ms, 2 to 25 ms.
d. Planning. The charts are designed to be used in the mission planning and briefing stage to derive a loadout and target specific reactive weaponeering matrix that can be used inflight for quick reference. The charts can also be used in determining required loadouts for time critical planning.
e. Execution. Inflight you will use your derived reactive weaponeering matrix to determine the appropriate weapon and settings to use against a target set. This will help maximize effects against targets. If two weapons are of similar effects, choose the weapon that is least likely to be used later (e.g. a Laser Maverick has a similar damage percentage against a single story wooden structure as a 500-pound JDAM). If moving targets may be encountered later in flight the Laser Maverick would be better to keep for that target set. The charts do not factor in collateral damage estimates, asymmetric stores considerations. The charts are simply a tool to use with other factors to help determine which weapon to select for a situation.
f. PGM reactive weaponeering chart. This chart is an unclassified summary chart derived from the classified JAWS based information. The colors represent effectiveness categories; green is 75 to 100 percent, yellow is 50 to 74 percent, and red is 0 to 50 percent.
## Precision Guided Munitions Reactive Weaponeering

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<td>J83 In 85/65</td>
<td>G12 In</td>
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<td>G16 1</td>
<td>G16 2</td>
<td>G12 1</td>
<td>J82 In 65</td>
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<td>J83 In 85</td>
<td>J83 1/2 85/65</td>
<td>LMAV In</td>
<td>J82 In 65</td>
<td>J83 1/2 65</td>
<td>G16 In</td>
<td>J82 In 65</td>
<td>J83 1/2 65</td>
<td>G16 1/2</td>
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<td>J83 V 85/65</td>
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<td>J82 In 85</td>
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<td>J83 V 85/65</td>
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<td>LMAV In/1</td>
<td>G16 1</td>
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<td>G16 2</td>
<td>G12 1</td>
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<td>Structure</td>
<td>Masonry SS/60x40x15</td>
<td>G16 In</td>
<td>J83 In 85/65</td>
<td>G12 In</td>
<td>J82 In 65</td>
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<td>Reinforced SS/60x40x15</td>
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Delivery for JDAM and LGBs based on 20,000' HAT/480 KTAS/No Wind

<table>
<thead>
<tr>
<th>JDAM</th>
<th>LGBs</th>
<th>V</th>
<th>In</th>
<th>65</th>
</tr>
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<tbody>
<tr>
<td>J82</td>
<td>500#</td>
<td>JDAM</td>
<td>65</td>
<td>degree impact angle (JDAM)</td>
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<td>J83</td>
<td>1000#</td>
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<td>degree impact angle (JDAM)</td>
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<td>G12</td>
<td>GBU-12</td>
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<td>10 ms delay (14 ms LMAV)</td>
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<tr>
<td>G16</td>
<td>GBU-16</td>
<td>2</td>
<td>25 ms delay (30 ms LMAV)</td>
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<td>LMAV</td>
<td>AGM-65E</td>
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</table>

JDAM = Joint Direct Attack Munition
LMAV = AGM-65E

AV-8B FSG Ver. 3.0 MECH 13 - 24
Common Errors:

1. Poor or inaccurate weaponeering.
2. Failure to properly employ planned weaponeering matrix.
3. Failure to consider MSL release altitude, when calculating min intervals and max stick length.
4. Failure to consider delay option for electrical fuzing based on target.

Corrections for Errors:

1. Ensure weaponeering is thorough and safe.
2. Build a thorough and easy to read matrix for employment airborne. Audible weaponeering game-plan airborne as required. Review definitions of soft, medium and hard targets per the Air NTTP.
3. Ensure planned MSL release altitude, plus the effects of a high release are considered when calculating min intervals and maximum stick length.

Source Documents: Air NTTP
Name: Laser Guided Bomb / LGTR Delivery

Purpose: To maximize the accuracy and effectiveness of laser guided bombs by performing a standoff, level delivery.

Description of Procedures:

1. Successful delivery of a LGB begins in the planning phase. NTRP provides a description of laser guided bomb components and functions. Air NTTP provides information on employment profiles, which will also be discussed later in this chapter. The first step in the LGB planning process is to determine the required ordnance for your target set. Utilize JMEMs to determine the type of ordnance and delivery parameters required to destroy the target. Next, utilize PMPT to aid in selecting a delivery profile that will meet the requirements for target destruction. Other planning factors that must be taken into consideration include target area winds, and the DTL (designator to target line) if a ground or helo-borne lasing platform will be used. For winds, we would primarily like to drop with a tail wind, as it will steepen the profile of the weapon, increasing both the impact angle and velocity at impact. If it’s not feasible, drop with a headwind to minimize lateral drift due to crosswind. If required to drop with a crosswind, select a final attack heading that will minimize the crosswind component. Crosswinds of 30 kts or greater will significantly decrease the probability of a successful attack. If utilizing a helo-borne or ground based laser for terminal weapon guidance, the DTL must be taken into account. The DTL is the magnetic heading from the lasing platform to the target. From that, we can construct a ‘laser basket’. The best probability of laser acquisition occurs within a 60 degree cone from the DTL, with the first 45 degrees being optimal. We incorporate a 10 degree safety zone on either side of the DTL to minimize the risk of the weapon guiding on the lasing platform. Air NTTP Figure, Laser Basket, provides a diagram of the laser basket. With all of this information, we can select our planned delivery profile. The profiles we will use at 203 are described in follow on pages. General information on LGB preflight is contained in the TPG. Things of concern include: ensuring the desired laser code is properly selected on the side of the weapon, confirming the presence of an Mk-122 arming wire, and checking the arming wires for the thermal battery and the fin release. During your CWAIVER checks, select the LGB on the stores page and ensure that “AUTO” is selected, the appropriate fuze arm time is selected (normally 10 seconds) and that the correct fuze function time is selected. Once airborne, you will utilize the LST to verify the laser spot. When ready for the attack, fly a disciplined aircraft. Center the velocity vector on the ASL and maintain the correct altitude and airspeed for delivery. LGBs are usually delivered at 480 kts and 15,000’ AGL or higher for level releases. When the release cue appears at the top of the ASL, report “10 SECONDS.” You can expect the instructor (or other lasing platform) to make a “LASING” call prior to release. With release conditions met, hold down the bomb pickle button until release. Realize that there are many release points that should result in a successful attack. The Harrier community uses the “ballistic release point” (BRP) for LGB deliveries. The BRP is the calculated release point for an Auto delivery, and is
the point of release where the weapon would theoretically impact the target if it never guided on laser energy. At release, make the call, “MARS XX, ONE AWAY, TIME OF FALL XX SECONDS.” At this point, both aircraft will initiate a 30 degree ‘crank’ maneuver until weapon impact. At impact, Lead will make a “SPLASH, TERMINATE” call.

Common Errors:

1. Poor sensor planning / sensor timeline.
2. Inadequate knowledge of factors affecting laser guided bomb accuracy.

Corrections for Errors:

1. Plan sensor timeline IAW the FSG and Air NTTP. Plan to verify the laser spot using the LST prior to weapons release. Ensure laser code entered in the LST corresponds to code programmed in LGB. Review the TAWS data and adjust attack parameters as necessary. Understand and be prepared to brief the impact of release parameters and environmental conditions on laser guided bomb performance.

Source Documents: Air NTTP, NATIP, Paveway Munitions Planning Tool (1.0),
Name: Sensor Footprints / TAWS

Purpose: Utilize planning products to aid in target acquisition.

Description of Procedures:

1. Sensor Footprints will allow you to overlay the FOV of the sensor on the target area. Based on parameters you provide, you can construct a sensor footprint for the planned sensor and see the amount of terrain that will be covered. These footprints are helpful when conducting a transition profile into the target as well as the delivery. They are especially helpful at night when utilizing the FLIR (or APG-65 for expand mapping and Litening Pod CCD / FLIR when you are in the fleet). The footprint is used in planning and the brief to enable the pilot to construct a mental picture of the target. The mission planning computers have an Excel spreadsheet installed that will produce these footprints electronically. To build a footprint, open the spreadsheet and select the sensor on the tabs at the bottom of the sheet. Input the data required in the green boxes and select “Calculate Footprint.” The spreadsheet will create three footprints: one for a 1:50k scale map, one for a 1:100k and one for a 1:250k.

2. TAWS (target acquisition weather software) is a planning product provide by the weather office. It provides information on the predicted acquisition range of specific targets based on the sensor and weather conditions that you provide. TAWS worksheets are located on the mission planning computers. Fill in as much information as possible on the worksheet and fax it to the weather office at least 24 hours prior to the mission. Weather will fax back a data sheet showing the predicted acquisition range of your target. TAWS data will be used in planning and during the brief to maximize the use of sensors and to select attack profiles.

Common Errors:

1. Incorrect data to construct footprint.
2. Lack of TAWS data for flights.

Corrections for Errors:

1. Ensure you input the correct data into the required fields. The Excel document will do all the required calculations to create the footprint.
2. Submit the TAWS worksheet to weather far enough in advance to have the data prior to brief.

Source Documents: Air NTTP
Name: LGB Buddy (Left / Right) Attack

Purpose: To execute a level attack with a precision guided weapon as a wingman, while maintaining stand-off from the target / threat and mutual support within the section.

Description of Procedures:

1. LGB deliveries at 203 will be conducted as “buddy” attacks. The instructor will generate coordinates with a Litening pod and pass them to you. Enter the coordinates into target point 1 through the data page. Once coordinates have been passed and verified, the instructor will make the attack audible “MARS 12, BUDDY RIGHT, 1 BY GBU-12, INSTANTANEOUS, 1688, PRESS.” Respond with “MARS 12, BUDDY RIGHT, 1 BY GBU-12, INSTANTANEOUS.” At this point, he will take Deployed Echelon on you and climb 1000’. At the IP, conduct MWSS checks. Expect to conduct a ramp profile from your ingress altitude down to your release altitude, leveling roughly 1 NM prior to the BRP. The instructor will conduct targeting with the pod and report “MARS 11, CAPTURE” once he has the target on the pod. To maximize the chance for success, fly the briefed altitude and airspeed, and maintain the velocity vector centered on the ASL. When you see the ‘weapons release cue’ appear at the top of the HUD (approx 0.8 prior to the planned BRP), report “MARS 12, TEN SECONDS.” Hold the pickle button down until weapons release and report “MARS 12, ONE AWAY, TIME OF FALL XX SECONDS.” The instructor will reply with, “MARS 11, LASING.” At this point, make a 30 degree hard turn in the briefed direction and provide mutual support by maintaining sight of the target area and looking for threats. The instructor will make a hard turn for 45 degrees at your release call, flowing outside of your flight path while supporting the weapon to impact. At impact, the instructor will call, “MARS 11, SPLASH, LASER OFF.”

Common Errors:

1. Inadequate knowledge of LGB release parameters.
2. Failure to account for winds in preflight planning.
3. Failure to complete MWSS checks at the IP.

Corrections for Errors:

1. Utilize PMPT and TAWS data to aid in selecting a release. Be able to brief the planned BRP and subsequent impact angle and velocity of the weapon.
2. Get target area winds prior to the brief and select an attack direction that minimizes the crosswind component during release.
3. Be methodical with MWSS checks at the IP. Ensure the master arm is on and the weapon is selected in Auto mode with the appropriate arm time and fuze function setting. Ensure that the coordinates entered for the target are your steer to point.
and verify DESG STP on the EHSD. Move the sensor select switch aft once to bring up the LST in the HUD.

Source Documents: 
- Air NTTP
- Paveway Munitions Planning Tool (1.0)
Name: JDAM Absolute (Left / Right) Attack

Purpose: To execute a level attack with a joint direct attack munitions (JDAM), while maintaining stand-off from the target / threat and mutual support within the section.

Description of Procedures:

1. JDAM attacks at 203 will be conducted as absolute attacks. Coordinates will either be preplanned in JMPS or generated by an off board sensor (Lead’s targeting pod) and passed to you. Having an understanding of the weapon and system is critical to a successful attack. JDAM uses target contributors for attack. Target points can be preplanned in JMPS using the target (triangle) symbol instead of a normal waypoint symbol. Up to 32 target points can be planned. Of those, 4 can be assigned as target contributors for attack at any one time. To do this in JMPS, select the aircraft target assignment button near the bottom of the screen (aircraft with three small red triangles around it). From there, you can drag the desired target points from the top of the screen into the “flight position” and assign them as target contributor 1 through 4. Ensure you check the box next to each one to send it to the DSU / AMU during mission transfer. You also have the option to set terminal parameters for target point 0 on that screen. Select “Target 0 Parameters”, and input the desired attack heading and impact angle. You must ensure to check “valid” if you want the parameters to be utilized. Selecting terminal parameters for the individual Target point is done by editing the point (right click on the triangle and select “edit route point”). Scroll across the top of the route editor box to the last option and select “Tgt Params.” Then select “Term Parameters” and enter the desired heading and angle along with selecting the ‘valid’ option as appropriate. The last thing to be completed in JMPS for a JDAM attack is to load the GPS crypto keys. To do this, you must be running JMPS on a classified hard drive. Insert the PCMCIA card that contains the current GPS crypto keys. At the bottom of the JMPS AV8 UPC screen you will need to load the mission to the DSU / AMU as normal, and then select the “GPS Crypto” option. Then select “Write DSU keys” or “Write Mission card keys” as appropriate. Your DSU / AMU will now have the required keys to transfer to the JDAM. It is also now classified and must be handled accordingly.

2. On start up, the jet will recognize the crypto keys on the DSU / AMU and will display a “classified data” banner across the SDAT page. DTX as usual. Power will automatically be applied to all JDAM on the aircraft and can be confirmed by noting the “warm” under the weapon on the stores page. The weapon will conduct the initial BIT, which takes roughly 2 ½ minutes. The Transfer Alignment process will begin and the JDAM will transition from “warm” to “DALN-2”, then to “DALN-1” and eventually to “RDY.” Realize that the weapon may still be in a DALN status by takeoff time. You should confirm the appropriate target contributors and terminal parameters were transferred during DTX. To check the terminal parameters, select the WPN button on the UFC (with the JDAM store selected on the stores page). Select ODU option 1 (TGPT). The ODU will display T1 through T4. Ensure the
desired target points are colonized and all others are not. You can also confirm the Fuze time via the WPN button on the UFC. Bravo models (J82B or J83B....FMU-139 with Mk-122 arming wire) will use 10 seconds arm time. Charlie models (J82C or J83C....FMU-139 with a FZU-48) will use 20 seconds arm time. To confirm the terminal parameters for a target point, select the data page and select the desired target point between the waypoint arrows. Box “WYPT” on the bottom of the Data page. On the ODU, select TGPT. ODU window 1 will switch to TERM. From there you can select HDG or ANG and confirm the correct data. ANG should be set for 85 degrees. HDG will not be used at 203 and should be invalidated. Confirm this by colonizing HDG and the colonizing INV.

3. If the JDAM stores show a weapon fail (WFAIL), select the SMSFF page to confirm the type of failure. A station bit can be done by selecting SBIT on the stores data page, moving the asterisk to the desired station and then selecting WBIT. If WBIT is selected without selecting SBIT, all JDAM on the aircraft will go into BIT mode.

4. Once en route, confirm the status of the weapon. If the weapon is stuck in DALN-2, it should not be released since the alignment quality is Unsat. If the weapon is in DALN-1, an alignment maneuver can be accomplished by taking a 30 degree check turn away from the target, turning to parallel the initial course, and then taking another 30 degree check turn back to the original flight path. If this does not upgrade the JDAM to a RDY status, it can still be released in the DALN-1 condition. Time-of-fall should be maximized to allow the weapon the best chance of acquiring GPS satellite updates. If the weapon is showing D-GPS, it can be released in an “INS only” mode. Time-of-fall should be minimized to limit the amount of INS drift that occurs during weapon time of flight.

5. Select target point 1 as your steer-to-point and designate it. With the JDAM selected and in A/G master mode, you will get the NIRD circle and associated JDAM symbology. Deliveries will be flown level at 480 KTAS. Select Terminal Parameters Enabled or not enabled per the flight brief (toggle between the two via the cage / uncage switch). Confirm your selection by verifying the “T” or “N” in the HUD and the correct color of the LAR displayed on the EHSD (green for terminal parameters enabled, red for terminal parameters off). Once you’ve flown 30 percent into LAR (verified by the percentage of LAR display below the NIRD circle once in LAR), press and hold the pickle button until the weapon is released. Remember that JDAM stores take roughly 1 full second to release from the aircraft (up to 2 seconds is possible), so ensure the pickle button remains depressed until weapon release. Make your release call, “MARS 11, ONE AWAY, TIME-OF-FALL XX SECONDS” (Time-of-fall will be displayed on the HUD in the JDAM data block on the right side above GPS time once in LAR and until weapon release). Execute a 30 degree crank in the briefed direction. Lead will conduct the same maneuver and will maintain the Litening pod on the target until impact to verify the hit. Lead will report “SPLASH, TERMINATE” once impact occurs.
6. Once the flight is complete, you will need to erase the crypto keys from the DSU. To accomplish this, select the SDAT page, and select ERSE at the bottom of the page. You must then colonize “ACPT” in the ODU. The only way to verify that the crypto keys have been erased is by noting the “classified data” banner being removed from the SDAT page. The Mission Computer and SMC will automatically dump the crypto keys upon engine shutdown, but the pilot is responsible for removing them from the DSU. If you forget to do it, you can accomplish it via JMPS with the classified hard drive inserted by selecting GPS crypto at the bottom of the AV-8B UPC and selecting “Erase Crypto Keys.” You must ensure that you do not give the DSU to maintenance control until the crypto keys have been erased. The crypto keys on the PCMCIA cards cannot be truly erased; therefore, the cards will remain classified and will be stored in the safe.

Common Errors:

1. Programming the incorrect coordinates into a target contributor.
2. Failure to select the correct target contributor.
3. Not having Terminal Parameters selected as briefed.

Corrections for Errors:

1. Confirm correct coordinates for a preplanned target point via the data page. If Lead passes you updated coordinates for a target, read back the coordinates directly from the data page to confirm they were entered correctly.
2. Ensure that the desired target contributor is colonized and that the correct target point is between the arrows on the EHSD, and that DESG STP is displayed in the lower left corner of the EHSD.
3. Utilize the cage / uncage switch to select or deselect terminal parameters, and verify by the “T” or “N” in the HUD and the correct color of the LAR displayed on the EHSD.

Source Documents: Air NTTP, NATIP
SUPPORT:
- BHA

OPTIMIZE:
- CORRECT TGTPT
- TERMINAL PARAMETERS
- RDY WEAPON
- LAR

ABORT CRITERIA:
- ROE
- MALFUNCTION

UNCLASSIFIED

JDAM Absolute (Left/Right) Attack

AV-8B FSG Ver. 3.0

MECH 13 - 35
Name: Laser Maverick (LMAV) (Left / Right) Attack

Purpose: To execute an LMAV attack utilizing the standard 20 degree ramp profile.

Description of Procedures:
1. Review the reference lessons and Air NTTP.

Planning:
1. Ingress altitude: 14,000 ft
2. Ingress airspeed: 400 KTAS
3. 20 deg ramp
4. Use LMAV ROT (Air NTTP) to determine profile.

Contracts:

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<tr>
<th>Contracts / Assumptions</th>
<th>Cover</th>
<th>Shooter</th>
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<tr>
<td>1. De-confliction</td>
<td></td>
<td>1. Attack</td>
</tr>
<tr>
<td>2. Targeting (BHA if supported by an external laser)</td>
<td>2. Target confirmation if able (ARBS)</td>
<td></td>
</tr>
<tr>
<td>3. 1 to 2 NM separation / Z + 1.</td>
<td>3. Tally / blind</td>
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3. Complete your MWSS checks prior to the IP.

<table>
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<th>Actions Prior to the IP</th>
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</thead>
<tbody>
<tr>
<td><strong>Cover</strong></td>
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<tr>
<td>W NA.</td>
</tr>
<tr>
<td>S System designation (STP and DESG/STP). Map scale/mode as required</td>
</tr>
<tr>
<td>S TPOD Sensor mode (SSS down x 2). AR/PT track (SSS aft) TPOD scan IAW Air NTTP Figure, TPOD Scan WD Zoom 0/NAR Zoom 0 to search NAR/Zoom 2 when target acquired. Laser code/laser or D&amp;M HUD DES/TRK DES until captured</td>
</tr>
</tbody>
</table>

4. If at any time during the attack the LMAV seeker loses laser energy it will continue to scan in the previously selected scan volume. Continue the ramp while attempting to regain a valid laser lock. If a valid lock is not achieved by $R_{\text{min}}$, abort the attack, cage the seeker head, reset, and re-attack.

**Products:**

1. LMAV employment time line.

**Common Errors:**

1. Failure to complete MWSS prior to the IP.
2. Not meeting LMAV employment time line (Air NTTP, Figure, LGB Self (Left/Right) Attack).
3. Using trigger instead of pickle button to fire weapon.
4. Poor weapons delivery parameters (GPI outside of launch constraint circle, no laser lock on, outside of optimal launch envelope altitude).
5. Poor expendable use.
6. Incorrect flow off target / flying over target area.
7. Not adhering to contract geometric de-confliction off target.
8. Poor LMAV / laser comm.

**Corrections for Errors:**

1. Plan to complete MWSS checks prior to IP.
2. Verify GPI in launch constraint circle.
3. Fly a precise, disciplined aircraft.
4. Use the course line function on the AMPCD to depict the restricted run-in heading or zone. Ensure your aircraft remains on the correct side of the course line.
5. Study contracts and visualize / talk through required calls prior to sortie.
6. Execute briefed expendable plan.

7. Pay special attention to briefed contract de-confliction plan off target. Do not blow-through briefed de-confliction altitude.

Source Documents: Air NTTP
Figure 7.24 (U) LMAV Employment Time Line.

- **Egress**
  - Off-Target Maneuver
  - Expendables passing through horizon
  - Climb to sanctuary or avoid overflight of target area

- **Attack**
  - ROE satisfied
  - Solid square GPI within Launch Constraint Circle
  - Fire, pickle button depress

- **Optimize**
  - LASER lock-on occurs (solid square GPI)
  - Center GPI in Launch Constraint Circle
  - Expendables passing through sanctuary

- **Capture**
  - Established on 20-degree ramp
  - Uncage missile seeker head: CAGE/UNCAGE depress
  - Ensure scan pattern starts

---

**Abort Criteria**

- No LASER lock-on by Rmin
- GPI outside of Launch Constraint Circle
- ROE not met

**Abort Procedures**

- Cage missile seeker head: CAGE/UNCAGE depress
- Reset and m-attack

---

Figure 7.25 (U) GPI Position Validation.

**Invalid**

**Valid**

**Valid (Optimal)**

---

UNCLASSIFIED

---

UNCLASSIFIED
Name: Medium Altitude Same Side Attack

Purpose: Day or night section attack used when a restricted run-in heading or zone is required, degraded section visual mutual support is acceptable, and time in the target area needs to be minimized.

Description of Procedures:

1. Review the reference lesson and Air NTTP.

Planning:

1. The SPINS for medium altitude same side attacks at VMAT-203 are as follows:
   a. Level entry to dive delivery
   b. Ingress altitude: Apex altitude for a 30 deg or 45 deg dive delivery
   c. Ingress airspeed: 420 KTAS
   d. Weapons
      i. MK-76, simulating a MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   e. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
   f. Reactive weaponeering per Air NTTP for hard / med / soft, unitary and area targets. You will be dropping singles during the flight simulating the reactive weaponeering.

Contracts:

1. In order for the standard target area attacks to work safely and effectively, each pilot must adhere strictly to the contracts. For the same side and split attacks, the contracts are in Air NTTP Figure, Medium-Altitude Same Side Attack, and Figure, Medium-Altitude Same Split Attack; for the swept attacks, Air NTTP Figure, Swept Attack; for the lead trail attacks, Air NTTP Figure, Medium-Altitude Lead Trail Attack.
Same Side / Split Attack Contracts

<table>
<thead>
<tr>
<th>Contracts/Assumptions</th>
<th>Shooter</th>
<th>Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attack</td>
<td>1. De-confliction</td>
<td></td>
</tr>
<tr>
<td>2. TALLY prior to roll-in</td>
<td>2. Mutual Support</td>
<td></td>
</tr>
<tr>
<td>3. BLIND post separation</td>
<td>3. BLIND post separation</td>
<td></td>
</tr>
<tr>
<td>4. Z altitude</td>
<td>4. Z + 1 altitude</td>
<td></td>
</tr>
</tbody>
</table>

"OFF (DIR)" call when TALLY, at briefed sanctuary altitude, and ready to assume cover role.

<table>
<thead>
<tr>
<th>Role Swap Implied at Shooter's &quot;OFF&quot; Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
</tr>
<tr>
<td>1. Mutual Support</td>
</tr>
<tr>
<td>2. TALLY/BLIND</td>
</tr>
<tr>
<td>3. Z + 1 altitude</td>
</tr>
</tbody>
</table>

2. It is important to have a firm understanding of the concept of shooter / cover and role swap. The terms shoot and cover define what role each member of the flight is playing, and role swap defines when those roles change. For the target area tactics taught at 203, there will always be only one shooter and only one cover with no overlap of roles. In more advanced attacks, there can be more than one shooter / cover. Do not confuse shooter / cover with Lead / wingman.

3. The Air NTTP defines the shooter as the member of the flight who employs ordnance and his responsibilities are to attack the target.

4. The cover is defined as the member of the flight who does not employ ordnance and is responsible for flight de-confliction and mutual support.

5. Flight de-confliction is fairly self explanatory, do not hit your wingman.

6. Mutual support is a little more complicated. The idea is that when your wingman is focused on attacking the target, you are looking for threats. Threats can be either surface-to-air or air-to-air. As cover, you should be scanning your radar (if you have one) and looking out of the cockpit for bandits, AAA, SAMs, and anything else that might pose a threat to you or your wingman. If you see a threat, you can alert your wingman who is probably very focused on his attack and may not be aware of the threat. While in the MECH stage at 203, consider all threats are in the target area and to focus you efforts there.

7. Role swap is as it sounds, is a swapping of cover / shooter roles. If the plan is to attack the target with both aircraft, at some point in the attack the shooter will become the cover and the cover will become the shooter. The attack contract tables describe what is required in order for the role swap to safely occur.

8. The term TALLY refers to the target. When you are TALLY, it means that you have SA of the target / target area. NO JOY means you do not have SA of the target / target area.
The term VISUAL refers to your wingman. When you are “VISUAL”, it means you have your wingman in sight. “BLIND” means you do not have your wingman in sight.

Execution:

1. A same side attack is initiated with an attack audible from Lead similar to the following: “MARS 11 SAME SIDE RIGHT, 4 BY 1 BY 30 MK 82, INSTANTANEOUS.” To which wing responds, “MARS 12, SAME SIDE RIGHT, 4 BY 1 BY 30, MK 82, INSTANTANEOUS.”

2. The attack commences at the IP with all aircraft MWSS complete, in defensive combat spread, and at 420 KTAS. At the IP, but no later than 8 NM, wing executes a separation maneuver and assumes cover responsibilities. The separation maneuver is a 90-degree hard turn in the direction of the briefed attack (left or right), with 15 to 20 seconds of wings-level time (medium altitude). This maneuver results in approximately 30 to 45 seconds of separation. Once planned separation has occurred, cover may descend to Z altitude. At this point, cover provides non-visual mutual support by scanning the target area while crosschecking timing, airspeed, and altitude. With timing complete, cover initiates a hard turn to place the target on the nose. Six NM from the target, each aircraft offsets 20 degrees in the same direction as the attack in order to acquire the target and provide mutual support. At the IP, Lead assumes the shooter role and should make an “IN” call at approximately the same time cover turns back towards the target area after completion of the separation maneuver. Post-weapons release, shooter climbs off target and executes any defensive maneuvers. Passing through sanctuary altitude the shooter makes an “OFF” call once “TALLY” is regained and cover responsibilities can be assumed. At this point, roles are swapped without acknowledgement, as this is preplanned. Wing is now shooter, Lead is now cover and both flight members execute a preplanned altitude swap in accordance with their new roles. The shooter employs his / her weapon via the planned dive delivery maneuver. Cover climbs to Z + 1 off target and provides mutual support. Off target, the shooter climbs to Z until “VISUAL” and egresses. Off target, cover is normally at shooter’s 10 or 2 o’clock position in the direction of the off-target maneuver. Once shooter is “VISUAL” on the egress, Lead will verbalize “MARS 11, SWAP.” When the “SWAP” is called, Lead descends to Z altitude and wing climbs to Z + 1. The flight is now ready to commence another attack with Lead as the shooter, and wing as the cover.

3. Assumptions. Separation occurs at the action point. At that point, cover is TALLY, but may or may not be “VISUAL.” The shooter, meanwhile, is “TALLY” and “BLIND” post-separation. An automatic role swap is affected with the shooters “OFF” call.
**UNCLASSIFIED**

Medium Altitude Same Side Attack
Products:

1. Z diagrams for tactical 30 deg or 45 deg
2. Reference Air NTTP Figure, Medium-Altitude Same Side Attack, for overlay

Common Errors:

1. Failure to complete appropriate actions at the IP, thus unprepared for shooter role.
2. Wingman executing poor timing / delay maneuver.
3. Not adhering to restricted run-in heading or zone.
4. Wingman spending too much time in the cockpit, not providing the desired level of mutual support.
5. Improper comm.
6. Poor weapons delivery parameters.
7. Poor expendable use.
8. Incorrect flow off target.
9. Not adhering to contract geometric de-confliction off target.

Corrections for Errors:

1. Focus on formation, target mechanics, basic target attack procedures, and actions at the IP (Air NTTP Table, Actions Prior to the IP).
2. Wingman will take action as briefed / directed by Lead. After rolling out, time the appropriate wings level portion of the delay using the clock in the HUD. Desired separation for medium altitude attacks is 30-45 seconds.
3. Use the course line function on the AMPCD to depict the restricted run-in heading or zone. Ensure your aircraft remains on the correct side of the course line.
4. Balance scan in and out of the cockpit to ensure desired level of mutual support is maintained and proper start parameters are obtained. Maintain a tally.
5. Study contracts and visualize / talk through required calls prior to sortie.
6. After assuming shooter role, focus all attention on good start parameters, followed by solid BCWD procedures. Remember that proper TPA is the cornerstone of reticle sight bombing techniques.
7. Execute briefed expendable plan.
8. Pay special attention to briefed contract de-confliction plan off target. Do not blow-through briefed de-confliction altitude.

Source Documents: Air NTTP
Name: Medium Altitude Split Attack

Purpose: Day or night altitude section attack when different attack axes are preferred, degraded section visual mutual support is acceptable, and time in the target area needs to be minimized.

Description of Procedures:

1. Review the reference lesson and Air NTTP.

Planning:

1. The SPINS for medium altitude split side attacks at VMAT-203 are as follows:
   a. Level entry to dive delivery
   b. Ingress altitude: Apex altitude for a 30 deg or 45 deg dive delivery
   c. Ingress airspeed: 420 KTAS
   d. Weapons
      i. MK-76, simulating a MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   e. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
   f. Reactive Weaponeering per Air NTTP for hard / med / soft, unitary and area targets. You will be dropping singles during the flight simulating the reactive weaponeering.

Contracts:

1. The contracts for the split attack are exactly the same as the same side attack.

Execution:

1. The medium altitude split attack is identical to the same side attack with one primary difference. This difference is the direction wing turns for the separation maneuver and the resultant geometry. Wing turns opposite the direction of the audibled attack (i.e. for a split right, wing actions to the left). All the contracts and in and off target altitudes are the same as for the same side attack.

2. Assumptions. Separation occurs at the action point. At that point, cover is “TALLY”, but may or may not be “VISUAL.” The shooter, meanwhile, is “TALLY” and “BLIND” post-separation. An automatic role swap is affected with the shooters “OFF” call.
Products:

1. Z diagrams for tactical 30 deg or 45 deg
2. Reference Air NTTP Figure, Medium-Altitude Split Attack, for overlay

Common Errors:

1. Failure to complete appropriate actions at the IP, thus unprepared for shooter role.
2. Wingman executing poor timing / delay maneuver.
3. Wingman spending too much time in the cockpit, not providing the desired level of mutual support.
4. Improper Comm.
5. Poor weapons delivery parameters.
6. Poor expendable use.
7. Incorrect flow off target.
8. Not adhering to contract geometric de-confliction off target.

Corrections for Errors:

1. Focus on formation, target mechanics, basic target attack procedures, and actions at the IP (Air NTTP Table, Actions Prior to the IP).
2. Wingman will take action as briefed / directed by Lead. After rolling out, time the appropriate wings level portion of the delay using the clock in the HUD. Desired separation for medium altitude attacks is 30-45 seconds.
3. Balance scan in and out of the cockpit to ensure desired level of mutual support is maintained and proper start parameters are obtained. Maintain a tally.
4. Study contracts and visualize / talk through required calls prior to sortie.
5. After assuming shooter role, focus all attention on good start parameters, followed by solid BCWD procedures. Remember that proper TPA is the cornerstone of reticle sight bombing techniques.
6. Execute briefed expendable plan.
7. Pay special attention to briefed contract de-confliction plan off target. Do not blow-through briefed de-confliction altitude.

Source Documents: Air NTTP
Name: Medium Altitude Swept Attack

Purpose: Day or night section attack used when a restricted run-in is not required, a vertical sanctuary exists, and section visual mutual support is desired.

Description of Procedures:

1. Review the reference lesson and Air NTTP.

Planning:

1. The SPINS for medium altitude split side attacks at VMAT-203 are as follows:
   a. Level entry to dive delivery
   b. Ingress altitude: Apex altitude for a 30 deg or 45 deg dive delivery
   c. Ingress airspeed: 420 KTAS
   d. Weapons
      i. MK-76, simulating a MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   e. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
   f. Reactive Weaponeering per Air NTTP for hard / med / soft, unitary and area targets. You will be dropping singles during the flight simulating the reactive weaponeering.

Contracts:

<table>
<thead>
<tr>
<th>Swept Attack Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contracts/Assumptions</td>
</tr>
<tr>
<td>Shooter</td>
</tr>
<tr>
<td>1. Attack</td>
</tr>
<tr>
<td>2. TALLY prior to roll-in</td>
</tr>
<tr>
<td>3. BLIND post roll-in</td>
</tr>
<tr>
<td>4. Z altitude</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
</tr>
<tr>
<td>1. De-confliction</td>
</tr>
<tr>
<td>2. Mutual Support</td>
</tr>
<tr>
<td>3. TALLY</td>
</tr>
<tr>
<td>4. Visual Desired</td>
</tr>
<tr>
<td>5. Z + 1,000 feet altitude</td>
</tr>
<tr>
<td>6. ACD + 1 NM</td>
</tr>
</tbody>
</table>

Role Swap

“PRESS” directive required after:
“OFF” call (tally and sanctuary).
Must also have one of the following:
One aircraft visual (Lead can call “PRESS” wing can recommend “PRESS”), or > 90 degrees geographic separation referencing sub-cardinal directions from the target, or 2 NM separation from attack cone (e.g., “MARS 11, OFF SOUTH, BLIND,” “MARS 12 BLIND, 4 SOUTHWEST”, “MARS 11, 6 SOUTH, PRESS”, “MARS 12”).

<table>
<thead>
<tr>
<th>After Role Swap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
</tr>
<tr>
<td>1. De-confliction – climb to Z + 1,000 feet</td>
</tr>
<tr>
<td>2. Mutual Support</td>
</tr>
<tr>
<td>3. TALLY</td>
</tr>
<tr>
<td>4. Visual desired</td>
</tr>
<tr>
<td>Shooter</td>
</tr>
<tr>
<td>1. Descent to Z altitude</td>
</tr>
<tr>
<td>2. Attack</td>
</tr>
<tr>
<td>3. TALLY / BLIND</td>
</tr>
<tr>
<td>4. Off target Z altitude until visual</td>
</tr>
</tbody>
</table>
Execution:

1. The contract for the swept attack is much different than that for the same side and swept attacks. The attack commences at the IP with aircraft in defensive combat spread, MWSS complete, and 420 KTAS. Initially, Lead assumes the shooter role with wing as cover. Cover remains in defensive combat spread until shooter rolls in. At 6 NM, the flight takes an offset in the direction of the attack in order to achieve a visual look angle into the target area. The roll-in and off-target flow will be opposite the direction of the offset (e.g., a swept right implies a right offset for a left roll-in and a left pull off-target). Upon reaching the attack cone, shooter rolls in while cover provides mutual support by maintaining Z + 1 and ACD + 1 NM with a tally of the target area. If cover or shooter is “VISUAL”, the role swap will occur automatically once shooter calls “OFF” on his / her climb up to sanctuary. However, if both shooter and cover are “BLIND”, greater than 90 degrees of separation around the attack cone or at least 2 NM of separation (based on distance to the target) is required for a role swap. The shooter climbs to Z altitude. Cover maintains Z + 1 until the role swap occurs, or if “VISUAL”, cover can descend to Z altitude and close in to attack cone in order to expedite the attack once the swap occurs. Cover can audible “RECOMMEND PRESS” if “VISUAL” shooter or cognizant that the criteria above are met. However, a role swap does not occur until shooter audibles, “PRESS” and the call is acknowledged by cover. At role swap, the new cover immediately elevates to Z + 1 while the new shooter descends to Z altitude and executes the planned delivery maneuver. Off-target, shooter now climbs to Z altitude looks for cover at Z + 1. Lead should maneuver in order to facilitate the off-target join-up. Once shooter is “VISUAL” on the egress, Lead will verbalize “MARS 11, SWAP.” When the “SWAP” is called, Lead descends to Z altitude and wing climbs to Z + 1. The flight is now ready to commence another attack with Lead as the shooter, and wing as the cover.

2. Assumptions. Cover is “TALLY”, but may or may not be “VISUAL.” The shooter, meanwhile, is “TALLY” and “BLIND” post roll-in. A role swap is only affected with the shooter’s “PRESS” call.

Products:

1. Z diagrams for tactical 30 deg or 45 deg
2. Reference Air NTTP Figure, Medium-Altitude Swept Attack, for overlay

Common Errors:

1. Failure to complete appropriate actions at the IP, thus unprepared for shooter role.
2. Poor position as cover, flying too far inside or outside of the attack cone, or off briefed altitude, thus not prepared to rapidly transition to the shooter role.
3. Wingman spending too much time in the cockpit, not providing the desired level of mutual support.
4. Improper communications.
5. Poor weapons delivery parameters.
6. Poor expendable use.
7. Incorrect flow off target.
8. Not adhering to contract geometric de-confliction off target.

**Corrections for Errors:**

1. Focus on formation, target mechanics, basic target attack procedures, and actions at the IP (Air NTTP Table, Actions Prior to the IP).
2. Wingman should fly outside of the attack cone, at briefed altitude, in order to maintain tally and be prepared to rapidly transition to the shooter role when required.
3. Balance scan in and out of the cockpit to ensure desired level of mutual support is maintained and proper start parameters are obtained. Maintain a tally.
4. Study contracts and visualize / talk through required calls prior to sortie.
5. After assuming shooter role, focus all attention on good start parameters, followed by solid BCWD procedures. Remember that proper TPA is the cornerstone of reticle sight bombing techniques.
6. Execute briefed expendable plan.
7. Pay special attention to briefed contract de-confliction plan off target. Do not blow-through briefed de-confliction altitude.

**Source Documents:**

Air NTTP
ABORT CRITERIA:
- ROE
- MALFUNCTION
- TAC ABORT

UNCLASSIFIED

Swept Attack
Name: Low Altitude Same Side Attack

Purpose: Day or night section attack used when a restricted run-in heading or zone is required, degraded section visual mutual support is acceptable, and time in the target area needs to be minimized.

Description of Procedures:

1. Review the reference lesson and Air NTTP.

Planning:

1. Ingress altitude will be the highest of the following conditions:
   a. 500’ AGL
   b. The ingress altitude the PUI performed the low altitude pop attack with an IP in the T/AV-B on the low altitude transitions sortie (MECH-1434).
   c. The altitude dictated by BASH conditions
   d. IP comfort level

2. Ingress airspeed will be 450 KGS.

3. Plan a low altitude 20 deg pop attack to a 10 degree dive delivery.

4. Weapons
   a. MK-76, simulating a MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   b. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
   c. Reactive Weaponeering per Air NTTP for hard / med / soft, unitary and area targets. You will be dropping singles during the flight simulating the reactive weaponeering.

Contracts:

1. Target area mechanics will be performed at VMAT-203 using the contracts / assumptions from Air NTTP 7.3.1.7.6, with the following additions:
   a. Shooter and cover will be co-altitude on the ingress, with cover responsible for de-confliction
   b. Shooter will call “OFF” once he is tally and at his egress altitude.

2. The “OFF” call is still required for the role swap to occur.

Execution:

1. Executing the low altitude same side attack is a combination of the medium altitude same side attack and the low altitude pop attack. The attack geometry works
exactly the same low as it does high, the track across the ground should be no different; i.e. the overlays should look the same with the exception of the ACD. The big difference is that each aircraft will be conducting a pop attack to the attack cone.

2. IP inbound, the flight should be in low altitude defensive combat spread (co-altitude), 450 KGS, with LAT and MWSS checks complete. At 8 NM, wing performs his action in the direction of the attack. This action will require a slight climb to ensure de-confliction with Lead. When rolled out on a heading perpendicular to the attack, wing begins his timing and starts a descent back to the ingress altitude using small descent rules. Because the ingress airspeeds are faster on the low altitude attacks, it will not require the full 20 seconds to achieve the desired separation. After about 12-15 seconds outbound, begin your full power 4 G turn inbound. It may be necessary to reduce power to maintain airspeed once in the turn. Out of the turn the target should be off the nose. At this point, follow your low altitude pop procedures. Prior to tipping in, the role swap needs to occur with shooters “OFF” call.

3. Off target, Lead will recover at the ingress altitude and the PUI will perform a 20° straight oblique jink and recovery at ingress altitude +500’ until both the Lead and the student are visual. The off target plan should also incorporate the use of terrain to provide cover from threats. The off target plan must be briefed in detail and thoroughly understood by all aircrew.

Products:

1. Z diagrams for a low altitude 20 deg pop to a 10 deg delivery
2. Reference Air NTTP 7.3.1.7.6 for overlay

Common Errors:

1. Wingman executing poor timing / delay maneuver.
2. Poor turn technique.
3. Poor cockpit task management.
4. Improper Comm.
5. Not adhering to restricted run-in heading or zone.
6. Poor weapons delivery parameters.
7. Target fixation.
8. Not adhering to contract geometric de-confliction off target.
9. Poor expendable use.
10. Violating LAT rules of conduct.

Corrections for Errors:

1. Wingman will take action as briefed / directed by Lead. After rolling out time the appropriate wings level portion of the delay using the clock in the HUD. Desired separation for low altitude attacks is 30-45 seconds.
2. Execute proper low altitude turn techniques. There is no mission cross check time in a turn. Adhere to LAT ROC.
3. Properly prioritize cockpit task management per LAT training.
4. Study contracts and visualize / talk through required calls prior to sortie.
5. After separation maneuver, focus on solid pop-up parameters, leading to good start parameters, followed by solid BCWD procedures. Remember that proper TPA is the cornerstone of reticle sight bombing techniques.
6. Use the course line function on the AMPCD to depict the restricted run-in heading or zone. Ensure your aircraft remains on the correct side of the course line.
7. Do not fixate on the target.
8. Pay special attention to briefed contract de-confliction plan off target. Off target de-confliction will be achieved via altitude contracts. Do not descend below briefed de-confliction altitude until cleared by Lead.
9. Execute briefed expendable plan.

Source Documents: Air NTTP
Name: Low Altitude Split Attack

Purpose: Day or night low altitude section attack when different attack axes are preferred, degraded section visual mutual support is acceptable, and time in the target area needs to be minimized.

Description of Procedures:

1. Review the reference lesson and Air NTTP.

Planning:

1. Ingress altitude will be the highest of the following conditions:
   a. 500’ AGL
   b. The ingress altitude the PUI performed the low altitude pop attack with an IP in the T/AV-B on the low altitude transitions sortie (MECH-1434).
   c. The altitude dictated by BASH conditions
   d. IP comfort level

2. Ingress airspeed will be 450 KGS.

3. Plan a low altitude 20 deg pop attack to a 10 degree dive delivery.

4. Weapons
   a. MK-76, simulating a MK-82 / BSU-86LD / FMU-139 (5.5) / thermally protected / blunt nose
   b. Calculate PUC by using altitude loss in the dive for the longest stick length in your reactive weaponeering matrix as the worst case scenario.
   c. Reactive Weaponeering per Air NTTP for hard / med / soft, unitary and area targets. You will be dropping singles during the flight simulating the reactive weaponeering.

Contracts:

1. Target area mechanics will be performed at VMAT-203 using the contracts / assumptions from Air NTTP 7.3.1.7.6, with the following additions:
   a. Shooter and Cover will be co-altitude on the ingress, with cover responsible for de-confliction
   b. Shooter will call “OFF” once he is tally and at his egress altitude.

2. The “OFF” call is still required for the role swap to occur.

Execution:

1. Executing the low altitude split attack is a combination of the medium altitude same split attack and the low altitude pop attack. The attack geometry works exactly the
same low as it does high, the track across the ground should be no different. The overlays should look the same with the exception of the ACD. The big difference is that each aircraft will be conducting a pop attack to the attack cone.

2. IP inbound, the flight should be in low altitude defensive combat spread (co-altitude), 450 KGS, with LAT and MWSS checks complete. At 8 NM, wing performs his action in the opposite direction of the attack. This action will require a slight climb to ensure de-confliction with Lead. When rolled out on a heading perpendicular to the attack, wing begins his timing and starts a descent back to the ingress altitude using small descent rules. Because the ingress airspeeds are faster on the low altitude attacks, it will not require the full 20 seconds to achieve the desired separation. After about 12-15 seconds outbound, begin your full power 4 G turn inbound. It may be necessary to reduce power to maintain airspeed once in the turn. Out of the turn the target should be off the nose. At this point, follow your low altitude pop procedures. Prior to tipping in, the role swap needs to occur with shooters “OFF” call.

3. Off target, Lead will recover at the ingress altitude and the PUI will perform a 20° straight oblique jink and recovery at ingress altitude +500’ until both the Lead and the student are visual. The off target plan should also incorporate the use of terrain to provide cover from threats. The off target plan must be briefed in detail and thoroughly understood by all aircrew.

Products:

1. Z diagrams for a low altitude 20 deg pop to a 10 deg delivery
2. Reference Air NTTP Figure, Medium-Altitude Split Attack, for overlay

Common Errors:

1. Wingman executing poor timing / delay maneuver.
2. Poor turn technique.
3. Wingman initiating “action” in wrong direction.
4. Poor cockpit task management.
5. Improper communications.
6. Not adhering to restricted run-in heading or zone.
7. Poor weapons delivery parameters.
8. Target fixation.
9. Not adhering to contract geometric de-confliction off target.
10. Poor expendable use.

Corrections for Errors:

1. Wingman will take action as briefed / directed by Lead. After rolling out time the appropriate wings level portion of the delay using the clock in the HUD. Desired separation for low altitude attacks is 30-45 sec.
2. Execute proper low altitude turn techniques. There is no mission cross check time in a turn. Adhere to LAT ROC.
3. Ensure turn in proper action is taken. Remember that the wingman goes opposite the direction of the briefed flow (ex: split left – wingman action taken to the right).
4. Properly prioritize cockpit task management per LAT training.
5. Study contracts and visualize / talk through required calls prior to sortie.
6. After separation maneuver, focus on solid pop-up parameters, leading to good start parameters, followed by solid BCWD procedures. Remember that proper TPA is the cornerstone of reticle sight bombing techniques.
7. Use the course line function on the AMPCD to depict the restricted run-in heading or zone. Ensure your aircraft remains on the correct side of the course line.
8. Do not fixate on the target.
9. Pay special attention to briefed contract de-confliction plan off target. Off target de-confliction will be achieved via altitude contracts. Do not descend below briefed de-confliction altitude until cleared by Lead.
10. Execute briefed expendable plan.

**Source Documents:** Air NTTP
Close Air Support Stage

Name: Plan a CAS Mission

Purpose: To thoroughly prepare for close air support missions. Consideration will be given to threat counter-tactics, weather, terrain, and ordnance delivery. CAS planning will be conducted in the CAS planning labs under IP supervision.

Description of Procedures:

1. During your planning lab you will be given a handout that will include an ATO, SPINS, and general description of the flight requirements.
2. Review the stage readings to include JP 3-09.3, NATIP, Air NTTP.
3. Planning should be executed in a logical and sequential manner to ensure that all planning factors are adequately addressed. The Joint Publication for the Application of Firepower (JFIRE) contains a standardized mission planning checklist. Utilize this checklist during your CAS planning lab to ensure thorough preparation.
4. Specific considerations for CAS planning at 203 include the following:
   a. UTM datum. WGS-84 is the JPUB standard and should be utilized for both Yuma and Cherry Point execution.
   b. Your target area study should be extremely thorough. Utilize JMPS and 1: 50,000 maps to develop an intimate familiarity with the target area. The likely target area should be plotted on a map along with all pertinent FSCMs in order to allow for discussion during the brief. Tactical size targets are difficult to see, familiarity with the big picture will allow for expeditious funneling of available sensors and a higher probability of target acquisition. Additionally, geographic references that are associated with control measures should be identified and discussed to aid in de-confliction. When PGMs are going to be utilized, be sure to plot laser to target lines, LARs and anticipated ballistic release points to ensure compliance with range restrictions and other FSCMs. This will aid in the development of a gameplan prior to execution. Additionally, be familiar with the mean target area elevation so that you understand how your Z-diagram will apply to varying target elevations.
   c. The CP / IP architecture should be included in the JMPS mission plan in its entirety. Utilize both overlay 1 and 2 so that all information is visible to the aircrew.
   d. Include the effects of weather from the very beginning stages of your planning. Z-diagrams should account for weather contingencies and additionally target acquisition affects of various conditions should be discussed. Winds will have a definite impact on the effectiveness of the mark and should be considered both in planning and execution.
e. Detailed weaponeering is key to success. As mentioned, have redundant z-diagrams but more importantly, know them cold to include the PUC and LAW and how the target elevation will affect them. Dudded ordnance is not a mission success.

Common Errors:

1. Insufficient chart, imagery, and doctrine study.
2. Insufficient attention to environmental conditions in planning (sun, moon, winds, clouds, etc).
3. Inadequate Threat Counter-tactics game-plan.
4. Improper reactive weaponeering plan.
5. Not understanding HUD Mil relationship for FAC corrections.
6. No overlays of standard attacks.
7. Not understanding how to properly input data into aircraft systems.

Corrections for Errors and Amplifying Procedures:

1. Start planning with the target and target area in mind. Prepare charts per Air NTTP. Maximize chart and imagery study before and during the brief.
2. Take environmental conditions into account in planning. Know environmental effects on adaptive roll-in technique and target acquisition.
3. Ensure all aspects of the plan include considerations for the threat.
4. Weaponeering should be based on reactive weaponeering, not deliberate plan.
5. Correlate FAC corrections to HUD symbology (HUD symbology mil size from NATIP) Utilize pre-flight preparation of imagery and target attack overlays to visualize corrections from various final attack headings.

Source Documents: JP 3-09.3, NATIP, Air NTTP, DPA Courseware
Name: Combat Holding

Purpose: To hold in elements from section up to division at an assigned airspace control point in a manner to balance tactical requirements with fuel efficiency. Consideration should be given to sensor management.

Description of Procedures:

1. Review the reference Air NTTP
2. Day section holding formation is either defensive combat spread or fighter wing. Flight Leads will provide a detailed brief on holding procedures during the execution phase of the specific sortie brief. At 203, fighter wing is commonly used due to the fact that it lowers the work load while managing cockpit tasks and maintaining formation.
3. Holding airspeed should be 300 KCAS simulating a low threat environment under 20,000 ft. Another technique that may be briefed is holding at a particular fuel flow. This will vary based on aircraft gross weight, holding altitude and ordnance loadout. If CAS is briefed for holding, consideration should be given to calculating the 300 KCAS to TAS conversion at a particular holding altitude as you will be holding in the A/G master mode.
4. Racetrack holding pattern perpendicular to the threat / target area is often utilized at VMAT-203 in order to optimize the opportunity to look into the target area and build situational awareness. Remember, the holding formation and location must be in compliance with assigned instructions, pertinent coordinating measures and range restrictions.
5. Ensure that you comply with briefed responsibilities while in holding. Do not fixate on position keeping and task management. The flight Lead is responsible for comm. External to the section, managing navigation and attack timing control. Dash 2 is responsible for lookout and de-confliction. Build this into your task management timing control so that you complete the CAS syllabus with not only solid system management and CAS procedures, but a solid foundation as a wingman.
6. Take the opportunity to quickly set your cockpit for receipt of the 9-line immediately after you are established in holding. Ensure that your CAS page is ready for data input and that your Tacadmin checks are otherwise complete. Notify your flight Lead as soon as you are ready and able to receive a 9-line.

Common Errors:

1. Not orienting the formation to maximize available sensors.
2. Poor basic air work in holding (airspeed, altitude and position keeping).
3. Holding in incorrect master mode.

 Corrections for Errors and Amplifying Procedures:

1. Ensure a detailed holding plan is briefed referencing CP / IP architecture per the SPINS. Formulate a gameplan to request from the air officer or FAC if the holding...
instructions do not optimize available sensors. Be sure to account for identified threat envelopes and applicable FSCMs that may be in effect. Make every effort to reference available imagery while in the holding stack in order to build SA and correlate target location with information the FAC is providing prior to beginning your weapons employment timeline.

2. Poor basic airwork can be mitigated through an active mission crosscheck scan. Flight Leads will brief holding parameters. (Alt, formation, airspeed, etc.) Utilize these parameters as a baseline when correcting for position errors. Accomplish required mission tasks in small increments, crosschecking aerodynamic and vector control as you would while operating at low altitude. AFC is an effective tool to utilize to minimize the workload during this process.

3. Selecting air-to-ground master mode is considered part of the “fencing in” process. Understand that once you are established in holding you may be called upon to deliver ordnance in a very short period of time. Strive to develop disciplined habit patterns so that prior to being established in holding, all of your administrative and tactical checklists are completed.

Source Documents: Air NTTP
Name: Close Air Support Threat Considerations

Purpose: To avoid or counter surface-to-air threats.

Description of Procedures:

1. Review the MAWTS ASP reference lecture; Air NTTP.
2. Threat counter tactics for every enemy weapon system defined on a particular sortie within the FSG will be briefed thoroughly.

Common Errors:

1. Not using established TACAIR / AV-8B surface-to-air counter-tactics.
2. Not including threat reaction fuel in planning.
3. Not planning for flight de-confliction during threat reaction.
4. Poor threat reaction Comm.

Corrections for Errors and Amplifying Procedures:

1. Adhere to counter-tactics planning considerations, timelines, maneuvers and de-confliction gameplans introduced in TCT stage. The brief is where the TCT gameplan is delineated. Identify key decision points based on the SPINS and known threats and memorize how you will respond to any contingencies at these various points in the weapons employment timeline that starts as you depart the IP.
2. Utilize Air NTTP to formulate a fuel plan. Per the Air NTTP, Tiger fuel should account for two minutes of sustained maneuvering at max fuel flow to support threat counter tactics in order to “fight into a target area, kill it, and disengage.” This should be in addition to JMPS derived fuel to proceed from the holding stack, through the IP, to the target area and egress to the ECP at anticipated operating speeds.
3. Care must be taken to ensure energy is not needlessly depleted to the point that the aircraft is unable to effectively react to employed threat. Continually reference IMN to ensure that maneuvering energy remains on the aircraft. Though not executed at the FRS, consideration must be given to jettison criteria during threat reaction. Reference Air NTTP for some rules of thumb.
4. Utilize Multi-service Air-Air, Air-Surface, Surface-Air Brevity Codes (ALSA) comm. when reacting to threats. Chair-fly various

Name: CAS Check in Brief

Purpose: To exchange vital information between pilot and terminal controller.

Description of Procedures:

1. CAS check in brief is per Air NTTP and JCAS-3-09.3.
2. CAS check in communication flow will simulate check in with the direct air support center (DASC) and then a push to a tactical air direction (TAD) frequency. Aircraft checking in with the DASC will report, “UP AS FRAGGED.” Once the DASC passes the section to the TAD frequency the flight Lead will give the “CMNPOP” close air support check-in brief to the forward air controller (FAC).
3. C – Callsign
4. M - Mission number
5. N – Number and type of Aircraft
6. P – Position and altitude
7. O – Ordnance (include weapon laser code)
8. P – Playtime (time on station)
9. Abort code – At VMAT-203 we will always just say “ABORT” instead of Comm brevity.

Common Errors:

1. Not giving timely information in proper format. The format is “CMNPOP.” Callsign, mission number, number of aircraft, position, ordnance and playtime- meaning time on station. What is not part of this memory aid but must also be included is the abort code as well as any remarks and/or special equipment / capabilities that the aircraft / aircrew possess. Examples of details in the remarks could be the fact that a targeting pod is being carried, LGB laser code or that the aircrew is a FAC (A). More detailed examples can be found in the JCAS pub.

Corrections for Errors and Amplifying Procedures:

1. As a governing document for one of our primary missions, the JP 3-09.3 must be read and thoroughly understood by all aircrew. In particular, the chapter on execution.
2. Follow the CMNPOP template with all FACs. Understand that the FAC you are checking in with in the real world may be operating in an austere location with little or no access to the ATO. Do not simply tell him that you are checking in “AS FRAGGED” as he may not know what the ATO called for, and more importantly may only have a small period of time to make an appropriate weapon to target match based on the threat or even collateral damage considerations. They will be using the specific info that you provide them at check in to formulate their gameplan for target prosecution and there is little time to be wasted asking questions for clarification.

Source Documents: JP 3-09.3, Air NTTP
Name: CAS Brief (9-line Format)

Purpose: To copy a CAS brief and set up aircraft systems to arrive on time via planned routing with desired weapon program.

Description of Procedures:

1. Review JP 3-09.3, NATIP,
2. JCAS 9-line format:
   i. IP
   ii. Heading (degrees magnetic from the IP to the target
   iii. Distance (NM and tenths of nautical miles from IP to target)
   iv. Target elevation (Feet MSL)
   v. Target description
   vi. Target location
   vii. Mark
   viii. Friendly location (Cardinal direction and distance in meters given)
   ix. Egress instructions

*JP 3-09.3 requires that all readbacks of information from line 4 and 6 must come directly from the system. This is to mitigate potential errors that may be a result of data input.

Common Errors:

1. Incorrect systems set-up prior to copying CAS brief.
2. Copying CAS brief incorrectly.
3. Not using proper waypoint DATUM.
4. Incorrect data entry into system.
5. Not cross-referencing lines 2 and 3 of the 9-line brief against the system defined bearing and distance to the target.
6. Not executing JP 3-09.3 read-back requirements directly from the system. (CAS page)
7. Poor holding while copying and processing CAS brief.
8. Not applying reactive weaponeering matrix.
9. No target attack audible.
10. Not soliciting "Amplifying Remarks" from the FAC.

 Corrections for Errors and Amplifying Procedures:

1. Reference the Air NTTP for appropriate aircraft systems set-up.
2. Carefully enter the 9-line information directly into the CAS page or copy the 9-line to a kneeboard card. Strive to be able to enter information directly into the system-apply lessons learned from in-ability to do so to subsequent sorties.
3. Ensure you are operating in the same datum as the FAC upon check-in. WGS-84 is the JPB standard. Ensure mission planning is done in accordance with this standard.
4. Carefully cross check information you enter against information the FAC provided. Often the FAC derives 9-line information on a 1:50,000 MAP or from a digital system under austere conditions. Recognize that there may be minor differences based on the fact that he is using tools he has available and the precision may not be equal to that of the CAS page.
5. **JP 3-09.3 requires that all readbacks of information from line 4 and 6 must come directly from the system. This is to mitigate potential errors that may be a result of data input.**
6. Further cross check information inter-flight via the “ALPHA” check as described in the Air NTTP.
7. Plot target coordinates on 1:50,000 chart and perform correlation between what the data page is showing, the map indicates and the FAC description.
8. Practice disciplined holding to enable yourself and your wingman to maximize the ability to complete mission critical cockpit tasking. Be on briefed heading, at briefed airspeed and perform correct turns.
9. Apply weaponeering matrix to briefed target sets and audible the planned target attack.
10. After complete with data entry query the FAC for “amplifying remarks” in order to continue to build target SA.

**Source Documents:** JP 3-09.3, NATIP, Air NTTP
Name: Attack Preparation Checklist (MASAWPT)

Purpose: To ensure all flight members have plotted correct target location, apply correct reactive weaponeering, timing, and that the target location has been correlated through all available information.

Description of Procedures:

1. Review the reference lesson; Air NTTP
2. Air NTTP attack preparation checklist:
   a. Alpha check
   b. Systems check
   c. Attack and weapons audible
   d. Push time
   e. Target plot

Common Errors:

1. Incorrect data entry into system.
2. Not applying reactive weaponeering matrix.
3. Not plotting target on 1:50,000 chart and comparing to DATA page or TAMMAC as available.

Corrections for Errors and Amplifying Procedures:

1. Carefully enter the 9-line information directly into the CAS page
2. Apply weaponeering matrix to briefed target sets and audible the planned target attack. Program an initial systems setup as part of CWAIVER checks based on flight Lead guidance or pre-flight intel assessment. The flight Lead will modify the reactive weaponeering or PGM profile as necessary based on the FAC request, destruction criteria, collateral damage estimate or available ordnance.
3. Plot target coordinates on 1:50,000 chart and perform quick chart study in the cockpit. Compare this location to the target location depicted on the data page after use is boxed, as well as TAMMAC if available. The goal is to correlate the target location with amplifying information provided by FAC. This will increase the probability of visually acquiring the target for conventional weapons delivery.

Source Documents: JP 3-09.3, NATIP, Air NTTP
Name: CAS Communications

Purpose: To clearly transfer information between an aircraft and a terminal controller to coordinate target attacks and provide additional situational awareness as available.

Description of Procedures:

1. Review JP 3-09.3, Air NTTP; MCRP 3-25B Multi-service Air-Air, Air-Surface; Surface-Air Brevity Codes (ALSA).
2. The term “TALLY” signifies that you have the specific target in sight. Conversely, the term “NO JOY” indicates that you do not see the specified target.
3. The term “VISUAL” signifies that the friendly forces are in sight. “BLIND” indicates that they are not.
4. The term “CONTACT” will be used to convey that you see a specified reference point.
5. A singular “MARS XX IN FROM THE (cardinal direction)” at roll-in.

Common Errors:

1. Incorrectly interchanging “TALLY / NO JOY” and “VISUAL / BLIND” calls.
2. Using the term “TALLY” for a reference point.
3. Not using sub-cardinal directions with “IN” call.
4. Descriptive COMM after “IN” call.
5. Making “OFF” calls prior to meeting briefed criteria.

Corrections for Errors and Amplifying Procedures:

1. Use the terms “TALLY” and “NO JOY” for the target “VISUAL” and “BLIND” to reference friendly forces. Criteria for each of these are delineated in the Air NTTP. If there is any confusion clarify the terms in the brief with your flight Lead. Incorrect language used during the flight can detract from everyone’s situational awareness and potentially result in an abort be directed from the FAC. It is imperative that accurate terminology be used.
2. Use the term “CONTACT” for reference points that are utilized by the FAC during the target area talk on or as part of any amplifying information that they pass. If you are referencing the point on imagery be sure to indicate that to the FAC and strive to visually acquire the reference point as soon as able.
3. Make “IN” call with direction, based on sub-cardinal headings, just prior to initiating roll-in. Utilize preflight study of standard target area attacks to have an idea of what cardinal heading you may be rolling in from based on CP / IP architecture or preplanned 9-lines. In the aircraft, utilize the “centered” function of the EHSD to reference a direction just prior to roll in. An accurate “IN CALL” can be the difference between getting approval for weapons release and being told to abort during CAS under type 1 control. The FAC has a very short period of time to visually acquire your aircraft so it is imperative you are accurate with your in call.
4. Once you have rolled in and your nose is pointed at the target area, await further instructions from the terminal controller (i.e. "CLEARED HOT" or "ABORT"). Make a single "IN CALL" and wait for weapons release approval or the abort directive. Subsequent calls may step on the FAC speaking.

**Source Documents:**
- JP 3-09.3, NATIP, Air NTTP,
- MCRP 3-25B Multi-service Air-Air, Air-Surface,
- Surface-Air Brevity Codes (ALSA)
Name: CAS Systems Management

Purpose: To set up aircraft systems for CAS data entry, and facilitate navigation, target acquisition and weapons delivery.

Description of Procedures:

1. Review the reference lecture; NATIP; Air NTTP
2. 9-line data entry and specific considerations are as follows:
   a. Ensure that your CAS page is called up. Save any 9-line information that is displayed if it is not going to be utilized. Be sure that you verify that the asterisk is adjacent to line 1. The up or down arrow can be utilized to change the location of the cursor. “UP” or “DOWN”, when displayed are utilized to alter specific information on the line adjacent to the asterisk.
      i. **IP**. This is the IP that you will be routed through on your way to the target. The MC cannot accept text entry into this line so you must select the appropriate waypoint from your mission plan based on its corresponding number. Once you have selected the correct waypoint and hit “enter”, the selected waypoint name will be displayed next to line 1. Waypoint names must be entered into the MC via the DSU or AMU during the mission planning process.
      ii. **Heading**. There are two fields displayed for data entry on this line. The first is the magnetic direction from the IP to the target. The second is the MC calculated bearing. These two fields should be roughly similar. Additionally, if an offset has been identified by the FAC, you can enter a direction via the ODU, either left or right. Note that this must be done prior to entering the numerical value of the heading on the UFC.
      iii. **Distance**. Again, two fields are displayed on this line. The first is the FAC provided distance in NM and tenths of NM provided by the FAC. This is the number you enter via the UFC. The second data field contains the MC computed distance from the IP to the TGT. Again, these should be roughly similar.
      iv. **Elevation**. Utilize the UFC to enter the target elevation provided by the FAC. This standard is Mean Sea Level. (MSL)
      v. **Description**. This line allows for a text entry of the target description. Additionally, the “UP” and “DOWN” arrows allow the pilot to scroll through a series of target descriptions loaded in the mission computer.
      vi. **Location**. Enter the UTM coordinate provided by the FAC. This line accepts up to 10 digit coordinates. Be sure to ensure that you are using the correct 1:100,000 grid zone identifier. The ODU will be energized with options that are available from the mission computer. If you desire to enter LAT / LONG, utilize the “UP” and “DOWN” arrows to change the format for data entry. Additionally, if desired you can select POI via the “UP” and “DOWN” arrows to transfer a previously stored waypoint, mark point, target point of MTC from the LPOD. At VMAT-203 you will enter a 6 to 10 digit UTM as the target location.
vii. **Mark.** This line allows for entry of the mark type.

viii. **Friendly location.** You can enter friendly location in relation to the target by utilizing the sub-cardinal capability of the UFC (North being the #1 etc) and a distance in hundreds of meters. Data entered in this line will be geographically displayed in the HUD via the “rake” and should be referenced during the attack.

ix. **Egress.** This line allows for egress data entry. Similar to line 1, the CP that is to be utilized for egress must be identified via its waypoint number as stored in the mission computer.

b. Line 14 allows for entry of the TOT as requested by the FAC / JTAC. Enter this information via the UFC. An accurate time HACK should be conducted in the brief and validated by referencing GPS time in the aircraft. GPS time is assumed and an inability to operate this way must be identified to the FAC / JTAC.

3. Once data entry is complete, select the “USE” option via pushbutton. The ODU will be energized with TGT, ensure that you are entering zero which will command the target to be an offset of the selected IP.

**Common Errors:**

1. Failure to select A/G master mode after data entry, thus referencing CAS vice TAS for airspeed.
2. Performing “ALPHA CHECK” to IP, vice the target.
3. Poor cockpit management to include card set up, map and waypoint availability.
4. Incorrect DATUM for IP and thus target.
5. Failure to plot target on 1:50,000 chart.
6. Performing “System Speed” checks with IP designated.
7. Poor formation work while performing cockpit tasks.
8. Failure to use sensors for target acquisition.
9. Blindly following command speed time.

**Corrections for Errors and Amplifying Procedures:**

1. A/G master mode selection should be completed as part of the Tacadmin checks while entering the target area.
2. Ensure waypoint offset is selected (target) for “ALPHA CHECK” vice the waypoint (IP).
3. Cockpit setup should be IAW Air NTTP. Flight Leads will brief deviations from the standard. Ensure that your cockpit is ready to receive data input as soon as you are established in assigned holding. When the CAS page is selected, ensure you know exactly where the asterisk is prior to data entry.
4. Ensure all waypoints are programmed into the DSU in the briefed DATUM. Per the JPub, WGS-84 is the standard datum and should be planned for unless otherwise identified in the SPINs or on a JTAR from the FAC.
5. After systems checks, plot target on 1:50,000 chart.
6. Save all CAS missions using the “SAVE” option on the CAS page.
7. Ensure appropriate ingress routing is selected and that no waypoints are designated for “System Speed” check.
8. Use waypoint designation, ARBS, FLIR and other available sensors to aid in target acquisition. Do not forget that your eyes are an available sensor. Strive to look into the target area as soon as you are able. Realistically, this habit pattern is essential to acquire the target area, and provide the mutual support that you are obligated to, per the section contracts in the Air NTTP.
9. Crosscheck command speed time against real time and distance to go.

Source Documents: JP 3-09.3, NATIP, Air NTTP
CLOSE AIR SUPPORT BRIEFING FORM (9-LINE)

Do not transmit line numbers. Units of measure are standard unless otherwise specified. Lines 4, 6 and any restrictions are mandatory read-back items. JTAC may request read-back of additional items as required.

“JTAC: ______________, this is ______________ (aircraft call sign) (JTAC)

Type ______________ Control ______________”

(1, 2, or 3)

1. IP/BP: “________________________________________” (IP/BP to target)

2. Heading: “________________________ Offset: L/R __________________________”

3. Distance: “________________________” (IP-to-target in nautical miles/BP-to-target in meters)

4. Target elevation: “________________________” (in feet MSL)

5. Target description: “________________________”

6. Target location: “________________________” (latitude/longitude or grid coordinates or offsets or visual)

7. Type mark: “________________________” Code: “________________________” (WP, laser, IR) (actual code)

8. Location of friendlies: “________________________”

(from target, cardinal directions and distance in meters)

Position marked by: “________________________”


(cardinal direction and/or control point)

Remarks (As appropriate): “________________________”

Laser to target line: “___________(degrees)”

Time on Target (TOT): “________________________”

Time-to-Target (TTT): “Stand by_________ Plus_________, Hack.”

(Minutes)_________(Seconds)________
Name: CAS Ingress

Purpose: To push at the proper time, ingress to the target per routing instructions, and deliver ordnance on-time-on-target.

Description of Procedures:

1. Review the reference lecture; Air NTTP
2. After the completion of data entry and the exchange of amplifying information with the FAC / JTAC, the section will at the prescribed time, begin its weapons employment timeline by flowing through the IP and proceeding toward the target area.
3. During this time, it is imperative that all aircrew have completed all actions necessary prior to the IP: MWSS checks
   a. Verify master arm on, and TPOD armed if applicable
   b. Verify weapons selected and programmed
   c. Systems
      i. System designation verified
      ii. H/VPE error checked
      iii. Map scale / mode selected
   d. Sensors
      i. HAT source selected
      ii. Sensor selected (TPOD or other as available)
4. While flowing through the IP it is necessary for the section to transition to the appropriate formation to support the attack profile delineated in the attack and weapons audible. If holding in fighter wing, be sure to transition to DCS prior to the action point so that the geometry is correct to facilitate desired separation. At this point in the weapons employment timeline, the roles of the aircraft are IAW the standard target area attack templates, the shooter is focused on target acquisition and the cover aircraft is responsible for de-confliction and mutual support. Anticipate that the speed of the section will increase the briefed ingress speed to comply with the TOT as requested by the FAC
5. All aircrew need to maneuver their aircraft to the parameters specified on the Z-diagram in order to ensure that you are in a position to release accurate, fuzed ordnance on the target on your first pass. Utilize mission crosscheck time to ensure that you are managing critical tasks, but not disregarding the requirement to maneuver the aircraft to a successful start on the attack cone or a position where a safe, effective adaptive roll in can be initiated.

Common Errors:

1. Leaving holding late, resulting in a late arrival in the target area.
2. Leaving holding early, resulting in a slow ingress or an early arrival in the target area.
3. Poor airspeed control on ingress.
4. Making large airspeed corrections in reaction to large CST fluctuations inside 12 miles.
5. Not following briefed routing.
6. Failure to conduct appropriate actions at the IP.
7. Failure to achieve good start parameters.

**Corrections for Errors and Amplifying Procedures:**

1. Ensure A/G master mode is selected as part of Tacadmin checks conducted while entering holding.
2. Use CS/T function and back it up with simple math (420 KGS = 7 miles per minute) to forecast push time. Reference Air NTTP for CS/T that will result in correct ingress airspeeds.
3. If you do begin your ingress early, correct by making a pump maneuver to allow the required ingress airspeed to increase prior to continuing. Do not fly a slower ingress to account for poor timing. This will ensure that you maintain airspeed necessary for threat reaction if required.
4. Scan airspeed and CS/T required airspeed on ingress. Once inside 12 NM to target, ensure referencing “time-to-go” to target, vice CS/T.
5. Adhere to briefed routing. This is imperative to ensure de-confliction with active gun target lines or other aircraft operating in the target area. Any deviations to routing must be cleared with the FAC or air officer to ensure they can be conducted safely IAW applicable FSCMs.

**Source Documents:** JP 3-09.3, NATIP, Air NTTP
Name: Type 1 Control

Purpose: Execute Air NTTP standard attacks (same side or split) in support of (ISO) FAC or FAC (A) from medium or low alt, IAW JCAS Type I requirements.

Description of Procedures:

1. Review JP 3-09.3, Air NTTP;
2. Type 1 control is defined in the JCAS pub as follows:
   a. “Type 1 control is used when the JTAC must visually acquire the attacking aircraft and the target for each attack. Analysis of attacking aircraft geometry is required to reduce the risk of the attack affecting friendly forces.

Common Errors:

1. Improper separation maneuver.
2. Poor BCWD
3. Dropping without “CLEARED HOT” call.
4. Improper corrections from mark.

Corrections for Errors and Amplifying Procedures:

1. Adhere to timing per Air NTTP.
2. Ensure pre-briefed start parameters are achieved prior to roll in. Proper BCWD is essential to first pass success as it optimizes the chances of accurate, fused ordnance being delivered on target. Re-attacks increase the chances of surface to air fires targeting the aircraft and should be avoided unless absolutely necessary. Most importantly, a “CLEARED HOT” call is required for weapons release. Chair-fly your BCWD so that it is second nature. At roll in, you need to be focused on visually acquiring the target and communicating. BCWD needs to be second nature at this point.
3. Do not touch bomb pickle button until “CLEARED HOT” call is broadcast.
4. Ensure orientation with cardinal direction prior to applying corrections. Utilize the SKYVIEW function of JMPS prior to flight to see the target area from the perspective of both roll in and check point altitudes from different azimuths. Know what the cardinal headings are from these different perspectives so that appropriate corrections can be applied if required.

Source Documents: JP 3-09.3, NATIP, Air NTTP
Name: Type 2 Control

Purpose: Employ ordnance ISO FAC or FAC (A) IAW JCAS Type II requirements.

Description of Procedures:

1. Review JP 3-09.3, Air NTTP;
2. Type 2 control is defined in the JCAS pub as follows:
   Type 2 control is used when the JTAC requires control of individual attacks and any or all of the following conditions exist.
   a. JTAC is unable to visually acquire the attacking aircraft at weapons release.
   b. JTAC is unable to visually acquire the target.
   c. The attacking aircraft is unable to acquire the mark / target prior to weapons release.

Common Errors:

1. Flying improper airspeeds / altitude for ballistic release point.
2. Dropping without a “CAPTURED” call from designating platform or the appropriate ground controller.
3. Dropping without a “CLEARED HOT” call.

Corrections for Errors and Amplifying Procedures:

1. Ensure pre-briefed parameters are flown all the way to weapon release. Preflight preparation should include building a detailed familiarity with the BRP, LAR and EOTDA products. Review the Air NTTP and applicable PGM in-flight guides to be familiar with various employment rules of thumb in the event that conditions require a deviation from planned attack geometry.
2. For GBU deliveries, ensure “CAPTURED” call is broadcast prior to weapons release if necessary. If utilizing a ground based laser, ensure that the ground controller knows time of fall for the weapon. This allows him to economically employ his laser while ensuring adequate opportunity for the weapon to acquire the laser energy and accurately guide to the intended target.
3. Do not touch bomb pickle button until “CLEARED HOT” call is broadcast. Often times a FAC will request an “IN WITH HEADING CALL.” As a measure to ensure compliance with assigned restrictions. Remember, despite the range from the target that weapons employment timelines for PGMs occur, it means nothing without a release authorization from the FAC. Allow adequate time between your call and ballistic release point for the FAC to communicate with you.

Source Documents: JP 3-09.3, Air NTTP
Name: Mission Reporting

Purpose: To report mission results to the command and control structure for tactical decision making.

Description of Procedures:

1. Procedures are in accordance with JP 3-09.3, and Air NTTP.
2. The template from joint publications is as follows:

![Inflight Report Template]

3. Communications throughout the battle space is of utmost importance to the commander as well as to other aircraft and ground troops fighting the battle. It is important to report as quickly and accurately as possible type, location, number, disposition, perceived intent and BDA of targets detected and/or prosecuted in any mission. This usually happens in the “Return to Force” (RTF) phase of flight. INFLTREP format is the preferred means of mission reporting. More precise mission reporting will be conducted after landing. INFLTREP format is in your Brief 4 slot.

Common Errors:

1. Not doing mission report.
2. Giving inaccurate information in INFLTREP.

**Corrections for Errors:**

1. Build habits to provide mission reports during the RTF phase of all OAS sorties both training and actual. Accurate IFREPS are integral to the targeting cycle that contributes to the ATO. If you destroy a target it is essential to let the DASC know so that other assets are not dedicated when not necessary. By the same token, be accurate in your assessments when additional targeting is necessary.
2. Be very careful to give accurate information in the mission report. Be particularly careful passing information using encryption and / or code words.
3. Have a card (loaded in the DSU and on your kneeboard) with the INFLTREP format for quick reference. Practice using INFLTREP format during training.

**Source Documents:** JP 3-09.3, Air NTTP
Air Interdiction Stage

Name: Air Interdiction

Purpose: AI missions are flown against targets whose locations are known in advance and usually involve the employment of large strike packages against enemy infrastructure such as bases, runways, C3 nodes, bridges, railways, lines of communication, and so forth.

Description of Procedures:

1. AI employment: An AI force, or strike package, varies in size and composition as required to accomplish the commander’s intent. There are two basic employment options to consider when an air threat is expected: force concentration and defense in depth.

   Follow on information is classified and can be found in Air NTTP. Ideally the Air Interdiction will have the following:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEAD</td>
<td>Threat emitters</td>
</tr>
<tr>
<td>Sweepers (Blue Air)</td>
<td>Adversaries (red air)</td>
</tr>
<tr>
<td>AIC / GCI</td>
<td>Surface-to-air threats</td>
</tr>
<tr>
<td>Designation platform</td>
<td></td>
</tr>
<tr>
<td>Tankers</td>
<td></td>
</tr>
</tbody>
</table>

   - You may have all, some, or none of these outside assets available for your strike.
   - Some may be simulated (notional), while others omitted.
   - You will get to drop ordnance on a known target; utilizing an electronic warfare range and TACTS.


   a. Objectives of an AI sortie are:

      i. Locate target
      ii. Deliver fuzed ordnance on target
      iii. Survive the threat

   b. Planning will determine what tactics are needed based on the target, threat and environment.

   c. Planning considerations are:

      i. Collect information: targets, aimpoints, source of coordinates, date, TLE, TOT, Comms, SEAD, ROE, SPINS
      ii. Analyze the mission: What are the damage criteria, surface threats, air threats, radio electronic combat, and weather
      iii. Show stoppers: Threats? Ordnance available? Wx? Diverts?
iv. Build a timeline
v. Formulate a general gameplan
vi. Identify contingencies. Reference Air NTTP
vii. Initiate detailed planning

3. Mission brief: The goal of the brief is to ensure that all strike package members have a clear understanding of mission objectives and overall execution game plan. Following this brief the package members will break into smaller groups for more detailed briefing. Usually these groups are broken up based on platform, mission, and location (Large strike packages typically do not have the entire package co-located).

Considerations during the brief:
a. Air-to-surface time line. The time line essentially conveys how each flight member will identify and attack the target.
b. Target attack templates. Use SOP target attacks in Air NTTP as a reference. Draw the attack blueprint on a 1:50K map. Use scaled sensor footprints and EOTDA to help determine the probability of acquisition. Highlight funneling or limiting features that identify the target area and its surroundings. Brief in sufficient detail to ensure that all flight members can rapidly find their DMPIs if targeting is required. COMMON ERROR: to breeze through this part of the brief when it will possibly have the most effect on the ability to identify the target and execute the attack.
c. Snapshots. Import JMPS snapshots into PowerPoint to provide graphical depictions of the strike package at important points during the mission and build SA as to where every strike asset should be at the depicted times.
d. Push criteria. Carefully plan and clearly brief abort criteria at the marshal stack and decision points.
e. Threat reaction game plan. Reference Air NTTP to construct contingencies. Missions rarely go as planned. Many contingencies are easily anticipated due to their historic rate of occurrence. Fallouts, bent sensors, hung ordnance, ROLEX, are a few examples of what to consider.
f. Ideally this will be an electronic PowerPoint brief built off the example on the JMPS. Secondary – white board brief. The instructor shall conduct the brief to the RP as if he were a combat wingman.

4. Execution. First pass success requires mastery of the basics and disciplined execution to avoid introducing friction into later parts of the mission.

Mission Considerations:
b. Formations. Section, Division

c. Altitude. Threat avoidance, weather, range to target, Comm. reception, fuel requirements.


e. Timing. Is the basic means to coordinate AI missions. GPS time hack for the entire package

f. Communication. With a known strike route, strive to execute the entire route and attack without communication. This allows the package time to listen and process threat information and SA.

g. Routing. Follow the detailed routing that developed in planning and presented in the brief. Keep in mind the other packages in your AOR and near your timeline.

h. Holding / marshaling. Arrive with FELPG-F checks complete. Hold in a racetrack pattern oriented towards the major threat axis in the assigned altitude block. Hold at max conserve if tactically sound. Build SA and listen to AIC and mission common.

i. Ingress. Accelerate early enough to ensure they overfly the push point on time at the briefed ingress speed. Continue to build SA based from mission common.

j. Sensor usage. Map scales, air-to-air radar mode

k. Attack

i. DP. Pilot needs to decide whether or not to transition from an air-to-air mindset to an air-to-surface mindset. Base the distance between DP to target on type of delivery (visual or sensor).

ii. IP. Should be far enough away from the target to allow aircraft the time to assume their final attack formation, altitude, and airspeed. A quick threat assessment should be conducted and fine tune the target solution prior to release. Once IP inbound focus on targeting the correct DMPI and only use SA-enhancing calls that have been briefed or are otherwise required.

l. Egress. Do not loiter in the target area and be wary of presenting hot aspect to follow-on fighters or strikers. There will probably be another section across the same target area in about 2 minutes. And there may be one 2 minutes ahead of you as well. Regain radar air picture and then mutual support.

5. If this seems like a lot of planning, it is. The AI sortie is a culmination of everything you have learned at the FRS and is your opportunity to demonstrate your knowledge and abilities. You are responsible for everything introduced in previous stages. If there was a planning document required in a previous stage, you should utilize it for this sortie as well.
Common Errors:

1. Not providing fuel and timing for routing.
2. Defaulting to a SOP attack instead of deliberate planning.
3. Not planning a threat reaction matrix for SAM and AA threats.
4. Not having a de-confliction plan for threat reaction.
5. Not setting Go / No-Go, reset, abort, and SIMULATED jettison criteria.
6. No sensor timeline or timeline does not match EOTDA.
7. Expendable programming doesn't match expendable plan.
8. No target imagery, and not giving it due attention during the brief.
9. Not ensuring plan is within administrative range restrictions.

Corrections for Errors:

1. AI planning should be a challenging and rewarding evolution. An AI can be as simple as a low level nav route to a target with no threats to a large force exercise to include everything mentioned above.

Source Documents: All previously introduced documents and lessons
Name: **AI-1451 – Graduation Sortie**

**Purpose:** AI mission flown against target whose location is known in advance within a large strike package (simulated) against enemy infrastructure such as bases, runways, C3 nodes, bridges, railways, lines of communication, and so forth.

**Description of Procedures:**

1. IP and RP planning to execute an AI mission. The intent is to execute an AI sortie within a strike package consisting of actual and simulated aircraft. Because this sortie will depend on outside assets there will be leeway for planning and execution. Fixed requirements are stated in the AI-1451 sortie description. Additional support will be coordinated and scheduled by the aircrew. JMPS desktop computers contain a folder with previous AI sorties, contact numbers, PPT briefs for all players, and COMM cards.

**Intent:**

1. It is not the intent of this sortie for the IP and RP to schedule an LFE. However, the effort shall be made to schedule and coordinate external assets. Boundaries set for this flight are:
   a. Target attack – low altitude to a pop and low level egress. BDU-45 or MK-76s if in Yuma will be used for the attack.
   b. Threat reaction – to emitters and/or air threat. MAWER range or 2301W will be used.
   c. External asset – every effort shall be made to have actual aircraft and controlling agencies involved. A minimum or one asset should be coordinated.
   d. Route – low is preferred but a route flown at 4k within the route structure is acceptable if weather drives it higher.
   e. This sortie may be planned with 2 sections from VMAT-203 with separate TOTs.
   f. Brief / debrief – will be conducted by the IP. TACTS range should be used as a debriefing tool.
   g. Planning: At least one week should be given to plan and coordinate this sortie.

**Planning considerations:**

1. See examples on JMPS computers.

**Suggested support:**

1. **Friendly:**
b. SEAD – Prowlers  
c. TANKERS – USAF or USMC  
d. AIC / GCI – MACS 1, AWACS, E-2, E-6

2. **Threat**

   a. Surface threat in the R-5306 / R-2301 with emitters  
   b. Air threat - F-18, AV-8B, F-15, F-16, F-22

**Supporting Activities:**

1. Schedule VR route  
2. TACTS range for support and debrief  
3. Range scheduling to include emitters.
**LFE COMM CARD EXAMPLE:**

**CONSOLIDATED SPINS FOR ALL PLAYERS, BIG PICTURE**

<table>
<thead>
<tr>
<th>PACKAGE C/S:</th>
<th>COMAO 2</th>
<th>DATE: 18-Mar</th>
<th>PACKAGE LEADER:</th>
<th>MARS02</th>
<th>DEPUTY: MARS04</th>
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<td>ROLE</td>
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<th>CODEWORDS</th>
<th>MODE 1</th>
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<td>151A,342,425</td>
<td>ROLEX</td>
<td>TIMEX</td>
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<tr>
<td>PRINCE CROW</td>
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<td>KILL PASS</td>
<td>151A,342,425</td>
<td>WX ABORT</td>
<td>MONZA</td>
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</table>

<table>
<thead>
<tr>
<th>BULLSEYE</th>
<th>BASE</th>
<th>PACKAGE INFO</th>
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<tr>
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<td>9000</td>
<td>TENISO503 300-340</td>
<td>HOLD1: 135WP1 10-20NM</td>
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<tr>
<td>LON: 002º 55’ W</td>
<td>68</td>
<td>TENISO503 300-340</td>
<td>HOLD2: 165WP1 10-20NM</td>
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</tbody>
</table>

**COBRA TRACKING**

- **A/A TCN:** FL180
- **TYPE:** 2XMK-84
- **ROUTE:** 1-2-3-4-5-6
- **AREA TARGET FLOW**

**THREATS (TYPE/RNG/ALT):**

- **FOX3**
- **WPT 5**
- **IP**

**OFF TARGET**

- **MARS 02**
- **CHICO 07**

**NOTES:**

- **WPT NAME:** FL200
- **ALT:** TENISO503
- **BIG PICTURE**

---

**AV-8B FSG Ver. 3.0**

<table>
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<tr>
<th>C/S</th>
<th>N° WPN</th>
<th>DMNP</th>
<th>AREA TARGET FLOW</th>
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<td>2 X 2MK2</td>
<td>FE</td>
<td>TGT TYPE: SP-WJ-001 DMNP01</td>
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<td>MARS 02</td>
<td>2 X 10BU12</td>
<td>FE</td>
<td>RUNWAY</td>
</tr>
</tbody>
</table>

**COMMIT CRITERIA:**

- IAW ROE'S / TENISO3/MARS04

**AA REFUELING**

- **C/S TANKER C/S:**
  - **TYPE:**
  - **FREQ:**

**AA CR/PCT:**

- **AA CR/PCT(1):**
  - **AARCP(1):**
  - **NOTES AAR:**

---

**PAYLOAD**

- **WPT 6**
- **TGT**

---

**AARCP/CT(2)**

- **C/S FREQ:**
  - **30NM HOT AND SPIKED**
  - **SPEED:**

**AARCP/PCT:**

- **AARCP/PCT(3):**
  - **NOTES AAR:**

---

**ADVANCED TACTICAL PILOTING**

- **C/A:** FL180
- **T/A:** 1-2-3-4-5-6

---

**BIG PICTURE**

- **OFF TGT**
- **EGRESS**
  - **MARS 02**
  - **CHICO 07**

---

**COMMIT CRITERIA:**

- IAW ROE'S / TENISO3/MARS04

**AA REFUELING**

- **C/S TANKER C/S:**
  - **TYPE:**
  - **FREQ:**

**AA CR/PCT:**

- **AA CR/PCT(1):**
  - **AARCP(1):**
  - **NOTES AAR:**

---

**ADVANCED TACTICAL PILOTING**

- **C/A:** FL180
- **T/A:** 1-2-3-4-5-6
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Air-to-Air Stage

Name: Flight Preparation and Briefing

Purpose: To define the preparation and briefing requirements for air-to-air training events.

Description of Procedures:

1. Preparation: The FRS syllabus must be efficient because we have very few sorties in which to instruct and enormous amount of knowledge and skills. The only way to compensate for this is to aggressively pursue the relevant “book knowledge.” It is imperative you capitalize on this opportunity.

2. Brief – You should have a Smart Pack with at least the Admin 1, Admin 2 and Admin 3 (SOE) cards. The white board should be set up in accordance with the template for the specific event listed in the stage SPINS.

Common Errors:

1. Not being prepared for syllabus events, including ground school lessons.

 Corrections for Errors:

1. Take advantage of the time available between the stage in-brief and the beginning of the academic ground school. A large portion of the reading is classified so you will not be able to do it at home at night. The ground school schedule is aggressive with full days of classroom academics. If you do not get ahead on the reading list prior to the ground school you will not be able to keep up.

Source Documents: N/A
Name: ACM Training Rules

Purpose: Ensure knowledge of ACM training rules.

Description of Procedures:

1. Reference source documents.
2. Utilize the VMAT-203 ACM Training Rules Briefing Guide, issued during air-to-air ground school, for briefing of the training rules. This briefing guide summarizes the training rules from the various source documents in a briefing format. It should not be used as an all-inclusive source and does not relieve the pilot of studying and being familiar with the training rules listed in the source documents.
3. The following items are included here for clarification and standardization of the application of the ACM training rules at VMAT-203. In all cases, the following guidance is more restrictive than that directed by the source documents.
4. The standard decks for VMAT-203 BFM training will be a 5000 ft AGL hard deck and a 10,000 ft AGL soft deck. When fighting over terrain with elevation the MSL hard and soft decks will be briefed based upon the highest terrain elevation within the engagement area. In-flight the ACTI may audible a change to the standard decks based upon cloud decks, visibility, airspace limitations, etc. The hard deck will always be 5000 ft above a broken or overcast layer. The maximum acceptable hard deck for VMAT-203 BFM training is 12,000 ft MSL.
5. Maneuvering below the soft deck will require greater attention to aircraft parameters and engagement geometry to ensure that an unsafe situation is avoided due to the proximity to the ground level. The following limits apply to maneuvering below the soft deck while performing air-to-air training at VMAT-203 and will be strictly adhered to:
   • AOA will not exceed 20 units.
   • Airspeed will be maintained above 120 KCAS.
   • No TVC will be used.
   • No out of plane nose low guns defense will be executed below the soft deck. A nose high guns defense is allowed as long as all other “below the soft deck” limits are complied with.

Common Errors:

1. Not knowing rules.

Corrections for Errors:

1. No excuse for lack of training rule knowledge. Review rules.

Source Documents: N/A
Name: AIM-9 and LAU-7 Preflight

Purpose: Perform aircraft preflight with CAIM-9 and LAU-7.

Description of Procedures:

1. Aircraft preflight procedures remain the same.

Preflight checks
a. Parent rack with ADU-299 / LAU-7:
   i. Safe / arm lever – SAFE
   ii. Swaybraces adjusted
   iii. Cartridges not installed; breech caps tight
b. LAU-7:
   i. Detent wrench safety pin installed
   ii. Detent hold-down pin installed
c. (MK 36 Mod 8 / 9 / 10 / 11 motor) SAFE / ARM mechanism T handle installed; SAFE position
d. Dome protector installed
e. Umbilical connected to launcher
f. Target detector cover installed
g. AIM-9 hooks connected to missile umbilical block
h. Fin retainers engaged
i. LAU-7 detent and snubbers securely engaging hangers
j. Rolleron covers removed
k. (LAU-7) Aft fairing secured

After landing or ground abort (ground crew)
a. Safing (dearming area before engine shutdown)
   i. Install launcher safety pins
   ii. Install dome protectors
b. Safing (dearming / rearming area after engine shutdown)
   i. Inspect missile exhaust ports; clean, no soot evident
   ii. (MK 36 Mod 8 / 9 / 10 / 11 motor) as applicable, install SAFE / ARM mechanism T-handle and rotate to SAFE

Common Errors:

1. Unsure how to determine which CAIM-9 version.
2. Unsure what to check on preflight.
Corrections for Errors:

1. Ensure the CAIM-9 preflight is demonstrated by an ACTI.
2. Review AIM-9 Lesson and / or ask questions.
3. Allow sufficient time to conduct the additional required preflight for the CAIM-9.

Source Documents:  N/A
Name: In-the-Line Missile Checks

Purpose: Ensure CAIM-9 operational status before flight.

Description of Procedures:

1. PRE-POSITIONING CHECKS are described in the FAM and air-to-surface stages and NATOPS. As part of the CWAIVER checks, the CAIM-9 is checked prior to taxi. This constitutes the “W” in CWAIVER.

2. After final checks, ordnance personnel will approach your aircraft to check the serviceability of your missile. To check the operation of the seeker head we will use the following procedure:
   a. After starting the aircraft, select MENU / STRS and ensure the SMC recognizes a missile on the appropriate station. (This should be done as soon after start-up as possible while complying with NATOPS procedures. If the missile is not being recognized you might have to shut-down for trouble-shooting, so it would be pointless to conduct a majority of your checks prior to determining missile functionality.)
   b. Switch your IR COOL switch to ON (located on the ASCMI).
   c. Select the air-to-air master mode by rocking forward on the air-to-air select switch (BST).
   d. Adjust the missile volume to about the two o’clock position on the rheostat (should be loud enough to be mildly annoying).
   e. While continuing with your post-start checks leave the captive AIM-9 selected (air-to-air master mode) and listen; 5-30 sec after selecting IR COOL the seeker will begin to cool down. This cool-down process is the best way to hear if the missile is working properly. Take note of what the missile sounded like prior to selecting IR COOL. Once the seeker starts to cool, the background noise will dissipate. The background noise will change from a constant growl to a cool hissing sound. Once the background noise starts to change, it will only take a couple of seconds for the seeker to be completely cooled down.
   f. After final checks as the ordnance Marines approach your jet, select the CAIM-9 BST and then show your hands to the ordnance supervisor.
   g. Listen for a distinct growl as the ordnance Marine waves the torch in front of the seeker. After you hear the tone change, give the ordnance supervisor a thumbs-up. Many times the seeker on the CAIM-9 is no longer sensitive enough to see the torch or the torch may not be operating correctly so if after a few waves of the torch you do not hear a growl give the ordnance supervisor a “thumbs up” anyway. The missile may still work in flight versus an actual aircraft. If not, write a MAF against the missile and aircraft after the flight.
Common Errors:

1. Not selecting IR COOL.
2. Not adjusting the sound loud enough to hear missile tone.

Corrections for Errors:

1. Follow the procedures as outlined in the AV-8B NATIP.

Source Documents: N/A
Name: AIM-9M Missile Checks and Range Estimation Drill

Purpose: To determine the status of your CAIM-9(s) and to determine the range of the target based on its size relative to either the seeker head position indicator (SHPI) or the long / short range LCOS sight.

Description of Procedures:

1. Normally, Dash 2 will perform the missile check immediately after take-off prior to join up, en route to the working area. After the take-off, complete NATOPS After Takeoff procedures then lag the Lead aircraft to arrive no greater than 1 NM in trail to perform the check.
2. AIM-9M missile checks: Wingmen ensure master arm – OFF and assume a trail position on their element Leader. Adjust tone level, lock the missile onto the heat source and adjust seeker head position indicator (SHPI). To boresight the missile, select BST on the stores page, slew the SHPI over the heat source with the TDC, and deselect BST. Check all missiles in boresight and SEAM / STR. When complete, continue with range estimation drill.
3. Range estimation drill: Select the AIM-9M Missile in the boresight and SEAM / STR mode; and then assume a 1 mile trail position. Evaluate Lead’s aircraft size based on the SHPI. Maneuver you aircraft to a 0.5-mile trail position and evaluate Lead’s aircraft size based on the SHPI. Next call up the long-range gun sight and evaluate Lead’s aircraft size. Move your aircraft to a position 45° AOT, 0.2-0.1 miles from Lead. Finally position your aircraft in the briefed formation, and prepare for expendable checks.

Common Errors:

1. Not understanding the method to determine ranging.
2. Not understanding the procedures to boresight the AIM-9 or not boresighting all missiles.
3. Not completing NATOPS “After Takeoff” procedures prior to attempting the checks and over-speeding the gear / flaps, etc.

Corrections for Error:

1. Take your time and get your aircraft safely airborne with all of you NATOPS procedures completed before attempting missile / systems checks. There are several minutes of transit time to the operating area in which to complete the missile systems checks.

Source Documents: N/A
Name: Stadiametric Range Estimation

Purpose: Determine the range of the target based on the size of the target relative to either the AIM-9 boresight SHPI or the long / short range gun sight.

Description of Procedures:

1. In the AV-8B Night Attack variant, the ability to recognize a weapon engagement zone (WEZ) or adversary range without a radar lock is dependent upon the pilot’s ability to use stadiametric range estimation.

2. To determine the target’s range utilizing the gun sights, review the “Combat Gunnery” Lesson and the AV-8B NATIP for LCOS long and short range sight size. Determining target range utilizing the Sidewinder is a little more difficult. The SHPI is 28 mils in diameter. Therefore, a Harrier with a wingspan of approximately 30’ would be at 1000’ if it fills the SHPI considering that 1 mil = 1’ at 1000’ range. Furthermore, if the Harrier is approximately one-half the size of the SHPI, the range would be 2000’; one-quarter the size of range is 4000’, etc. Using this method we are able to determine whether or not the target is within the AIM-9 weapons range envelope.

3. The only time the entire wingspan of the target is visible is when you are directly in front of or behind it or when you are abeam the target and it is showing you pure planform. In BFM these instances are rare so often it is more useful to use fuselage apparent size to determine range or a combination of the fuselage and wingspan apparent size. The non-radar visual range estimation table handed out to you during air-to-air ground school (also in the AV-8B TPG) shows the apparent size of a Harrier wingspan and fuselage compared to air-to-air weapon symbology at given ranges. Study this table to gain a sight picture of when an air-to-air target is in range for the selected weapon. The top of the table shows the apparent size of a target when the fuselage or wingspan are visible with no offset and the bottom of the table shows the apparent size with a 45° offset in the look angle.

Common Errors:

1. Not understanding the method to determine ranging.

Corrections for Errors:

1. Review the range estimation table for applicable ranges for the AIM-9 and GAU-12 WEZs.

Source Documents: N/A
Name: Shot Validation

Purpose: To determine whether an air-to-air weapons employment would have a high probability of killing the target aircraft in a training environment.

Description of Procedures:

1. Procedures are in accordance with Air NTTP
2. By having a solid understanding of the aircraft’s air-to-air weapons and systems, the shot validation aspect of air-to-air training is intuitive. In a real air-to-air engagement, the ultimate shot validation is “if the bandit is a flaming fireball in the sky, the shot must have been valid.” Since we are not shooting real weapons at each other in training, a tangible method to determine whether a shot would have been valid and therefore the other aircraft is "dead" must be used.
3. Refer to the secret PowerPoint® lesson on the classified DPA laptop for AV-8B examples.

Common Errors:

1. Not knowing weapons and systems capabilities.
2. Not knowing shot validation rules for air-to-air.
3. Not understanding Stadiametric Range Estimation

Corrections for Errors:

1. Review weapon LARs and shot validation rules

Source Documents: N/A
Name: Kill Criteria

Purpose: To define number of valid air-to-air weapons employments that must be achieved to "kill" an adversary in a training environment.

Description of Procedures:

1. Procedures are in accordance with the TOPGUN Manual.

Common Errors:

1. Not knowing kill criteria.
2. Failing to correctly apply shot validation to determine if kill criteria has been met.

Corrections for Errors:

1. Know your weapons and shot validation requirements.

Source Documents: N/A
Name: Kill Removal

Purpose: To identify to a participating aircraft in an air-to-air training environment that kill criteria has been met.

Description of Procedures:

1. The default kill removal at VMAT-203 will be shooter controlled kill removal (SCKR) as defined in the TOPGUN Manual. For 1v1 sorties the kill call will normally dictate the termination of the set. However, ACTIs may allow the RP to initiate a bug from their kill to evaluate bug mechanics.
2. Missile shots will be called with “MARS-XX, FOX-2” and gunshots with a “TRIGGER DOWN” call. If the Shooter evaluates the shot as valid, call “MARS-XX, KILL HARRIER, LEFT / RIGHT HAND TURN, XX THOUSAND” (if it is the first valid snap-shot of the engagement, just call “SNAP” if the shot was assessed to have been a “hit”). If the shot is not deemed valid, then no follow-on call is required. All defenders will acknowledge “KILL” calls with a “MARS-XX, COPY KILL” response. If the kill call is not acknowledged by the defender, the proper call by the attacker will be “REPEAT KILL, HARRIER LEFT / RIGHT HAND TURN, XX THOUSAND.”
3. Proper fine will be paid for kill calls derived from an invalid shot.

Common Errors:

1. Forgetting to make a kill call after a valid weapons employment and kill criteria met.
2. Forgetting to “time out” a shot prior to making a kill call.

Corrections for Errors:

1. Use the time-of-flight rule of thumb as described in the TOPGUN Manual or Air NTTP for air-to-air weapons employment.
2. Think about what you are going to say before transmitting a kill call.

Source Documents: N/A
Name: Air-to-Air ALE-39/47 Employment

Purpose: To effectively use expendables to preemptively deny air-to-air weapons employment or reactively defeat employed weapons.

Description of Procedures:

1. Threat counter-tactics and ALE-39/47 employment are described in the Air NTTP and TacNotes. PUIs shall simulate and be prepared to brief SEL 5 during all A/A events.
2. Due to NCEA restrictions it is not feasible to carry a full expendable load for air-to-air training at VMAT-203.
3. The P1 training load will be used for air-to-air events.
4. Proper expendable usage will also be determined via the DSP function in the HUD.

Common Errors:

1. Failing to properly setup ALE-39/47.
2. Failing to use expendables appropriately.

Corrections for Errors:

1. After the expendable check select P/P/P on ECM page.
2. Per the P1 program the expendable switch should be selected forward for a preemptive program and inboard for a reactive program.

Source Documents: N/A
Name: Negative G Check

Purpose: To check the pilot's security in the cockpit and the integrity of the cockpit components and the aircraft prior to performing dynamic maneuvering.

Description of Procedures:

1. On all sorties where there is an increased probability of departing the aircraft (i.e. all BFM sorties) a negative G check will be conducted after the standard G-awareness maneuver is performed. Prior to executing the negative G check ensure your lap belts tight, harness locked and cockpit gear stowed and secured.

2. After performing standard Air NTTP / FSG G-awareness maneuver, the ACTI will call for you to conduct your negative G check individually. Initiate the negative G check by pulling the nose up to a 10-20° positive FPA and then roll the aircraft inverted and push forward on the stick to unload the aircraft to approximately negative (-)0.5 G for 2-3 seconds while checking the security of your lap belts, cockpit components, loose gear and for any hidden FOD. The check must be conducted deliberately yet expeditiously to abide by NATOPS limit for less than 1 G and prevent engine problems due to oil starvation.

3. Once the check is complete, roll the aircraft upright and reestablish defensive combat spread. The ACTI will conduct a negative G check individually after the PUI.

Common Errors:

1. Pushing too hard during negative G check.
2. Negative loaded rolls.

Corrections for Errors:

1. When performing forward push on stick you should smoothly unload to 0 G and then ease the stick forward very slightly establish a slight negative G profile. If you snap the stick forward it is quite likely you will “under-G” (-3 G limit) the aircraft.

2. G should be between 0-1G when performing rolls to enter and exit this check.

Source Documents: N/A
Name: Resets and Transitions

Purpose: To define the series of event that must occur after the completion of an engagement to prepare the flight for the next engagement.

Description of Procedures:

1. Resets and transitions will be in accordance with Air NTTP. Starting parameters are defined using the acronym PADS, which stands for Position, Altitude, Distance, and Speed.
2. The default formation between sets at VMAT-203 is defensive combat spread. The ACTI may direct another formation to expedite the setup and flow of the sortie. However, unless otherwise stated, the RP will regain a visual at the end of an engagement, capture 300 kts IAS and then maneuver to combat spread while the ACTI is climbing to setup the next engagement and writing notes. The RP’s primary responsibility after formation-keeping is visual / lookout for the section, since the ACTI is dividing MCT for navigation, notes and lookout.

Common Errors:

1. Not maneuvering expeditiously to establish correct formation.
2. Losing sight.
3. Poor TACFORM.

Corrections for Errors:

1. Once visual is re-established transmit your visual status to the ACTI. Fly your aircraft to DCS or the next position on the SOE while maintaining de-confliction.
2. Flying good TACFORM minimizes time between sets and yields more training. Ensure that you are making corrections to get into the proper formation.

Source Documents: N/A
Name: Conventional and TVC Slow Speed / High AOA Maneuvering

Purpose: To demonstrate Slow Speed / High AOA Maneuvering.

Description of Procedures:

1. The PUI will commence this maneuver at 250 KCAS and 15,000’. When cleared by instructor select full power and pull 10 units AOA to 40° nose-up. Passing 150 KCAS, reset nose attitude to maintain 120 KCAS (approximately 15° nose high). At 120 KCAS the AOA will be approximately 20 to 23 units and aircraft climbing slightly in moderate buffet. The wind vane should be monitored to ensure no sideslip buildup occurs. Coordinated use of aileron and rudder will be required to maintain aircraft control. Initiating turns will require slight reductions in aft stick pressure to prevent excessive AOA excursions. AOA above 25 units without TVC will normally lead to a departure. Rapid AOA excursions can be stopped by momentarily releasing aft stick pressure and reapplying appropriate force (this is known as “pumping the stick”). Perform straight and level flight and turns in both directions (attempt to prevent roll hesitation, roll reversal or auto roll).

2. This maneuver will be repeated to introduce TVC slow flight characteristics. The procedures for entry into the TVC slow speed / high AOA maneuvering will be the same as in conventional flight except that prior to initiation the instructor will direct you to set your power to 100-103% instead of full power for the pull up. Then at 150 KCAS select 20-25° nozzles as you push the nose down to reset 120 KCAS. Notice the lower nose attitude and turn characteristics. Conventionally you were required to use mostly rudder to turn the aircraft, with TVC, ailerons can be used effectively due to RCS.

Common Errors:

1. Not knowing maneuver procedures.
2. Due to VV lag you must lead the target FPA. If you do not lead the VV, you will overshoot 40° and get excessively slow.
3. Allowing sideslip buildup thus leading to departure.
4. Not monitoring AOA / airspeed while maneuvering aircraft.
5. Flying in incorrect HUD master mode.
6. Not coordinating use of aileron and rudder resulting in excessive sideslip and departure.

Corrections for Errors:

1. Review the maneuver procedures.
2. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
3. AOA / airspeed must be incorporated into scan to prevent excessive AOA and departures.
4. Flying in Reject 1 or 2 will not display AOA greater than 20 units.
5. Coordinate use of flight controls to ensure excessive sideslip and departure does not occur. Slow speed flight requires substantially more rudder input to maintain controlled flight.

Source Documents: N/A
Name: Break Turns

Purpose: To develop proper techniques for the execution of a break turn while exploiting the effects of plane-of-motion.

Description of Procedures:

1. The PUI will start the maneuver at corner speed or 0.75 IMN, whichever is lower, and at 20, 15 or 10 thousand feet. This maneuver will be repeated several times with different planes of motion to show the effect of plane-of-motion on instantaneous turn capability and energy sustainment.

2. For the oblique break turns once cleared by the instructor, execute an unloaded roll to set the proper plane-of-motion then smoothly increase back stick pressure to establish a lift limit pull for 180° of turn. Expendables should be utilized at the onset of turn. For the vertical break turns you will use a 10 deg check turn in the vertical. Following the "EXECUTE" call you will check 10 degrees nose up, pull power to idle, unload roll, set the plane-of-motion and smoothly increase back stick pressure to establish a lift limit pull for 180° of turn. Passing through -80 FPA begin adding power to ensure you do not slow below 325 KCAS.

3. Exceeding the lift limit is characterized by wing rock, maneuvering tone or heavy buffet (pitch hesitation). If any of these indications appear then reduce back stick pressure to eliminate the indication. The target AOA for these break turns is 11-14 units from corner speed (below 0.78 IMN) down to 325 KCAS and 15-17 units below 325 KCAS.

4. The plane-of-motion for the 20 thousand foot break turns are:
   a. Vertical low

5. The plane-of-motion for the 15 thousand foot break turns are:
   a. 20° nose high (simulator)
   b. Level (simulator)
   c. 30° nose low

6. The plane-of-motion for the 10 thousand foot break turns are:
   a. 20° nose high (simulator)
   b. Level (simulator)
   c. 30° nose low

7. At the completion of 180° of turn the PUI will unload and roll out while calling airspeed and maximum G in the break turn to note energy bleed. The ACTI will inform the PUI of the time required to turn 180° to assess turn rate performance.

8. If at any time during a break turn the speed exceeds 0.78 IMN, a knock-it-off will be initiated by reducing the throttle to idle and extending the speed brake while smoothly rolling to wings level and returning to level flight with a gradual increase in AOA and G until the airspeed decreases below 0.78 IMN.

Common Errors:

1. Loaded rolls / overriding high-speed stops.
2. Use of rudder.
3. Pulling into maneuvering tone or wing rock.
4. Exceeding 0.78 IMN.

Corrections for Errors:

1. To achieve the best roll rate you must unload, set the vector, smoothly apply G to lift limit. Smooth G application does not imply that this cannot be accomplished aggressively. We are trying to avoid “snatching” the G on the aircraft.
2. It is not recommended to use any rudder above 0.5 IMN. Don’t mistakenly push rudders while attempting to acquire another aircraft in the aft quadrant.
3. Maneuvering tone or wing rock is an indication that the DEPRES system is saturated and departure is imminent. PUI must quickly reduce AOA slightly until indications subsides.
4. At 15,000 feet keep the throttle set when breaking in the oblique until the AOA is set and the airspeed starts to decay. When performing vertical nose low break turns, reduce the throttle (even to idle) prior to initiating the nose low pull. After the AOA is established the throttle can be advanced but do not allow the aircraft to accelerate above 0.78 IMN. Once the nose passes 90° down, the throttle definitely needs to be advanced to full power if the airspeed has been maintained at or below corner speed, to allow the engine to spool up and provide maximum thrust as the aircraft is arriving on the bottom of the “egg” to avoid excessive energy loss. If airspeed is greater than corner speed keep the throttle at idle and even extend the speed brake at 90° down to decelerate back to corner speed.

Source Documents: N/A
Name: Deck Transitions

Purpose: To develop proper techniques for selecting and executing an energy rate or positional deck transition.

Description of Procedures:

1. This maneuver will be performed two times, once to perform an Energy Rate Deck Transition (ERDT) and then to perform a Positional Deck Transition (PDT).
2. Deck transitions will be start at 10,000 feet AGL and 325 KCAS. When cleared by the ACTI, perform an unloaded roll to establish a full power, 20-30° nose low plane of motion hard or break turn to the specified deck transition. The 30-20-10 rule will be used to transition to a level hard turn just above the hard deck.
3. At completion of deck transition the PUI should be slightly above the hard deck to deny any nose low maneuvering for the bandit.
4. Two types of deck transitions may be performed:
   a. Energy Rate Deck Transition (ERDT) – Target 12-13 units AOA and execute in accordance with Air NTTP.
   b. Positional Deck Transition (PDT) – Target 15 units AOA and execute in accordance with Air NTTP. Adhere to training rules for minimum airspeed and maximum AOA below the soft deck.

Common Errors:

1. Late application of 30-20-10 rule followed by a rolling pull to wings level in an attempt to not go through the hard deck.
2. Pulling into maneuvering tone or wing rock.
3. Incorrectly applying 30-20-10 rule and either leveling off well above hard deck and giving bandit maneuvering room or hitting the hard deck.
4. Poor airspeed / AOA control for specified deck transition.

Corrections for Errors:

1. Apply 30-20-10 rule to level off 300-500 feet above the hard deck.
2. Maneuvering tone or wing rock is an indication that the DEPRES system is saturated and departure is imminent. PUI must quickly relax the AOA until the indications subsides.
3. ERDT: Assuming that airspeed is within the sustained rate band between 12-13 units AOA will maintain that airspeed / sustained turn rate.
4. PDT: Flying more than 13 units will bleed energy while allowing a decrease in turn radius down to 150-170 KCAS just above the hard deck. Below 150 KCAS the turn radius increases rapidly (bad for maintaining a positional advantage). For a two circle flow, allowing the airspeed to bleed off below 250 KCAS will cause the sustained turn rate to decrease.

Source Documents: N/A
Name: TVC Straight and Level and Turning Flight

Purpose: Develop a familiarity of the aircraft performance with introduction of TVC.

Description of Procedures:

1. Procedures are in accordance with the CTVC lesson and Air NTTP.
2. At VMAT-203 post all TVC drills you will transmit “recovered” when all of the recovery indications have been met. The nozzles are aft, airspeed is increasing past 150 KCAS, the AOA is less than 15 AOA and there is no apparent sideslip.
3. TVC straight and level – Accelerate the aircraft to 350 knots at 15,000’. The ACTI will inform you to “SET THE POWER”, select 100%-103% RPM and report “POWER SET.” When cleared by the ACTI, move the nozzles to 65°. You will need forward stick to control AOA, G and flight path. Monitor aircraft handling characteristics. Once cleared, select hover-stop with the nozzles. Continue to monitor aircraft handling characteristics. A scan of the cockpit instruments will include the following indications that all is well with both engine and aircraft with nozzles at other-than-aft (i.e. HS or BS) are: 15 second caution light as JPT rises; lack of forward acceleration; deceleration with high RPM; RPM at ~113.5%, above the 109% or 111% band; high duct pressure, above 0-3; loss of altitude while keeping AOA under control, or increasing AOA at level flight; nozzle position indicator pointing to ~6 o’clock, or not to the 3 o’clock; nozzle lever position not forward; increase in pitch sensitivity, etc. Finally select Braking Stop. Continue to monitor aircraft handling characteristics. When instructed by the ACTI or at 200 KCAS, clean the aircraft up by moving the nozzles aft and selecting full throttle. Once the aircraft has been returned to normal flight transmit “RECOVERED.”
4. TVC turning flight – Accelerate the aircraft to 300 knots at 15,000’. Select 100%-103% RPM. Next put the aircraft in a 2-3 G level turn to maintain 300 KCAS constant airspeed. When instructed by the ACTI select 20-25° nozzles for 2-3 seconds and then return the nozzles to the aft position, without adjusting back stick pressure. You should note an increase in turn rate, a reduction in airspeed, and an instantaneous AOA and G spike. The G will tend to increase by 1 to 1.5 G as the nozzles are deflected, however, do not allow the AOA to increase above 15 units.

Common Errors:

1. Not knowing maneuver procedures.
2. Allowing sideslip buildup thus leading to departure.
3. Not monitoring AOA / airspeed while maneuvering aircraft.
4. Flying in incorrect HUD master mode.
5. Not transmitting “recovered” post maneuver.

Corrections for Errors:

1. Review the maneuver procedures.
2. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
3. AOA / airspeed must be incorporated into scan to prevent excessive AOA induced departures.
4. Select NAV or A/A master mode to display both G and AOA.

Source Documents:  N/A
Name: TVC Hover Stop Push Over (HSPO)

Purpose: Introduce aircraft handling in the slow speed environment with TVC.

Description of Procedures:

1. Procedures are in accordance with the CTVC lesson and Air NTTP.
2. At VMAT-203 this maneuver will start at 15,000 feet and 250 KCAS.
3. Once PADS have been achieved the ACTI will clear you to set the power to 100-103%. On the command to “EXECUTE”, initiate a 12-15 unit pull to 65 degrees nose high. While waiting for the aircraft to slow to 150 KCAS ensure you unload the aircraft. Once the aircraft has slowed to 150 KCAS apply forward stick and move the nozzles to the hover stop position (3 sec transition time). This maneuver will almost require moving the stick to the forward stop. Stabilize the aircraft in a 10 – 15 degree nose low position increasing airspeed to 60 – 65 KCAS.
4. In the nose down hover stop position the ACTI may clear you for mild maneuvering, if so ensure you do not allow the AOA or sideslip to build up.
5. On the command to “recover”, maintain forward stick pressure and slowly begin to nozzles out. Allow the aircraft to increase airspeed while reducing AOA and keeping the nose below the horizon.
6. Once all criteria for recovery have been met transmit “RECOVERED.”

Common Errors:

1. Not knowing maneuver procedures.
2. Allowing sideslip buildup thus Leading to departure.
3. Not monitoring AOA / airspeed while maneuvering aircraft.
4. Rapid nozzle inputs.
5. Incorrect timing for nozzle input.
6. Not maintaining sufficient forward stick deflection once maneuver initiated thus leading to a departure.
7. If the aircraft departs controlled flight, leaving nozzles deflected after departure.

Corrections for Errors:

1. Review the maneuver procedures.
2. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
3. AOA / airspeed must be incorporated into scan to prevent excessive AOA induced departures.
4. Near full forward stick is required once nozzles are introduced into maneuver or a departure will result. Pitch trim can be used to eliminate excessive control forces.

Source Documents: N/A
Name: TVC Hover Stop Wing Over (HSWO)

Purpose: Introduce aircraft handling in the slow speed environment with TVC.

Description of Procedures:

1. Procedures are in accordance with the CTVC lesson and Air NTTP.
2. At VMAT-203 this maneuver will start at 15,000 feet and 250 KCAS.
3. This drill is performed similar to the TVC hover stop push over up until the selection of hover stop. At 150 KCAS transition the nozzles to hover stop, roll the aircraft to 110 degree AOB and insert rudder. Continue to scan the wind vane to ensure you do not build excessive sideslip. The intent is to get the nose coming down to intercept 180° reverse heading. Use AOB to finish the heading reversal. You must use forward stick to keep the nose coming down. Stabilize in a negative 40º FPA and target 100 KCAS.
4. Completion of the maneuver is initiated by reducing nozzle angle slowly to zero while maintaining required forward stick. Rapid nozzle angle reduction or late initiation can lead to a departure. After completion of the maneuver, power should only be adjusted once nozzles are aft.

Common Errors:

1. Not knowing maneuver procedures.
2. Allowing sideslip buildup thus leading to departure.
3. Not monitoring AOA / airspeed while maneuvering aircraft.
4. Rapid nozzle inputs.
5. Incorrect timing for nozzle input.
6. Not over banking during wingover.
7. Leaving nozzles deflected during last portion of maneuver.

Corrections for Errors:

1. Review the maneuver procedures.
2. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
3. AOA / airspeed must be incorporated into scan to prevent excessive AOA induced departures.

Source Documents: N/A
Name: TVC Flop / Flop Immelman

Purpose: Introduce aircraft handling in the slow speed environment with TVC.

Description of Procedures:

1. Procedures are in accordance with the CTVC lesson and Air NTTP.
2. At VMAT-203 this maneuver will start at 15,000 feet and 250 KCAS.
3. Once PADS are achieved the ACTI will clear you to “SET THE POWER.” You will then add power to 100 – 103%. On the command “EXECUTE” you will pull 12 – 15 units AOA until 70º and unload. Once the aircraft has slowed to 150 KCAS start moving the nozzles 20-40º while simultaneously adding forward stick. Target AOA should be 15-20 units AOA. 15-20º prior to the desired attitude, use forward stick to stop nose movement and nozzle out.
4. For the Flop Immelman, complete as above except 15-20º prior to the horizon apply forward stick and/or reduce nozzle angle. Roll the aircraft upright while keeping the vane centered. Nozzle out to complete maneuver.

Common Errors:

1. Not knowing maneuver procedures.
2. HUD fixation.
3. Allowing sideslip buildup thus leading to departure.
4. Not monitoring AOA / airspeed while maneuvering aircraft.
5. Rapid nozzle inputs.
6. Incorrect timing for nozzle input.
7. Leaving nozzles deflected.
8. Not coordinating flight control inputs.

Corrections for Errors:

1. Review the maneuver procedures.
2. This maneuver should incorporate inside / outside scan.
3. Wind vane must be incorporated into scan pattern to ensure excessive sideslip buildup does not occur.
4. AOA / airspeed must be incorporated into scan to prevent excessive AOA induced departures.
5. This maneuver emphasizes AOA and vane control. If one of these parameters becomes excessive due to the introduction of sideslip or abrupt control inputs a departure will likely result. Smooth, coordinated input of flight controls is paramount for success.

Source Documents: N/A
Name: Bug / Separation Drill

Purpose: Develop the proper techniques for the execution of a bug or tactical separation and engaging turn from a separation maneuver.

Description of Procedures:

1. This drill teaches the PUI the mechanics of unloading the aircraft to quickly increase airspeed to create separation while monitoring FPA and altitude and keeping sight of the adversary in an air-to-air engagement. Additionally, it teaches the sight picture for a bug decision point for continuing or turning back in to re-engage. The PUI should also gain Mach number awareness and control for commencing an engaging turn.

2. To transition to the correct starting parameters for this drill, the lead will transmit, “MARS 11, PUSH FOR SPEED, BUG DRILL.” Dash-2 will maneuver to:

   P – Abeam
   A – HD+5K (co-altitude)
   D – 1.0 NM
   S – 300 KCAS

3. Once correct parameters are achieved, Dash-2 will transmit, “MARS 12, SPEED AND ANGELS.” Lead will check the flight 30-40° into the PUI to place the PUI acute. Lead will then broadcast, “MARS 12, EXECUTE BUG DRILL.”

4. While the PUI is executing the drill the lead will maintain 300 KCAS straight and level until the PUI reaches 1 NM range. Lead may then roll into 90° AOB to give the PUI a wing flash to help achieve a “TALLY” if lost previously. After PUI calls “TALLY” Lead will return to 300 KCAS, HD+5K, straight and level.

5. To execute the drill the PUI will select full power and overbank slightly to place the plane-of-motion beneath the Lead while using a hard (energy sustaining) turn into lead to attempt to pass 500-1000 feet directly underneath lead’s aircraft with 60-90° TCA. After the turn the PUI will unload to 0 G to no more than 25° nose low. At HD+2K the PUI will recover to level flight just above the HD while continuing to accelerate. At 1 NM separation PUI will call out airspeed and Mach number to evaluate bug effectiveness. Regardless of bug effectiveness, the PUI will regain a tally on the lead (if lost), slow to 0.78 IMN (if faster) and start an engaging turn back into lead. It is critical that if the Mach number is above 0.78 the PUI not try rolling the aircraft quickly or introducing G / AOA until the speed is reduced. Pull the throttle back to idle, as speed bleeds down to 0.78 IMN, roll aircraft to place the lift vector on lead and select full power while initiating a hard turn back into lead to arrive in pure pursuit. Once the PUI establishes nose-on to Lead, maintain pure pursuit to a valid AIM-9 WEZ and take a “FOX-2.” The PUI will then time out the missile and call the kill. Lead will then call, “TERMINATE” and the PUI will turn to parallel lead’s heading and maneuver back to defensive combat spread.
**Common Errors:**

1. Not unloading to 0 G to get best acceleration.
2. Not adhering to NATOPS time limit for flight at less than 1 G.
3. Not keeping sight of lead during maneuver.
4. Not checking Mach number and adjusting speed prior to starting engaging turn.
5. Not having lead in sight and pulling for a blind Lead turn.

**Corrections for Errors:**

1. 0 G will give you the best acceleration because it will cause you to have a negative FPA and it eliminates induced drag because the wings are not generating any lift. Unload to 0 G for the separation.
2. NATOPS limits flight at less than 1 G to less than 15 seconds. If this drill is started on the proper parameters, flight at 0 G should last for no more than 10 seconds, however, take note of the seconds in the clock at the start of the unload and if you have not hit -25° FPA or 1 NM prior to 15 seconds, increase back stick pressure to re-establish 1G flight.
3. The scan will have to be in the HUD and over the shoulder while unloading to keep track of flight parameters and sight. Priority goes to honoring flight parameters, especially FPA, altitude and IMN. If sight is lost, look to re-acquire Lead at the 5 or 7 o'clock position, 25-30° above the horizon.
4. Check Mach number and reduce it to less than 0.78 prior to engaging turn.

**Source Documents:** N/A
Name: Heat to Guns Drill

Purpose: To introduce stadiametric range estimation, AIM-9 and GAU-12 weapons engagement zones (WEZ), symbology and HOTAS against a cooperative target

Description of Procedures:

1. Setup and initiation of this exercise is per Air NTTP PADS for this drill will be:

   P – Abeam  
   A – HD+10K (co-altitude)  
   D – 1.0 NM  
   S – 350 KCAS  

   After both aircraft call, “SPEED AND ANGELS” the maneuver will be initiated by the ACTI. The ACTI will check the flight 50º in the direction of the defender. The attacking aircraft will execute a hard turn to achieve a BST mode lock-on. Once in position the attacker will call for the defender to “REVERSE YOUR TURN.” The defender will now reverse and enter a 30º AOB turn maintaining 300 KCAS. When in range and all criteria have been met, the attacker will employ an AIM-9 shot, calling “FOX-2” and the kill once the missile has timed out. The defender will acknowledge the kill and continue in a 30º AOB turn.

2. Post the “FOX-2” the attacker will then maneuver the aircraft into a GAU-12 WEZ and call up the short range LCOS sight. Prior to maneuvering for a tracking shot solution the attacker must ensure that angles, range and closure have been solved IOT prevent and overshoot or excessive closure.

3. When a tracking shot solution is achieved the attacker will call, “PIPPER ON, TRACKING.” The defender will then change plane-of-motion to defeat the tracking solution. When the tracking solution is defeated the PUI will call, “PIPPER OFF.” The defender will then stabilize in a 3-4 G turn in the new plane-of-motion until the PUI is able to achieve another tracking solution. This process will continue until 2 valid tracking shots are achieved. After the second tracking shot the exercise will be terminated.

Common Errors:

1. Invalid weapons employment.
2. Slow to or unable to achieve WEZ.
3. Improper comm.
4. Excessive closure on the tracking shot.

Corrections for Errors:

1. Review TOPGUN AIM-9 rule-of-thumb envelope and Air NTTP GAU-12 envelope and the range estimation table for visual range estimation.
2. Fly proper pursuit curves to achieve valid AIM-9 and GAU-12 tracking WEZ.
3. Study Air NTTP for proper comm for heat to guns exercise.

Source Documents: N/A
Name: IR Missile Defense (IRMD) Drill

Purpose: To learn proper procedures to defeat an IR missile in an air-to-air engagement.

Description of Procedures:

1. This maneuver will begin at 15,000 feet and 380 KCAS and will only be performed in the simulator. The instructor will place a bandit at your 10 or 2 o'clock position at 3-4 NM range with heading, altitude and airspeed all matching your aircraft. When you see the bandit, call “TALLY.” The instructor will then call “TURNING IN” and will make the bandit turn into you to pure pursuit. This will cause the bandit to arrive at or just slightly aft of your 3 / 9 line. When the bandit is in a valid WEZ the instructor will call “FOX-2” and shoot an IR missile at you.
2. Execute an IR missile defense in accordance with Air NTTP.

Common Errors:

1. Poor timing on IRMD.
2. Poor G and/or vector control on IRMD.
3. Forgetting or incorrectly using expendables.

Corrections for Errors:

1. Study reference to visualize proper timing and execution of maneuver.
2. Use ALL program of expendables during maneuver and know what its time coverage and effectiveness is against the suspected threat weapon.

Source Documents: N/A
Name: Flat Scissors Drill

Purpose: Introduce skills and procedures for offensive and defensive flat scissors maneuvering.

Description of Procedures:

1. The setup of this drill is per Air NTTP.
   
   P – Abeam
   A – HD+10K (co-altitude)
   D – 0.5 NM
   S – 200 KCAS

2. Initiation will start with a “3-2-1 PULL” call. Start a 12-15 unit AOA pull up. As the nose begins to rise, call, “FIGHT’S ON.” Continue the wings level pull to at least 45° nose high. Call the de-confliction and then set your lift vector aft of the bandit to initiate the weave.

3. The first execution of the drill the PUI will be offensive. The bandit will pause for 2-3 seconds after the PUI’s pull up. This will give the PUI a 3 / 9 line advantage and will also likely make the PUI high on the first de-confliction call. The bandit will fly 120-150 KCAS in the scissors to allow the PUI to work offensive.

4. The goal of the PUI in an offensive flat scissors is to work in-phase and in-plane. To get in phase, reverse prior to the flight path crossing. Be careful that you do not conduct a blind Lead turn if you reverse prior to the flight path crossing while you are above the bandit. To work in plane with the bandit from above you need to reduce power slightly with your plane-of-motion slightly underneath the bandit. Be sure to make the appropriate de-confliction calls prior to converging flight paths.

5. On the second execution the PUI will be defensive. The bandit will start to pull up as “3-2-1 PULL” is being called. The PUI will again initiate a 12-15 unit pull up to 45° nose high, call de-confliction and then initiate the weave.

6. The goal of the PUI in a defensive flat scissors is to work out-of-phase and slightly out of plane (enough to deny POM for a snap shot, but not so much that excess turning room is given to the bandit – i.e. 500 - 800°) To stay out-of-phase reverse when the bandit crosses your flight path.

Common Errors:

1. Poor AOA management on initial pull up and in weave.
2. Late or non-existent de-confliction calls.
3. Poor lift vector and velocity vector placement for offensive or defensive maneuvering.
4. Departing controlled flight due to flying to slow.
5. Not controlling airspeed and spitting out in front.

Corrections for Errors:
1. Target 12-15 units on initial pull up. Once established in the weave, AOA should typically be 15-17 units, but at no time should AOA ever exceed 22 units.
2. De-confliction must be called no later than 0° TCA prior to the aircraft developing converging flight paths.
3. Review BFM procedures for winning and losing flat scissors in the Air NTTP.

Source Documents: N/A
Name: Rolling Scissors Drill

Purpose: Introduce skills and procedures for rolling scissors maneuvering

Description of Procedures:

1. Setup and initiation of this drill is per Air NTTP. The PUI will always start the drill from the rear position.

   P – 40° AOT
   A – HD+10K (co-altitude)
   D – 0.5 NM
   S – 250 KCAS

2. After the “3-2-1 PULL” call the ACTI will pull up at 12-15 units AOA to 40-50° nose high, then roll into approximately 90-100° AOB towards the bandit, allowing the nose to fall back towards the horizon to arrive at 2000 - 3000' above the bandit with approximately 90° TCA (a barrel-roll start). “FIGHT’S ON” will be called as the ACTI crosses over the top of the bandit.

3. Once established in the rolling scissors, maneuver as per Air NTTP. Be careful about pulling too hard and bleeding energy excessively. Target 12-15 units on the pull up; unload to 0 G for the roll on top, no more than 20 units AOA on the pull down and 15 units AOA on the nose low pull up back to the horizon. Catalyst for beginning the pirouette will be 150 KCAS. Ensure a minimum airspeed of 180 - 200 KCAS is achieved as the nose is rising back towards the horizon. If necessary, unload briefly to gain minimum airspeed prior to starting back up for next roll.

Common Errors:

1. Poor lift vector placement.
2. Poor energy management, AOA/airspeed control.

Corrections for Errors:

1. Review Air NTTP for proper lift vector placement based upon winning and losing in a rolling scissors.
2. Cross-reference AOA and aircraft “feel” (buffet) while looking outside at the bandit for lift vector placement.

Source Documents: N/A
Name: Snap Shot Drill and Defense

Purpose: Develop proper sight picture for snap-shot gun employment. Develop proper techniques and timing for successful guns defense.

Description of Procedures:

1. This exercise accomplishes several objectives. Primarily, it teaches snap-shot gunnery. It also demonstrates the resultant geometry from a failed snap-shot attempt. It teaches collision bearing recognition in a dynamic environment, and it can be used to introduce snapshot defense. Details on snap-shot gunnery can be found in Air NTTP, Combat Gunnery Lecture and TOPGUN Ch 21.

2. The PADS and set up for Snap Shot Drill (SSD) are:

   P – Abeam  
   A – HD+10K  
   D – 1.0 NM  
   S – 300 KCAS

   The stores code of 99 should be entered on station 4 and Training should be boxed on the stores page. This will provide a round countdown based on trigger down time. When a GAU-12 is not installed on the aircraft the MASTER ARM should be switched to ARM in order to provide accurate symbology. With a GAU-12 installed you should leave the MASTER ARM OFF to prevent bleed air spinning the GAU. The proper gun sight for the snap shot drill is the short range LCOS.

3. Initiation of maneuvering for the SSD is per Air NTTP. The ACTI will initiate all Comms for the drill regardless of what position the instructor is in. Maneuvering will be initiated after Dash-2 calls “IN AS SHOOTER / TARGET.” The target will roll into a 60° AOB / 2 “G” level turn at 300 KCAS. The shooter will initiate a 3 “G” level turn into the target to ensure the aircraft is aft of collision bearing on the target and then to achieve GAU-12 WEZ. After the snapshot attempt the shooter will clear aft and above the target and then reverse back to the initial heading (beware of target aircraft’s jet wash). The target will wait until the shooter has passed the extended 6 o’clock position and then reverse back to the initial heading. After each weave the RP, regardless of shooter or target role, will expeditiously maneuver back to PADS for the next weave. For the role definition “non-maneuvering” will be assumed, “… MANEUVERING” will be stated after each aircraft’s role when a guns defense is to be performed by the target. Dash-2 will be the target for the first two weaves with the second being a “maneuvering” weave. Then a role swap will occur and the three weaves will be repeated with Dash-2 as the shooter, third weave “maneuvering.” The shooter will use the snap-shot ROT (Air NTTP) to position for the best possible shot opportunity.

4. When acceptable shot parameters are met; the shooter will call “TRIGGER DOWN” followed by and assessment call (“SNAP”, “MISS HIGH / LOW”, “LATE / EARLY” or “UNASSESSABLE”). The goal for the shooter is to achieve the best snapshot
possible. This means trying to get a minimum line-of-sight rate shot in plane, in
range, and with adequate Lead.

5. There are several variables to control in order to achieve a valid snapshot. One
variable we have to control at all times is relative plane-of-motion. You have to
determine the target’s plane-of-motion (via line-of-sight rate analysis) and maneuver
your aircraft in the exact same plane. Two aircraft in the same plane-of-motion can
still be in different phases. If the two aircraft are turning in opposite directions, then
they are out-of-phase. If the two aircraft are turning in the same direction, then they
are in-phase. If both aircraft are not turning, then the phase isn’t relevant.
Obviously, an in-phase shot will have a lower line-of-sight rate than an out-of-phase
shot. A lower line-of-sight rate will allow for higher bullet density, assuming you are
still in plane with adequate Lead. If you can always maintain plane-of-motion
alignment (using it as a control variable), it will allow you to better assess the other
variables and have more success with high-deflection gunnery. For this reason,
getting in plane will be your first priority.

6. The other variable to control is the lead requirement. With the infinite number of
possibilities for lead that could exist, you need to condense the contingencies into
something useable. Assume worst case (maximum lead). Worst case is defined as
90° aspect and 500 KTAS. In this condition, 20° of lead is required. Any other
aspect and / or any lesser speed will require less total lead. If you make this lead
the “open fire” lead requirement for all situations, it can be assured that some bullets
will have enough lead.

7. With these two variables controlled, how do you make valid shots? As the Shooter,
make the initial turn-in at best performance G (which is about 3 G at 300 KCAS
level). This will preserve as much weapons separation as possible and allow you to
pull past the collision bearing quickly. The ability to recognize the collision bearing is
critical if you are going to get the lowest line-of-sight rate possible at the proper
range.

8. How do you recognize collision bearing while you are actively maneuvering your
aircraft? The response of “he’s staying at the same spot on the canopy” doesn’t
always apply since you’re in a turn and inducing a line-of-sight rate relative to your
own canopy. Sometimes the answer lies in how the target is moving relative to his
background. If the target is moving aft relative to the background (background can
be clouds, beach line, etc.) you are forward of the collision bearing. That means that
if you rolled out, you would pass in front of the target. If the target is moving forward
relative to his background, then you are aft of the collision bearing. This means if
you rolled out, you would pass behind the target. If the target is stationary relative to
his background, then you are on the collision bearing and will hit the target if you roll
out. Obviously, you must pull aft of the collision bearing, but only enough that allows
you to pass 500 - 1000’ nose to tail. How far past the collision bearing to pull
depends on the range to the target as the collision bearing is recognized. Shorter
ranges require you to pull farther aft of the collision bearing to achieve the same shot
range compared with longer ranges.
a. If at any point in the weave, you have <= 20° of Lead aft of the collision bearing (forward drift by bandit in relation to background), pull the trigger and don’t change phase (don’t modify your plane-of-motion or AOB).

b. If at any point in the weave, you have <= 20° of Lead but are still forward of the collision bearing (aft drift by bandit in relation to background), abort the run. If you recognize the necessity to abort a weave then execute the abort and broadcast “SKIP IT” as an informative call. If you do not recognize an unsafe situation developing the ACTI will call “SKIP IT” as directive Comm: level your wings and maneuver out-of-plane with the target to ensure adequate altitude separation exists. The standard de-confliction plan for a SSD is shooter high / target low. However, if there is any doubt about de-confliction state your own intentions.

c. If you have pulled far enough past the collision bearing to realize 500 - 1000’ nose-to-tail and still have > 20° of Lead, roll out and continue your assessment. If the target stays in a steady-state turn, pull the trigger when you have 20° of Lead. If the target increases his turn rate, reinitiate a turn in plane towards the target and start the process over again. If the target decreases his turn rate, either accept a longer than desired shot or turn in-phase to limit opening.

9. The guns defense maneuver is covered in depth in the above stated reference and will not be discussed due to the level of security classification. This maneuver has the potential for high-speed departure if flown improperly. Guns defense will not be conducted nose low below the soft deck.

Common Errors:

1. Not starting weave on parameters.
2. Poor Comm.
3. Not following snapshot procedures resulting in invalid shots.
4. Violation of training rules.
5. Not adhering to gun restrictions and limitations.
6. Weak pulls on start.
7. Shooting too early or excessively late.
8. Improper guns defense procedures.

 Corrections for Errors:

1. Fly disciplined formation and start on parameters.
2. Follow prescribed snap shot drill procedures.
3. Watch loaded rolls, use of rudder, and wing-rock / maneuvering tone on defense.

Source Documents:       N/A
Name: Approach to Fight Start

Purpose: To define the procedures to setup an offensive or defensive engagement.

Description of Procedures:

1. Perch BFM sets are used to introduce specific learning points and create exact geometry to achieve defined learning objectives. Classified details on BFM can be found in Air NTTP and TOPGUN Manual, BFM and Air-to-Air Gunnery chapters, as well as the BFM lesson. It is imperative that you have a solid understanding of this material prior to the brief.

2. All BFM engagements will be started from an approach to fight start (ATFS) as described in Air NTTP. Note that the PADS change for the ATFS based upon whether a 3000’ or 6000’ start is being flown. Air NTTP does not have an altitude delta between the attacker and defender. At VMAT-203 the standard is defender at HD+10 and the attacker stepped up 500-1000 feet. Distance is always start range + 0.5 NM. So for the 3000’ start PADS distance should be 1 NM and for the 6000’ start, 1.5 NM. Airspeed also varies based upon the start range. The 3000’ start is at 325 KCAS and the 6000’ start is at 380 KCAS. Be aware of your speed as the defensive aircraft, especially during the 3000’ start. If you select full power at 325 KCAS while only pulling 3-4 G’s to maintain the attacker at 40° AOT you will likely get fast.

3. As the attacker, during the 50° check turn into the defender select BST or SEAM and uncage the missile on the bandit. To make the geometry work correctly the attacker should call for the reversal when the defender’s aircraft is on the canopy bow. The defender will initially need to roll into 30-45° AOB to gain a tally. After calling “TALLY” the defender is responsible for managing the G (typically between 3-4 G) to maintain the attacker at 40° AOT until the “FIGHT’S ON” range.

4. Approaching the specified start range, Lead will start the countdown then call the fights on, “1.2, 1.1, ”MARS-11, FIGHT’S ON.” Maneuvering will commence once Dash-2 replies, ”MARS-12, FIGHT’S ON.”

5. After the termination of an engagement, lead aircraft will maneuver the flight as discussed in the Resets and Transitions section or as briefed. It is important that you fly expeditiously back to you assigned position with disciplined TACFORM. Needless time and fuel can be wasted trying to redress the formation. Climbing back to altitude the PUI should remain visual, check fuel, G’s, “powder state” and sanitize the airspace in front of the flight visually.

Common Errors:

1. Not prepared for sortie (lack of knowledge on systems, weapons, threat and procedures).
2. Not achieving desired start parameters prior to engagement.
3. Improper HOTAS.
4. Invalid shots.
5. Not employing the aircraft based on key performance numbers. Not monitoring AOA, airspeed, altitude and POM.
6. Violation of ACM training rules.
7. Not recognizing impending departures.

Corrections for Errors:

1. Study the references.
2. All shots should be validated using TOPGUN shot criteria.
3. Fundamental BFM basics must be flown to achieve success.
4. Strict adherence to ACM training rules is mandatory.

Source Documents: N/A
Name: Neutral Setup

Purpose: To define the procedures to setup a neutral engagement.

Description of Procedures:

1. In the last 1 v 1 sortie, you will be introduced to High Aspect BFM. The ACTI will provide you with a bandit profile to teach you specific fight types and mechanics. A tactically sound game plan should consist of a first move followed by contingency plans for expected adversary counters. Contingency planning should provide opportunities for you to gain turning room or deny weapons separation. Once the roles are defined the engagement will evolve into offensive and defensive maneuvering.

2. We will begin our neutral starts using the Butterfly Setup as described in Air NTTP.

3. The neutral setup is a cooperative entry into a neutral fight with the objective being to arrive at a neutral, 500-1000’ abeam, wings level pass at the PADS altitude and airspeed. Pre-merge, forward quarter IRCM should be used and forward quarter missile shots may be attempted in accordance with training rules and the rule-of-thumb envelop, however, no kill removal will be made from valid pre-merge shots. Priority approaching the merge should be (1) de-confliction, (2) correct neutral geometry at the merge, and (3) IRCM / weapons employment.

4. To reduce the risk of high speed departure due to high IMN, approaching the neutral merge the PUI will call the de-confliction / pass direction and aircraft IMN, “MARS 12, LEFT-TO-LEFT, 0.77.” The allowable range is 0.72-0.78 IMN. Unintentional Mach greater than 0.78 is a safety-of-flight issue and will warrant a “KNOCK-IT-OFF” and an immediate reduction in airspeed prior to turning the aircraft. Unintentional Mach less than 0.70 indicates a loss of SA or a performance error, requiring a “TERMINATE” to reset the start on proper parameters.

5. At VMAT-203 the ACTI will set the flow IAW the line desired. Post initial merge the PUI will execute a nose low turn across the bandits’ tail. The ACTI will then reverse or set the flow as appropriate. Through follow on merges it will be the PUI’s responsibility to maintain the pre-briefed flow.

Common Errors:

1. Not prepared for sortie (lack of knowledge on systems, weapons, threat and procedures).
2. Not achieving desired start parameters prior to engagement.
3. Not adhering to game plan based on briefed profile.
4. Poor second merge maneuvering.
5. Improper HOTAS.
6. Invalid shots.
7. Not employing the aircraft based on key performance numbers. Not monitoring AOA, airspeed, IMN, altitude and POM.
8. Violation of ACM training rules.
Corrections for Errors:

1. Study the references.
2. All shots should be validated using TOPGUN shot criteria.
3. Formulation of game plan based on the profile will enable you to effectively employ your weapon systems.
4. Fundamental BFM basics must be flown to achieve success.
5. Strict adherence to ACM training rules is mandatory.

Source Documents:  N/A
Name: BFM Profiles

Purpose: To define the objective and maneuvers of each air-to-air engagement.

Description of Procedures:

1. VMAT-203 uses standard profiles for BFM instruction. The purpose behind this way of training is to increase standardization and to provide RPs with a specific scenario on each engagement against which to hone their skills. Each profile states the objectives of the engagement and defines the bandit’s (IP) profile and the fighter’s (RP) mechanics that will be flown to successfully meet the objectives of the profile. It is highly recommended that RPs chair fly and even practice going through the profiles using the briefing aircraft models prior to each event.

2. The standard start altitude is hard deck (HD) + 10,000 feet, typically 15-17,000 feet MSL. The start altitude will be maintained until the “FIGHT’S ON” call during an offensive or defensive approach to fight start or until after the first merge for neutral sets. The PADS airspeed will be maintained until the “FIGHT’S ON” call for an offensive and defensive approach to fight start or until after the first merge for neutral sets.

<table>
<thead>
<tr>
<th>LEGEND</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1C</td>
<td>One circle</td>
<td>NH</td>
<td>Nose high</td>
</tr>
<tr>
<td>2C</td>
<td>Two circle</td>
<td>NL</td>
<td>Nose low</td>
</tr>
<tr>
<td>AW</td>
<td>Attack window</td>
<td>OBFM</td>
<td>Offensive basic fighter maneuvers</td>
</tr>
<tr>
<td>BDT</td>
<td>Bandit</td>
<td>OOP</td>
<td>Out of plane</td>
</tr>
<tr>
<td>BT</td>
<td>Break turn</td>
<td>O/S</td>
<td>Overshoot</td>
</tr>
<tr>
<td>CZ</td>
<td>Control zone</td>
<td>POM</td>
<td>Plane of motion</td>
</tr>
<tr>
<td>DBFM</td>
<td>Defensive basic fighter maneuvers</td>
<td>RS</td>
<td>Rolling scissors</td>
</tr>
<tr>
<td>DBT</td>
<td>Defensive break turn</td>
<td>TC</td>
<td>Turn circle</td>
</tr>
<tr>
<td>EF</td>
<td>Engaged fighter</td>
<td>TTK</td>
<td>Time to kill</td>
</tr>
<tr>
<td>FF</td>
<td>Free fighter</td>
<td>WEZ</td>
<td>Weapon engagement zone</td>
</tr>
<tr>
<td>FS</td>
<td>Flat scissors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTR</td>
<td>Fighter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HD</td>
<td>Hard deck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOBS</td>
<td>High off boresight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRCM</td>
<td>Infrared counter measures (flares)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBT</td>
<td>Offensive break turn</td>
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## OFFENSIVE 1V1 PROFILES

<table>
<thead>
<tr>
<th>Profile 1</th>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• CZ management</td>
</tr>
<tr>
<td></td>
<td>• Valid gun kill (snap or track)</td>
</tr>
<tr>
<td></td>
<td>• TTK &lt; 45 sec / ~ 540° (1 ½ circles)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DBT for 90°</td>
</tr>
<tr>
<td>• Sustain 4-5G @ ~300 KCAS</td>
</tr>
<tr>
<td>• ~20° NL POM to HD +1k</td>
</tr>
<tr>
<td>• Sustain 300 KCAS @ HD +1k (whatever G that gives)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lag entry to CZ</td>
</tr>
<tr>
<td>• OOP Lead to employ gun</td>
</tr>
<tr>
<td>• OOP lag back to CZ</td>
</tr>
<tr>
<td>• Repeat until valid kill</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nail AW for OBT</td>
</tr>
<tr>
<td>• Stabilize in CZ</td>
</tr>
<tr>
<td>• Valid AIM-9 or gun kill</td>
</tr>
<tr>
<td>• TTK &lt; 1 min / ~ 720°</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Profile 2</th>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Mis-aligned TC entry</td>
</tr>
<tr>
<td></td>
<td>• Valid AIM-9 kill</td>
</tr>
<tr>
<td></td>
<td>• TTK &lt; 30 sec / ~360°</td>
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<table>
<thead>
<tr>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as Profile 1</td>
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</table>

<table>
<thead>
<tr>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lag entry to CZ</td>
</tr>
<tr>
<td>• Ease G to flow outside bandit TC</td>
</tr>
<tr>
<td>• Sustained rate pull (don’t bleed below 300 KCAS) back inside TC w/ wep sep</td>
</tr>
<tr>
<td>• Valid Fox-2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nail AW for OBT</td>
</tr>
<tr>
<td>• Ditch counter</td>
</tr>
<tr>
<td>• Valid AIM-9 or gun kill</td>
</tr>
<tr>
<td>• TTK &lt; 1 min / ~ 720°</td>
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<table>
<thead>
<tr>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DBT for ~60°</td>
</tr>
<tr>
<td>• Ditch as fighter arrives in sensor nose or lags for mis-aligned TC</td>
</tr>
<tr>
<td>• Out of ditch ~4G 2C flow to HD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pure pursuit off perch for AIM-9 WEZ down to Rmin</td>
</tr>
<tr>
<td>• Lag to AW</td>
</tr>
<tr>
<td>• OBT to CZ</td>
</tr>
<tr>
<td>• Follow-on maneuvering to valid AIM-9 / gun WEZ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile 3</th>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Remain offensive on countering bandit</td>
</tr>
<tr>
<td></td>
<td>• Valid AIM-9 or gun kill</td>
</tr>
<tr>
<td></td>
<td>• TTK &lt; 1 minute / ~ 720°</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DBT for 90°</td>
</tr>
<tr>
<td>• Counter fighter OOP Lead / lag maneuvers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lag entry to CZ (snap shot?)</td>
</tr>
<tr>
<td>• OOP Lead for WEZ and lag to manage CZ &lt;OR&gt;</td>
</tr>
<tr>
<td>• Mis-aligned TC for WEZ</td>
</tr>
<tr>
<td>• Correct for BDT counters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Remain offensive on BDT performing multiple ditches / redefines</td>
</tr>
<tr>
<td>• Valid AIM-9 or gun kill</td>
</tr>
<tr>
<td>• TTK &lt; 60 sec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DBT for ~60°</td>
</tr>
<tr>
<td>• Ditch as fighter arrives in sensor nose or lags for mis-aligned TC</td>
</tr>
<tr>
<td>• Out of ditch - follow on ditch / redefine at FTR sensor nose</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pure pursuit off perch for AIM-9 WEZ down to Rmin</td>
</tr>
<tr>
<td>• Lag to AW</td>
</tr>
<tr>
<td>• OBT to CZ</td>
</tr>
<tr>
<td>• Ditch counter(s)</td>
</tr>
<tr>
<td>• Follow-on maneuvering to valid AIM-9 / gun WEZ</td>
</tr>
</tbody>
</table>
## DEFENSIVE 1V1 PROFILES

<table>
<thead>
<tr>
<th>Profile 1</th>
<th>3000’ Set</th>
<th>6000’ Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective:</strong></td>
<td>Maintain sight</td>
<td>OOP Lead / lag counters</td>
</tr>
<tr>
<td></td>
<td>WEZ recognition</td>
<td>WEZ recognition</td>
</tr>
<tr>
<td></td>
<td>Deck awareness</td>
<td>IRCM</td>
</tr>
<tr>
<td><strong>Bandit Profile:</strong></td>
<td>In plane lag entry to CZ</td>
<td>AW to CZ entry</td>
</tr>
<tr>
<td></td>
<td>Maneuver from inner side of CZ to Lead pursuit and then back to CZ (repeat until FTR is able to consistently maintain sight)</td>
<td>OOP Lead / lag for WEZ and CZ</td>
</tr>
<tr>
<td><strong>Fighter Mechanics:</strong></td>
<td>20-30° NL DBT…</td>
<td>DBT (expendables)</td>
</tr>
<tr>
<td></td>
<td>Down to sustained rate turn (no slower than 300 KCAS)</td>
<td>At sensor nose, ditch</td>
</tr>
<tr>
<td></td>
<td>30/20/10 deck transition to HD +300 ft</td>
<td>Recognize BDT error and force O/S</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile 2</th>
<th>3000’ Set</th>
<th>6000’ Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective:</strong></td>
<td>Overshoot recognition</td>
<td>Ditch</td>
</tr>
<tr>
<td></td>
<td>WEZ recognition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRCM</td>
<td></td>
</tr>
<tr>
<td><strong>Bandit Profile:</strong></td>
<td>Slightly OOP pure/Lead pursuit for snap shot</td>
<td>AW to CZ entry</td>
</tr>
<tr>
<td></td>
<td>In-close O/S</td>
<td>OOP Lead / lag for WEZ and CZ</td>
</tr>
<tr>
<td></td>
<td>Initial entry into FS or RS</td>
<td>At FTR ditch, pull pure pursuit (bad counter) for immediate follow</td>
</tr>
<tr>
<td><strong>Fighter Mechanics:</strong></td>
<td>DBT (expendables)</td>
<td>DBT (expendables)</td>
</tr>
<tr>
<td></td>
<td>Maintain sight</td>
<td>At sensor nose, ditch</td>
</tr>
<tr>
<td></td>
<td>At O/S, unload and roll aircraft upright</td>
<td>Recognize BDT error and force O/S</td>
</tr>
<tr>
<td></td>
<td>DRT stop pull: 12-15° pull up to ~ 45° NH</td>
<td>Reverse to 1C flow or positional deck transition (2C flow – altitude dependent)</td>
</tr>
<tr>
<td></td>
<td>At 180 KCAS or when BDT starts to pull into FTR, assess altitude differential and either pull towards BDT CZ for FS or pull over the top for RS (call deconfliction as necessary)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile 3</th>
<th>3000’ Set</th>
<th>6000’ Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective:</strong></td>
<td>Mis-aligned TC counter</td>
<td>NH redefine</td>
</tr>
<tr>
<td><strong>Bandit Profile:</strong></td>
<td>AW to CZ entry</td>
<td>TC to AW</td>
</tr>
<tr>
<td></td>
<td>Ease out of TC to est. mis-aligned TC</td>
<td>OBT</td>
</tr>
<tr>
<td></td>
<td>Maintain sustained rate pull (no slower than 300 KCAS) to pull back inside TC with WEZ</td>
<td>OOP Lead / lag to CZ</td>
</tr>
<tr>
<td><strong>Fighter Mechanics:</strong></td>
<td>DBT (expendables)</td>
<td>Rolling scissors or 2C rate war</td>
</tr>
<tr>
<td></td>
<td>Unload to regain energy when BDT lags</td>
<td>DBT (expendables)</td>
</tr>
<tr>
<td></td>
<td>Tighten down turn as BDT tightens down to hold nose in lag</td>
<td>Prior to sensor nose, ditch (check altitude) or NH redefine</td>
</tr>
<tr>
<td></td>
<td>Repeat until BDT neutralized or…</td>
<td>At top of redefine either roll underneath BDT to setup rolling scissors or overbank to 2C rate war</td>
</tr>
<tr>
<td></td>
<td>Ditch if unable to hold BDT’s nose in lag (sensor nose)</td>
<td></td>
</tr>
<tr>
<td>Profile 1</td>
<td>2C OOP Rate Fight</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Objective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Forward quarter WEZ awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Out rate inferior BDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Maintain sight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Create weapon separation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Valid AIM-9 kill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TTK &lt; 90 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bandit Profile:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IRCM approaching merge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- At merge, best BT across tail for 2C flow for 90°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Then G = 1% of KCAS (i.e. 450 KCAS = 4.5 G)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- If after 3rd 2C flow (~90 seconds engaged) FTR has not achieved WEZ – “TERMINATE”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fighter Mechanics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Establish lateral separation approaching merge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IRCM until inside forward quarter Rmin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- NL BT across bandit’s tail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Execute energy rate deck transition to sustained rate numbers for rate war (no slower than 300)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Be patient and allow rate advantage to work for you. Don’t over-pull and bleed below sustained rate unless doing so will immediately yield a valid WEZ (watch min airspeed for weapons)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transition to OBFM 2C flow and kill bandit when valid WEZ achieved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile 2</td>
<td>1C OOP Radius Fight</td>
<td></td>
</tr>
<tr>
<td><strong>Objective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Forward quarter WEZ awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transition from corner speed to radius fight airspeed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Manage energy / AOA / and vector for OOP 1C flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Kill bandit or remain alive for &gt; 1 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bandit Profile:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IRCM approaching merge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- At merge, reverse NH away from FTR to force 1C OOP flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- After each subsequent merge reverse as necessary to maintain 1C OOP flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transition to RS if geometry dictates</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fighter Mechanics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Establish lateral/vertical separation approaching merge, call the deconfliction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IRCM until inside forward quarter Rmin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- At merge, 20° NL turn across bandit’s tail (bandit will reverse at the merge to force 1C flow)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Maintain / regain tally on bandit 20-30° above horizon in the direction of your initial turn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transition to radius numbers (may need to reduce throttle to bleed down in NL turn)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Once bandit is at your 3/9 line reduce AOB to begin to climb to next merge, call the deconfliction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- At next merge, reverse your turn direction to maintain the 1C flow along the initial down range travel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Watch for opportunity/necessity to transition to a RS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recognize winning and losing and transition to OBFM / DBFM as appropriate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile 3 1C In Plane Radius Fight</td>
<td>Objective:</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Forward quarter WEZ awareness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Transition from corner speed to radius fight airspeed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Manage energy / AOA / and vector for in plane 1C flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Kill bandit or remain alive for &gt; 1 min</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Bandit Profile:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• IRCM approaching merge</td>
</tr>
<tr>
<td></td>
<td>• At merge, reverse NL away from FTR to force 1C in plane flow</td>
</tr>
<tr>
<td></td>
<td>• After each subsequent merge reverse NH or NL (FTR will force POM) to maintain 1C flow along initial down range travel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fighter Mechanics:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Establish lateral/vertical separation approaching merge, call the deconfliction</td>
</tr>
<tr>
<td></td>
<td>• IRCM until inside forward quarter Rmin</td>
</tr>
<tr>
<td></td>
<td>• At merge, 20° NL turn across bandit’s tail (bandit will reverse at the merge to force 1C flow)</td>
</tr>
<tr>
<td></td>
<td>• Maintain / regain tally on bandit level on horizon in the direction of your initial turn</td>
</tr>
<tr>
<td></td>
<td>• Transition to radius numbers (may need to reduce throttle to bleed down in NL turn)</td>
</tr>
<tr>
<td></td>
<td>• Call the deconfliction</td>
</tr>
<tr>
<td></td>
<td>• At next merge, reverse your turn direction and set your POM to maintain the 1C in plane flow (BDT may change POM, you will have to correct)</td>
</tr>
<tr>
<td></td>
<td>• Recognize winning and losing and transition to OBFM / DBFM as appropriate</td>
</tr>
</tbody>
</table>

**Common Errors:**

1. Not knowing profiles.
2. Not flying proper profile.

**Corrections for Errors:**

1. Study!

**Source Documents:** N/A
Night Systems Stage

Name: Night Aircraft Preflight

Purpose: Perform aircraft preflight at night

Description of Procedures:

1. Aircraft preflight procedures remain the same for day or night. The preflight checklist is contained within the NATOPS Pocket Checklist and clearly delineates the necessary checks. The difference at night is the inability to clearly see aircraft discrepancies due to lack of illumination. Lack of illumination can be overcome by use of the pilot’s flashlight (using the clear lens). The red lens should be removed prior to using the flashlight to preflight, as hydraulic fluid will not be detectable with that lens in place. Should NVD compatible lighting be required, utilize the green lens on the flashlight during preflight (this is not a consideration at the FRS, so the clear lens should be used). Field-of-view to observe aircraft discrepancies with the flashlight is limited to the area illuminated by the flashlight. Allow additional preflight time (normally an extra 5 minutes will suffice) in order to conduct a satisfactory check.

Common Errors:

1. Not using a flashlight under dusk conditions.
2. Weak flashlight batteries resulting in poor illumination.
3. Behind timeline resulting in missed items on preflight checklist or late start.
4. Improper preflight.

Corrections for Errors:

1. Always use a flashlight to preflight, even during dusk conditions to illuminate areas that are shaded (such as the cold nozzles, main wheel well, and turbine blades for example).
2. Always preflight your flight gear prior to leaving Flight Equipment; this means checking the battery power (brightness) of your flashlight. If the flashlight is weak, ask Flight Equipment for a replacement.
3. Allow sufficient time to conduct necessary steps to proceed safely with the flight.
4. Review Familiarization Stage and / or ask questions.

Source Documents: NATOPS, VMAT-203 SOP
Name: Aircraft Exterior Lights

Purpose: The pilot should be able to adjust the aircraft exterior light package to suit the environmental conditions.

Description of Procedures:

1. All light switches should be set prior to start. The aircraft exterior lights will be placed in the following condition prior to engine start for a night sortie:
   a. Exterior Lights Master Switch – ON.
   b. Anti-collision Light Switch – ON.
   c. Position Lights Switch – OFF.
   d. Formation Lights Knob – OFF.
   e. Landing Light Switch – OFF.
   f. Auxiliary Landing Light Switch – OFF.
2. Once the aircraft has been started, the following exterior lights will be turned on:
   a. Position Lights Switch – BRT
   b. Formation Lights Knob – BRT (fully rotated clockwise).
3. During final checks the plane captain will signal the pilot to:
   a. Landing Light Switch – momentarily APRCH, then HVR, then OFF.
   b. Auxiliary Landing Light Switch – momentarily AUX, then OFF.
4. The Landing Light Switch will be placed to the APRCH or HVR position for taxi at night. Choosing the APRCH light over the HVR light is dependent on ambient light levels and current environmental conditions. Generally, choose the position that gives you the most SA on what is in front of your aircraft.
5. On sorties where NVDs are donned on deck, a light package drill will be conducted in the warm-up area (or other marshal / hold-short area). When both aircraft are positioned abeam and “UP AND READY” has been confirmed by the flight Lead, the following will take place:
   a. “MARS 11 FLIGHT, CLOAK” – at which point both aircraft will secure their position lights and taxi light, and place the Exterior Lights Master Switch to the NVD position. Each member of the flight will ensure that they can see the formation lights and anti-collision lights of each aircraft through the NVGs. A quick check underneath the NVGs will ensure that there is no overt lighting coming from the anti-collision light of the wingman’s aircraft.
   b. “MARS 11 FLIGHT, LIGHTS OUT” – at which point both aircraft will secure the Exterior Lights Master Switch. Each member of the flight will then visually confirm that there are no exterior lights on (either overt or cloaked).
   c. “MARS 11 FLIGHT, LIGHTS ON” – at which point both aircraft will reconfigure to the briefed overt lighting package for takeoff.
6. Aircraft position lighting is required thirty minutes prior to sundown to thirty minutes after sunrise. Aircraft anti-collision lights (one minimum) are required any time the
engine is running. All three position lights (one complete set) must work in either the
dim or bright position.
7. Night lighting packages will be briefed IAW SOPs and the Air NTTP. On the east
cost, due to range constraints, either the NVG Admin or NVG Training with FAA
Restrictions will be used according to the appropriate portion of the sortie.

**Common Errors:**

1. Exterior Lights – Master in OFF or NVD position.
2. Formation Lights in the ON position before the generator is on line which can cause
   arcing and light burnout.
3. Not using the APRCH or HVR light for taxi.
4. Improper switch positioning for the lights check when aided on deck.

**Corrections for Errors:**

1. Ensure your lighting package is IAW the brief.

**Source Documents:**

NATOPS, OPNAV 3710.7,
MAG-14 SOP, VMAT-203 SOP
Name: Aircraft Interior Lights

Purpose: The pilot should adjust the aircraft interior light package to suit the environmental conditions.

Description of Procedures:

1. Adequate interior lighting is of the utmost importance during night operations. If the intensity is too high, it will diminish night adaptation, generate unwanted canopy reflections (known as "veiling glare") and generally decrease visual acuity and overall SA. Therefore, lighting should be set only as bright as necessary to read and interpret instruments under the current ambient light levels and prevailing environmental conditions. The aircraft interior lights should be completely checked and operational. To facilitate this process, the following switch positions and procedures will be performed prior to APU or engine start:
   a. Instrument Panel Lights Knob – BRT.
   b. Console Lights Knob – BRT.
   c. Console Floodlights Knob – BRT.
   d. Compass / Lights Test Switch – COMP.
   e. Emergency Floodlights – BRT.
   f. Chart / Kneeboard Lights – CHECK OPERATION.
   g. Utility Floodlights – CHECK OPERATION / AS REQ..

2. After APU or engine start (and throughout the remaining portion of the sortie), the following switch positions and procedures will be performed:
   a. Instrument Panel Lights Knob – As desired.
   b. Console Lights Knob – As desired.
   c. Console Floodlights Knob – As desired (nearly always off; these lights will create the most amount of veiling glare and decreased visual acuity).
   d. Warning / Caution Lights Knob – RESET.
   e. Charts / Kneeboard Lights – As desired.
   f. Utility Floodlight – As desired.
   g. HUD Symbology Brightness Control Knob – As desired.
   h. AMPCD Brightness and Contrast – As desired.
   i. EDP Brightness Control Knob – As desired.
   j. UFC Brightness Control Know – As desired
   k. ACNIP or RSC – As desired.

3. After you start the aircraft, you will place most interior lights to the full-bright position (as stated above). Then, as your eyes adjust and you taxi away from artificial light sources (the hanger), you will appropriately dim them. Interior lights are adjusted often to suit the conditions throughout the flight. For example, when airborne and away from cultural lighting, the interior lights will likely have to be dimmed. When
returning to land, with the bright cultural lights of the airfield and city, the interior lights will almost definitely have to be brightened. This practice is most pronounced with the HUD brightness. A good rule of thumb is to adjust (as necessary) the different brightness levels of your interior lighting to the lowest acceptable levels.

4. While wearing NVGs, the cockpit lighting will need to be brighter in since stimulated light is shown through the NVG tubes. This requires typical settings a bit higher (than for unaided flight) so that when looking under the NVG tubes, the instruments and displays can be seen.
   a. AMPCD Brightness and Contrast – As desired.
   b. Instrument Panel Lights Knob – turned up from the unaided setting.
   c. Console Lights Knob – turned up from the unaided setting.

**Common Errors:**

1. Interior lights are too bright causing canopy reflections.
2. Unfamiliar with cockpit interior lighting.
3. Not adjusting the lighting for aided flight following donning / doffing of the NVDs.

**Corrections for Errors:**

1. Turn down the interior lights to the lowest acceptable levels.
2. There are many cockpit switches and knobs that control interior lighting. NATOPS contains a description of the switches and knobs and also a diagram of their location. During FAM stage use the opportunity to familiarize yourself with all of the location and functions of the interior cockpit lights. The simulator is an excellent instructional aide in this regard.
3. Adjust the interior lights as required so that the appropriate displays can be seen while wearing NVGs or after they have been removed. Once NVGs have been doffed, it will take several minutes for your eyes to adapt back to the unaided scene, and cockpit lights will likely have to be progressively turned down.

**Source Documents:** NATOPS, Air NTTP
Name: Night Plane Captain Signals

Purpose: Understand and react to night plane captain (visual communication) signals.

Description of Procedures:

1. Communication between the plane captain (PC) and aircrew is primarily visual. On rare occasion, avionics troubleshooters will have a ground / aircraft intercom to communicate with the pilot. During periods of darkness, PC hand and arm signals may be difficult to see and interpret. For this reason, NATOPS contains the night hand and arm signals used by the PC and signaled by flashlight, glow stick, or wand. The sequence of events does not change from day to night. The pilot can expect the conduct and execution of the pre-start, post-start and before taxi checks to remain the same; the difference will be how the PC signals for and responds to the pilot during the specified checks.

2. Instead of using hand signals for one- to four-finger checks, the plane captain will flash wands the appropriate number of times to indicate the associated check. Typically the plane captain will be able to see the pilots hand signal to indicate the initiation of the check and will reply in kind with flashing wands. Use of interior flood lights or left chart / kneeboard light will aid the PC in seeing your signals to him. Remember, the sequence and tempo of the checks remains the same.

Common Errors:

1. Unsure of what plane captain is trying to communicate.

 Corrections for Errors:

1. Familiarize yourself with the night visual signals prior to the first night sortie.

Source Documents: NATOPS, VMAT-203 SOP
Name: Unaided Taxi and Takeoffs at Night

Purpose: Safely perform unaided takeoffs at night.

Description of Procedures:

1. The procedures for night takeoffs are exactly the same as in the daytime environment. The primary difference is a lack of visual cues that pilots become comfortable with and accustom to when operating in daylight conditions.

2. Individual unaided takeoffs pose no significant problems. Pilots must understand the lack of peripheral vision and depth perception and adjust their scan appropriately. The decreased sense of motion at night will require increased scanning of the ground speed in the HUD. The scan is more of an instrument scan than that used in daylight conditions. If equipped, incorporation of the NAVFLIR display into the scan can increase SA on what is in front of the aircraft. Once airborne, the instrument scan is key to indicate the performance of the aircraft and allow the pilot to ensure that a positive rate of climb is maintained.

3. Unaided section takeoffs involve a higher scan workload of Lead aircraft, instruments and lineup. Unaided section takeoffs will be Stream STOs. Once airborne, wingman should take lateral offset (placing Lead on the edge of HUD glass) and abide by the night flying closure rules. The closer you get to Lead, the more you will have to transition to a visual scan to fly a good position off Lead aircraft. However, instruments must continuously scanned. In VMAT-203, unaided Section Conventional Take Offs at night are not performed.

4. Lighting: Lead will utilize the briefed lighting package when flying with an unaided wingman. Once close aboard, the wingman can ask for “LIGHTS” and the Lead will secure the anti-collision light.

5. Lighting Configuration:
   a. Lead: Smash lights on, NAV lights on, form lights bright.
   b. Wing: Smash lights on, NAV lights on, form lights bright.

6. Rendezvous: The NAVFLIR shall not be used for rendezvous due to lack of depth perception and visual distance assessment. Normal night rendezvous airspeeds will apply unless otherwise briefed. Lead should be notified prior to closing inside 0.3 DME with a “VISUAL” call. This will indicate to Lead that you as the wingman have Lead in sight and are providing adequate separation to prevent a possible mid-air. Wingman will not position the velocity vector on the Lead aircraft within 1.0 DME.

7. For a night unaided vertical takeoffs, the pilot must select outside references similar to daylight operations; at night these will probably be lights on the airfield. The visual scan remains important; however the instrument scan becomes significantly more important as you climb away from the ground. Small corrections are the key. Due to the decreased visual references, it will become harder to notice movement strictly by what the pilot sees. Thus instruments must be relied on (especially for judging rate of climb).
Common Errors:

1. Fixating on Leads aircraft, dropping an instrument scan, and developing excessive closure.
2. Not integrating a proper scan during takeoff and rendezvous.
3. At least one aircraft in section needs anti-collision lights on (almost always a wingman).

Corrections for Errors:

1. Do not fixate on Lead aircraft. Maintain your side of the runway and cross check the instruments with the outside picture.

2. Incorporate a visual / instrument scan during takeoff and rendezvous.
3. Ensure the proper lighting package has been selected prior to takeoff.

Source Documents: MAG-14 SOP, VMAT-203 SOP
Name: Unaided Landings at Night

Purpose: Safely land the aircraft unaided at night.

Description of Procedures:

1. The night landing pattern remains the same as the day landing pattern. The objective is to fly the same ground track regardless daytime or night. The difference lies in the lack of the daylight visual reference provided by the horizon and the unconscious cues that are derived from the pilot’s peripheral vision. At night, the landing pattern is conducted with increased reference to instruments. A very important thing to remember is that regardless of light conditions or proficiency level, at no time should you fly a daytime approach. Always cross-reference and incorporate your instruments into your scan. The pilot must strive to fly the approach turn as depicted and described in the FSG to arrive at the start (groove or key) in an advantageous position to ensure a safe and satisfactory pass. The actual procedures to perform the approach turn leading to each type of landing do not change. Our perceptions, due to the lack of visual references and motion cues, are what have changed.

2. During the approach turn, the runway can be referenced, but the primary scan must be with reference to the HUD. From the 180 to the 90 position, HUD indications (mainly attitude, altitude and AOA) and AMPCD position (TRAK and course lines) makes up the majority of the scan. From the 90 to the landing, your scan moves increasingly to an “outside” or visual scan. Flying a disciplined pattern at night is similar to flying instruments with the primary reference being the HUD-presented flight information.

3. From the 45 to touchdown, there will be a tendency to want to move to a greater outside scan. This is natural, but realize that the lack of peripheral vision will impact your ability to judge rate of descent and speed as you approach touchdown. Continue to scan your instrument indications for airspeed and rate of descent. The outside scan of the runway environment will provide valid lineup cues and allow you to adjust touchdown point. As the aircraft nears touchdown (at approximately 30’ AGL), the landing light will begin to illuminate the runway and provide additional cues. Setting the landing attitude and touching down remains the same and during the day.

4. Rollout will again require a combined instrument and visual scan to ensure that centerline is maintained and that the aircraft is decelerating sufficiently to be stopped appropriately. Use of the landing light and NAVFLIR (if so equipped) will provide the best SA as to what lies in front of the aircraft.

5. Unaided decels to vertical landings are challenging due to the lack of depth perception and inability to easily judge closure to the pad. Similar to the normal pattern discussed above, the VL pattern is unchanged. The primary change comes with the increased dependency on instrument scan to ensure that closure to the pad is controlled and that proper altitudes are maintained. The pad will be lighted (in blue) which will aid in judging closure. It is better to select hover stop early in a night decel to avoid pulling the nose up in close to slow closure. Pulling the nose up can
be disorienting, as can the selection of braking stop during a night decel. Once in position over the pad, the hover light will aid in lighting the landing surface, and more of a traditional visual scan will be possible. The visual / instrument scan must be maintained on the comedown to avoid drift or excessive rate of descent.

Common Errors:

1. Not wanting to descend from the 180° position or tentative approach turn, due to lack of visual references and proximity of the ground (caused by poor instrument scan).
2. High all the way during the approach to landing.
3. Too much rate of descent due to a lack of depth perception while attempting to use a visual scan.
4. Late selection of hover stop during a decel to vertical landing resulting in pulling the nose up and losing sight of the landing environment. This disorientation can be exacerbated with the selection of braking stop.

Corrections for Errors:

1. Conduct the approach turn to the runway with reference to HUD and AMPCD to arrive at a good start for the landing.
2. Visual illusion due to the runway lights being inboard of the actual edge of the paved runway area making the landing area appear narrow. Reference HUD altitude (remember to select RADALT!) and attitude throughout the pass and set the proper landing attitude prior to touchdown.
3. Reference HUD flight information to assist in judging rate of descent and pattern altitudes. Do not rely on visual reference only. Always cross-reference and incorporate your instruments into your scan.
4. Select hover stop (slightly) early rather than late to allow for more of a level attitude decel. If you begin to trundle, push the nose forward slightly to maintain closure or nozzle out 1-2 degrees. Keep your scan going!

Source Documents: NATOPS, Air NTTP
Name: Unaided Basic Formation

Purpose: Facilitate the execution of basic formation at night without the use of NVGs.

Description of Procedures:

1. Unaided parade position. Parade position in the night is no different than daylight operations. The lighting package will have Lead aircraft with position and formation lights on and typically the anti-collision light secured. The wingman’s lights will be all on full bright (pos, form, and anti-coll). The wingman’s anti-collision light will illuminate Lead’s aircraft enough to maintain a visual scan to maintain position.

2. Unaided cross under. The unaided night cross under is executed the same as in the daylight. The key is to make small corrections to maintain a controlled position throughout the maneuver.

3. Unaided lead change. The unaided Lead change is similar to the daytime Lead change. The Lead aircraft will state, “STANDBY FOR LEAD CHANGE.” He will then change his light package to that of the wingman (Pos lights to bright and anti-collision light on). The comm cadence is as follows:
   - MARS 11 “YOU HAVE THE LEAD ON THE L/R.”
   - MARS 12 “I HAVE THE LEAD ON THE L/R.”
   - MARS 11 “YOU HAVE THE LEAD.”

   Once the Lead has been changed, the new Leader will reconfigure his lighting package to that of the Leader (Pos lights dim and anti-collision light off). We still want a positive three-way change of Lead. A good memory aid for the night unaided Lead change is “lights, lips, lips, lips, lights.”

4. Unaided night rendezvous: Night rendezvous shall be carried out in VMC. The following procedures will be used:
   a. Airspeed is 300 KIAS.
   b. Altitude as briefed by Lead.
   c. Trailing aircraft will call “VISUAL” when lead aircraft is identified. If a circling rendezvous is required, the lead aircraft shall call and commence a port or starboard 30° AOB turn. If a running rendezvous is required, the wingman will take offset to one side and commence the approach.
   d. Trailing aircraft will close slightly below lead’s altitude with lateral separation, and call “LIGHTS”, “SMASH OFF” and / or “DIM” as required.
   e. Maximum closure in-trail is 25 knots.
   f. Maximum closure once on-bearing is 15 knots.
   g. There will be NO mission crosschecks completed from the cruise position until stabilized in parade position on all night rendezvous.

3. Night breakup and rendezvous practice:
   a. “Breakup and rendezvous” will be performed in the same manner as day, with the following additions:
i. Lead will turn his anti-collision lights on just prior to the breakup.

ii. Lead will transmit "LEFT" or "RIGHT" to indicate direction of turn.

b. Bearing line on a night rendezvous is difficult to discern. Using the taillight, wingtip light, and anti-collision light, place the anti-collision light one-third of the distance from the wingtip light to the taillight. At approximately one-half mile you will be able to pick up the strip lighting. At this point, align lead’s wingtip light with the strip light on top of his aircraft, just aft of the canopy. Once in close, your anti-collision light will illuminate Lead’s wing, allowing you to complete the rendezvous visually.

Common Errors:

1. Improper lighting package for lead and wing.
2. Too much closure during rendezvous.

Corrections for Errors:

1. Both aircraft are responsible to ensure that the lighting package is correct for the flight. If there is a lighting package problem, fix it.
2. Keep scan working and adhere to the maximum closure rules.

Source Documents: N/A
Name: Don and Doff Procedures

Purpose: Developing standards for Donning and Doffing NVGs while airborne.

Description of Procedures:

1. Transitioning from the “unaided” scene to the “aided” scene is done by resetting the
goggles from the up or stowed position to the down / operational position. Ensure
the battery switch is placed ON. This transition shall be a pre-briefed item and
performed when both aircraft are in a stabilized platform. A stabilized platform
requires:
   a. VMC
   b. > 1000’ above minimum safe altitude.
   c. > 0.3 DME separation
   d. Straight and level with AFC & altitude hold on.
   e. Under positive communication with each other.

2. Communications sequence: (Donning NVGs)
   a. Lead: “MARS 11 STANDBY TO GOGGLE”
   b. Wing: “MARS 12 READY TO GOGGLE”
   c. Lead: “MARS 11 FLIGHT GOGGLE”
   d. Wing: “MARS 12 GOOD GOGGLES”
   e. Lead: “MARS 11 GOOD GOGGLES”

3. Communications sequence: (Doffing NVGs)
   a. Lead: “MARS 11 STANDBY TO DEGOGGLE”
   b. Wing: “MARS 12 READY TO DEGOGGLE”
   c. Lead: “MARS 11 FLIGHT DEGOGGLE”
   d. Wing: “MARS 12 GOGGLES STOWED”
   e. Lead: “MARS 11 GOGGLES STOWED”

4. The transition from aided to unaided can be a difficult shift. Ensure that there is
   enough time allowed for all members of the flight to adjust their eyes and cockpit
   lighting to the unaided scene. This will usually require cockpit lighting to be turned
down accordingly. It may also require several minutes for your eyes to adjust to the
   unaided night scene.

Common Errors:

1. Incorrect brightness of the HUD and interior cockpit lighting.
2. Mixed aided flight. (One member either having goggles on / off – opposite of Lead)
3. Not being in stabilized platform while donning / doffing
Corrections for Errors:

1. Adjust the HUD to ensure that the display can be seen through the goggles when donned. Adjust the interior cockpit lighting to the lowest acceptable levels.
2. Proper preflight briefing shall cover all aspects of the flight to include donning / doffing procedures.
3. Ensure that your jet is trimmed up with AFC selected, prior to donning the goggles.

Source Documents: Air NTTP, NVD Manual, MAG-14 SOP
Name: NVD Environmental Assessment

Purpose: Properly execute a night environmental assessment to evaluate the performance of NVGs and NAVFLIR (if so equipped).

Description of Procedures:

1. The NVDs and the NAVFLIR are affected by environmental conditions which were previously discussed in the NITE lab and stage briefs. Proper pre-flight planning will show the effects on a particular sensor and what the pilot should expect during the flight. It should be noted that your environmental conditions will change during the flight. The pre-flight briefing should detail the predicted effects and the environmental changes expected during the flight. Once airborne and aided, a proper environmental assessment shall be accomplished. During this assessment, note any adverse affects or conditions which would preclude mission success. The environmental assessment is then continuous as the environment may change during the flight. A proper environmental assessment will be performed by the flight Lead, since he has the final authority in mission accomplishment and safe execution.

2. A proper environmental assessment will include but not be limited to an evaluation of the following:
   a. Lunar azimuth and elevation
   b. Dynamic shadowing
   c. Visibility and ground texture
   d. Horizon definition
   e. Ambient light levels
   f. Ceiling
   g. FLIR performance (If configured)
   h. NVD performance
   i. Cultural Lighting
   j. Moon Phase

3. Once NVGs have been donned, the flight Lead will inform the flight to “STANDBY FOR ENVIRONMENTAL ASSESSMENT.” The flight will accelerate to 300 KCAS in deployed echelon. The flight Lead will then initiate a 300 KCAS turn away from the wingman (to prevent the wingman from going belly up) for approximately 180 degrees. During this turn the environment will be evaluated through the NVGs with the above elements being considered. The flight will then execute another 180 degree turn (in the same direction as the initial turn), again evaluating the above elements. Upon conclusion of the full 360 degrees of turn, the flight Lead will state any specific factors that may impact the mission. During the NS syllabus, the IP will describe what he is seeing throughout the turn for the students benefit.

Common Errors:

1. Losing sight of Lead during environmental assessment.
Corrections for Errors:

1. If the wingman pulls inside of Lead’s turn radius, the potential exists to go belly up. The proper corrective action for this is to lag Leads turn when required to facilitate not going belly up. Remember that you are going to be looking at Lead through a 40 degree FOV (limitation of the NVGs). Keep your scan going.

Source Documents: N/A
Name: Aided Familiarization

Purpose: Facilitate the introduction of NVGs to the RP.

Description of Procedures:

1. Following the donning of the NVGs and performance of the environmental assessment, as scan drill will be performed at 5000’ and then at 1000’ (conditions warranted). The scan drill will consist of a series of 4 G turns for 90, 180, and 360 degrees at 350 KCAS. During the night stage of the syllabus, these type turns are no problem in the daylight, but at night with the goggles on your head you will be presented with a new challenge. The idea behind the NS scan drill is to evaluate the limited FOV of the goggles and their weighted effect on your head.

2. This will be accomplished in the TAV-8 on NS-1604. All of the turns will be called by the IP. On the IP’s call, the RP will clear the turn by turning the head in the proper direction to ensure that the path is clear. Remember that you are looking through a 40 degree tube, so you must move your head. Then initiate an unloaded roll in the proper direction to set the proper AOB and POM. Apply full power and smoothly pull the aircraft to establish a 4 G turn. Readjust power as required to ensure that 350 kts is maintained throughout the turn. Lead the rollout by unloading the back stick and smoothly rolling the aircraft out on the new heading.

3. The scan will begin on the HUD and then move to the canopy bow and back (very similar to the scan used in AAH). Altitude, airspeed, POM, and G will have to be scanned and adjusted to maintain the target parameters.

4. The new wrinkle is obviously the NVDs. As G is applied to the aircraft, you will feel the weight of the goggles on your helmet and a tendency to want to pull the mask down your nose and the goggles into your face. This effect can be reduced by ensuring a tight fit of your mask and a securely fastened chin strap. If things do begin to slide, reposition your mask and helmet so that the full image can be seen through the goggles.

Common Errors:

1. Being off airspeed, altitude, or G.

 Corrections for Errors:

1. Fly a smooth aircraft and maintain a good scan.

Source Documents: N/A
Name: Aided Takeoffs at Night

Purpose: Safely perform aided takeoffs at night.

Description of Procedures:

1. Aided takeoffs involve a higher workload and require an intensive scan of both Lead aircraft and instruments. The standard individual takeoff will be STOL flap STOs. Standard section takeoffs will be Stream STOs. On deck, donning of the NVGs will be accomplished in the warm-up, marshal or hold-short area prior to calling “UP AND READY.” At the completion of the “UP AND READY” call, the flight Lead will assume the flight is goggled. Advise your lead of any alibis at that point if you are not ready.

2. Once airborne, Dash-2 should take lateral offset from Lead and prevent “bore sighting” Leads aircraft at all times. In VMAT-203, aided section conventional takeoffs will not be performed.

3. Upon unstick from a STO or VTO, the lack of peripheral cues will require that you evaluate accelerating transitions (or transition to the hover for a press-up) via a good instrument scan. This instrument scan will be combined with a visual scan to facilitate a join-up or turn to downwind in the pattern.

4. Lighting configuration (master NORM):
   a. Lead: Smash lights on, NAV lights DIM, form lights in the BRT position.
   b. Wing: Smash lights on, NAV lights BRT, form lights in the BRT position.

5. Rendezvous: The NAVFLIR should not be used for rendezvous due to lack of depth perception and visual distance assessment. Normal night rendezvous airspeeds will apply unless otherwise briefed. Lead should be notified prior to closing inside 0.3 DME with a “VISUAL” call. This will indicate to Lead that you as the wingman have Lead in sight and are providing adequate separation to prevent a possible mid-air. Wingman will not position the velocity vector on the Lead aircraft within 1.0 DME.

Common Errors:

1. Fixating on Leads aircraft, and developing excessive closure.
2. Not integrating a proper “aided” scan during takeoff and rendezvous.
3. At least one aircraft in section needs anti-collision lights on.

Corrections for Errors:

1. Incorporate a proper “aided” scan during takeoff.
2. Incorporate a proper “aided” scan during takeoff.
3. Ensure the proper lighting package is complied with.

Source Documents: Air NTTP, NVD Manual
Name: Aided Landing at Night

Purpose: Safely perform aided landings at night.

Description of Procedures:

1. Aided night landings are performed in a manner nearly identical to the unaided night landings. A good instrument scan must be incorporated for aided night landings. A proper instrument scan will aid the pilot in flying around the pattern when outside visual cues are insufficient. The NVGs should not be utilized as the sole sensor; they are an additional sensor used in the landing pattern. Remember: no NVDs will ever turn night time into day! The two most apparent differences to landing on NVGs is the lack of peripheral vision and depth perception. The lack of depth perception may force you to think you are lower or slower than you actually are, so resist the urge to spot or anticipate the deck; fly your AGL numbers with a solid instrument-visual scan. The NAVFLIR can be used (if so equipped) during straight-in approaches assist you in acquiring the appropriate landing environment.

2. Field lighting is very important in determining the workload that will be experienced when landing with the goggles on. If the airfield lighting is too bright, it will de-gain the goggles to the point that you will not be able to make out the landing spot. Landings can be safely made with no runway lighting if the ambient light level is high enough. As a rule of thumb, if the tower places the runway lights at their lowest setting, then you will be able to make out the runway surface and landing spot while not de-gaining the goggles to an extreme.

3. Cultural lighting must also be considered. At times (depending on the active runway), cultural lighting can de-gain the goggles to the point that aided landings become unsafe. If this is the case, it is often a good idea to doff the goggles and land unaided. Otherwise, you may look under the goggles to get an “unaided” appreciation for the outside scene. Often, a combined scan of looking through the goggles and then under them paints the best “picture” of the outside world and provides you with the best information to safely recover your aircraft. Additionally, this combined scan is a good idea to ensure you are in fact lined up on the runway and not on a taxiway.

4. All the while, you must not forget the importance of an instrument scan in the aided night landing pattern. The goggles don’t turn night into day, and without the benefit of peripheral vision, all that you see through the goggles must be cross checked with instrument information.

Common Errors.

1. Not flying the aircraft all the way to the deck.
2. Not incorporating a proper instrument scan as well as a proper visual scan.
Correction for Errors:

1. Fly the aircraft until you are at a complete stop. Utilize all of the information available to you with respect to instruments as well as through the goggles. Do not spot or anticipate the deck.
2. Anticipate differences using NVDs, and incorporate a proper scan to make up for a lack of visual cues. Airfield and cultural lighting must always be evaluated so that a decision can be made on whether to remain aided or to doff the goggles. Keep your scan going; if you lose SA, wave off.

Source Documents: Air NTTP, NVD Manual
Name: Night Formation Using NVGs

Purpose: Developing the basic skills required to keep formation on NVGs.

Description of Procedures:

1. Flying on the goggles requires a different scan and understanding of aircraft energy states that you are not accustomed to. The lack of depth perception and other visual cues mandates that you use other systems and a different scan in order to achieve mission success. The standard formation at night is Deployed Echelon. Other formations, such as Cruise, Parade, or Fighter Wing, may also be used.

2. Parade or Cruise formations are used during Section Approaches. Due to the lack of peripheral views and depth perception, a slightly “sucked” position is allowable. A “NVG parade” position is where the Lead aircraft is placed just inside the NVG goggle FOV, with Lead’s nose and tail touching the sides of the FOV’s circle. It is a difficult task to maintain proper parade position while on NVDs. The lead aircraft’s anti-collision light will probably mandate that the anti-coll is secured. Ownship anti-coll will provide abundant lighting to see the necessary cues as parade is maintained. In parade, hand and arm signals typically will not work due to being too close, so calls for configuration, Lead, and formation changes should be accomplished over the radio.

3. Deployed Echelon will allow the wingman to accomplish inter-cockpit tasks and maintain a safe distance from Lead (increased MCT). Turns in Deployed Echelon can be performed at any speed or altitude. At no time should wing put his velocity vector on Leads aircraft within 1.0 DME. A de-confliction plan should be briefed by the Lead so that there is an altitude difference between aircraft within the flight.
   a. Deployed Echelon: As defined in the Air NTTP. Flying a proper position will require a proper scan both inside the cockpit and outside at Leads aircraft. The pilots scan inside the cockpit should include, but is not limited to:
      i. Airspeed
      ii. Altitude
      iii. A/A TACAN DME
   b. The scan outside should include, but is not limited to:
      i. Lead’s aircraft
      ii. Lead’s attitude and altitude
      iii. Scan through Lead’s aircraft to the horizon

4. Rendezvous on NVGs are accomplished in the same manner that they are when unaided. The key on NVGs is to force the incorporation of an instrument scan and to not be lulled into complacency just because you can “see.” The closure rules of thumb apply in aided execution.
Common Errors:

1. Not flying the correct formations or not maintaining proper separation from Lead’s aircraft.
2. Not incorporating an instrument scan with the NVD scan to ensure that airspeed, altitude, and closure are kept under control

Corrections for Errors:

1. Proper understanding of your aircraft’s energy state. A proper pre-flight briefing and an understanding of the mission requirements will allow for safe NVD operations.
2. Keep your scan going. Don’t become lazy, just because you can “see.”

Source Documents: Air NTTP, MAG-14 SOP, NVD Manual
NATOPS Stage

Name: NATOPS Evaluation

Purpose: Conduct NATOPS evaluation as required by OPNAV 3710.7.

Description of Procedures:

1. The NATOPS check is an annual check flight. The NATOPS check is a four-part event. The Open and Closed book NATOPS exam (parts 1 and 2) must be completed, turned in to DSS, and graded within 60 days prior to the event brief. It is your responsibly to ensure this happens. Failure to do this will result in an unsatisfactory grade. The third part is an oral examination of aircraft systems knowledge and procedures. The fourth part is the flight evaluation. Contact your evaluator for planning specifics.

2. Although the plan and the brief are for a tactical sortie, the emphasis of this flight is on knowledge of the AV-8B and the ability to safely operate it. You will brief the flight IAW the Air NTTP briefing guides. You should strive to complete the administrative portion of the brief within 20 minutes; the use of SOPs are highly encouraged. The tactical portion of the brief should require the bulk of the briefing time; this includes specifics on the route, weaponeering, the target attack, threat reaction, and egress.

3. The following are required for the NATOPS check:
   a. Completed and graded Open and Closed Book NATOPS Exams.
   b. DD-175
   c. Jet log and complete smart pack for the instructor.
   d. Weaponeering.
   e. A detailed route map and 1:50,000 target area chart.

4. A thorough review of the route, route restrictions, and diverts are recommended. Also review the communication procedures to fly to the route, enter the restricted area, BT-11, and return to Cherry Point. The instructor will simulate all controlling agencies, base radio, and your wingman.

Common Errors:

1. Not applying the correct procedures for a given emergency or malfunction.
2. Being unfamiliar with divert field location and layout.
3. Not using CRM to help with an emergency or malfunction.
4. Improper NATOPS and SOP procedures.
5. Improper knowledge of aircraft systems.
6. Not following VR route and range restrictions.
7. Poor navigation planning and execution.
8. Poor weaponeering and execution of air-to-surface attack skills.
Correction for Errors:

1. Apply appropriate procedures IAW NATOPS.
2. Review approach plates and IFR Supplement to become familiar with divert fields.
3. Use wingman, ODO, LSS / LSO, and ATC for help during an emergency or malfunction.
4. Ensure knowledge of aircraft systems.
5. Brief and follow all VR route and range restrictions.
6. Detailed weaponeering is required along with appropriate charts and imagery.

Source Documents: NATOPS, VMAT-203 SOP, Air NTTP
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<th>Mission: SFAM-1100</th>
<th>Duration: 2.0</th>
<th>Prerequisites:</th>
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| **Goal:** Introduce the AV-8B cockpit and After Entering Cockpit, Pre-Start, Starting Engine, and Before Taxiing Checks, AMPCD with emphasis on DVMS modes, UFCS, communication systems, and HUD with emphasis on V/STOL and navigation master modes symbology. | **Aircraft:** RNAWST | • FAM GS  
• Instrument Procedures Lesson |
| **Performance Standards:** PUI shall be familiar with all NATOPS aircraft system functionality and normal procedures checklists. | **Ordnance:** None | **External Support:** • CSI |
| **Simulator Parameters:**  
- Initialize in VMAT-203 line  
- CSI will conduct orientation from crew station  
- SKC, 22°C, 30.00, 310/10 32 L/R | **Range:** Simulated | **Threat:** None |
| **Requirements:**  
**Introduce:**  
- Cockpit orientation  
- Data transfer equipment installation  
- VRS installation  
- After entering cockpit checks  
- Pre-Start checks  
- Starting engine checks  
- INS ground alignment  
- Radar power up  
- DMT power-up  
- AMPCD operations to include DMVS modes  
- UFCS operations  
- Radio system programming  
- VSTOL and NAV master mode HUD symbology  
- Before taxiing checks  
- After landing checks  
- Post-flight aircraft data retrieval  
- Data transfer equipment removal | **Sequence of Events:**  
- Cockpit orientation  
- Before entering cockpit checks  
- After entering cockpit checks  
- Pre-start checks  
- Starting engine  
- Before taxiing checks  
- After landing checks | **Emergency Procedures Discussion:** • None |
| **Review:**  
• None | **Evaluate:**  
• None |
### Concepts and Discussion Topics:
- Crew resource management (CRM)
- DDI / AMPCD:
- EHSI / EHSD
- TACAN / TACAN offset
- WYPT / WYPT offset
- Course line and delta indication
- Range scales
- Data Page
  - DTX / OLX
  - GPS
- MAPM
  - Color options
  - Zoom function
  - Track
  - Map
  - OLR 1 & 2
- AUTO BIT
- SMSFF
- SAAHS BIT
### Mission: SFAM-1101

**Goal:**
Review the AV-8B cockpit and After Entering Cockpit, Pre-Start, Starting Engine, and Before Taxiing Checks, AMPCD with emphasis on DVMS modes, UFCS, communication systems, and HUD with emphasis on V/STOL and navigation master modes symbology.

**Performance Standards:**
PUI shall be familiar with all NATOPS aircraft system functionality and normal procedures checklists

**Simulator Parameters:**
- Initialize in VMAT-203 line
- SKC, 22°C, 30.00, 310/10 32 L/R

**Requirements:**

**Introduce:**
- None

**Review:**
- Cockpit orientation
- Data transfer equipment installation
- VRS installation
- After entering cockpit checks
- Pre-Start checks
- Starting engine checks
- INS ground alignment
- Radar power up
- DMT power-up
- AMPCD operations to include DMVS modes
- UFCS operations
- Radio system programming
- VSTOL and NAV master mode HUD symbology
- Before taxiing checks
- After landing checks
- Post-flight aircraft data retrieval
- Data transfer equipment removal

**Evaluate:**
- None

**Duration:** 2.0

**Aircraft:** RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**Prerequisites:**
- SFAM 1100

**External Support:**
- CSI

**Threat:** None

**Sequence of Events:**
- Cockpit orientation
- Before entering cockpit checks
- After entering cockpit checks
- Pre-start checks
- Starting engine
- Before taxiing checks
- After landing checks

**Emergency Procedures Discussion:**
- None
### Concepts and Discussion Topics:
- Crew resource management (CRM)
- DDI / AMPCD:
- EHSI / EHSD
- TACAN / TACAN offset
- WYPT / WYPT offset
- Course line and delta indication
- Range scales
- Data Page
  - DTX / OLX
  - GPS
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  - Color options
  - Zoom function
  - Track
  - Map
  - OLR 1 & 2
- AUTO BIT
- SMSFF
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**Goal:**
Introduce blindfold cockpit check, data transfer / entry, taxi / pre-positioning / takeoff / in-flight / landing checks, flight manoeuvres, and landings. Practice normal cockpit check procedures.

**Performance Standards:**
PUI will be familiar with the location of all cockpit switches.

**Aircraft:**
RNAWST

**Ordnance:**
• None

**Range:**
• R5306A

**External Support:**
• CSI

**Simulator Parameters:**
- Initialize in VMAT-203 line
- CSI will conduct cockpit check from crew station
- SKC, 22°C, 30.00, 310/10  32 L/R

**Requirements:**

**Introduce:**
- Blindfold cockpit check
- JMPS mission planning and data transfer
- Engine data entry
- Anti-skid, brake checks
- Pre-positioning checks
- AMPCD VRST STO display
- Takeoff checklist
- One-finger checks
- Two- / five-finger checks
- CTO
- STOL flap STO
- After takeoff checks
- VFR Climb technique
- Handling drills
- Approach to stall (clean, dirty)
- VFR straight-in
- Landing checklist
- STOL flap FNSL (2)
- Auto flap VNSL (2)
- PNB

**Review:**
• None

**Evaluate:**
• None

**Threat:**
None

**Sequence of Events:**
- Blindfold cockpit check
- Line checks
- Taxi
- Pre-positioning checks
- Takeoff checklist
- CTO
- After takeoff checks
- R5306A entry
- Handling drills
- Approach to stall (clean, dirty)
- R5306A exit
- VFR straight-in to STOL flap FNSL
- STOL flap FNSL
- STOL flap STO
- Auto flap VNSL (2)
- PNB

**Emergency Procedures Discussion:**
• None
**Concepts and Discussion Topics:**

- CRM
- Starting limitations
- HUD:
  - V/STOL, NAV, A/G master modes
  - Reject modes
- AMPCD set-up for flight
- VRST displays – performance and assumptions
  - CRUS
  - BNGO
  - VL
  - VTO
  - STO
**Mission:**

**SFAM-1103**

**Goal:**
Introduce CWAIVER checks, VRST VL display, takeoffs, landings PAR, missed approach, waveoff, and emergency procedures. Practice takeoffs and landings.

**Performance Standards:**
- Airspeed within 100 KCAS
- Altitude within 300 ft
- AOA within 4 units in landing configuration

**Aircraft:**
RNAWST

**Ordnance:**
None

**Duration:**
2.0

**Range:**
Simulated

**Prerequisites:**
- SFAM-1102

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- SKC, 26°C, 30.20, 050/10, 5 L/R

**Requirements:**

**Introduce:**
- CWAIVER checks
- AMPCD VRST VL display
- PAR
- Missed approach
- Auto flap FNSL
- STOL flap VNSL (2)
- SL to roll and go procedure (2)
- Press-up (2)
- Waveoff
- Emergency procedures:
  - Emergency shutdown
  - Abnormal start

**Review:**
- CTO
- STOL flap STO
- STOL flap FNSL
- Auto flap VNSL (2)

**Evaluate:**
None

**External Support:**
- CSI

**Threat:**
None

**Sequence of Events:**
- Ground checks / procedures
- CWAIVER checks
- CTO
- Depart VFR to GCA (PAR)
- Waveoff
- STOL flap FNSL
- Auto flap FNSL
- STOL flap VNSL (2)
- Auto flap VNSL (2)
- STOL flap STO
- Press-up (2)
- Emergency procedures

**Emergency Procedures Discussion:**
- Emergency shutdown
- Abnormal start
- Over rotation on take-off
- Engine airstart procedures
### Concepts and Discussion Topics:

CRM – Base, Tower, Metro, etc

- **UFC**
  - Button pushing techniques
  - RADALT
  - IFF
  - TACAN
  - Radios
  - TMR

- **Engine:**
  - General information
  - IGVs
  - Oil system
  - Air Induction system
  - DECS, DECU, FMU
  - DECS limiting
  - Fire warning system

- **Water Injection System**
**Mission:** SFAM-1104

**Goal:**
Introduce TACAN approach, conventional landings maneuvers, and emergency procedures.

**Performance Standards:**
- Airspeed within 75 KCAS
- Altitude within 250 ft
- AOA within 4 units in landing configuration

**Aircraft:** RNAWST

**Ordnance:**
- None

**External Support:**
- CSI

**Range:** Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- OVC 030, 32° C, 29.92, 300/10, 32 L/R

**Requirements:**

**Introduce:**
- TACAN approach
- CL to full stop (3)
- CL to roll and go
- CL to touch and go (2)
- Emergency procedures:
  - Ground fire
  - Loss of engine control
  - Oil system failure (oil caution light)

**Review:**
- STOL flap STO
- Missed approach
- Auto flap VNSL (2)
- Press-up (2)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Techniques for handling airborne emergencies
  - (aviate, navigate, communicate)
- Engine controls
  - Nozzle control lever
  - Butterfly valve operation
  - CMBT and JPTL switches
  - Fire warning system
- Engine Displays
  - EDP
  - HUD
  - DDI / AMPCD
  - Engine Warning / Caution Lights
  - OT Warning
  - JPTL Warning

**Sequence of Events:**
- Ground checks / procedures
- STO
- Depart VFR to TACAN approach
-Missed approach
- Auto flap VNSL (2)
- CL to roll and go
- CL to touch and go (2)
- CL to full stop (3)
- Press-up
- Emergency procedures

**Concepts and Discussion Topics:**
- CRM
- Techniques for handling airborne emergencies
  - (aviate, navigate, communicate)
- Engine controls
  - Nozzle control lever
  - Butterfly valve operation
  - CMBT and JPTL switches
  - Fire warning system
- Engine Displays
  - EDP
  - HUD
  - DDI / AMPCD
  - Engine Warning / Caution Lights
  - OT Warning
  - JPTL Warning

**Emergency Procedures Discussion:**
- Engine fire on ground
- Oil system failure (oil caution light)
- Loss of engine control

**Duration:**
- 2.0

**Prerequisites:**
- SFAM-1103

**Threat:** None
- 15 sec Light
- EFC Warning / Caution Light
- MFS
  - MFS selection and considerations
  - MFS emergency battery
- GTS / APU start and operating limits
## Mission: SFAM-1105

**Goal:**
Introduce VTO, VFR overhead, RVL, VL, and emergency procedures.

**Performance Standards:**
- Airspeed within 60 KCAS
- Altitude within 200 ft
- AOA within 3.5 units in landing configuration

**Aircraft:**
RNAWST

**Duration:**
2.0

**Prerequisites:**
- SFAM-1104

**Ordnance:**
- None

**External Support:**
- CSI

**Range:**
- Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- SKC, 28° C, 29.92, 260/10, 23L/R

**Requirements:**

### Introduce:
- Continuous VTO-accel (2)
- VFR overhead
- RVL (3)
- Decel to VL (2)
- Box pattern
- Emergency procedures:
  - Brake failure
  - Abort
  - No liftoff on STO
  - Main generator failure (GEN, DC, and STBY TR Caution LTS)

### Review:
- STOL flap STO
- STOL flap VNSL
- CL to roll and go
- Press-up

### Evaluate:
- None

**Concepts and Discussion Topics:**
- CRM
- Electrical system
  - AC system
    - Generator
  - DC system
    - Main TRU
    - Stby TRU
  - GTS / APU
  - Battery system
  - Emergency batteries
  - External electrical power

**Emergency Procedures Discussion:**
- Brake failure / Skid failure
- Abort
- No liftoff on STO
- Main generator failure (GEN, DC, and STBY TR Caution LTS)

**Sequence of Events:**
- Ground checks / procedures
- STO
- Depart / re-enter for Overhead break
- STOL flap VNSL
- CL to roll and go
- RVL (3)
- Decel to VL (2)
- Box pattern
- Press-up
- Emergency procedures

**Threat:** None
- 408 water check procedures
- VSTOL handling techniques
  - Crosswind take-off techniques
  - Difference and requirements for continuous v. non-continuous accelerating transitions
**Mission:**
**SFAM-1106**

**Goal:**
Introduce RVTO, HSSL, crosswind / SAAHS off decel VLs, and emergency procedures.

**Performance Standards:**
- Airspeed within 50 KCAS
- Altitude within 150 ft
- AOA within 3.5 units in landing configuration
- Accurate completion of all check lists

**Aircraft:**
RNAWST

**Prerequisites:**
- SFAM-1105

**Ordnance:**
- None

**External Support:**
- CSI

**Range:**
- Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 line
- SKC, 30° C, 29.80, 020/010, 5 L/R

**Requirements:**

**Introduce:**
- RVTO (2)
- Hover stop slow landing
- Crosswind decel VL
- SAAHS off decel VL (2)
- Emergency procedures:
  - Over rotation on STO
  - Standby TRU failure (STBY TR caution light)
  - Airstart
  - SAS failure

**Review:**
- STOL flap STO
- Continuous VTO-accel
- STOL flap FNSL
- CL to roll and go
- RVL (2)
- Decel-VL

**Evaluate:**
- None

**Duration:**
2.0

**Sequence of Events:**
- Ground checks / procedures
- STO directly into landing pattern
- STOL flap FNSL
- Hover stop slow landing
- CL to roll and go
- RVL (2)
- RVTO (2)
- Crosswind decel VL
- SAAHS off decel VL (2)

**Threat:**
None

**Emergency Procedures Discussion:**
- Over rotation on STO
- Standby TRU failure (STBY TR Caution Light)
- Airstart
- SAS failure
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Engine operation and handling techniques</strong></td>
<td></td>
</tr>
<tr>
<td>◦ Short lift selection and limits</td>
<td></td>
</tr>
<tr>
<td>◦ Max Continuous / Combat selection and limits</td>
<td></td>
</tr>
<tr>
<td>◦ 60 kt check</td>
<td></td>
</tr>
<tr>
<td>◦ JPTL Off considerations</td>
<td></td>
</tr>
<tr>
<td><strong>SAAHS system</strong></td>
<td></td>
</tr>
<tr>
<td>◦ AFC</td>
<td></td>
</tr>
<tr>
<td>◦ DEPRES</td>
<td></td>
</tr>
<tr>
<td><strong>SAAHS-off handling characteristics</strong></td>
<td></td>
</tr>
<tr>
<td><strong>VSTOL Handling Techniques</strong></td>
<td></td>
</tr>
<tr>
<td>◦ Crosswind decel and landing techniques</td>
<td></td>
</tr>
<tr>
<td><strong>SAAHS off decel and landing techniques</strong></td>
<td></td>
</tr>
</tbody>
</table>
**Mission:** SFAM-1107

**Goal:**
Introduce non-continuous VTO accel, pedal turn, and emergency procedures.

**Performance Standards:**
- Airspeed within 50 KCAS
- Altitude within 125 ft
- AOA within 3 units in landing configuration
- Accurate completion of all check lists

**Aircraft:** RNAWST

**Ordnance:**
- None

**External Support:**
- CSI

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- SKC, 31° C, 30.00, 110/10, 14 L/R

**Requirements:**

**Introduce:**
- Non-continuous VTO accel (2)
- Pedal turn (2)
- Cruise flap decel to VL
- Emergency procedures:
  - Landing gear fails to retract
  - APU generator failure (APU GEN Caution Light)
  - Emergency DC bus failure
  - Flap channel failure (flaps 1 or 2 caution);
  - Flap failure (flap warning light)
  - Nose wheel steering caster failure

**Review:**
- CTO
- STOL flap STO
- STOL flap FNSL
- Auto flap FNSL
- RVL (2)
- Crosswind decel-VL
- Press-up

**Evaluate:**
- None

**Duration:**
2.0

**Prerequisites:**
- SFAM-1106

**Sequence of Events:**
- Ground checks / procedures
- CTO
- STOL flap FNSL
- Auto flap FNSL
- STOL flap STO
- RVL (2)
- Crosswind decel-VL
- Cruise flap decel to VL
- Non-continuous VTO accel (2)
- Pedal turn (2)
- Press-up

**Threat:** None

**Emergency Procedures Discussion:**
- Landing gear fails to retract
- APU generator failure (APU GEN Caution Light)
- Flap channel failure (flaps 1 or 2 caution)
- Flap failure (flap warning light)
- Nose wheel steering caster failure
Concepts and Discussion Topics:
- CRM
- Cruise flap decel technique
- Out-of-wind transitions / VSTOL equation
- Landing system
  - Main gear
  - Nose gear
  - Wing gear
  - Emergency extension
  - LDG emergency battery
  - Down lock override
  - Warning lights
- NWS
- Brake system
- Anti-skid System
**Mission:**
**SFAM-1108**

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce SAHHS off RVL, braking stop decel VL, emergency procedures.</td>
<td>2.0</td>
<td>• SFAM-1107</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Aircraft:</th>
<th>Ordnance:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Airspeed within 45 KCAS</td>
<td>RNAWST</td>
<td>• None</td>
<td>• None</td>
</tr>
<tr>
<td>• Altitude within 110 ft</td>
<td></td>
<td></td>
<td>• ON WING</td>
</tr>
<tr>
<td>• AOA within 3 units in landing configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Accurate completion of all check lists</td>
<td></td>
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<table>
<thead>
<tr>
<th>Simulator Parameters:</th>
<th>Requirements:</th>
<th>Threat:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialize in VMAT-203 Line</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>SKC, 30° C, 30.10, 030/10, 5 L/R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulator Parameters:</th>
<th>Requirements:</th>
<th>Threat:</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduce:</th>
<th>Sequence of Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• SAHHS off RVL (2)</td>
<td>• Ground checks / procedures</td>
</tr>
<tr>
<td>• Braking stop decel-VL (2)</td>
<td>• STO depart / re-enter for VFR straight-in</td>
</tr>
<tr>
<td>• Emergency procedures:</td>
<td>• STOL flap FNSL</td>
</tr>
<tr>
<td>◦ Uncommanded flap motion</td>
<td>• Auto flap FNSL</td>
</tr>
<tr>
<td>◦ Uncommanded nose down pitch movement</td>
<td>• HSSL</td>
</tr>
<tr>
<td>◦ Landing gear unsafe fails to extend</td>
<td>• RVL (2)</td>
</tr>
<tr>
<td>◦ Reaction control failure</td>
<td>• SAHHS off RVL (2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• STOL flap STO</td>
<td>• Uncommanded roll on VTO</td>
</tr>
<tr>
<td>• Non-continuous VTO-accel</td>
<td>• Uncommanded flap motion</td>
</tr>
<tr>
<td>• STOL flap FNSL</td>
<td>• Uncommanded nose down pitch movement</td>
</tr>
<tr>
<td>• Auto flap FNSL</td>
<td>• Landing gear unsafe fails to extend</td>
</tr>
<tr>
<td>• HSSL</td>
<td>• Reaction control failure</td>
</tr>
<tr>
<td>• RVL (2)</td>
<td>• SAHHS off decel VL</td>
</tr>
<tr>
<td>• SAHHS off decel VL</td>
<td>• Press-up</td>
</tr>
<tr>
<td>• Press-up</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluate:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• None</td>
<td></td>
</tr>
</tbody>
</table>
**Concepts and Discussion Topics:**

- CRM
- Flight control system
  - Primary flight controls
    - Aileron
    - Stabilator
    - Rudder control system
  - Secondary flight controls
    - Flaps
    - Aileron droop
    - Flap and aileron droop schedule
    - Speed brake
    - RCS
    - Butterfly valve operation
    - LIDS
  - Duct pressure indicator
  - Aircraft trim system
- Nose tuck during flap programming
- Braking-Stop Decel technique
- SAAHS off landing technique
| **Mission:** SFAM-1109 | **Duration:** 2.0 | **Prerequisites:**  
• SFAM-1108 |
|------------------------|-------------------|---------------------|
| **Goal:**  
Introduce emergency procedures. | **Aircraft:** RNAWST | **External Support:**  
• None  
• ON WING |
| **Performance Standards:**  
• Airspeed within 40 KCAS  
• Altitude within 100 ft  
• AOA within 3 units in landing configuration  
• Accurate completion of all check lists | **Ordnance:**  
• None | |
| **Simulator Parameters:**  
• Initialize in VMAT-203 Line  
• SKC, 20° C, 29.80, 350/10 32 L/R | **Range:**  
• Simulated | |
| **Requirements:**  
**Introduce:**  
• Emergency procedures:  
  ° Flight control malfunction  
  ° HYD 1 failure (HYD 1 caution light)  
  • CTO  
  • STOL flap STO  
  • Continuous VTO accel (2)  
  • Auto flap VNSL  
  • STOL flap VNSL  
  • SL to roll and go procedure  
  • SAAHS off RVL  
  • Crosswind decel VL  
  • Braking stop decel VL (2)  
  • SAAHS off decel VL (2)  
  • Press-up  
**Review:**  
• Flight control malfunction  
• HYD 1 failure (HYD 1 caution light)  
**Evaluate:**  
• None  
| **Sequence of Events:**  
• Ground checks / procedures  
• CTO  
• STOL flap VNSL  
• Auto flap VNSL  
• SAAHS off RVL  
• STOL flap STO  
• Crosswind decel VL  
• Braking stop decel VL (2)  
• SAAHS off decel VL (2)  
• Press-up  
**Emergency Procedures Discussion:**  
• Flight control malfunction  
• HYD 1 failure (HYD 1 caution light) |
## Concepts and Discussion Topics:

- CRM
- Hydraulic power supply system
  - HYD 1
  - HYD 2
- Fuel system
  - Fuel Shut-off Handle
  - Engine Driven boost pumps
  - Transfer system
  - L or R TRANS
  - L or R Tank
  - Boost pumps
  - Prop
  - Wing fuel dump
  - Fuel low level indicating
  - Fuel quantity indicating
  - Bingo setting and indicators
- SAAHS off landing technique
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SFAM-1110</td>
<td>2.0</td>
<td>• SFAM-1109</td>
</tr>
</tbody>
</table>

**Goal:**
Introduce emergency procedures.

**Performance Standards:**
- Airspeed within 35 KCAS
- Altitude within 90 ft
- AOA within 2.5 units in landing configuration
- Accurate completion of all check lists

**Aircraft:**
RNAWST

**Ordnance:**
• None

**External Support:**
• None
• ON WING

**Range:**
• Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 line
- OVC 005, 3 SM, 30° C, 29.70, 200/15, 23 L/R for PAR then BKN 025, 7 SM for landing pattern

**Requirements:**

**Introduce:**
- Emergency procedures:
  - Brake failure (airborne)
  - EFC caution and JPTL warning lights on
  - Single DECS failure (EFC caution light)
  - Dual DECS failure (EFC warning light) or loss of engine control
  - Engine mechanical failure / engine vibration
  - IGV failures

- STOL flap STO
- Continuous VTO accel (2)
- GCA (PAR)
- Missed approach
- STOL flap VNSL (2)
- CL to full stop (2)
- RVL (2)
- Crosswind decel-VL (2)
- SAAHS off decel-VL (2)
- Press-up

**Review:**
- STOL flap STO
- Continuous VTO accel (2)
- GCA (PAR)
- Missed approach
- STOL flap VNSL (2)
- CL to full stop (2)
- RVL (2)
- Crosswind decel-VL (2)
- SAAHS off decel-VL (2)
- Press-up

**Evaluate:**
- None

**Threat:** None

**Sequence of Events:**
- Ground checks / procedures
- STO
- Depart VFR to GCA (PAR)
- Missed approach
- STOL flap VNSL (2)
- CL to full stop (2)
- RVL (2)
- Crosswind decel-VL (2)
- Continuous VTO accel (2)
- SAAHS off decel-VL (2)
- Press-up

**Emergency Procedures Discussion:**
- EFC caution and JPTL warning lights on
- Single DECS failure (EFC Caution Light)
- Dual DECS failure (EFC warning light) or loss of engine control
- Engine mechanical failure/engine vibration
- IGV failures (full open and full closed)
### Concepts and Discussion Topics:
- CRM
- Mission computer
- ADC
- Display computer
- Radar altimeter
- Lighting
  - Cockpit
  - Exterior
- Conventional handling characteristics
- 100% LERX
- VSTOL handling characteristics
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>SFAM-1111</strong></th>
<th><strong>Duration:</strong></th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce emergency procedures.</td>
<td><strong>Prerequisites:</strong></td>
<td>- SFAM-1110 -</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | - Airspeed within 30 KCAS  
- Altitude within 80 ft  
- AOA within 2.5 units in landing configuration  
- Accurate completion of all check lists | **Aircraft:** | RNAWST |
| **Ordnance:** | None | **Range:** | Simulated |
| **External Support:** | None  
ON WING | **Simulator Parameters:** | - Initialize in VMAT-203 line  
- OVC 015-120, 5 SM, 22° C, 29.70, 010/15 5 L/R |
| **Requirements:** | **Introduce:** | **Sequence of Events:** | - Ground checks / procedures  
- CTO  
- Depart VFR for TACAN approach to FNSL  
- STOL flap VNSL  
- Auto flap VNSL  
- CL to full stop  
- RVTO  
- RVL  
- Crosswind decel VL  
- Braking stop decel VL  
- SAAHS off decel VL  
- Pedal turn  
- Box pattern  
- Press-up |
| - Emergency procedures: |  
- Minor RPM fluctuation  
- Compressor stall  
- Fuel transfer failure (L trans / R trans caution light)  
- Fuel low level (L fuel / R fuel caution light(s) flashing)  
- Loss of engine control in-flight  
- Engine fire (fire warning light) procedures (takeoff / landing / vertical operation)  
- Engine fire (fire warning light) procedures (in-flight) | **Evaluate:** | None |
| - Review: | - CTO  
- STOL flap STO  
- RVTO  
- Continuous VTO accel (2)  
- TACAN approach  
- Missed approach  
- STOL flap FNSL  
- Auto flap VNSL  
- STOL flap VNSL  
- CL to full stop  
- RVL  
- Crosswind decel VL  
- Braking stop decel VL  
- SAAHS off decel VL  
- Press-up  
- Pedal turn  
- Box pattern | **Threat:** | None |
| **Evaluate:** | None | **Emergency Procedures Discussion:** | - Minor RPM fluctuation  
- Compressor stall  
- Fuel transfer failure (L trans / R trans caution light)  
- Fuel low level (L fuel / R fuel caution light(s) flashing) |
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• TACAN Navigation</td>
</tr>
<tr>
<td>° TACAN approach techniques</td>
</tr>
<tr>
<td>• INS</td>
</tr>
<tr>
<td>° NAV and IFA differences</td>
</tr>
<tr>
<td>° Update options</td>
</tr>
<tr>
<td>• Aircraft DATA page</td>
</tr>
<tr>
<td>• GPS page</td>
</tr>
<tr>
<td>• Stored GPS library</td>
</tr>
<tr>
<td>• NSEQ programming</td>
</tr>
<tr>
<td>Mission: SFAM-1112</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Goal: Introduce emergency procedures and progress check.</td>
</tr>
<tr>
<td>Performance Standards: • Airspeed within 25 KCAS • Altitude within 70 ft • AOA within 2 units in landing configuration • Accurate completion of all check lists</td>
</tr>
<tr>
<td>Simulator Parameters: • VMAT-203 Line • OVC 003, 2 SM, 28° C, 29.95, 100/10 14 L/R for PAR then SKC</td>
</tr>
<tr>
<td>Requirements:</td>
</tr>
<tr>
<td>Introduce: • Emergencies: ◦ Total electrical failure (GEN, APU GEN, DC, STBY TRU) ◦ No radio NORDO ◦ Low altitude flameout ◦ Damaged aircraft procedures</td>
</tr>
<tr>
<td>Review: • CTO • STOL flap STO • RVTO • Non-continuous VTO accel • GCA (PAR) • Missed approach • STOL flap FNSL • Auto flap VNSL • STOL flap VNSL • CL to full stop • RVL • Crosswind decel VL • Braking stop decel VL • SAAHS off decel VL • Press-up (2) • Pedal turn • Box pattern</td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• Plane captain signals</td>
</tr>
<tr>
<td>• ECS</td>
</tr>
<tr>
<td>° Air conditioning</td>
</tr>
<tr>
<td>° Pressurization</td>
</tr>
<tr>
<td>° Equipment cooling</td>
</tr>
<tr>
<td>• NATOPS aircraft limits and restrictions</td>
</tr>
<tr>
<td>• Slow flight and departure characteristics</td>
</tr>
</tbody>
</table>
**Mission:**

**FAM-1113**

**Goal:**
Introduce CTO, STOL flap STO, handling drills, approach to stalls, VFR overhead, STOL flap FNSL, auto flap VNSL, waveoff, and hot refueling.

**Performance Standards:**
- Airspeed within 60 KCAS
- Altitude +/- 200 ft
- AOA within 3 units in landing configuration
- Checklists performed IAW NATOPS
- Glideslope control +/- 1 deg
- Centerline control

**Aircraft:**
(1) TAV-8B

**Ordnance:**
- None

**Range:**
- R5306A

**Prerequisites:**
- SFAM-1112

**External Support:**
- None
- ON WING

**Requirements:**

**Introduce:**
- Aircraft preflight
- Ejection seat preflight
- TAV-8 Intercom system
- Visual signals
- CTO
- STOL flap STO
- Handling drills
- Approach to stall (clean / dirty)
- VFR straight in
- STOL flap FNSL (2)
- Auto flap VNSL (2)
- Wave-off
- Hot brake / de-arming inspection
- Hot refueling

**Demonstrate:**
- IP demo approach turn FNSL
- IP demo AFVNSL

**Review:**
- None

**Evaluate:**
- None

**Duration:**
1.3

**Threat:** None

**Sequence of Events:**
- Start
- Taxi
- Marshal
- CTO
- Departure to VFR climb
- R5306A entry
- Handling drills
- Approach to stall
- R5306A exit
- Recovery
- VFR straight in
- STOL flap FNSL (2)
- Auto flap VNSL (2)

**Emergency Procedures Discussion:**
- T-Bird emergencies
- Emergency question of the day
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM</td>
</tr>
<tr>
<td>VRS: tape insertion, recording options</td>
</tr>
<tr>
<td>Nose tuck during flap programming</td>
</tr>
<tr>
<td>TAV-8B differences</td>
</tr>
<tr>
<td>HUD power margin indicator</td>
</tr>
<tr>
<td>OSCAR TAV-8B / AV-8B</td>
</tr>
<tr>
<td>DDI: EHSI display and scales, course line use</td>
</tr>
<tr>
<td>CUE function</td>
</tr>
<tr>
<td>NKT course rules and airfield layout</td>
</tr>
<tr>
<td>MCAS Cherry Point VSTOL pads</td>
</tr>
<tr>
<td>FOD awareness and avoidance</td>
</tr>
<tr>
<td>R5306A area</td>
</tr>
<tr>
<td>Canopy (TAV-8B / AV-8B)</td>
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<tr>
<td>MDC</td>
</tr>
<tr>
<td>Ejection seat / envelope TAV-8B / AV-8B</td>
</tr>
</tbody>
</table>
**Mission:**

**FAM-1114**

**Goal:**
Introduce TACAN approach, auto flap FNSL, STOL flap VNSL, SL to roll and go, and press-up.

**Performance Standards:**
- Airspeed within 60 KCAS
- Altitude +/- 200 ft
- AOA within 3 units in landing configuration
- Checklists performed IAW NATOPS
- Glideslope control +/- 1 deg
- Centerline control

**Aircraft:**
(1) TAV-8B

**Duration:**
1.3

**Prerequisites:**
- FAM-1113

**Ordnance:**
- None

**External Support:**
- None
- ON WING

**Range:**
- None

**Requirements:**

**Introduce:**
- TACAN approach
- Auto flap FNSL
- STOL flap VNSL (2)
- SL to roll and go procedure
- Press-up (2)
- ACNIP usage

**Review:**
- CTO
- STOL flap STO
- STOL flap FNSL
- Auto flap VNSL (2)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Nozzle usage for landing off of an instrument approach
- ACNIP / RSC programming and usage
- Pit turn procedures
- RADAR altimeter
- ADC system
- Nozzle drive system
- IFF programming and modes

**Threat:**
None

**Sequence of Events:**
- Start
- Taxi
- Marshal
- CTO
- Departure to VFR Climb
- TACAN approach
- FNSL straight in off of approach
- Roll and go
- STOL flap STO
- STOL flap FNSL
- Auto flap FNSL
- STOL flap VNSL (2)
- Auto flap VNSL (2)
- Press-up (2)
- ACNIP usage

**Emergency Procedures Discussion:**
- Emergency questions of the day
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
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<tbody>
<tr>
<td><strong>FAM-1115</strong></td>
<td>1.3</td>
<td>• FAM-1114</td>
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<table>
<thead>
<tr>
<th><strong>Goal:</strong></th>
<th><strong>Aircraft:</strong></th>
<th><strong>External Support:</strong></th>
</tr>
</thead>
</table>
| Introduce GCA (PAR), VTO – accel, decel-VL, practice takeoff / in-flight / landing checks and maneuvers. | • (1) TAV-8B | • None  
• ON WING |

<table>
<thead>
<tr>
<th><strong>Performance Standards:</strong></th>
<th><strong>Ordnance:</strong></th>
<th><strong>Range:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Airspeed within 60 KCAS</td>
<td>• None</td>
<td>• None</td>
</tr>
</tbody>
</table>
• Altitude +/- 200 ft       |              |           |
• AOA within 3 units in landing configuration |              |           |
• Checklists performed IAW NATOPS |              |           |
• Glideslope control +/- 1 deg |              |           |
• Centerline control |              |           |

<table>
<thead>
<tr>
<th><strong>Requirements:</strong></th>
<th><strong>Threat:</strong></th>
<th><strong>Sequence of Events:</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Introduce:</strong></td>
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<td></td>
</tr>
<tr>
<td>• GCA (PAR)</td>
<td></td>
<td>• Start</td>
</tr>
<tr>
<td>• SL to touch and go procedure</td>
<td></td>
<td>• Taxi</td>
</tr>
<tr>
<td>• CL to full stop (2)</td>
<td></td>
<td>• Marshal</td>
</tr>
<tr>
<td>• CL to roll and go procedure</td>
<td></td>
<td>• STO</td>
</tr>
<tr>
<td>• CL to touch and go procedure</td>
<td></td>
<td>• Departure to IFR climb</td>
</tr>
<tr>
<td>• Continuous VTO-accel</td>
<td></td>
<td>• GCA pattern</td>
</tr>
<tr>
<td>• Decel VL</td>
<td></td>
<td>• Missed approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tower downwind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Auto flap FNSL touch and go</td>
</tr>
<tr>
<td><strong>Demonstrate:</strong></td>
<td></td>
<td>• CL to touch and go</td>
</tr>
<tr>
<td>• IP Demonstrate decel- VL</td>
<td></td>
<td>• CL to roll and go</td>
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<tr>
<td></td>
<td></td>
<td>• CL to full stop (2)</td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td></td>
<td>• Decel VL</td>
</tr>
<tr>
<td>• STOL flap STO</td>
<td></td>
<td>• Press up</td>
</tr>
<tr>
<td>• SL to roll and go</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Auto flap FNSL</td>
<td></td>
<td></td>
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<tr>
<td>• Press up</td>
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<table>
<thead>
<tr>
<th><strong>Evaluate:</strong></th>
<th><strong>Emergency Procedures Discussion:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• None</td>
<td>• HYD 1 failure</td>
</tr>
<tr>
<td></td>
<td>• Engine Fire indications</td>
</tr>
<tr>
<td></td>
<td>• Emergency questions of the day</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Concepts and Discussion Topics:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• Emergency procedures page of the AMPCD</td>
</tr>
<tr>
<td>• Default card setup</td>
</tr>
<tr>
<td>• NAV card usage</td>
</tr>
<tr>
<td>• ARC-210 radio usage</td>
</tr>
<tr>
<td><strong>Mission:</strong></td>
</tr>
<tr>
<td>---</td>
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<tr>
<td><strong>FAM-1116</strong></td>
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<table>
<thead>
<tr>
<th><strong>Goal:</strong></th>
<th><strong>Aircraft:</strong></th>
<th><strong>Ordnance:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce Continuous VTO accel, RVL decel VL, and box pattern. Practice takeoff / in-flight / landing checks and maneuvers</td>
<td>(1) TAV-8B</td>
<td>• None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Performance Standards:</strong></th>
<th><strong>External Support:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Airspeed within 60 KCAS</td>
<td>• None</td>
</tr>
<tr>
<td>• Altitude +/- 200 ft</td>
<td>• ON WING</td>
</tr>
<tr>
<td>• AOA within 3 units in landing configuration</td>
<td></td>
</tr>
<tr>
<td>• Checklists performed IAW NATOPS</td>
<td></td>
</tr>
<tr>
<td>• Glideslope control +/- 1 deg</td>
<td></td>
</tr>
<tr>
<td>• Centerline control</td>
<td></td>
</tr>
<tr>
<td>• Checklist completion IAW Air NTTP timeline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Requirements:</strong></th>
<th><strong>Threat:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduce:</strong></td>
<td>None</td>
</tr>
<tr>
<td>• RVL (2)</td>
<td></td>
</tr>
<tr>
<td>• Box pattern</td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td></td>
</tr>
<tr>
<td>• STOL flap STO</td>
<td></td>
</tr>
<tr>
<td>• TACAN</td>
<td></td>
</tr>
<tr>
<td>• Missed approach (2)</td>
<td></td>
</tr>
<tr>
<td>• SL to roll and go procedure</td>
<td></td>
</tr>
<tr>
<td>• CL to full stop (2)</td>
<td></td>
</tr>
<tr>
<td>• Continuous VTO-accel</td>
<td></td>
</tr>
<tr>
<td>• Decel VL</td>
<td></td>
</tr>
<tr>
<td>• Press-up</td>
<td></td>
</tr>
<tr>
<td><strong>Evaluate:</strong></td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Concepts and Discussion Topics:</strong></th>
<th><strong>Sequence of Events:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• Start</td>
</tr>
<tr>
<td>• IGV operation</td>
<td>• Taxi</td>
</tr>
<tr>
<td>• INS theory</td>
<td>• Marshal</td>
</tr>
<tr>
<td>• Designation options</td>
<td>• STO</td>
</tr>
<tr>
<td>• Scan and priorities on RVL</td>
<td>• Departure to IFR climb</td>
</tr>
<tr>
<td>• Wind effects on rate of descent during VL</td>
<td>• TACAN</td>
</tr>
<tr>
<td>• VL loss of performance with LIDS failure</td>
<td>• Tower downwind</td>
</tr>
<tr>
<td></td>
<td>• SL to roll and go</td>
</tr>
<tr>
<td></td>
<td>• CL to full stop (2)</td>
</tr>
<tr>
<td></td>
<td>• RVL (2)</td>
</tr>
<tr>
<td></td>
<td>• Decel VL</td>
</tr>
<tr>
<td></td>
<td>• Box pattern</td>
</tr>
<tr>
<td></td>
<td>• Press-up</td>
</tr>
</tbody>
</table>

**Threat:** None

**Sequence of Events:**
- Start
- Taxi
- Marshal
- STO
- Departure to IFR climb
- TACAN
- Tower downwind
- SL to roll and go
- CL to full stop (2)
- RVL (2)
- Decel VL
- Box pattern
- Press-up

**Emergency Procedures Discussion:**
- Emergency questions of the day
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>FAM-1117</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce RVTO, HSSL, and cruise flap decel VL. Review takeoff / in-flight / landing checks and maneuvers.</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | • Airspeed within 60 KCAS  
  • Altitude +/- 200 ft  
  • AOA within 3 units in landing configuration  
  • Checklists performed IAW NATOPS  
  • Glideslope control +/- 1 deg  
  • Centerline control  
  • Checklist completion IAW Air NTTP timeline |
| **Aircraft:** | (1) TAV-8B |
| **Ordnance:** | None |
| **External Support:** | None  
  • ON WING |
| **Range:** | None |
| **Prerequisites:** | • FAM-1116 |
| **Requirements:** | **Sequence of Events:** |
| **Introduction:** | • Start  
  • Taxi  
  • Marshal  
  • STO  
  • Departure to IFR climb  
  • GCA pattern  
  • Roll and go FNSL off of PAR  
  • Tower downwind  
  • HSSL  
  • CL to roll and go  
  • CL to full stop  
  • RVTO  
  • RVL  
  • Cruise flap decel VL  
  • Continuous VTO-accel  
  • Decel VL |
| **Review:** | **Emergency Procedures Discussion:** |
| • RVTO  
  • HSSL  
  • Cruise flap decel VL | • Emergency question of the day |
| • STOL flap STO  
  • GCA (PAR)  
  • STOL flap FNSL  
  • SL to roll and go procedure  
  • CL to full stop  
  • RVL  
  • CL to roll and go  
  • Continuous VTO-accel  
  • Decel VL |  
| **Evaluate:** | **Concepts and Discussion Topics:** |
| • None | • CRM  
  • Oil system  
  • Cruise flap landing differences  
  • High, hot and heavy operations  
  • VL exhaust gas re-ingestion |
| **Threat:** | None |
| **Emergency Support:** | None  
  • ON WING |

**AV-8B FSG Ver. 3.0**

**SORTIES - 32**
**Mission:**

**FAM-1118**

**Goal:**
Introduce pedal turn. Review takeoff / in-flight / landing checks and maneuvers.

**Performance Standards:**
- Airspeed within 60 KCAS
- Altitude +/- 200 ft
- AOA within 3 units in landing configuration
- Checklists performed IAW NATOPS
- Glideslope control +/- 1 deg
- Centerline control
- Checklist completion IAW Air NTTP timeline

**Aircraft:**
- (1) TAV-8B

**Ordnance:**
- None

**External Support:**
- None

**Range:**
- None

**Requirements:**

**Introduce:**
- VFR overhead
- Crosswind decel VL
- Pedal turn

**Review:**
- CTO
- STOL flap STO
- Continuous VTO accel
- FNSL
- RVL (2)
- Decel VL (2)
- Press-up (2)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- NATOPS performance chart review
- VSTOL handling characteristics
- Intake momentum drag
- NATOPS aircraft limits and restrictions

**Duration:**
1.3

**Prerequisites:**
- FAM-1117

**Sequence of Events:**
- Start
- Taxi
- Marshal
- STO
- Depart and re-enter
- Overhead break
- FNSL
- RVL (2)
- Crosswind decel VL
- Continuous VTO accel
- Decel VL (2)
- Pedal turn
- Press-up (2)

**Threat:** None

**Emergency Procedures Discussion:**
- Flap failure
- Emergency question of the day

**Concepts and Discussion Topics:**
- CRM
- NATOPS performance chart review
- VSTOL handling characteristics
- Intake momentum drag
- NATOPS aircraft limits and restrictions
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
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<tbody>
<tr>
<td><strong>FAM-1119</strong></td>
<td>1.3</td>
<td>• FAM-1118</td>
</tr>
<tr>
<td>Goal:</td>
<td>Aircraft:</td>
<td>External Support:</td>
</tr>
<tr>
<td>Introduce SAAHS off RVL and decel-VL. Review takeoff / in-flight / landing checks and maneuvers</td>
<td>(1) TAV-8B</td>
<td>• None</td>
</tr>
<tr>
<td>Performance Standards:</td>
<td>Ordnance:</td>
<td>Range:</td>
</tr>
<tr>
<td>• Airspeed within 60 KCAS</td>
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</tr>
<tr>
<td>• Altitude +/- 200 ft</td>
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<tr>
<td>• AOA within 3 units in landing configuration</td>
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<tr>
<td>• Checklists performed IAW NATOPS</td>
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<td></td>
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<tr>
<td>• Glideslope control +/- 1 deg</td>
<td></td>
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<tr>
<td>• Centerline control</td>
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</tr>
<tr>
<td>• Checklist completion IAW Air NTTP timeline</td>
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<tr>
<td>Requirements:</td>
<td>Threat:</td>
<td></td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
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<td></td>
</tr>
<tr>
<td>• SAAHS off RVL</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td><strong>Sequence of Events:</strong></td>
<td></td>
</tr>
<tr>
<td>• STOL flap STO</td>
<td>• Start</td>
<td></td>
</tr>
<tr>
<td>• VFR overhead</td>
<td>• Taxi</td>
<td></td>
</tr>
<tr>
<td>• STOL flap FNSL</td>
<td>• Marshal</td>
<td></td>
</tr>
<tr>
<td>• STOL flap VNSL</td>
<td>• STO</td>
<td></td>
</tr>
<tr>
<td><strong>Evaluate:</strong></td>
<td>• Depart and re-enter</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td>• Overhead break</td>
<td></td>
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<tr>
<td></td>
<td>• STOL flap FNSL</td>
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<td></td>
<td>• STOL flap VNSL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SAAHS off RVL</td>
<td></td>
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<tr>
<td></td>
<td>• Incomplete landings from previous sorties</td>
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<tr>
<td>Concepts and Discussion Topics:</td>
<td><strong>Emergency Procedures Discussion:</strong></td>
<td></td>
</tr>
<tr>
<td>• CRM</td>
<td>• Emergency question of the day</td>
<td></td>
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<tr>
<td>• SAAHS system</td>
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<td>• AFC</td>
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<tr>
<td>• DEPRES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SAAHS-off handling characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• VSTOL handling techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Crosswind decel and landing techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SAAHS off decel and landing techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mission:</td>
<td>Duration:</td>
<td>Prerequisites:</td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>SINST-1120</strong></td>
<td>2.0</td>
<td>• FAM-1119</td>
</tr>
</tbody>
</table>

**Goal:**
Introduce instrument flight planning, instrument flight procedures, instrument climb profile, instrument level-off procedures, partial panel instrument procedures, unusual attitude flight, max range cruise profile, holding procedures, and approaches

**Performance Standards:**
- Airspeed within 15 KCAS
- Altitude within 50 ft
- AOA within 1 units in landing configuration
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Aircraft:**
RNAWST

**Ordnance:**
• None

**Range:**
• Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- 006 OVC, 3 SM, 30° C, 29.90, 300/10, 32L/R

**Requirements:**

**Introduce:**
- Instrument flight planning
- Instrument flight procedures
- Instrument climb profile
- Intermediate level-off procedures
- Partial panel instrument procedures
- Unusual attitude flight
- Max range cruise profile
- Holding procedures
- IFR penetration procedures

**Review:**
- STOL flap STO
- TACAN approach
- GCA (PAR)
- Missed approach
- STOL flap FNSL
- RVL

**Emergency Procedures Discussion:**
- Generator failure, APU not in stby & in stby
- DC failure
- Complete electrical failure
- Lost communication in IMC conditions

**Sequence of Events:**
- Initialize engine running
- Ground checks / procedures
- STO
- Departure to IFR climb
- Intermediate level-offs
- Unusual attitude
- Max range cruise
- TACAN approach at Seymour Johnson AFB
- Climb / level-off / cruise RTB NKT
- En route descent to GCA (partial panel PAR) at NKT
- Missed approach
- STOL flap FNSL
- RVL

**Threat:**
None
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• OPNAV 3710 Weather filing minimums</td>
</tr>
<tr>
<td>• Navigation systems</td>
</tr>
<tr>
<td>° INS / GPS</td>
</tr>
<tr>
<td>° TACAN</td>
</tr>
<tr>
<td>° Standby Compass</td>
</tr>
<tr>
<td>• Electrical system</td>
</tr>
<tr>
<td>• Fuel planning considerations</td>
</tr>
<tr>
<td>• GTS / APU start and operating limits</td>
</tr>
<tr>
<td>• IFR supplement</td>
</tr>
</tbody>
</table>
**Mission:**

**SINST-1121**

**Goal:**
Introduce airways navigation on a round-robin flight. Practice instrument flight procedures, instrument flight planning, and takeoff / in-flight/landing checks and procedures.

**Performance Standards:**
- Airspeed within 15 KCAS
- Altitude within 30 ft
- AOA within 1 units in landing configuration
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**External Support:**
- CSI

**Simulator Parameters:**
- Initialize in VMAT-203 line
- OVC 005, 3 SM, 22° C, 30.10, 280/10, 32 L/R

**Requirements:**

**Introduce:**
- Airways navigation on a round-robin flight

**Review:**
- Instrument flight planning
- STOL flap STO
- Instrument flight procedures
- Instrument climb profile
- Intermediate level-off procedures
- Partial panel instrument procedures
- Unusual attitude flight
- Max range cruise profile
- Holding procedures
- IFR penetration procedures
- TACAN approach
- GCA (PAR)
- Missed approach
- Auto flap VNSL
- RVL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- High altitude charts and approach plates
- Mission Computer
- ARC-210
- GPS coupling and master mode selection for IMC flight
- Flight information handbook

**Duration:**
2.0

**Prerequisites:**
- SINST-1120

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**External Support:**
- CSI

**Threat:** None

**Sequence of Events:**
- Initialize engine running
- Ground checks / procedures
- STO
- IFR climb to ISO, J121 to WEAVR direct TABUE
- TACAN approach at NAS Oceana
- Missed approach to CLAPY
- En route descent to GCA (partial panel PAR) at NKT to full stop
- Auto flap VNSL
- RVL

**Emergency Procedures Discussion:**
- Standby TRU failure in IMC
- APU advisory light / APU GEN caution light
- Emergency question of the day
**Mission:**

**SINST-1122**

**Goal:**
Introduce minimum fuel PAR. Review instrument flight procedures, airways navigation, and instrument flight planning.

**Performance Standards:**
- Airspeed within 10 KCAS
- Altitude within 30 ft
- AOA within 1 units in landing configuration
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- OVC 005, 2.5 SM, 28° C, 30.00, 240/5, 32 L/R

**Requirements:**

**Introduce:**
- Minimum fuel GCA (PAR)

**Review:**
- Instrument flight planning
- STOL flap STO
- Instrument flight procedures
- Instrument climb profile
- Intermediate level-off procedures
- Airways navigation on a round-robin flight
- Max range cruise profile
- IFR penetration procedures
- TACAN approach
- GCA (PAR)
- Missed approach
- STOL flap FNSL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Standby Instruments (TAV-8 and AV-8B)
- Lost comm. Procedures
- Hydraulic Power supply system
- AWLS

**Duration:**
2.0

**Prerequisites:**
- SINST-1121

**External Support:**
- CSI

**Threat:**
None

**Sequence of Events:**
- Initialize engine running
- Ground checks / procedures
- STO
- IFR climb to ISO, TILTZ, J40, TYI, CVI, DRONE
- TACAN approach at NAS Norfolk
- Missed approach to GCA (PAR) at NAS Norfolk
- Missed approach to WEAVR, NKT
- En route decent to GCA (minimum fuel PAR)
- STOL flap FNSL

**Emergency Procedures Discussion:**
- HUD failure
- Display computer failure
- HYD-1 failure in IMC
- Emergency question of the day
### Mission: INST-1123

**Goal:**
Introduce instrument climb profile, intermediate level-off procedures, max range cruise, holding procedures, IFR penetration procedures, and missed approach procedures.

**Performance Standards:**
- Airspeed within 20 KCAS
- Altitude within 50 ft
- AOA within 1 units in landing configuration
- Accurate completion of all checklists within Air NTTP timeline
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Requirements:**

**Introduce:**
- Instrument climb profile
- Intermediate level-off procedures
- Max range cruise profile
- Holding procedures
- IFR penetration procedures
- Missed approach procedures

**Review:**
- Instrument flight planning
- STOL flap STO
- TACAN approach
- GCA (PAR)
- RVL
- Decel VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- VRST page
- AOA system
- Landing system
  - Flap and aileron droop schedule
  - LIDS
- ADC
- TAV-8 instrument location

### Duration: 1.5

**Aircraft:**
(1) TAV-8B

**Ordnance:**
- None

**Range:**
- R5306A

**Threat:** None

**Sequence of Events:**
- Ground checks / procedures
- STO
- Departure to IFR R5306A
- Holding procedures
- TACAN approach at NKT
- Missed approach
- GCA (PAR)
- Missed approach
- RVL
- Decel VL

**Emergency Procedures Discussion:**
- ADC failure IMC
- Oil light IMC
- Emergency question of the day

**External Support:**
- None

**Prerequisites:**
- SINST-1122
### Mission: INST-1124

**Goal:**
Introduce airways navigation on a round robin flight and minimum fuel GCA (PAR).

**Performance Standards:**
- Airspeed within 15 KCAS
- Altitude within 30 ft
- AOA within 1 units in landing configuration
- Accurate completion of all checklists within Air NTTP timeline
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Aircraft:**
(1) TAV-8B

**Ordnance:**
- None

**External Support:**
- None

**Prerequisites:**
- INST-1123
- None

**Duration:**
1.5

**Range:**
- None

**Ordnance:**
- None

**External Support:**
- None

**Requirements:**

**Introduce:**
- Airways navigation on a round-robin flight
- Minimum fuel GCA (PAR)

**Review:**
- Instrument flight planning
- STOL flap STO
- Instrument climb profile
- Intermediate level-off procedures
- Max range cruise profile
- Holding procedures
- IFR penetration procedures
- TACAN approach
- Missed approach procedures
- RVL
- Decel VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Fuel system
- IFF system
- Wet compass operation

**Sequence of Events:**
Ground checks / procedures
- STO
- IFR climb to ISO, J121 to WEAVR direct TABUE
- TACAN approach at NAS Oceana
- Missed approach to CLAPY
- En route descent to minimum fuel GCA (PAR) at NKT to full stop
- RVL
- Decel VL

**Emergency Procedures Discussion:**
- Mission computer failure IMC
- Fire light in IMC
- Emergency question of the day

**Threat:** None
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINST-1125</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Goal:**
In-type instrument check.

**Performance Standards:**
- Airspeed within 10 KCAS
- Altitude within 20 ft
- AOA within 1 units in landing configuration
- Accurate completion of all checklists within the Air NTTP timeline
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Aircraft:**
RNAWST

**Ordnance:**
None

**Range:**
None

**Prerequisites:**
- Inst GS

**External Support:**
None

**Simulator Parameters:**
- Center Mat
- 006 OVC, 3 SM, 25° C, 29.99, 300/10, 32 L/R

**SPINS:**
- Route NKT-NTU-NKT
- VMAT-203 DSS SharePoint site contains the current weather and forecast weather that must be used for planning: [https://intranet.2dmaw.usmc.mil/mag14/VMAT203/DSS/Natops/Forms/AllItems.aspx](https://intranet.2dmaw.usmc.mil/mag14/VMAT203/DSS/Natops/Forms/AllItems.aspx)

**Requirements:**

**Introduce:**
- None

**Review:**
- None

**Evaluate:**
- Instrument flight planning
- Instrument flight procedures
- Instrument climb profile
- Intermediate level-off procedures
- Partial panel procedures
- Unusual attitudes
- Airways navigation on a round-robin flight
- Max range cruise profile
- Holding procedures
- IFR penetration procedures
- TACAN approach (to an unfamiliar field)
- GCA (PAR)
- Missed approach

**Concepts and Discussion Topics:**
- CRM
- Review flight publications
- Review of filing and flight weather minimums
- Lost comm. procedures

**Threat:**
None

**Sequence of Events:**
- Ground checks / procedures
- STO
- IFR climb (for route ask instructor)
- TACAN approach at (instructors choice)
- Missed approach
- RTB NKT (instructors choice)
- GCA (PAR)

**Emergency Procedures Discussion:**
- Emergencies in IMC
- Emergency question of the day
### Mission: FAM-1126

**Goal:**
Introduce flight briefing, VFR straight in, and SAAHS off decel VL.

**Performance Standards:**
- Airspeed within 10 KCAS
- Altitude within 40 ft
- AOA within 1 units in landing configuration
- Accurate completion of all checklists within Air NTTP timeline

**Aircraft:**
(1) TAV-8B

**Ordnance:**
- None

**External Support:**
- None

**Range:**
- None

**Requirements:**

<table>
<thead>
<tr>
<th>Introduce</th>
<th>Review</th>
<th>Evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP to conduct flight briefing</td>
<td>CTO</td>
<td>None</td>
</tr>
<tr>
<td>SAAHS off decel VL</td>
<td>STOL flap STO</td>
<td>None</td>
</tr>
<tr>
<td>Non-continuous VTO accel</td>
<td>VFR straight-in</td>
<td>None</td>
</tr>
<tr>
<td>VFR overhead</td>
<td>STOL flap FNSL</td>
<td>None</td>
</tr>
<tr>
<td>STOL flap FNSL</td>
<td>Auto flap VNSL</td>
<td>None</td>
</tr>
<tr>
<td>Auto flap VNSL</td>
<td>CL to full stop</td>
<td>None</td>
</tr>
<tr>
<td>CL to roll and go procedure</td>
<td>RVL (3)</td>
<td>None</td>
</tr>
<tr>
<td>RVL (3)</td>
<td>Decel VL</td>
<td>None</td>
</tr>
</tbody>
</table>

**Sequence of Events:**
- Ground checks / procedures
- CTO
- Depart for VFR straight-in to full stop
- STOL flap FNSL
- STOL flap STO
- Depart / re-enter for overhead break
- Auto flap VNSL
- CL to roll and go
- CL to full stop
- RVL (3)
- SAAHS off decel VL
- Non-continuous VTO accel

**Concepts and Discussion Topics:**
- CRM
- DECS, DECU, FMU
- SAAHS-off handling characteristics
- SAAHS off decel and landing techniques

**Prerequisites:**
- SINST-1125

**Threat:** None

**Emergency Procedures Discussion:**
- SAS failure
- HYD-1 failure
- Emergency landing gear extension
- Emergency question of the day
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>SFAM-1127</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce compound emergencies.</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | - Airspeed within 25 KCAS  
- Altitude within 50 ft  
- AOA within 1 units in landing configuration  
- Accurate completion of all checklists within Air NTTP timeline  
- PUI will correctly identify system malfunctions and apply appropriate corrective procedures  
- PUI will utilize CRM effectively to diagnose and correct malfunction or land aircraft |
| **Duration:** | 2.0 |
| **Aircraft:** | RNAWST |
| **Ordnance:** | None |
| **Range:** | Simulated |
| **Prerequisites:** | - FAM-1126 |
| **External Support:** | - CSI |

<table>
<thead>
<tr>
<th><strong>Simulator Parameters:</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Initialize in VMAT-203 line</td>
<td>SKC, 19° C, 30.00, 200/10, 23 L/R</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Requirements:</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduce:</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
  - Compound emergencies |
| **Review:**       |  
  - STOL flap STO  
  - Continuous VTO-accel  
  - Instrument flight procedures  
  - TACAN approach  
  - Auto flap VNSL  
  - STOL flap VNSL  
  - CL to full stop  
  - SAAAH off RVL  
  - SAAAH off decel VL  
  - Press-up |
| **Evaluate:**     |  
  - None |

<table>
<thead>
<tr>
<th><strong>Concepts and Discussion Topics:</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
  - CRM – Using the ODO / LSI  
  - Water Injection System  
  - MFS  
  - Emergency procedures page of AMPCD  
  - NATOPS aircraft limits and restrictions  
  - Ejection envelopes  
  - Ejection decision | | |

| **Threat:** | None |

<table>
<thead>
<tr>
<th><strong>Sequence of Events:</strong></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| - Ground checks / procedures  
- STO  
- Depart IFR to TACAN Z approach at NKT  
- Landing pattern work | | |
| *** Note *** | | |
| All emergencies will be taken to the appropriate landing / ejection decision |

<table>
<thead>
<tr>
<th><strong>Emergency Procedures Discussion:</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
  - Handling compound emergencies  
  - Recognize indications of malfunctions  
  - Prioritize by severity  
  - Assess effects of other factors  
    → WX  
    → Fuel  
    → Wingman  
    → Communication capability  
    → External stores  
  - Develop gameplan  
  - Communicate gameplan  
  - Execute gameplan  
  - Above all else: AVIATE, NAVIGATE, COMMUNICATE | | |
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FAM-1128</strong></td>
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<td>• SFAM-1127</td>
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<tr>
<td>Goal:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe for solo check.</td>
<td></td>
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</tr>
<tr>
<td>Performance Standards:</td>
<td>Aircraft:</td>
<td>Ordnance:</td>
</tr>
<tr>
<td>• PUI will perform all maneuvers IAW NATOPS standards without exhibiting any unsafe trends</td>
<td>(1) TAV-8B</td>
<td>• None</td>
</tr>
<tr>
<td>• Airspeed within 10 KCAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Altitude within 30 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• AOA within 1 units in landing configuration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Accurate completion of all checklists within Air NTTP timeline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisites:</td>
<td>External Support:</td>
<td></td>
</tr>
<tr>
<td>• SFAM-1127</td>
<td>• None</td>
<td></td>
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<tr>
<td>Requirements:</td>
<td>Threat:</td>
<td></td>
</tr>
<tr>
<td>Introduce:</td>
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<td>None</td>
</tr>
<tr>
<td>• None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review:</td>
<td></td>
<td></td>
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<tr>
<td>• None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CTO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• STOL flap STO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Continuous VTO accel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Instrument flight procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• GCA (PAR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Missed approach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• STOL flap FNSL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Auto flap VNSL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• STOL flap VNSL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SL to roll and go procedure</td>
<td></td>
<td></td>
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<tr>
<td>• CL to full stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RVL</td>
<td></td>
<td></td>
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<tr>
<td>• Decel VL</td>
<td></td>
<td></td>
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<tr>
<td>• Press-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td>Emergency Procedures Discussion:</td>
<td></td>
</tr>
<tr>
<td>• CRM – ODO and LSI</td>
<td>• Any emergency procedures listed in NATOPS Chapters V-13 through V-18</td>
<td></td>
</tr>
<tr>
<td>• Check ride procedures</td>
<td>• AVIATE, NAVIGATE, COMMUNICATE</td>
<td></td>
</tr>
<tr>
<td>• Lost comm. procedures</td>
<td>• Emergency question of the day</td>
<td></td>
</tr>
<tr>
<td><strong>Mission:</strong></td>
<td><strong>Duration:</strong></td>
<td><strong>Prerequisites:</strong></td>
</tr>
<tr>
<td>---</td>
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</tr>
</tbody>
</table>
| **FAM-1129** | 1.5 | • Open Book NATOPS Test  
• FAM-1128 |

**Goal:**
Solo Flight

**Performance Standards:**
- Perform all maneuvers IAW NATOPS standards without exhibiting any unsafe trends
- Airspeed within 10 KCAS
- Altitude within 30 ft
- AOA within 1 units in landing configuration

**Aircraft:**
(1) AV-8B(E)

**Ordnance:**
• None

**Range:**
• RSTD / MOA

**External Support:**
• LSI

**Threat:** None

**Sequence of Events:**
- Ground checks / procedures
- CTO
- Depart to GCA (PAR) (perform GCAs until landing weight)
- Option to tower downwind
- STOL flap FNSL
- STOL flap VNSL
- Auto flap VNSL
- CL to full stop
- RVL
- Decel VL
- Continuous VTO accel
- Press-up

**Concepts and Discussion Topics:**
- CRM
- Night Attack / Radar differences:
  - Cockpit differences
  - HOTAS
    - Speed brake
    - Bore sight for DMT and FLIR
    - WINC
    - DAT button
    - HUD layout
  - Warning and caution light differences
  - AMPCD operation and flight set-up
  - MAP set-up and use
  - GPWS system
  - Standard LSI calls
  - Solo wind and weather SOP limits
- Fuel pit procedures

**Review:**
- None

**Requirements:**

**Introduce:**
- None

**Review:**
- CTO
- STOL flap STO
- Continuous VTO accel
- GCA (PAR)
- STOL flap FNSL
- Auto flap VNSL
- STOL flap VNSL
- SL to roll and go procedure
- CL to full stop
- RVL
- Decel VL
- Press-up

**Evaluate:**
- None

**Emergency Procedures Discussion:**
- Emergency question of the day
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFOB-1200</td>
<td>1.0</td>
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</table>

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce FOB and emergency procedures.</td>
<td>• FAM-1129</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Aircraft:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactorily execute all procedures IAW AV-8B NATOPS. Achieve an average pass grade of 2.5.</td>
<td>RNAVST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ordnance:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>• CSI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulator Parameters:</th>
<th>Threat:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Initialize in center mat</td>
<td>None</td>
</tr>
<tr>
<td>• SKC, 22° C, 30.00, 200/10, 23 L/R</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements:</th>
<th>Sequence of Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct FOB operations and simulated emergency procedures. Perform 3 maximum performance STO and 4 precision RVL at an air facility.</td>
<td>• Initialize in warm up engine running</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduce:</th>
<th>• STO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• FOB operations</td>
<td>• Departure</td>
</tr>
<tr>
<td>• Maximum performance STO (3)</td>
<td>• Paddles check-in</td>
</tr>
<tr>
<td>• FOB arrival and pattern entry procedures</td>
<td>• Marshal stack</td>
</tr>
<tr>
<td>• Precision RVL (4)</td>
<td>• Entry Into Bogue Field</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review:</th>
<th>Evaluate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Brake failure (air) procedures</td>
<td>• Landings</td>
</tr>
<tr>
<td>• Engine fire (fire warning light) procedures (takeoff / landing / vertical operation)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bogue Field course rules</td>
<td>• NWS failure</td>
</tr>
<tr>
<td>• Wave-off</td>
<td>• No liftoff on STO</td>
</tr>
<tr>
<td>• Standard LSS calls</td>
<td>• Abort</td>
</tr>
</tbody>
</table>

<p>| Over rotation on STO | NORDO |</p>
<table>
<thead>
<tr>
<th>Mission: FOB-1201</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong> Introduce FOB.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong> Satisfactorily execute all procedures IAW AV-8B NATOPS. Achieve an average pass grade of 2.5.</td>
</tr>
<tr>
<td><strong>Duration:</strong> 1.2</td>
</tr>
<tr>
<td><strong>Aircraft:</strong> (1) TAV-8B</td>
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<tr>
<td><strong>Ordnance:</strong> None</td>
</tr>
<tr>
<td><strong>Range:</strong> Air facility</td>
</tr>
<tr>
<td><strong>Prerequisites:</strong> SFOB-1200</td>
</tr>
<tr>
<td><strong>External Support:</strong> LSS</td>
</tr>
<tr>
<td><strong>Threat:</strong> None</td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
</tr>
<tr>
<td>- STO</td>
</tr>
<tr>
<td>- Departure</td>
</tr>
<tr>
<td>- Paddles check-in</td>
</tr>
<tr>
<td>- Marshal stack</td>
</tr>
<tr>
<td>- Entry Into Bogue Field</td>
</tr>
<tr>
<td>- Overhead</td>
</tr>
<tr>
<td>- FOB pattern</td>
</tr>
<tr>
<td>- Hot refueling</td>
</tr>
<tr>
<td>- Departure out of Bogue</td>
</tr>
<tr>
<td>- Recovery at NKT</td>
</tr>
<tr>
<td><strong>Introduction:</strong></td>
</tr>
<tr>
<td>- FOB operations</td>
</tr>
<tr>
<td>- Maximum performance STO (3)</td>
</tr>
<tr>
<td>- FOB arrival and pattern entry procedures</td>
</tr>
<tr>
<td>- Precision RVL (4)</td>
</tr>
<tr>
<td><strong>Review:</strong> None</td>
</tr>
<tr>
<td><strong>Evaluate:</strong> Landings</td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
</tr>
<tr>
<td>- Bogue Field course rules</td>
</tr>
<tr>
<td>- Wave-off</td>
</tr>
<tr>
<td>- FOB fuel requirements</td>
</tr>
<tr>
<td>- Standard LSS calls</td>
</tr>
<tr>
<td>- FOD prevention</td>
</tr>
<tr>
<td>- Ground procedures / taxi plan</td>
</tr>
<tr>
<td>- Grading criteria</td>
</tr>
<tr>
<td><strong>Emergency Procedures Discussion:</strong></td>
</tr>
<tr>
<td>- Brake failure</td>
</tr>
<tr>
<td>- No liftoff on STO</td>
</tr>
<tr>
<td>- Abort</td>
</tr>
<tr>
<td>- V/STOL loss of thrust</td>
</tr>
<tr>
<td>- Emergency question of the day</td>
</tr>
</tbody>
</table>
**Mission:**
**FOB-1202**

**Goal:**
Practice FOB.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS. Achieve an average pass grade of 2.5.

**Duration:**
0.8

**Aircraft:**
(1) AV-8B(E)

**Ordnance:**
• None

**Range:**
• Air facility

**Prerequisites:**
• FOB-1201

**External Support:**
• LSS

**Requirements:**
Conduct FOB operations at an air facility. Perform 3 maximum performance STO and 4 precision RVL.

**Introduce:**
• None

**Review:**
• Maximum performance STO (3)
• Precision RVL (4)

**Evaluate:**
• FOB operations
• FOB arrival and pattern entry procedures

**Sequence of Events:**
• STO
• Departure
• Paddles check-in
• Marshal stack
• Entry Into Bogue Field
• Overhead
• FOB pattern
• Hot refueling
• Departure out of Bogue
• Recovery at NKT

**Threat:** None

**Concepts and Discussion Topics:**
• Bogue Field no fly areas
• Waveoff
• FOD prevention

**Emergency Procedures Discussion:**
• Landing gear malfunctions
• Fire:–In-flight, Takeoff / landing
• Emergency question of the day
| Mission: SFCLP-1210 | Duration: 1.0 | Prerequisites:  
|---------------------|--------------|-----------------------------|
| **Goal:** Introduce day FCLP normal and emergency procedures. | **Aircraft:** RNAWST | • FAM-1129  
| **Performance Standards:** Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5. | **Ordnance:** None | • FCLP GS  
| **Simulator Parameters:**  
| • Initialize in center mat  
| • SKC, 22° C, 30.00, 250/10, 23 L/R | **Range:** Simulated | • CSI  
| **Requirements:** Perform day FCLP normal and emergency FCLP procedures to a simulated L-Class ship. Perform a Case 1 recovery, 5 VL, and 4 STO. | **Threat:** None |  
| **Introduce:**  
| • Day FCLP Case 1 recoveries  
| • Fuel ladder  
| • Charlie time  
| • Shipboard STO (4)  
| • FCLP Decel VL (5)  
| • Abort (afloat)  
| • NORDO approach  
| • Emergency procedures  
| ◦ RPM stagnation / loss of thrust afloat  
| ◦ Abort – afloat (STO) procedures | **Sequence of Events:**  
| • Initialize in warm up engine running  
| • STO  
| • Departure  
| • Paddles check-in  
| • Marshal Stack  
| • Entry Into Bogue Field  
| • Overhead  
| • FCLP pattern  
| • Shipboard emergencies  
| • Departure out of Bogue  
| • Recovery at NKT |  
| **Review:** Dual DECS failure (EFC warning light) | **Evaluate:** Landings and pattern work |  
| **Concepts and Discussion Topics:**  
| • Course rules  
| • Fuel ladder construction / management  
| • AMPCD setup  
| • NWS use  
| • Waveoff procedures  
| • LSO terminology and proper response | **Emergency Procedures Discussion:**  
| Electrical failures  
| Landing gear malfunctions  
| BRAKE FAILURE  
| NO LIFT OFF ON STO  
| Loss of thrust  
| DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL  
| ABORT  
| OVER ROTATION ON STO  
| FIRE (FIRE light)  
<p>| NORDO approach |</p>
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>FCLP-1211</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce day FCLP.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td>Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5.</td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Aircraft:</strong></td>
<td>(1) AV-8B</td>
</tr>
<tr>
<td><strong>Ordnance:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>Sim LHA Deck</td>
</tr>
<tr>
<td><strong>Prerequisites:</strong></td>
<td>SFCLP-1210</td>
</tr>
<tr>
<td><strong>External Support:</strong></td>
<td>LSO, Launch Officer</td>
</tr>
<tr>
<td><strong>Threat:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td>Perform day FCLP normal and emergency FCLP procedures to a simulated L-Class ship. Perform a Case 1 recovery, 4 VL, 3 STO, and test waveoff. Introduce launch officer signals.</td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
<td>Day FCLP Case 1 recoveries, Fuel ladder, Charlie time, Shipboard STO (3), Shipboard launch signals, FCLP Decel VL (4), Test wave-off</td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Evaluate:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
<td>Bogue Field course rules, Engine management, Waveoff procedures, Proper communication during FCLP sortie, Launch Officer / LSE signals, FOD prevention, Ground procedures / taxi plan, OLS / HPI lighting systems, STO with nozzles lever vice throttle, Release of brakes on STO</td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
<td>STO, Departure, Paddles check-in, Marshal stack, Entry Into Bogue Field, Overhead, FCLP pattern, Test wave-off, Hot refueling, Departure out of Bogue, Recovery at NKT</td>
</tr>
<tr>
<td><strong>Emergency Procedures Discussion:</strong></td>
<td>Electrical failures, Landing gear malfunctions, BRAKE FAILURE, NO LIFT OFF ON STO, Loss of thrust, DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL, ABORT, OVER ROTATION ON STO, FIRE (FIRE light), NORDO approach</td>
</tr>
<tr>
<td>Mission:</td>
<td><strong>FCLP-1212</strong></td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce simulated NORDO approach. Review day FCLP.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td>Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5.</td>
</tr>
<tr>
<td><strong>Aircraft:</strong></td>
<td>(1) AV-8B</td>
</tr>
<tr>
<td><strong>Ordnance:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>External Support:</strong></td>
<td>LSO, Launch Officer</td>
</tr>
<tr>
<td><strong>Threat:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Prerequisites:</strong></td>
<td>FCLP-1211</td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>Sim LHA Deck</td>
</tr>
</tbody>
</table>

**Requirements:**
Perform simulated NORDO approach. Review day FCLP normal and emergency procedures to a simulated L-Class ship.

**Introduce:**
- Simulated NORDO approach

**Review:**
- Day FCLP Case 1 recoveries
- Fuel ladder
- Charlie time
- Shipboard STO (3)
- Shipboard launch signals
- FCLP Decel VL (4)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Course rules no over fly areas
- Waveoff procedures
- FOD prevention
- Water system

**Sequence of Events:**
- STO
- Departure
- Paddles check-in
- Marshal stack
- Entry Into Bogue Field
- Overhead
- FCLP pattern
- Simulated NORDO approach
- Hot refueling
- Departure out of Bogue
- Recovery at NKT

**Emergency Procedures Discussion:**
- Electrical failures
- Landing gear malfunctions
- BRAKE FAILURE
- NO LIFT OFF ON STO
- Loss of thrust
- DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL
- ABORT
- OVER ROTATION ON STO
- FIRE (FIRE light)
- NORDO approach
**Mission:**
**FCLP-1213**

**Goal:**
Review day FCLP.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5.

**Duration:**
1.0

**Aircraft:**
(1) AV-8B

**Ordnance:**
- None

**Range:**
- Sim LHA Deck

**Prerequisites:**
- FCLP-1212

**External Support:**
- LSO
- Launch Officer

**Requirements:**
Review day FCLP normal and emergency procedures to a simulated L-Class ship

**Introduce:**
- None

**Review:**
- Day FCLP Case 1 recoveries
- Fuel ladder
- Charlie time
- Shipboard STO (3)
- Shipboard launch signals
- FCLP Decel VL (4)

**Evaluate:**
- None

**Sequence of Events:**
- STO
- Departure
- Paddles check-in
- Marshal stack
- Entry Into Bogue Field
- Overhead
- FCLP pattern
- Test Wave-off
- Hot refueling
- Departure out of Bogue
- Recovery at NKT

**Threat:**
None

**Concepts and Discussion Topics:**
- Course rules no over fly areas
- Waveoff procedures
- FOD prevention

**Emergency Procedures Discussion:**
- Electrical failures
- Landing gear malfunctions
- BRAKE FAILURE
- NO LIFT OFF ON STO
- Loss of thrust
- DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL
- ABORT
- OVER ROTATION ON STO
- FIRE (FIRE light)
- NORDO approach
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>FCLP-1214</td>
<td>1.0</td>
<td>• FCLP-1213</td>
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<table>
<thead>
<tr>
<th>Goal:</th>
<th>Aircraft:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review day FCLP.</td>
<td>(1) AV-8B</td>
<td>• LSO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Launch Officer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Ordnance:</th>
<th>Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5.</td>
<td>• None</td>
<td>• Sim LHA Deck</td>
</tr>
</tbody>
</table>

| Requirements: \ |
| Review day FCLP normal and emergency procedures to a simulated L-Class ship. |

| Introduce: \ |
| None |

| Review: \ |
| Day FCLP Case 1 recoveries |
| Fuel ladder |
| Charlie time |
| Shipboard STO (3) |
| Shipboard launch signals |
| FCLP Decel VL (4) |

| Evaluate: \ |
| None |

| Goal: \ |
| Review day FCLP |

| Aircraft: \ |
| (1) AV-8B |

| Ordnance: \ |
| • None |

| Range: \ |
| • Sim LHA Deck |

| Threat: \ |
| None |

| Sequence of Events: \ |
| STO |
| Departure |
| Paddles check-in |
| Marshal stack |
| Entry Into Bogue Field |
| Overhead |
| FCLP pattern |
| Test Wave-off |
| Hot refueling |
| Departure out of Bogue |
| Recovery at NKT |

| Concepts and Discussion Topics: \ |
| Course rules no over fly areas |
| Waveoff procedures |
| FOD prevention |

| Emergency Procedures Discussion: \ |
| Electrical failures |
| Landing gear malfunctions |
| BRAKE FAILURE |
| NO LIFT OFF ON STO |
| Loss of thrust |
| DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL |
| ABORT |
| OVER ROTATION ON STO |
| FIRE (FIRE light) |
| NORDO approach |
### Mission:
**FCLP-1215**

**Goal:**
Review day FCLP.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS. Achieve an average pass grade of 2.5.

**Aircraft:**
(1) AV-8B

**Ordnance:**
- None

**Range:**
- Sim LHA Deck

**Duration:**
1.0

**Prerequisites:**
- FCLP-1214

**External Support:**
- LSO
- Launch Officer

**Threat:**
None

---

**Requirements:**
Review day FCLP normal and emergency procedures to a simulated L-Class ship.

**Introduce:**
- None

**Review:**
- Day FCLP Case 1 recoveries
- Fuel ladder
- Charlie time
- Shipboard STO (3)
- Shipboard launch signals
- FCLP Decel VL (4)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Course rules no over fly areas
- Waveoff procedures
- FOD prevention

**Sequence of Events:**
- STO
- Departure
- Paddles check-in
- Marshal stack
- Entry Into Bogue Field
- Overhead
- FCLP pattern
- Test Wave-off
- Hot refueling
- Departure out of Bogue
- Recovery at NKT

**Emergency Procedures Discussion:**
- Electrical failures
- Landing gear malfunctions
- BRAKE FAILURE
- NO LIFT OFF ON STO
- Loss of thrust
- DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL
- ABORT
- OVER ROTATION ON STO
- FIRE (FIRE light)
- NORDO approach
**Mission:**
**FCLP-1216**

**Goal:**
Day FCLP qualification.

**Performance Standards:**
Execute all procedures IAW AV-8B NATOPS, V/STOL / LSO NATOPS, Shipboard Operating Bulletin, and LHA/LHD NATOPS.
Achieve an average pass grade of 2.5.

**Duration:**
1.0

**Prerequisites:**
- FCLP-1215

**Aircraft:**
- (1) AV-8B

**Ordnance:**
- None

**Range:**
- Sim LHA Deck

**External Support:**
- LSO
- Launch Officer

**Requirements:**
Review day FCLP normal and emergency procedures to a simulated L-Class ship.

**Introduce:**
- None

**Review:**
- Day FCLP Case 1 recoveries
- Fuel ladder
- Charlie time
- Shipboard STO (3)
- Shipboard launch signals
- FCLP Decel VL (4)

**Evaluate:**
- None

**Sequence of Events:**
- STO
- Departure
- Paddles check-in
- Marshal stack
- Entry Into Bogue Field
- Overhead
- FCLP pattern
- Test Wave-off
- Hot refueling
- Departure out of Bogue
- Recovery at NKT

**Threat:**
None

**Concepts and Discussion Topics:**
- Course rules no over fly areas
- Waveoff procedures
- FOD prevention

**Emergency Procedures Discussion:**
- Electrical failures
- Landing gear malfunctions
- BRAKE FAILURE
- NO LIFT OFF ON STO
- Loss of thrust
- DUAL DECS FAILURE (EFC WARNING LIGHT) OR LOSS OF ENGINE CONTROL or RPM FLUCTUATION during VL
- ABORT
- OVER ROTATION ON STO
- FIRE (FIRE light)
- NORDO approach
<table>
<thead>
<tr>
<th>Mission:</th>
<th>VCON-1220</th>
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<tbody>
<tr>
<td>Goal:</td>
<td>V/STOL Consolidation</td>
</tr>
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<td>Performance Standards:</td>
<td>Safely perform all maneuvers IAW the AV-8 NATOPS</td>
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<tr>
<td>Review:</td>
<td>STOL flap STO</td>
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<td>Continuous VTO accel</td>
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<td>TACAN approach</td>
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<td></td>
<td>STOL flap FNSL</td>
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<td>Auto flap VNSL</td>
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<td>STOL flap VNSL</td>
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<tr>
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<td>SL to roll and go procedure</td>
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<td>CL to full stop</td>
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<td>RVL</td>
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<td>Decel-VL</td>
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<td>Press-up</td>
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<td>Evaluate:</td>
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</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td>None</td>
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<td>Threat:</td>
<td>None</td>
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<td>Sequence of Events:</td>
<td>Takeoff</td>
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<td>TACAN approach to (LSI directed entry to landing pattern)</td>
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<td>Landing pattern work</td>
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<tr>
<td>Emergency Procedures Discussion:</td>
<td>Emergency question of the day</td>
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<tr>
<td><strong>Mission:</strong></td>
<td><strong>SVCON-1221</strong></td>
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<tr>
<td><strong>Goal:</strong></td>
<td>Review compound emergencies.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td>Safely perform all maneuvers IAW the AV-8 NATOPS</td>
</tr>
</tbody>
</table>

<table>
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</tr>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th><strong>Aircraft:</strong></th>
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<tr>
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</tr>
<tr>
<td><strong>Range:</strong></td>
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<tr>
<td><strong>External Support:</strong></td>
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<tr>
<th><strong>Simulator Parameters:</strong></th>
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<tr>
<td>Initialize in warm-up area one</td>
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<td>SKC, 22°C, 30.00, 010/10, 32 L/R</td>
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<table>
<thead>
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<th><strong>Introduce:</strong></th>
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<table>
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<tr>
<td>STOL flap STO</td>
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</tr>
<tr>
<td>TACAN approach</td>
<td></td>
</tr>
<tr>
<td>STOL flap FNSL</td>
<td></td>
</tr>
<tr>
<td>Auto flap VNSL</td>
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</tr>
<tr>
<td>STOL flap VNSL</td>
<td></td>
</tr>
<tr>
<td>CL to full stop</td>
<td></td>
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<tr>
<td>RVL</td>
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<tr>
<td>Decel VL</td>
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<tr>
<td>Compound emergencies</td>
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<table>
<thead>
<tr>
<th><strong>Concepts and Discussion Topics:</strong></th>
<th><strong>None</strong></th>
</tr>
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</table>

<table>
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<tr>
<th><strong>Threat:</strong></th>
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<table>
<thead>
<tr>
<th><strong>Sequence of Events:</strong></th>
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<tbody>
<tr>
<td>Takeoff</td>
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<tr>
<td>TACAN approach to (CSI directed entry to landing pattern)</td>
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<tr>
<td>Landing pattern work</td>
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<table>
<thead>
<tr>
<th><strong>Emergency Procedures Discussion:</strong></th>
<th></th>
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<tbody>
<tr>
<td>Emergency question of the day</td>
<td></td>
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</tbody>
</table>

| **AV-8B FSG Ver. 3.0** | **SORTIES - 57** |
### Mission: VCON-1222

**Goal:**
Review V/STOL.

**Performance Standards:**
- Safely perform all maneuvers IAW the AV-8 NATOPS

**Requirements:**

**Introduce:**
- None

**Review:**
- STOL flap STO
- Continuous VTO accel
- TACAN approach
- STOL flap FNSL
- Auto flap VNSL
- STOL flap VNSL
- SL to roll and go procedure
- CL to full stop
- RVL
- Decel VL
- Press-up

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- None

<table>
<thead>
<tr>
<th>Duration: 1.3</th>
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</thead>
</table>

**Aircraft:**
(1) AV-8B

**Ordnance:**
- None

**Range:**
- RSTD / MOA

**Prerequisites:**
- FAM-1129

**External Support:**
- LSI

**Threat:** None

**Sequence of Events:**
- Takeoff
- TACAN approach to (LSI directed entry to landing pattern)
- Landing pattern work

**Emergency Procedures Discussion:**
- Emergency question of the day
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<thead>
<tr>
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<th>Duration:</th>
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<tr>
<td>Performance Standards:</td>
<td>Safely perform all maneuvers IAW the AV-8 NATOPS</td>
<td>Aircraft:</td>
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<td>Range:</td>
<td>RSTD / MOA</td>
</tr>
<tr>
<td>External Support:</td>
<td>LSI</td>
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</tbody>
</table>

**Requirements:**

**Introduce:**
- None

**Review:**
- STOL flap STO
- Continuous VTO accel
- GCA (PAR)
- VFR overhead
- STOL flap FNSL
- Auto flap VNSL
- STOL flap VNSL
- SL to roll and go procedure
- CL to full stop
- RVL
- Decel VL
- Press-up

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- None

<table>
<thead>
<tr>
<th>Threat:</th>
<th>None</th>
</tr>
</thead>
</table>

**Sequence of Events:**
- Takeoff
- GCA approach to missed approach
- Depart and re-enter the initial for VFR overhead
- Landing pattern work

| Emergency Procedures Discussion: | Emergency question of the day |
**Mission:**

**FORM-1300**

**Goal:**
Introduce administrative formation procedures.

**Performance Standards:**
- Altitude +/-100’, airspeed +/-5 KCAS from target during rendezvous.

**Aircraft:**
(2) TAV-8B or
(1) TAV-8B and (1) AV-8B

**Duration:**
1.3

**Prerequisites:**
- FAM-1129
- Basic Form GS

**Ordnance:**
- None

**Range:**
- Warning/MOA/Rstd

**External Support:**
- None

**Requirements:**

**Introduce:**
- Formation taxi procedures
- Formation marshal procedures
- Section CTO
- Stream STO
- Parade formation
- Section cross under
- Section lead change
- Section cruise formation
- Section running rendezvous
- Section break up and rendezvous
- Section battle damage / ordnance checks
- Section TACAN approach
- Section VFR break maneuver

**Review:**
- STOL flap FNSL
- Auto flap VNSL
- Decel VL
- Press-up

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM-wingman coordination and integration
- Parade position reference points & corrections
- Formation comm. standards
- Formation visual signals
- Underrun and overrun procedures
- Approach speed and aileron droop
- Separation on final

**Sequence of Events:**
- Taxi
- Marshal
- Section CTO
- Departure / Rendezvous
- Area check-in
- Cross under
- Lead change
- Break-up and rendezvous
  - (3) short range
  - (3) long range
- Cruise
- Running rendezvous
- Battle damage / ordnance check
- Formation TACAN approach
  - Separate on final
  - Straight-in FNSL
- Rejoin in warm-up / marshal area
- SSTO
- Depart and re-enter
- Overhead break
- Landing(s)

**Emergency Procedures Discussion:**
- Section emergency procedures
- Inadvertent IMC
- NORDO/LCLS
- Midair

**Threat:** None
**Mission:**
**FORM-1301**

**Goal:**
Review administrative formation procedures and introduce section approaches.

**Performance Standards:**
- Altitude +/-100', airspeed +/-5 KCAS from target during rendezvous.

**Aircraft:**
(2) TAV-8B or (1) TAV-8B and (1) AV-8B

**Ordnance:**
None

**Range:**
Warning/MOA/Rstd

**Duration:**
1.3

**Prerequisites:**
- FORM-1300

**External Support:**
None

**Requirements:**

**Introduce:**
- Section GCA (PAR) to low approach
- Section GCA (PAR) to roll and go landing

**Review:**
- Formation taxi procedures
- Formation marshal procedures
- Section CTO
- Stream STO
- Parade formation
- Section cross under
- Section Lead change
- Section cruise formation
- Section running rendezvous
- Section break up and rendezvous
- RVL
- CL to refused landing
- Decel VL (2)

**Evaluate:**
None

**Concepts and Discussion Topics:**
- A/A and prox functions
- Section weather minimums

**Sequence of Events:**
- Taxi
- Marshal
- Stream STO
- Departure / Rendezvous
- Area check-in
- Cross under
- Lead change
- Break-up and rendezvous
  - (3) short range
  - (3) long range
- Cruise
- Running rendezvous
- Battle damage / ordnance check
- Section PAR
- Missed approach
- Section PAR
  - Separate on final
  - Straight-in RVL
- Landing(s)

**Emergency Procedures Discussion:**
- Section emergency procedures

**Threat:**
None
### Mission:
**SAAH-1310**

**Goal:**
Introduce advanced aircraft handling.

**Performance Standards:**
- PUI will demonstrate knowledge of all introduced flight drills and procedures.
- PUI will demonstrate knowledge of all emergency procedures and discussion items.
- PUI will demonstrate knowledge of discussed aircraft systems.
- AOA control ± 1 unit
- Airspeed ± 20 knots, ± 0.3 G

**Simulator Parameters:**
- Initialize in warm up area, engine running
- SKC, 16° C, 29.90, 340/08, 32 L/R

**Requirements:**

#### Introduce:
- Tacadmin Checks
  - FELPG-F
- Medium altitude break turns
- Deck transition drills
- Hard turns
- Aerobatics
- 3 G weave
- AOA / energy management drills
- Turn rate drills
- Accelerated / high speed stalls
- Slow speed departure
- Slow speed / high AOA drills
- 250-knot loop

#### Review:
- None

#### Evaluate:
- None

### Duration:
1.0

### Aircraft:
RNAWST

### Ordnance:
- None

### Range:
- Simulated

### Prerequisites:
- FORM-1301
- AAH GS

### External Support:
- CSI

### Goal:
Introduce advanced aircraft handling.

### Aircraft:
RNAWST

### Ordnance:
- None

### Range:
- Simulated

### Threat:
None

### Sequence of Events:
- STO
- Departure to training area
- Tacadmin Checks
  - FELPG-F
- Slow speed departure
- Slow speed / high AOA drill
- Accelerated stall / high speed stalls
- AOA / energy management drill
- Turn rate drill
- Hard turns
- Medium altitude break turn (20K/15K/10K)
- Deck transitions (10K)
- Aerobatics
- 250-knot loop
- 3 G weave

### Concepts and Discussion Topics:
- Departure / spin characteristics
- NATOPS prohibited maneuvers
- Break turn technique / departure avoidance
- AOA control
- Airspeed control

### Emergency Procedures Discussion:
- Out of control recovery
- Compressor stall
- Engine mechanical failure / engine vibration
- Airstart
### Mission:
**AAH-1311**

### Goal:
Introduce advanced aircraft handling.

### Performance Standards:
- PUI will demonstrate knowledge of all introduced flight drills and procedures.
- PUI will demonstrate knowledge of all emergency procedures and discussion items.
- PUI will demonstrate knowledge of discussed aircraft systems.
- AOA control ± 1 unit
- Airspeed ± 20 knots, ± 0.3 G

### Aircraft:
(1) TAV-8B

### Ordnance:
None

### Range:
MOA, RSTD

### Requirements:
- **Introduce:**
  - Hard turns
  - Aerobatics
  - 3 G weave
  - Turn rate drills
  - Unloaded rolls
  - Tacadmin checks
    - FELPG-F

- **Demonstrate:**
  - IP demonstrate - nozzle deflection training

- **Review:**
  - CL to full stop
  - Decel VL

- **Evaluate:**
  - None

### Concepts and Discussion Topics:
- CRM
- Performance numbers
- AOA control
- Airspeed control
- TAV-8 G limits
- TAV-8 Prohibited maneuvers

### Duration:
1.0

### Prerequisites:
- SAAH-1310

### Ordnance:
None

### Range:
MOA, RSTD

### External Support:
None

### Threat:
None

### Sequence of Events:
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Unloaded rolls
- Turn rate drill
- Hard turns
- Nozzle deflection training
- Aerobatics
- 3 G weave
- Recovery
- Landing(s)

### Emergency Procedures Discussion:
- Departure Recovery
- Compressor stall
- Airstart
- Emergency question of the day
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<th>AAH-1312</th>
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<tr>
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<td>Introduce advanced aircraft handling.</td>
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<td><strong>Performance Standards:</strong></td>
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<td>• PUI will demonstrate knowledge of all introduced flight drills and procedures.</td>
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<tr>
<td>• PUI will demonstrate knowledge of all emergency procedures and discussion items.</td>
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<tr>
<td>• PUI will demonstrate knowledge of discussed aircraft systems.</td>
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</tr>
<tr>
<td>• AOA control ± 1 unit</td>
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</tr>
<tr>
<td>• Airspeed ± 20 knots, ± 0.3 G</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
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</tr>
<tr>
<td><strong>Introduce:</strong></td>
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<tr>
<td>• Medium altitude break turns</td>
<td></td>
</tr>
<tr>
<td>• AOA / energy management drills</td>
<td></td>
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<tr>
<td>• Slow speed departure</td>
<td></td>
</tr>
<tr>
<td>• Slow speed / high AOA drills</td>
<td></td>
</tr>
<tr>
<td>• 250-knot loop</td>
<td></td>
</tr>
<tr>
<td>• Deck transition drills</td>
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<tr>
<td><strong>Review:</strong></td>
<td></td>
</tr>
<tr>
<td>• Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>◦ FELPG-F</td>
<td></td>
</tr>
<tr>
<td>• Decel VL</td>
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<tr>
<td><strong>Evaluate:</strong></td>
<td></td>
</tr>
<tr>
<td>• None</td>
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<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
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<td>• $Q \times \alpha \times \beta$</td>
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<tr>
<td>• Impending departure warning signs</td>
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| Duration: | 1.0 |
| Prerequisites: | • AAH-1311 |
| Aircraft: | (2) AV-8B |
| Ordnance: | • None |
| Range: | • MOA |
| • RSTD |
| External Support: | • None |
| Threat: | None |

| Sequence of Events: | 
| • Stream STO |
| • Tacadmin Checks |
| ◦ FELPG-F |
| • Slow speed departure |
| • Slow speed / high AOA drills |
| • AOA / energy management drills |
| • Medium altitude break turns (20K/15K/10K) |
| • Deck transition drills (10K) |
| • 250-knot loop |
| • Recovery to decel VL |

| Emergency Procedures Discussion: | 
| • Out of control recovery |
| • Compressor stall |
| • Emergency question of the day |
| • Airstart |
### Mission: TACFORM-1320

**Goal:**
Introduce section tactical formation at medium altitude.

**Performance Standards:**
- Proper MCT scan for tactical formation
- Deviation detection/correction – 10 sec
- Out of turn, position regained – 20 sec
- Airspeed ± 20 KCAS / 0.05 IMN
- AOA ± 1 unit / G ± 0.3

**Aircraft:**
(2) TAV-8B or
(1) AV-8B and (1) TAV-8B

**Ordnance:**
None

**Range:**
- Warning/MOA/Rstd

**Duration:**
1.1

**Prerequisites:**
- Complete TACFORM stage ground/academic training
- AAH-1312

**External Support:**
None

**Threat:**
None

**Sequence of Events:**
- Marshal
- Stream STO
- Departure / rendezvous
- Tacadmin Checks
  - FELPG-F
- Offensive combat spread
  - COMM-in turn series
- Defensive combat spread
  - COMM-in turn series
- Defensive combat spread
- Deployed echelon
- Deployment
- Rejoin – IP demo
- Battle damage check
- Section approach
- Recovery
- Landing(s)

**Concepts and Discussion Topics:**
- Formation definitions
- MCT in different formations
- Deviation correction
- A/A TACAN
- Reasons for the different tactical formations
- Canopy gouge
- Formation and turn standards – G, AOA, KCAS/IMN
- Turn circle and AOA relationships
- Section approach minimums
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<tr>
<td>Performance Standards:</td>
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<tr>
<td>• Proper MCT scan for tactical formation</td>
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<td></td>
</tr>
<tr>
<td>• Deviation detection/correction – 5 sec</td>
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<tr>
<td>• Out of turn, position regained – 15 sec</td>
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<td></td>
</tr>
<tr>
<td>• Airspeed ± 15 KCAS / 0.04 IMN</td>
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</tr>
<tr>
<td>• AOA ± 1 unit / G ± 0.3</td>
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<td></td>
</tr>
<tr>
<td>• Correct COMM-out turn interpretation</td>
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<td>Aircraft: (2) AV-8B or (1) TAV-B and (1) AV-8B</td>
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<td>Introduce:</td>
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<td>• Fighter wing formation</td>
<td></td>
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<tr>
<td>• Medium altitude COMM-out turns:</td>
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<td></td>
</tr>
<tr>
<td>◦ Check turns</td>
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<tr>
<td>◦ NAV turns</td>
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<tr>
<td>◦ TAC turns</td>
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<tr>
<td>◦ Cross turns</td>
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<tr>
<td>◦ Hook turns</td>
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<td>◦ Shackle turns</td>
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<tr>
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<td>• Defensive combat spread</td>
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<tr>
<td>• Offensive combat spread</td>
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<tr>
<td>• Medium altitude COMM-in turns:</td>
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<tr>
<td>◦ Check turns</td>
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<td>◦ NAV turns</td>
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<td>◦ TAC turns</td>
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<td>◦ Hook turns</td>
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<tr>
<td>◦ Shackle turns</td>
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<tr>
<td>• STOL flap VNSL</td>
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<tr>
<td>• Decel VL (2)</td>
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<tr>
<td>Threat: None</td>
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<tr>
<td>Sequence of Events:</td>
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<tr>
<td>• Marshal</td>
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<tr>
<td>• Stream STO</td>
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<tr>
<td>• Departure / rendezvous</td>
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<tr>
<td>• Tacadmin Checks</td>
<td></td>
<td></td>
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<tr>
<td>◦ FELPG-F</td>
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<tr>
<td>• Defensive combat spread</td>
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<td>◦ COMM-in turn series</td>
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<tr>
<td>• Offensive combat spread</td>
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<tr>
<td>◦ COMM-in turn series</td>
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<tr>
<td>• Fighter wing</td>
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<tr>
<td>• FENCE out</td>
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<tr>
<td>• Rejoin</td>
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<tr>
<td>• Battle damage check</td>
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<tr>
<td>• Recovery</td>
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<tr>
<td>• Landing(s)</td>
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<tr>
<td>Emergency Procedures Discussion:</td>
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<td></td>
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<tr>
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<td>• NORDO / LCLS</td>
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<tr>
<td>• Midair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Section emergencies</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Concepts and Discussion Topics:
- Formation definitions
- MCT in different formations
- Deviation correction
- Formation and turn standards – G, AOA, KCAS / IMN
- Reason for COMM-out maneuvering
- COMM-out maneuvering rule of thumb
### Mission: TACFORM-1322

#### Goal:
Introduce section tactical formation at low level.

#### Performance Standards:
- Proper MCT scan for tactical formation
- Deviation detection/correction – 5 sec
- Out of turn, position regained – 15 sec
- Airspeed ± 15 KCAS / 0.04 IMN
- AOA ± 1 unit / G ± 0.3

#### SPINS:
- Minimum altitude – 1000’ AGL
- Maximum altitude – 3000’ AGL

#### Aircraft:
(2) AV-8B

#### Duration:
1.1

#### Ordnance:
None

#### Range:
- Warning/MOA/Rstd

#### Prerequisites:
- TACFORM-1321

#### External Support:
- None

#### Requirements:

##### Introduce:
- Low altitude COMM-in turns:
  - Check turns
  - NAV turns
  - TAC turns
  - Cross turns
  - Hook turns
  - Shackle turns
- Terrain clearance tasks
- Mission tasks (CT and NCMT)
- Mission crosscheck time

##### Review:
- Tacadmin Checks
  - FELPG-F
- Defensive combat spread
- Offensive combat spread
- RVL
- Decel VL (2)

##### Evaluate:
- None

#### Threat:
None

#### Sequence of Events:
- Marshal
- Stream STO
- Departure / rendezvous
- Tacadmin Checks
  - FELPG-F
- Defensive combat spread
  - COMM -in turn series
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

#### Emergency Procedures Discussion:
- Section emergencies
- Inadvertent IMC
- NORDO / LCLS
- Midair
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Formation definitions</td>
</tr>
<tr>
<td>• MCT in different formations</td>
</tr>
<tr>
<td>• Deviation correction</td>
</tr>
<tr>
<td>• Formation and turn standards – G, AOA, KCAS / IMN</td>
</tr>
<tr>
<td>• BAM / BASH and obstructions</td>
</tr>
<tr>
<td>• LAT rules of conduct</td>
</tr>
<tr>
<td>• Emergencies in low altitude environment</td>
</tr>
<tr>
<td>• Deconfliction</td>
</tr>
<tr>
<td>• Operating terrain and environmental effects</td>
</tr>
</tbody>
</table>
### Mission:

**TACFORM-1323**

#### Goal:
- Introduce section tactical formation at high altitude.

#### Performance Standards:
- Proper MCT scan for tactical formation
- Deviation detection/correction – 5 sec
- Out of turn, position regained – 15 sec
- Airspeed ± 15 KCAS / 0.04 IMN
- AOA ± 1 unit / G ± 0.3

#### Aircraft:
(2) AV-8B

#### Ordnance:
None

#### External Support:
None

#### Duration:
1.1

#### Prerequisites:
- TACFORM-1322

#### Range:
Warning/MOA/Rstd

#### Sequence of Events:
- Marshal
- Stream STO
- Departure / rendezvous
- Tacadmin Checks
  - FELPG-F
- Offensive combat spread
- RVL
- Decel VL (2)
- High altitude energy sustaining turns (chased)
- Offensive combat spread
- High altitude COMM-in and COMM-out turns FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

#### Requirements:

**Introduce:**
- High altitude energy sustaining turns (chased)
- High altitude COMM-in and COMM-out turns:
  - Check turns
  - NAV turns
  - TAC turns
  - Cross turns
  - Hook turns
  - Shackle turns

**Review:**
- Tacadmin Checks
  - FELPG-F
- Offensive combat spread
- RVL
- Decel VL (2)

**Evaluate:**
- None

#### Concepts and Discussion Topics:
- Formation definitions
- MCT in different formations
- Deviation correction
- Expected turn performance – AOA / G
- Turn standards – KCAS / IMN only

#### Threat:
None

#### Sequence of Events:
- Marshall
- Stream STO
- Departure / rendezvous
- Tacadmin Checks
  - FELPG-F
- High altitude energy sustaining turns (chased)
- Offensive combat spread
- High altitude COMM-in and COMM-out turns FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

#### Emergency Procedures Discussion:
- Section emergencies
- Inadvertent IMC
- NORDO / LCLS
- Midair
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TACFORM-1324</strong></td>
<td>1.1</td>
<td>• TACFORM-1323</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Aircraft:</th>
<th>Ordnance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce division formation at medium altitude.</td>
<td>(4) TAV-8B</td>
<td>• None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Range:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Proper MCT scan for tactical formation</td>
<td>• Warning/MOA/Rstd</td>
<td>• None</td>
</tr>
<tr>
<td>• Deviation detection/correction – 5 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Out of turn, position regained – 15 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Airspeed ± 15 KCAS / 0.04 IMN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• AOA ± 1 unit / G ± 0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Altitude ± 200 feet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements:</th>
<th>Threat:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduce:</strong></td>
<td>None</td>
</tr>
<tr>
<td>• Division marshal</td>
<td></td>
</tr>
<tr>
<td>• Division stream STO</td>
<td></td>
</tr>
<tr>
<td>• Balanced parade formation</td>
<td></td>
</tr>
<tr>
<td>• Fingertip formation</td>
<td></td>
</tr>
<tr>
<td>• Running rendezvous</td>
<td></td>
</tr>
<tr>
<td>• Break up and rendezvous</td>
<td></td>
</tr>
<tr>
<td>• Division cruise</td>
<td></td>
</tr>
<tr>
<td>• Division box</td>
<td></td>
</tr>
<tr>
<td>• Division deployed echelon</td>
<td></td>
</tr>
<tr>
<td>• Fluid four</td>
<td></td>
</tr>
<tr>
<td>• Division VFR break</td>
<td></td>
</tr>
<tr>
<td>• Division COMM-in tactical turns</td>
<td></td>
</tr>
<tr>
<td>◦ NAV turns</td>
<td></td>
</tr>
<tr>
<td>◦ TAC turns</td>
<td></td>
</tr>
<tr>
<td>◦ Cross turns</td>
<td></td>
</tr>
<tr>
<td>◦ Hook turns</td>
<td></td>
</tr>
<tr>
<td>◦ Shackle turns</td>
<td></td>
</tr>
<tr>
<td>• Battle damage check</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review:</th>
<th>Sequence of Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tacadmin Checks</td>
<td>• Marshal</td>
</tr>
<tr>
<td>◦ FELPG-F</td>
<td>• Div stream STO</td>
</tr>
<tr>
<td>• Decel VL</td>
<td>• Departure / rendezvous</td>
</tr>
<tr>
<td></td>
<td>• Fingertip formation</td>
</tr>
<tr>
<td></td>
<td>• Balanced parade</td>
</tr>
<tr>
<td></td>
<td>• Section cross unders</td>
</tr>
<tr>
<td></td>
<td>• Division cruise</td>
</tr>
<tr>
<td></td>
<td>• Break up and rendezvous</td>
</tr>
<tr>
<td></td>
<td>• Tacadmin Checks</td>
</tr>
<tr>
<td></td>
<td>◦ FELPG-F</td>
</tr>
<tr>
<td></td>
<td>◦ Division G awareness (Fluid four or Division box)</td>
</tr>
<tr>
<td></td>
<td>• Fluid four</td>
</tr>
<tr>
<td></td>
<td>• Division box</td>
</tr>
<tr>
<td></td>
<td>• Division deployed echelon</td>
</tr>
<tr>
<td></td>
<td>• Running rendezvous</td>
</tr>
<tr>
<td></td>
<td>• FENCE out</td>
</tr>
<tr>
<td></td>
<td>• Battle damage check</td>
</tr>
<tr>
<td></td>
<td>• Recovery – VFR break</td>
</tr>
<tr>
<td></td>
<td>• Landing(s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluate:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• None</td>
<td>• Section emergencies</td>
</tr>
<tr>
<td></td>
<td>• Inadvertent IMC</td>
</tr>
<tr>
<td></td>
<td>• NORDO / LCLS</td>
</tr>
<tr>
<td></td>
<td>• Midair</td>
</tr>
</tbody>
</table>

<p>| Concepts and Discussion Topics: | |
|-------------------------------| |
| • Formation definitions | |
| • MCT in different formations | |</p>
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MNAV-1330</strong></td>
<td>0.8</td>
<td>• FAM-1129</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Goal:</strong></th>
<th><strong>Aircraft:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce ingress / egress string and CST NAV system.</td>
<td>MTT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Performance Standards:</strong></th>
<th><strong>Ordnance:</strong></th>
<th><strong>External Support:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach final point within +/- 20 seconds of IP given TOT.</td>
<td>• None</td>
<td>• None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Simulator Parameters:</strong></th>
<th><strong>Threat:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Per the MTT MNAV training mission</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Requirements:</strong></th>
<th><strong>Sequence of Events:</strong></th>
</tr>
</thead>
</table>
| Perform navigation at low altitude on input ingress string. | • Tacadmin Checks
  ◦ FELPG-F
  • Route check-in
  • Alpha check
  • Systems check
  • Command speed time
  • Turn point assessment
  • TOT
  • Knock it off
  • Climb to cope
  • FENCE out |

<table>
<thead>
<tr>
<th><strong>Introduce:</strong></th>
<th><strong>Emergency Procedures Discussion:</strong></th>
</tr>
</thead>
</table>
| • Low level navigation on a MTR
• Navigate to low level start point
• Systems navigation to low level
• Alpha check
• Visual navigation techniques
• Chart map interpretation
• Visual checkpoint identification
• Turn point technique
• Flyover of final point at preplanned TOT
• AMPCD displays
• TACAN options
• Waypoint options
• Markpoint options
• Command speed / time options
• Waypoint overfly options
• Non-Sequential route strings
• HUD symbology differences
• Targetpoint options
• Steer-to-point options
• Point of Interest options
• Quick Access
• Null points
• Bingo profile | • Low altitude flameout
• Airstart |

<table>
<thead>
<tr>
<th><strong>Review:</strong></th>
<th><strong>Evaluate:</strong></th>
</tr>
</thead>
</table>
| • Tacadmin Checks
  ◦ FELPG-F | • None |

<table>
<thead>
<tr>
<th><strong>Evaluate:</strong></th>
<th><strong>Sequence of Events:</strong></th>
</tr>
</thead>
</table>
| • None | • Tacadmin Checks
  ◦ FELPG-F
  • Route check-in
  • Alpha check
  • Systems check
  • Command speed time
  • Turn point assessment
  • TOT
  • Knock it off
  • Climb to cope
  • FENCE out |

<table>
<thead>
<tr>
<th><strong>Emergency Procedures Discussion:</strong></th>
<th><strong>Sequence of Events:</strong></th>
</tr>
</thead>
</table>
| • Low altitude flameout
• Airstart | • Tacadmin Checks
  ◦ FELPG-F
  • Route check-in
  • Alpha check
  • Systems check
  • Command speed time
  • Turn point assessment
  • TOT
  • Knock it off
  • Climb to cope
  • FENCE out |
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Command speed time vs. real time</td>
</tr>
<tr>
<td>• Terrain clearance tasks</td>
</tr>
<tr>
<td>• Mission tasks</td>
</tr>
<tr>
<td>• Critical tasks</td>
</tr>
<tr>
<td>• Noncritical tasks</td>
</tr>
</tbody>
</table>
**Mission:**
**SNAV-1331**

**Goal:**
Introduce navigation at low altitude.

**Performance Standards:**
- Satisfactorily execute all procedures IAW AV-8B NATOPS.
- Overfly the final point +/- 20 seconds of planned timing
- Arrive at the final point +/- 500 pounds of planned fuel.

**Simulator Parameters:**
- Initiate on the ground with the engine running

**Requirements:**
Perform navigation at low altitude on an MTR emphasizing JMPS planning, TACAN navigation, waypoint and markpoint utilization, command speed / time, non-sequential route strings, HUD symbology differences, targetpoint, steer-to-point, point of interest, quick access, and null points.

**Introduce:**
- Low level navigation on a military training route
- Navigate to low level start point
- Alpha check
- System navigation to low level
- Visual navigation techniques
- Chart map interpretation
- Visual checkpoint identification
- Turn point technique
- Flyover of final point at preplanned TOT
- JMPS mission planning and data transfer
- Bingo profile

**Review:**
- Tacadmin Checks
  - FELPG-F

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Command speed time
- Real time assessment
- TACFORM

**Duration:**
1.5

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**Prerequisites:**
- MNAV-1330

**External Support:**
- CSI

**Goal:**
Introduce navigation at low altitude.

**Performance Standards:**
- Satisfactorily execute all procedures IAW AV-8B NATOPS.
- Overfly the final point +/- 20 seconds of planned timing
- Arrive at the final point +/- 500 pounds of planned fuel.

**Simulator Parameters:**
- Initiate on the ground with the engine running

**Requirements:**
Perform navigation at low altitude on an MTR emphasizing JMPS planning, TACAN navigation, waypoint and markpoint utilization, command speed / time, non-sequential route strings, HUD symbology differences, targetpoint, steer-to-point, point of interest, quick access, and null points.

**Introduce:**
- Low level navigation on a military training route
- Navigate to low level start point
- Alpha check
- System navigation to low level
- Visual navigation techniques
- Chart map interpretation
- Visual checkpoint identification
- Turn point technique
- Flyover of final point at preplanned TOT
- JMPS mission planning and data transfer
- Bingo profile

**Review:**
- Tacadmin Checks
  - FELPG-F

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Command speed time
- Real time assessment
- TACFORM

**Sequence of Events:**
- Tacadmin Checks
  - FELPG-F
- Route check-in
- Alpha check
- Systems check
- Command speed time
- Turn point assessment
- TOT
- Knock it off
- Climb to cope

**Emergency Procedures Discussion:**
- Bird strike

**Threat:** None
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th>NAV-1332</th>
<th><strong>Duration:</strong></th>
<th>1.3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce navigation at low altitude.</td>
<td><strong>Prerequisites:</strong></td>
<td>SNAV-1331</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | • Satisfactorily execute all procedures IAW AV-8B NATOPS.  
• Overfly the final point +/- 20 seconds of planned timing  
• Arrive at the final point +/- 500 pounds of planned fuel. | **Aircraft:** | (1) TAV-8B |
| **Ordnance:** | None | **Range:** | MTR |
| **External Support:** | None |
| **Simulator Parameters:** | N/A |
| **Requirements:** | | **Threat:** | None |
| Perform navigation at low altitude on an MTR emphasizing JMPS planning, TACAN navigation, waypoint and markpoint utilization, command speed / time, non-sequential route strings, HUD symbology differences, targetpoint, steer-to-point, point of interest, quick access, and null points. | **Sequence of Events:** | • Marshal  
• Take-off  
• Departure / rendezvous  
• Tacadmin Checks  
  • FELPG-F  
• Route check-in  
• Alpha check  
• Systems check  
• Command speed time  
• Turn point assessment  
• TOT  
• Knock it off  
• Climb to cope  
• FENCE out  
• Rejoin  
• Battle damage check  
• Recovery  
• Landing(s)  
| **Introduce:** | • Low level navigation on a military training route  
• TACAN options  
• Waypoint options  
• Markpoint options  
• Command speed / time options  
• Non-Sequential route strings  
• HUD symbology differences  
• Targetpoint options  
• Steer-to-point options  
• Point of Interest options  
• Quick Access  
• Null points | **Emergency Procedures Discussion:** | • Low altitude flameout  
• Airstart  
• Birdstrike |
| **Review:** | • Alpha check  
• JMPS mission planning and data transfer  
• Decel VL | **Evaluate:** | None |
Concepts and Discussion Topics:
  - Systems management
  - Command speed time vs. real time
  - Terrain clearance tasks
  - Mission tasks
  - Critical tasks
  - Noncritical tasks
  - T-bird limitations
### Mission:

**AAR-1340**

### Goal:
Introduce Day Air-to-Air Refueling qualification.

### Performance Standards:
- Execute IAW ATP-56(B) without exhibiting any unsafe trends.
- Perform 2 wet and 4 dry plugs on the tanker drogue.

### Aircraft:
(2) AV-8B

### Ordnance:
None

### Range:
- AAR

### Prerequisites:
- TACFORM-1324
- AAR Stage Brief
- AAR Stage Exam

### External Support:
- AAR Platform

### Duration:
1.5

### Requirements:

#### Introduce:
- Four-finger ground check
- In-flight refueling in accordance with the AV-8B NATOPS Chap 9 and ATP-56(B)
- In-flight refueling in a COMM-in environment
- Tanker rendezvous
- Aerial refueling checklist
- Observation position
- Astern position
- Drogue contact
- Refueling position
- Disconnect procedure
- Reform position
- Post-refueling checks
- Tanker departure

#### Review:
- RVL
- Decel VL

#### Evaluate:
- None

### Threat:
None

### Sequence of Events:
- Ground checks (4-finger)
- Marshal
- Take-off
- Departure Rendezvous
- Area Check-in
- Tanker Check-in
- Tanker Rendezvous
- Aerial Refueling Checklist
- Observation Position
- Astern Position
- Drogue Contact
- Refueling
- Disconnect
- Reform Position
- Post Refueling Checks
- Tanker Departure
- Recovery
- Landings

### Emergency Procedures Discussion:
- Emergency Breakaway
- NORDO Procedures
- Dead Hose
- Canopy-Aircraft Strike
- Damaged Aircraft/Probe

### Concepts and Discussion Topics:
- Flap Setting for Aerial Refueling (Cruise / STOL)
- Transfer Lights During Refueling
- Press Switch Position
- AV-8B Refueling Equipment and Limitations
- KC-130 / KC-10 / K-707 Refueling Equipment, Lighting, Limitations (as applicable)
- Required Communications
- IFR on Tanker
- TANK Light
- Probe Fails to Retract
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th>MTCT-1350</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce expendable page setup, expendable programming, ECM panel, and CMDS functions.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td>Execute all procedures IAW AV-8B NATIP and Air NTTP</td>
</tr>
<tr>
<td><strong>Aircraft:</strong></td>
<td>MTT</td>
</tr>
<tr>
<td><strong>Ordnance:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Prerequisites:</strong></td>
<td>TACFORM-1324, TCT Stage Brief</td>
</tr>
<tr>
<td><strong>External Support:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Simulator Parameters:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **Introduce:** | - Expendable page setup
- Expendable programming
- ALR-67 BIT
- ALQ-164 BIT |
| **Review:** | None |
| **Evaluate:** | None |
| **Concepts and Discussion Topics:** | - ALQ-164 setup
- ALE-39/47 setup
- ALR-67 setup
- Countermeasures dispensing system
- ECM panel |
<p>| <strong>Duration:</strong> | 0.8 |
| <strong>Threat:</strong> | None |
| <strong>Sequence of Events:</strong> | TCT Ground Checks |
| <strong>Emergency Procedures Discussion:</strong> | None |</p>
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>STCT-1351</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>1.0</strong></th>
<th><strong>Prerequisites:</strong></th>
<th>• MTCT-1350</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce EW suite and applicable communication and surface to air threat counter tactics at Medium Altitude.</td>
<td><strong>Aircraft:</strong></td>
<td>RNAWST</td>
<td><strong>External Support:</strong></td>
<td>• None</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | • Execute TCT maneuvers IAW Air NTTP  
  • Adhere to TCT decision matrix  
  • Adhere to ALSA COMM brevity  
  • Employ ASE IAW Air NTTP and NATIP | **Ordnance:** | • (4) Mk-82LD  
  • ALQ-164  
  • SEL-1 | **Range:** | • Simulated |
| **Simulator Parameters:** | • Initialize in center mat  
  • SKC, 20 SM, 25° C, 30.00, 300/10, Rwy 32 | **Threat:** | SA-2, S-60, SA-7 | **Sequence of Events:** | • Initialize in warm-up with engine running  
  • ALR / ALQ BITs  
  • Marshal  
  • STO  
  • Departure  
  • Area check-in  
  • Tacadmin Checks  
  • FELPG-F  
  • Threat counter-tactics  
  • FENCE out  
  • Recovery |
| **Requirements:** | **Review:** | • Tacadmin Checks  
  • FELPG-F | **Emergency Procedures Discussion:** | • Departure / spin  
  • Compressor stall  
  • Damaged aircraft |
|               | **Introduction:** | • Medium altitude threat counter-tactics  
  • Lean  
  • Notch  
  • Beam  
  • Level S  
  • Guns jink  
  • SAM weave  
  • E-pole tactics  
  • Jettison criteria  
  • TCT ALSA communications  
  • Pre-emptive expendable game plan  
  • Reactive expendable game plan  
  • ALQ-164 setup and employment  
  • ALQ-164 BIT  
  • ALE-39/47 setup and employment  
  • ALR-67 setup and employment  
  • ALR-67 BIT | **Evaluate:** | • None |
### Concepts and Discussion Topics:
- CRM
- Departure avoidance
- Range known vs. range unknown tactics
- E-pole determination
- Medium altitude E-pole tactics
- RWR interpretation
- INS smoothing
- Decision matrix for jettison criteria
- ALR-67 BIT procedures
- ALQ-164 BIT procedures
- TCT ALSA COMM
  - Brevity terms
  - Directive / descriptive priority
### Mission: TCT-1352

**Goal:** Introduce surface to air threat counter-tactics at medium altitude.

**Performance Standards:**
- Execute TCT maneuvers IAW Air NTTP
- Adhere to TCT decision matrix
- Adhere to ALSA COMM brevity
- Employ ASE IAW Air NTTP and NATIP

**Aircraft:** (2) AV-8B(E)

**Duration:** 1.0

**Prerequisites:**
- STCT-1351

**Ordnance:**
- TACTS Pod-Stn 1
- 40 CHF / 10 FLR

**Range:**
- EW
- TACTS

**External Support:**
- TACTS Debrief

**SPINS:**
- 

**Requirements:**

**Introduce:**
- Jettison criteria
- ALE-39/47 arming and de-arming
- Medium altitude threat counter-tactics
  - Lean
  - Notch
  - Beam
  - Level S
  - Guns jink
  - SAM weave
  - E-pole tactics
- TCT ALSA communications
- Pre-emptive expendable game plan
- Reactive expendable game plan

**Review:**
- Tacadmin Checks
  - FELPG-F
- ALQ-164 setup and employment
- ALE-39/47 setup and employment
- ALR-67 setup and employment
- RVL
- Decel VL

**Evaluate:**
- None

**Sequence of Events:**
- Pre-Flight
- Arming ALE-39/47
- Marshal
- Take-off
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Threat counter-tactics
  - FENCE out
  - Rejoin
  - Battle damage check
  - Recovery
  - RVL
  - Decel VL
  - De-arming

**Threat:** SA-6, ZSU 23-4, SA-14/16

**Emergency Procedures Discussion:**
- Departure / spin
- Compressor stall
- Midair
- Damaged aircraft
- NORDO / LCLS
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
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<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• Departure avoidance</td>
</tr>
<tr>
<td>• Gaining and maintaining sight of threat</td>
</tr>
<tr>
<td>• Ground reference</td>
</tr>
<tr>
<td>• Notch and chaff effectiveness vs. radar types</td>
</tr>
<tr>
<td>Mission:</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Goal:</td>
</tr>
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</table>
| Performance Standards: | • Weaponing IAW NATIP utilizing WARP  
• Familiar with SMC programming  
• Familiar with HAT source cascade employment (BCIP, GCIP)  
• Familiar with HUD A/G symbology and HOTAS |
| Duration: | 1.0 |
| Aircraft: | MTT |
| Ordnance: | • (6) Mk-82 LD  
• M-904  
• FMU-139 |
| Range: | None |
| Simulator Parameters: | • Per MTT DMT training mission  
• 0.6M, 10,000’  
• SKC |
| SPINS: | • 30° / 500 KTAS delivery |
| Requirements: | Introduce:  
• WARP weaponing  
• Weapons system programming  
• Air-to-surface HOTAS  
• High angle BCIP / GCIP deliveries (3)  
• High angle ARBS / TV deliveries (3) |
| Emergency Procedures Discussion: | None |
| Review: | N/A |
| Evaluate: | None |
| Concepts and Discussion Topics: | • Use of ASCMI vs. UFC  
• Stores codes / ballistic algorithm relationship  
• MWSS / symbology scan pattern  
• Air-to-surface HOTAS |
| Threat: | None |
| Sequence of Events: | • Initialize MTT airborne  
• STRS page manipulation / weapons program (MTT on Freeze)  
  o General munitions (parent station / ITER)  
  o Q / M / I programming  
  o GAU-12  
  o Fuze programming  
  o Training mode  
  o Tone function  
  o Weapon system programming errors (per chart in FSG Weapon System Programming discussion)  
  o Site angle  
  o PUC / LAW  
  o WRD function  
• HUD symbology demonstration  
• Entry to medium altitude raked range pattern (execute minimum of six 30 degree deliveries) |
| Prerequisites: | • TACFORM-1324  
• TCT GS  
• A/S GS |
<p>| External Support: | None |</p>
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<th>SAS-1401</th>
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<th>1.0</th>
<th>Prerequisites:</th>
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<tr>
<td>Goal:</td>
<td>Introduce computed weapon delivery from medium altitude</td>
<td>Aircraft:</td>
<td>RNAWST</td>
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<tr>
<td>Performance Standards:</td>
<td>- Correct WARP weaponeering</td>
<td>Ordnance:</td>
<td>(12) Mk-76, SEL-1</td>
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<tr>
<td></td>
<td>- Roll-in ACD ± 0.1 NM, 200°</td>
<td>Range:</td>
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<td></td>
<td>- IRCM – 50% execution minimum</td>
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<td>- TPA ± 1 degree</td>
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<td></td>
<td>- Dive deliveries ±5° / 30 knots / 500’</td>
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<td></td>
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<td></td>
<td>- Off target maneuver IAW FSG</td>
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<tr>
<td></td>
<td>- CEP about MPI &lt; 14 mils</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>- Adherence to tactical abort parameters</td>
<td></td>
<td></td>
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<tr>
<td>Simulator Parameters:</td>
<td>- Database that corresponds to planned execution</td>
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<tr>
<td></td>
<td>(Yuma: Cactus West or Cherry Point: BT-11)</td>
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<td></td>
<td>- Scored target</td>
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<tr>
<td></td>
<td>- SKC, 20 SM, 25° C, 30.01, 040/15</td>
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<tr>
<td>Requirements:</td>
<td></td>
<td>SPINS:</td>
<td>45° / 500 KTAS delivery</td>
<td>Threat:</td>
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<td>30° / 500 KTAS delivery (tactical)</td>
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<td>- Weapons system programming in CWAIVER</td>
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<td>30° / 500 KTAS delivery (wx backup)</td>
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<td>- Clearing / spacer pass</td>
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<td>Weapon programming: Q1 / M1</td>
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<td>- Academic bombing pattern</td>
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<td></td>
<td>- High angle BCIP / GCIP deliveries (12)</td>
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<tr>
<td></td>
<td>- Adaptive roll-in technique</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Target placement angle</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- Curvilinear to straight path tracking</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- Jettison system</td>
<td></td>
<td></td>
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<td></td>
<td>- High angle off target maneuver</td>
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<td></td>
<td>- Air-to-surface HOTAS</td>
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<td>Demonstrate:</td>
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<tr>
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<td>- IP brief weaponeering limitations</td>
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<td>Review:</td>
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<td></td>
<td>- WARP weaponeering</td>
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<tr>
<td></td>
<td>-Tacadmin Checks</td>
<td></td>
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<tr>
<td></td>
<td>- FELPG-F</td>
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<td>None</td>
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<tr>
<td>Evaluate:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- None</td>
<td></td>
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<td>Emergency Procedures Discussion:</td>
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<tr>
<td></td>
<td>- Flameout in bombing pattern</td>
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<td></td>
<td>- Hung ordnance recovery</td>
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</tr>
</tbody>
</table>
### Concepts and Discussion Topics:
- CRM
- Local area ordnance procedures course rules
- Target area chart preparation
- Pattern / Range communication
- Curvilinear to straight path tracking
- Settling time prior to release
- Wind effects
- Jettison system
- Air-to-surface grading criteria (HITS calculation software)
- A/S expendable usage
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
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<tbody>
<tr>
<td>SAS-1402</td>
<td>1.0</td>
<td>SAS-1401</td>
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</tbody>
</table>

**Goal:**
Introduce 10-degree computed weapon deliveries

**Performance Standards:**
- Correct WARP weaponeering
- Roll-in ACD ±0.1 NM, 200'
- IRCM – 50% execution minimum
- TPA ± 1 degree
- Dive deliveries ± 5° / 30 knots / 500’
- Proper off target maneuver (360 KCAS min)
- CEP about MPI < 14 mils

**Aircraft:**
RNAWST

**Ordnance:**
- (6) Mk-76 (2/6)
- (2) MK-82 BSU-86 LD/HD (3/5)
- FMU-139
- SEL-1

**Range:**
- Simulated

**External Support:**
- None

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma: Cactus West or Cherry Point: BT-11)
- Scored target.
- OVC 090, 7 SM, 25° C, 29.98, 200/10

**SPINS:**
- 10° / 500 KTAS delivery
- Weapon programming: Q1 / M1

**Requirements:**

**Introduce:**
- Low angle deliveries of high drag ordnance (4)
- Low angle deliveries of low drag ordnance (4)
- Low altitude off target maneuver

**Review:**
- WARP weaponeering
- Weapons system programming
- Academic bombing pattern
- Adaptive roll-in technique
- Target placement angle
- Curvilinear to straight path tracking
- Air-to-surface HOTAS
- Tacadmin Checks
  - FELPG-F

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- FMU-139 Fuze arm time
- Break “X”
- Pull-up cue
- Low altitude off target maneuver / recovery
- Asymmetric dive recovery
- RADAR altimeter HAT / BOMB option
- Fragmentation patterns
- Reflected cue

**Emergency Procedures Discussion:**
- SMC / ASCMI failure
- HYD 1 failure

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- Clearing / spacer pass
- Bombing pattern
- FENCE out
- Recovery
- Landing(s)

**Threat:**
- None
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>SAS-1403</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong></td>
<td>Introduce ARBS / TV deliveries</td>
</tr>
</tbody>
</table>
| **Performance Standards:** | Roll-in ACD ±0.1 NM, 200’  
IRCM – 50% execution minimum  
Valid cascade plan on every pass  
Dive deliveries ± 5° / 30 knots / 500’  
Off target maneuver IAW FSG  
CEP about MPI < 14 mils |
| **Aircraft:** | RNAWST |
| **Ordnance:** | (12) Mk-76 |
| **External Support:** | CSI |
| **Simulator Parameters:** | Database that corresponds to planned execution  
(Yuma: Loom Lobby / Shade Tree or Cherry Point: BT-11)  
Scored target  
SKC, 20 SM, 25° C, 30.01, 040/15 |
| **SPINS:** | 45° / 500 KTAS delivery  
30° / 500 KTAS delivery (tactical)  
Weapon programming: Q2 / M2 |
| **Requirements:** | **Introduction:**  
WOF update / designation  
J-hook maneuver  
Straight path to straight path tracking  
CCIP to AUTO conversions  
Point blank bomb pickle  
ARBS / TV deliveries from high angle (12)  
Cascade plan  
ARBS / TV HOTAS |
| **Review:** | WARP weaponeering  
Tacadmin Checks  
FELPG-F  
Weapons system programming  
Academic bombing pattern  
Adaptive roll-in technique  
Target placement angle  
Curvilinear to straight path tracking  
Off target maneuver |
| **Evaluate:** | None |
| **Prerequisites:** | SAS-1401 |
| **Duration:** | 1.0 |
| **Sequence of Events:** | Initialize in warm-up engine running  
Marshal  
STO  
Departure  
Area check-in  
Tacadmin Checks  
FELPG-F  
IP – MWSS checks  
Clearing / spacer pass  
Bombing pattern  
ARBS / TV deliveries from 45° (6)  
ARBS / TV deliveries from 30° (6)  
FENCE out  
Recovery  
Landing(s) |
<p>| <strong>Threat:</strong> | None |</p>
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• ASCMI failure</td>
</tr>
<tr>
<td>• Upgrade / cascade plan</td>
<td>• Lost Communication</td>
</tr>
<tr>
<td>• ARBS designation criteria</td>
<td>• Uncommanded nose gear extension</td>
</tr>
<tr>
<td>• TDC action and no action slewing</td>
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</tr>
<tr>
<td>• Indications and actions for running designation</td>
<td></td>
</tr>
<tr>
<td>• Systems / target fixation</td>
<td></td>
</tr>
<tr>
<td>• Slewing below checkpoint altitude</td>
<td></td>
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<tr>
<td>• EOTDA</td>
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<tr>
<td><strong>Mission:</strong></td>
<td><strong>Duration:</strong></td>
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<tr>
<td><strong>Goal:</strong></td>
<td></td>
</tr>
<tr>
<td>Introduce ARBS / LST deliveries</td>
<td></td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td><strong>Aircraft:</strong></td>
</tr>
<tr>
<td>• Roll-in ACD ±0.1 NM, 200’</td>
<td>RNAVST</td>
</tr>
<tr>
<td>• TPA ± 1 degree</td>
<td></td>
</tr>
<tr>
<td>• IRCM – 70% execution minimum</td>
<td></td>
</tr>
<tr>
<td>• Valid cascade plan on every pass</td>
<td></td>
</tr>
<tr>
<td>• Dive deliveries ± 5° / 30 knots / 500’</td>
<td></td>
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<tr>
<td>• Proper off target maneuver (360 KCAS min)</td>
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<tr>
<td>• CEP about MPI &lt; 14 mils</td>
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<tr>
<td><strong>Simulator Parameters:</strong></td>
<td><strong>Ordnance:</strong></td>
</tr>
<tr>
<td>• Database that corresponds to planned execution (Yuma or Cherry Point)</td>
<td>• (12) Mk-76</td>
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<tr>
<td>• Scored target</td>
<td>• SEL-1</td>
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<tr>
<td>• SKC, 20 SM, 25° C, 30.01, 200/15</td>
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<tr>
<td><strong>SPINS:</strong></td>
<td><strong>Requirements:</strong></td>
</tr>
<tr>
<td>• 45° / 500 KTAS delivery</td>
<td></td>
</tr>
<tr>
<td>• 30° / 500 KTAS delivery (tactical)</td>
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</tr>
<tr>
<td>• Weapon programming: Q2 / M1</td>
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<tr>
<td><strong>Sequence of Events:</strong></td>
<td><strong>Introduce:</strong></td>
</tr>
<tr>
<td>Initialize in warm-up engine running</td>
<td>• ARBS / LST deliveries from high angle (12)</td>
</tr>
<tr>
<td>Marshal</td>
<td>• ARBS / LST / ARBS / TV handoff (3 minimum)</td>
</tr>
<tr>
<td>STO</td>
<td>• LST basket overlay</td>
</tr>
<tr>
<td>Departure</td>
<td>• ARBS / LST HOTAS</td>
</tr>
<tr>
<td>Area check-in</td>
<td></td>
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<tr>
<td>Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>◦ FELPG-F</td>
<td></td>
</tr>
<tr>
<td>Academic bombing pattern</td>
<td></td>
</tr>
<tr>
<td>Straight path to straight path tracking</td>
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<td>ARBS / TV deliveries from high angle</td>
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<tr>
<td><strong>Review:</strong></td>
<td><strong>Emergency Procedures Discussion:</strong></td>
</tr>
<tr>
<td>WARP weaponeering</td>
<td>• Selective / emergency jettison</td>
</tr>
<tr>
<td>Tacadmin Checks</td>
<td>• Dump target location and procedures</td>
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<td>◦ FELPG-F</td>
<td>• Asymmetric stores</td>
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<td>ARBS / TV deliveries from high angle</td>
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<td><strong>Evaluate:</strong></td>
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<tr>
<th>Goal:</th>
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<tbody>
<tr>
<td>Introduce GAU-12 and rocket deliveries</td>
<td><strong>RNAWST</strong></td>
</tr>
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<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Ordnance:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Roll-in ACD ±0.1 NM, 200’</td>
<td>• (300) 25 mm (8) 5.00” Zuni Rockets</td>
<td>• CSI</td>
</tr>
<tr>
<td>• IRCM – 70% execution minimum</td>
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<tr>
<td>• Dive deliveries ± 5° / 30 knots / 500’</td>
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<td></td>
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<tr>
<td>• Off target maneuver IAW FSG</td>
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<thead>
<tr>
<th>Simulator Parameters:</th>
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</tr>
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<tbody>
<tr>
<td>• Database that corresponds to planned execution (Yuma or Cherry Point)</td>
<td>• 10° / 550 KTAS delivery (GAU-12 300rds)</td>
</tr>
<tr>
<td>• Scored target</td>
<td>• 20° / 550 KTAS delivery (5” Zuni Rockets)</td>
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<tr>
<td>• BKN 050, 7 SM, 25° C, 30.03, 220/10</td>
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<tr>
<td>• Low angle attacks with the 25 mm gun (4)</td>
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<tr>
<td>• High angle rocket deliveries (8)</td>
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<tr>
<td>• Gun / rocket pattern</td>
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<tr>
<td>• Gun / rocket safe escape off target maneuver</td>
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<td>• Gun / rocket weaponneering</td>
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</tr>
<tr>
<td>• Gun not clear procedures</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Review:</th>
<th>Sequence of Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• WARP weaponneering data</td>
<td>• Initialize in warm-up engine running</td>
</tr>
<tr>
<td>• Weapons system programming</td>
<td>• Marshal / forward firing ordnance arming</td>
</tr>
<tr>
<td>• Tacadmin Checks</td>
<td>• STO</td>
</tr>
<tr>
<td>◦ FELPG-F</td>
<td>• Departure</td>
</tr>
<tr>
<td>• Straight path to straight path tracking</td>
<td>• Area check-in</td>
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<td>• Tacadmin Checks</td>
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<td></td>
<td>• IP – MWSS checks</td>
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<tr>
<td></td>
<td>• Clearing / spacer pass</td>
</tr>
<tr>
<td></td>
<td>• Strafing / rocket pattern</td>
</tr>
<tr>
<td></td>
<td>• Gun not clear procedures</td>
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<td></td>
<td>• FENCE out</td>
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<td></td>
<td>• Recovery</td>
</tr>
<tr>
<td></td>
<td>• Landing(s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• Bird Strike</td>
</tr>
<tr>
<td>• Arm / De-arm procedures</td>
<td>• Battle damage / Frag</td>
</tr>
<tr>
<td>• Gun firing techniques</td>
<td>• Gun malfunctions</td>
</tr>
<tr>
<td>• Rocket / Gun sight picture</td>
<td></td>
</tr>
<tr>
<td>• Rocket / Gun off target maneuver</td>
<td></td>
</tr>
<tr>
<td>• 25mm ammunition types</td>
<td></td>
</tr>
<tr>
<td>• Safe escape table to ensure safe releases</td>
<td></td>
</tr>
<tr>
<td>• Maximum frag envelope chart to ensure safe releases</td>
<td></td>
</tr>
<tr>
<td>Mission:</td>
<td>Duration:</td>
</tr>
<tr>
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<td><strong>AS-1406</strong></td>
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<td><strong>Goal:</strong></td>
<td></td>
</tr>
<tr>
<td>Introduce computed weapons deliveries</td>
<td></td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td></td>
</tr>
<tr>
<td>• Roll-in ACD ±0.1 NM, 200’</td>
<td></td>
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<tr>
<td>• Set TPA ± 1 degree</td>
<td></td>
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<tr>
<td>• Dive deliveries ± 5° / 30 knots / 500’</td>
<td></td>
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<tr>
<td>• Proper off target maneuver (360 KCAS min)</td>
<td></td>
</tr>
<tr>
<td>• CEP about MPI &lt; 14 mils</td>
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<tr>
<td><strong>Aircraft:</strong></td>
<td></td>
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<tr>
<td>(1) TAV-8B</td>
<td></td>
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<tr>
<td><strong>Ordnance:</strong></td>
<td></td>
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<tr>
<td>(6) Mk-76</td>
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<tr>
<td><strong>Range:</strong></td>
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<tr>
<td>RKD RNG</td>
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<tr>
<td><strong>External Support:</strong></td>
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<tr>
<td>Weapons scoring</td>
<td></td>
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<tr>
<td><strong>SPINS:</strong></td>
<td></td>
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<tr>
<td>• 45° / 500 KTAS delivery (RP shall conduct 45° deliveries in TAV-8B prior to conducting 45° deliveries solo)</td>
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<tr>
<td>• Tactical 30° / 500 KTAS delivery (Weather 30° if weather dictates)</td>
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<tr>
<td>• Weapon Programming: Q1 / M1</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
<td></td>
</tr>
<tr>
<td>• Weapons preflight</td>
<td></td>
</tr>
<tr>
<td>• Weapons system programming</td>
<td></td>
</tr>
<tr>
<td>• Clearing / spacer pass</td>
<td></td>
</tr>
<tr>
<td>• High angle BCIP / GCIP deliveries (4)</td>
<td></td>
</tr>
<tr>
<td>• High angle auto deliveries (2)</td>
<td></td>
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<tr>
<td>• Adaptive roll-in technique</td>
<td></td>
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<tr>
<td>• Target placement angle</td>
<td></td>
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<tr>
<td>• Straight path to straight path tracking</td>
<td></td>
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<tr>
<td>• High angle off target maneuver</td>
<td></td>
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<tr>
<td>• Academic bombing pattern</td>
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<td>• Air-to-surface HOTAS</td>
<td></td>
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<tr>
<td><strong>Review:</strong></td>
<td></td>
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<tr>
<td>• WARP weaponeering data</td>
<td></td>
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<tr>
<td>• STOL flap STO</td>
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<tr>
<td>• Tacadmin Checks</td>
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<td>• FELPG-F</td>
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<td>• RVL</td>
<td></td>
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<tr>
<td>• Decel VL</td>
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<tr>
<td><strong>Evaluate:</strong></td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
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<tr>
<td><strong>Threat:</strong></td>
<td></td>
</tr>
<tr>
<td>ZSU-23-4</td>
<td></td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
<td></td>
</tr>
<tr>
<td>• Preflight</td>
<td></td>
</tr>
<tr>
<td>• Marshal</td>
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<td>• STO</td>
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<td>• Departure</td>
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<td>• Area check-in</td>
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<td>• Tacadmin Checks</td>
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<tr>
<td>• FELPG-F</td>
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<td>• Clearing / spacer pass</td>
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<td>• Bombing pattern</td>
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<td>• FENCE out</td>
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<td>• Recovery</td>
<td></td>
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<tr>
<td>• Landing(s)</td>
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</tbody>
</table>
### Concepts and Discussion Topics:
- CRM
- Local area ordnance procedures and course rules
- Straight path to straight path tracking
- Settling time prior to release
- Wind effects
- Airborne hit analysis and error corrections
- TAV-8B limitations
- Canopy/cockpit gouge
- HUD scan pattern

### Emergency Procedures Discussion:
- ADC Failure
- RPM fluctuation
**Mission:**

**AS-1407**

**Goal:**
Practice high angle deliveries.

**Performance Standards:**
- Roll-in ACD ±0.1 NM, 200'
- Set TPA ± 1 degree.
- IRCM – 60% execution minimum.
- Dive deliveries ± 5° / 30 knots / 500'.
- Proper off target maneuver (360 KCAS min).
- Adhere to deconfliction plan.
- CEP about MPI < 14 mils.

**Aircraft:**
(2) AV-8B(E)

**Ordnance:**
- (6) Mk-76
- (10) FLR

**Range:**
- RKD RNG
- EXP

**External Support:**
- Weapon scoring

**SPINS:**
- 45° / 500 KTAS delivery (RP shall conduct 45° deliveries in TAV-8B prior to conducting 45° deliveries solo)
- Tactical 30° / 500 KTAS delivery (Weather 30° if weather dictates)
- Weapon Programming: Q1 / M1

**Requirements:**

**Introduce:**
- Off target rendezvous

**Review:**
- WARP weaponeering data
- Running rendezvous
- High angle BCIP / GCIP deliveries (4)
- High angle Auto deliveries (2)
- Adaptive roll-in technique
- Target placement angle
- Straight path to straight path tracking
- Academic bombing pattern
- Expendable switch usage
- High angle off target maneuver
- Ordnance / battle damage check
- Auto flap VNSL
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
- AS-1406

**Threat:**
SA-7, SA-14, SA-18

**Sequence of Events:**
- A/S briefing (RP will brief weaponeering portion)
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS checks
- Clearing / spacer pass
- Bombing pattern
- FENCE out
- Off-target rendezvous
- Ordnance / battle damage check
- Recovery
- Landing(s)
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• EFC Caution</td>
</tr>
<tr>
<td>• Adaptive roll-in</td>
<td>• EFC Warning</td>
</tr>
<tr>
<td>• Importance of good start and its effects on</td>
<td></td>
</tr>
<tr>
<td>parameters</td>
<td></td>
</tr>
<tr>
<td>• Straight path to straight path tracking</td>
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<tr>
<td>• Wind effects</td>
<td></td>
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<tr>
<td>• Airborne hit analysis and error corrections</td>
<td></td>
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<tr>
<td>• Pattern deconfliction</td>
<td></td>
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<tr>
<td>• A/S expendable usage</td>
<td></td>
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<tr>
<td>• Expendable arm / de-arm and expendable</td>
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<td>checks</td>
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<td>• FMU-139 fuze</td>
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</table>
**Mission:**

**AS-1408**

**Goal:**
Introduce ARBS / TV deliveries.

**Performance Standards:**
- Roll-in ACD ±0.1 NM, 200'
- Set TPA ± 1 degree.
- IRCM – 60% execution minimum.
- Employ sensor cascade plan on every pass where ordnance is released.
- Dive deliveries ± 5° / 30 knots / 500'.
- Proper off target maneuver (360 KCAS min).
- Adhere to deconfliction plan.
- CEP about MPI < 14 mils.

**Duration:**
1.0

**Aircraft:**
(2) AV-8B (NA)

**Ordnance:**
- (6) Mk-76
- (10) FLR

**Range:**
- RKD RNG
- EXP

**Prerequisites:**
- AS-1407

**External Support:**
- Weapon scoring

**SPINS:**
- 45° / 500 KTAS delivery (RP shall conduct 45° deliveries in TAV-8B prior to conducting 45° deliveries solo)
- Tactical 30° / 500 KTAS delivery (Weather 30° if weather dictates)
- Weapon programming: Q1 / M1

**Ordnance:**

**Requirements:**

**Introduce:**
- J hook maneuver
- High angle ARBS / TV deliveries (6)

**Review:**
- WARP weaponeering data
- Running rendezvous
- Adaptive roll in technique
- Academic bombing pattern
- Expendable switch usage
- High angle off target maneuver
- Straight path to straight path tracking
- Off target rendezvous
- Ordnance / battle damage check
- RVL
- Decel VL

**Evaluate:**
- None

**Threat:** S-60, 2S6

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS checks
- Clearing / spacer pass
- Bombing pattern
- FENCE out
- Off-target rendezvous
- Ordnance / battle damage check
- Recovery
- Landing(s)
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• Lost communication procedures</td>
</tr>
<tr>
<td>• EOTDA / PAR for ARBS TV lock</td>
<td>• Airstart procedures</td>
</tr>
<tr>
<td>• DMT Boresight</td>
<td></td>
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<tr>
<td>• Straight path to straight path tracking</td>
<td></td>
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<tr>
<td>• ARBS designation criteria / rule of thumb</td>
<td></td>
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<tr>
<td>• Cascade plan</td>
<td></td>
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<tr>
<td>• Slew below checkpoint altitude</td>
<td></td>
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<tr>
<td>• System / target fixation</td>
<td></td>
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<tr>
<td>Mission: AS-1409</td>
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<tr>
<td><strong>Goal:</strong></td>
<td></td>
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<tr>
<td>Introduce 10-degree deliveries with low drag ordnance.</td>
<td></td>
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<tr>
<td><strong>Performance Standards:</strong></td>
<td></td>
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<td>- Roll-in ACD ±0.1 NM, 200’</td>
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<td>- Dive deliveries ± 5° / 30 knots / 500’.</td>
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<tr>
<td>- RKD RNG</td>
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<td><strong>Aircraft:</strong></td>
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<td>(1) TAV-8B</td>
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<tr>
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<td><strong>Duration:</strong></td>
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<tr>
<td><strong>Prerequisites:</strong></td>
<td></td>
</tr>
<tr>
<td>• SAS-1402</td>
<td></td>
</tr>
<tr>
<td><strong>External Support:</strong></td>
<td></td>
</tr>
<tr>
<td>• Weapon scoring</td>
<td></td>
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<tr>
<td><strong>SPINS:</strong></td>
<td></td>
</tr>
<tr>
<td>• 10° / 500 KTAS delivery</td>
<td></td>
</tr>
<tr>
<td>• Weapon Programming: Q1 / M1</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
<td></td>
</tr>
<tr>
<td>• Low angle CCIP deliveries of low drag ordnance (6)</td>
<td></td>
</tr>
<tr>
<td>• Low altitude off target maneuver</td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td></td>
</tr>
<tr>
<td>• WARP weaponeering data</td>
<td></td>
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<tr>
<td>• Weapons preflight</td>
<td></td>
</tr>
<tr>
<td>• Weapon system programming</td>
<td></td>
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<tr>
<td>• Tacadmin Checks</td>
<td></td>
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<tr>
<td>- FELPG-F</td>
<td></td>
</tr>
<tr>
<td>• Clearing / spacer pass</td>
<td></td>
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<tr>
<td>• Air-to-surface HOTAS</td>
<td></td>
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<tr>
<td>• Adaptive roll-in technique</td>
<td></td>
</tr>
<tr>
<td>• Target placement angle</td>
<td></td>
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<tr>
<td>• Curvilinear to straight path tracking</td>
<td></td>
</tr>
<tr>
<td>• Academic bombing pattern</td>
<td></td>
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<tr>
<td>• STOL flap STO</td>
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<tr>
<td>• RVL</td>
<td></td>
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<tr>
<td>• Decel VL</td>
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<td><strong>Evaluate:</strong></td>
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<tr>
<td><strong>Threat:</strong></td>
<td></td>
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<tr>
<td>Stinger Basic</td>
<td></td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
<td></td>
</tr>
<tr>
<td>• Marshal</td>
<td></td>
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<td>• STO</td>
<td></td>
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<td>• Departure</td>
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<td>• Area check-in</td>
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<td>• Tacadmin Checks</td>
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<tr>
<td>- FELPG-F</td>
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<tr>
<td>• MWSS checks</td>
<td></td>
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<td>• Clearing / spacer pass</td>
<td></td>
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<tr>
<td>• Bombing pattern</td>
<td></td>
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<tr>
<td>• FENCE out</td>
<td></td>
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<tr>
<td>• Recovery</td>
<td></td>
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<tr>
<td>• Landing(s)</td>
<td></td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td>Emergency Procedures Discussion:</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>• CRM</td>
<td>• INS failure</td>
</tr>
<tr>
<td>• TAV-8B G limits</td>
<td>• Cockpit temperature hot / cold</td>
</tr>
<tr>
<td>• RADAR altimeter HAT</td>
<td>• DC caution light</td>
</tr>
<tr>
<td>• :BOMB v. :GPS HAT</td>
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<tr>
<td>• WOF usability and functions</td>
<td></td>
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<tr>
<td>• Low altitude raked range pattern</td>
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<tr>
<td>• Pattern deconfliction</td>
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<td>• Break X</td>
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<td>• PUC</td>
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<td>• GPWS</td>
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<tr>
<td>• Scan pattern techniques</td>
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<td>• Off target maneuver</td>
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</tbody>
</table>
### Mission: AS-1410

**Goal:**
Introduce GAU-12 employment and 10-degree deliveries with high drag ordnance.

**Performance Standards:**
- Roll-in ACD ±0.1 NM, 200’
- Set TPA ± 1 degree.
- IRCM – 80% execution minimum.
- Dive deliveries ± 5° / 30 knots / 300’.
- Adhere to RPM limits for gun
- Execute proper breakaway maneuvers.
- Proper off target maneuver (360 KCAS min).

**SPINS:**
- 10° / 500 KTAS delivery
- 10° / 550 KTAS delivery (GAU-12)
- Weapon programming: Q1 / M1

**Requirements:**

**Introduce:**
- Low angle / high drag ordnance deliveries (2)
- Low angle attacks with the 25 mm gun (2)

**Review:**
- WARP weaponeering data
- Running rendezvous
- Academic bombing pattern
- Low altitude off target maneuver
- Expendable switch usage
- Off target rendezvous
- Ordnance / battle damage check
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Aircraft:**
(2) AV-8B(E)

**Ordnance:**
- (2) BDU-45 HD 3/5
- (300) Rounds 25mm
- (20) FLR

**Range:**
- STRAFE
- HVY INERT
- WISS
- EXP

**Prerequisites:**
- SAS-1405
- AS-1409

**External Support:**
- Weapon scoring

**Threat:**
SA-9

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS checks
- Clearing / spacer pass
- Bombing pattern
- Strafe pattern
- FENCE out
- Off-target rendezvous
- Ordnance / battle damage check
- Recovery
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<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
<td>• Compressor stall</td>
</tr>
<tr>
<td>• Gun / ordnance preflight</td>
<td>• Engine mechanical failure/vibration</td>
</tr>
<tr>
<td>• Asymmetric dive recovery</td>
<td></td>
</tr>
<tr>
<td>• 25mm safe escape table / ricochet pattern</td>
<td></td>
</tr>
<tr>
<td>• System / target fixation</td>
<td></td>
</tr>
<tr>
<td>• Low angle strafing</td>
<td></td>
</tr>
<tr>
<td>• Burst length</td>
<td></td>
</tr>
<tr>
<td>• Insufficient recycle time between gun bursts</td>
<td></td>
</tr>
<tr>
<td>• Gun failures</td>
<td></td>
</tr>
<tr>
<td>• Hot gun cross</td>
<td></td>
</tr>
<tr>
<td>• Nozzle creep during gun firing and effects on</td>
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AV-8B FSG Ver. 3.0 SORTIES - 103
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<td>• RADALT awareness</td>
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### Mission: SLAT-1422

**Goal:** Introduce low altitude transition and surface-to-air threat countercyrtactics at low altitude.

**Performance Standards:**
- No low altitude training rule violations
- No violations of MCT
- No more than 5 low altitude warnings
- Airspeed +/- 20 kts
- G +/- 0.5

**Aircraft:** RNAWST

**Ordnance:** None

**External Support:** None

**Simulator Parameters:**
- SKC, 16° C, 29.98, 340/08, 32 L/R

**Requirements:**

**Introduce:**
- Medium to low deck transition
- Low altitude threat reaction lean maneuver
- Low altitude level S
- Low altitude guns jink
- Low altitude SAM weave
- Low altitude beam maneuver

**Review:**
- ALSA communications
- Pre-emptive expendable game plan
- Reactive expendable game plan
- ALE-39/47 usage and employment
- ALR-67 usage and employment

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Departure avoidance
- Allowable risk level v. threat – affects on mission
- E-Pole determination
- RWR interpretation
- Medium to low deck transition point
- LAT dive recovery rules
- Threat counter-tactics maneuver descriptions
  - RF pre-emptive / reactive
  - IR pre-emptive / reactive
  - AAA pre-emptive / reactive
- Gaining and maintaining sight of threat
- Jettison criteria
- TCT COMM
  - Brevity terms
  - Directive / descriptive & priority

**Prerequisites:**
- SLAT-1420
- STCT-1351

**Duration:** 1.0

**Threat:** SA-2 & ZSU-23-4

**Sequence of Events:**
- Initialize in warm up engine running
- ALE-39/47 and ALR-67 setup
- STO
- Tacadmin Checks
  - FELPG-F
- Medium to low altitude deck transition
- Low altitude threat reaction lean maneuver
- Low altitude threat reaction beam maneuver
- Low altitude level S
- Low altitude guns jink
- Low altitude SAM weave

**Emergency Procedures Discussion:**
- Low altitude flameout
- Dept / spin recovery
- Compressor stall
- Damaged aircraft

---

**Range:** Simulated
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**Mission:**
**LAT-1424**

**Goal:**
Practice basic and advanced LAT procedures.

**Performance Standards:**
- No low altitude training rule violations
- No violations of MCT
- No more than 5 low altitude warnings
- Airspeed +/- 20 kts
- G +/- 0.5

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**Aircraft:**
(2) AV-8B

**Ordnance:**
None

**Range:**
- MOA
- RSTD

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**Ordnance:**
None

**Sequence of Events:**
- STO
- Area check-in
- Tacadmin Checks  
  - FELPG-F
- Low altitude checklist
- Mission cross-check time
- Level high G turns
- 10 degree ridgeline crossing
- 50 percent rule
- Dive recovery rules
- Small descent rule
- Step down recovery
- Terminate procedures
- Knock-it-off / climb-to-cope procedures
- Straight oblique jink
- Vertical jink
- Turning oblique jink
- Reverse oblique jink
- 10 degree rule
- RVL

**Evaluate:**
None

**Threat:** None
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**Mission:**

**LAT-1425**

**Goal:**
Introduce surface-to-air threat countertactics at low altitude.

**Performance Standards:**
- No low altitude training rule violations
- No violations of MCT
- No more than 5 low altitude warnings
- Airspeed +/- 20 kts
- G +/- 0.5

**Duration:**
1.0

**Aircraft:**
(2) AV-8B

**Ordnance:**
- TACTS pod
- (40) chaff
- (10) flares

**Range:**
- TACTS
- Hi Fi EW

**Prerequisites:**
- LAT-1424
- TCT-1352

**External Support:**
- TACTS / EW debrief facility

**SPINS:**
- Medium to low deck transition will be conducted to an artificial deck of 5,000 AGL
- Minimum altitude for low altitude TCT: 500' AGL

**Requirements:**

**Introduce:**
- Medium to low deck transition
- Low altitude threat reaction lean maneuver
- Low altitude level S
- Low altitude guns jink
- Low altitude SAM weave
- Low altitude beam maneuver
- Low altitude E-pole tactics for range known threats
- Decision matrix for jettison criteria

**Review:**
- Low altitude checklist
- ALSA communications
- Pre-emptive expendable game plan
- Reactive expendable game plan
- ALE-39/47 setup and employment
- ALR-67 setup and employment
- RVL

**Evaluate:**
- None

**Threat:**
ZSU-23, SA-2

**Sequence of Events:**
- SSTO
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Medium to low altitude deck transition
- Low altitude threat reaction lean maneuver
- Low altitude threat reaction beam maneuver
- Low altitude level S
- Low altitude guns jink
- Low altitude SAM weave
- FENCE out
- Recovery
- 1 RVL

AV-8B FSG Ver. 3.0  SORTIES - 110
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<tbody>
<tr>
<td>CRM</td>
<td>Compressor Stall</td>
</tr>
<tr>
<td>Incorporating ALR-67 and ALQ-164 into ground checklists</td>
<td>Midair</td>
</tr>
<tr>
<td>Range known v. range unknown tactics</td>
<td>Damaged aircraft</td>
</tr>
<tr>
<td>E-Pole Determination</td>
<td>NORDO / LCLS</td>
</tr>
<tr>
<td>RWR interpretation</td>
<td>Low Altitude Flameout</td>
</tr>
<tr>
<td>INS smoothing – operation / pros / cons</td>
<td></td>
</tr>
<tr>
<td>Medium to Low Deck transition point</td>
<td></td>
</tr>
<tr>
<td>LAT Dive Recovery Rules</td>
<td></td>
</tr>
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<td>Threat counter-tactics maneuver descriptions</td>
<td></td>
</tr>
<tr>
<td>° RF Pre-emptive / Reactive</td>
<td></td>
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<tr>
<td>° IR Pre-emptive / Reactive</td>
<td></td>
</tr>
<tr>
<td>° AAA Pre-emptive / Reactive</td>
<td></td>
</tr>
<tr>
<td>Gaining and maintaining sight of threat</td>
<td></td>
</tr>
<tr>
<td>Jettison criteria</td>
<td></td>
</tr>
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<td>TCT COMM</td>
<td></td>
</tr>
<tr>
<td>° Brevity terms</td>
<td></td>
</tr>
<tr>
<td>Directive / Descriptive &amp; priority</td>
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<tr>
<td>Mission:</td>
<td><strong>MMECH-1430</strong></td>
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<tr>
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<tr>
<td>Goal:</td>
<td>Introduce PGM basic functionality and employment. Introduce JDAM and LGB symbology and employment profile execution.</td>
</tr>
<tr>
<td>Duration:</td>
<td>1.0</td>
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<tr>
<td>Aircraft:</td>
<td>MTT</td>
</tr>
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</table>
| Ordnance: | • (2) GBU-12  
• (2) GBU-38 |
| Range: | None |
| Performance Standards: | Successful release of LGB and JDAM |
| Prerequisites: | • AS-1409 |
| External Support: | None |
| Simulator Parameters: | • MTT MMECH-1430 mission set |
| SPINS: | • Level entry to level delivery at 480 KTAS, 15K AGL  
• Weapon programming:  
  ◦ Terminal parameters enabled  
  ◦ 85 degree impact angle  
• GBU-38 – Q2  
• GBU-12 – Q2  
• Perform 2 LGB Buddy (L/R) Profiles  
• Perform 2 JDAM Absolute (L/R) Attack Profiles |
| Aircraft: | MTT |
| Range: | None |
| Performance Standards: | Successful release of LGB and JDAM |
| Goal: | Introduce PGM basic functionality and employment. Introduce JDAM and LGB symbology and employment profile execution. |
| Duration: | 1.0 |
| Aircraft: | MTT |
| Ordnance: | • (2) GBU-12  
• (2) GBU-38 |
| Range: | None |
| Performance Standards: | Successful release of LGB and JDAM |

| Requirements: |
| Introduce: | • JDAM and LGB symbology  
• LGB Buddy (L/R) Profile (2)  
• JDAM Absolute (L/R) Attack Profile (2) |
| Review: | • Tacadmin Checks  
  ◦ FELPG-F |
| Evaluate: | • None |
| Concepts and Discussion Topics: | • Energy management during profiles  
• Cross checks during profiles  
• Error corrections for early / late to the attack cone during a buddy dive. |
| Threat: | SA-18 |
| Sequence of Events: | Initialize airborne  
• Tacadmin Checks  
  ◦ FELPG-F  
• IP – MWSS checks  
• Level entry to level delivery  
• Egress  
• FENCE out |
<p>| Emergency Procedures Discussion: | • Asymmetric stores recovery |</p>
<table>
<thead>
<tr>
<th>Mission:</th>
<th>SMECH-1431</th>
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<tbody>
<tr>
<td>Goal:</td>
<td>Introduce GP Bomb profiles, heavyweight aircraft handling, and reactive weaponeering</td>
</tr>
<tr>
<td>Duration:</td>
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<tr>
<td>Aircraft:</td>
<td>RNAWST</td>
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<tr>
<td>Ordnance:</td>
<td>(6) Mk-82</td>
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<tr>
<td>SPINS:</td>
<td>Pop: 10° / 500 KTAS delivery</td>
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<td>Threat:</td>
<td>SA-7 / SA-14 / SA-16</td>
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</table>

### Performance Standards:
- Roll-in ACD ±0.1 NM, 200’ <or> proper adaptive roll-in correction
- Set TPA ± 1 degree
- IRCM – 70% execution minimum
- Employ sensor cascade plan on every pass where ordnance is released
- Dive deliveries ± 5° / 30 knots / 500 ft
- Proper off target maneuver (360 KCAS min)
- CEP about MPI < 14 mils

### Simulator Parameters:
- Database that corresponds to planned execution (Yuma or Cherry Point)
- SCT 200, 10SM, 25°C, 29.98, 200/10

### External Support:
- None

### Range:
- East: BT-11
- West: Cactus West

### Requirements:
#### Introduce:
- Level entry to high angle deliveries
- Ramp down to high angle delivery
- Cruise climb to high angle delivery
- Low pop-up to low angle delivery
- Loft delivery
- Heavyweight STO

#### Review:
- WARP weaponeering data
- Tacadmin Checks
  - FELPG-F
- Adaptive roll-in technique
- Target placement angle
- Curvilinear to straight path tracking

#### Evaluate:
- None

### Prerequisites:
- Complete MECH stage ground/academic training
- AS-1409
- SLAT-1421

### Sequence of Events:
- Initialize in warm-up engine running
- Weapon programming in CWAIVER checks
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- GP Bomb profiles
  - Pop to 10° dive (2)
  - Loft
  - Cruise climb to 45° or 30° dive
  - Ramp to 45° or 30° dive
  - Level to 45° or 30° dive
- FENCE out
- Recovery
- Landing(s)
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
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<tr>
<td>• Canopy code / reference points</td>
<td>• Birdstrike</td>
</tr>
<tr>
<td>• Sensor timeline &amp; sensor management</td>
<td></td>
</tr>
<tr>
<td>• Energy management during profiles</td>
<td></td>
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<tr>
<td>• Cross checks during profiles</td>
<td></td>
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<tr>
<td>• Error corrections for early / late to the attack cone</td>
<td></td>
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<tr>
<td>• Target acquisition</td>
<td></td>
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<tr>
<td>• Reason for low-to-high transition maneuvers</td>
<td></td>
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<tr>
<td>• Transition attack: scan for HUD info / target tally</td>
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</tbody>
</table>
**Mission:**
**SMECH-1432**

**Goal:**
Introduce low altitude transition and JDAM profiles

**Performance Standards:**
- Roll-in ACD $\pm 0.1$ NM, 200 ft $<$or$>$ proper adaptive roll-in correction
- Set TPA $\pm$ 1 degree
- IRCM – 70% execution minimum
- Employ sensor cascade plan on every pass where ordnance is released
- Dive deliveries $\pm 5^\circ$ / 30 knots / 500 ft
- Level deliveries on ASL and $\pm$ 20 KTAS
- Proper off target maneuver (360 KCAS min)
- CEP about MPI $< 14$ mils

**Aircraft:**
RNAWST

**Ordnance:**
- AGM-65E
- (2) GBU-12
- (1) GBU-38

**Range:**
- East: BT-11
- West: R2507 N/S Abel N/S (Punch Bowl)

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma or Cherry Point)
- OVC 200, 7 SM, 25° C, 29.98, 200/10

**Requirements:**

**Introduce:**
- LGB buddy (L/R) (2)
- LGB buddy Dive (L/R)
- JDAM absolute (L/R)
- Laser Maverick attack

**Review:**
- Tacadmin Checks
  - FELPG-F
- WARP
- Reactive weaponenering
- Heavyweight STO
- Adaptive roll-in technique
- Target placement angle
- Curvilinear to straight path tracking
- STOL flap FNSL
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
- MMECH-1430

**External Support:**
- None

**SPINS:**
- LGB Buddy (L/R) attack, 480 KTAS, 15K AGL
- LGB Buddy 30° dive (L/R) attack, 500 KTAS, 7K AGL release
- JDAM absolute (L/R) attack, 480 KTAS, 15K AGL
- LMAV Tactical 20° / 400 KTAS delivery / 20° ramp
- Perform (5) PGM profile attacks

**Threat:**
SA-2

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- Weapon programming in CWAIVER checks
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- PGM Profiles
  - LGB Buddy (L/R)
  - LGB Buddy dive (L/R)
  - JDAM Absolute (L/R)
  - LMAV 20° ramp
- FENCE out
- Recovery
- Landings
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
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<tbody>
<tr>
<td>• Canopy code / reference points</td>
<td>• Compressor stall</td>
</tr>
<tr>
<td>• Sensor timeline &amp; sensor management</td>
<td></td>
</tr>
<tr>
<td>• Energy management during profiles</td>
<td></td>
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<tr>
<td>• Cross checks during profiles</td>
<td></td>
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<tr>
<td>• Error corrections for early / late to the</td>
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<tr>
<td>attack cone</td>
<td></td>
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<tr>
<td>• Target acquisition</td>
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</tbody>
</table>
### Mission: MECH-1433

**Goal:**
Introduce PGM profiles

**Performance Standards:**
- Roll-in ACD ±0.1 NM, 200 ft <or> proper adaptive roll-in correction
- Set TPA ± 1 degree
- IRCM – 70% execution minimum
- Employ sensor cascade plan on every pass where ordnance is released
- Dive deliveries ± 5° / 30 knots / 500 ft
- Level deliveries on ASL and ± 20 KTAS
- Proper off target maneuver (360 KCAS min)

**Aircraft:**
(2) AV-8B

**Ordnance:**
- (2) LGTR
- (1) GBU 38
- (10) Flares
  - or
  - (1) GBU-12
  - (1) LGTR
  - (1) CLMAV
  - (1) GBU 38
  - (10) Flares

**Range:**
- HE
- JDAM
- LSR

**External Support:**
- Ground-based laser or Litening Pod-equipped Lead A/C

**SPINS:**
- Level to 30° LGB / 500 KTAS delivery / 7000' AGL REL
- Level delivery: 480 KTAS, 15K AGL
- Perform, (1) LGB 30° dive, (1) level LGB profile, (1) level JDAM profile, and (1) 20° ramp / 20° dive LMAV profile
- Operable ARBS / LST is desired but not required for this event

**Requirements:**

**Introduce:**
- PGM Deliveries
  - JDAM absolute (L/R) attack
  - LGB/LGTR (L/R) buddy
  - LGB/LGTR buddy dive
  - Captive LMAV
  - LST (not required for completion)

**Review:**
- WARP weaponeering data
- Tacadmin Checks
  - FELPG-F
- Heavyweight STO
- Adaptive roll-in technique
- Target placement angle
- Curvilinear to straight path tracking
- RVL
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
- SMECH-1432

---

**Sequence of Events:**
- Marshal
- Weapon programming in CWAIVER checks
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- PGM Profile deliveries
  - LGB/LGTR (L/R) buddy
  - LGB/LGTR buddy dive
  - JDAM absolute (L/R) attack
- FENCE out
- Recovery
- Landings

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**Threat:**
SA-8

---

**Range:**
- HE
- JDAM
- LSR

---

**External Support:**
- Ground-based laser or Litening Pod-equipped Lead A/C

---

**SPINS:**
- Level to 30° LGB / 500 KTAS delivery / 7000' AGL REL
- Level delivery: 480 KTAS, 15K AGL
- Perform, (1) LGB 30° dive, (1) level LGB profile, (1) level JDAM profile, and (1) 20° ramp / 20° dive LMAV profile
- Operable ARBS / LST is desired but not required for this event

---

**Requirements:**

**Introduce:**
- PGM Deliveries
  - JDAM absolute (L/R) attack
  - LGB/LGTR (L/R) buddy
  - LGB/LGTR buddy dive
  - Captive LMAV
  - LST (not required for completion)

**Review:**
- WARP weaponeering data
- Tacadmin Checks
  - FELPG-F
- Heavyweight STO
- Adaptive roll-in technique
- Target placement angle
- Curvilinear to straight path tracking
- RVL
- Decel VL

**Evaluate:**
- None

---

**Sequence of Events:**
- Marshal
- Weapon programming in CWAIVER checks
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- PGM Profile deliveries
  - LGB/LGTR (L/R) buddy
  - LGB/LGTR buddy dive
  - JDAM absolute (L/R) attack
- FENCE out
- Recovery
- Landings

---

**Threat:**
SA-8
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<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th>Emergency Procedures Discussion:</th>
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<tbody>
<tr>
<td>• CALA operations</td>
<td>• Fire in-flight</td>
</tr>
<tr>
<td>• HE ordnance pre-flight</td>
<td>• Airstart</td>
</tr>
<tr>
<td>• Environmental effects (wind / sun angle) and chart study</td>
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<tr>
<td>• EOTDA (PAR ARBS / TV, LST)</td>
<td></td>
</tr>
<tr>
<td>• Heavyweight aircraft maneuvering</td>
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</tr>
<tr>
<td>• Canopy code / reference points</td>
<td></td>
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<tr>
<td>• Sensor timeline &amp; sensor management</td>
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<td>• Energy management during profiles</td>
<td></td>
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<td>• Cross checks during profiles</td>
<td></td>
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<tr>
<td>• Error corrections for early / late to the attack cone</td>
<td></td>
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<tr>
<td>• Asymmetric dive recovery</td>
<td></td>
</tr>
<tr>
<td>• Ordnance jettison procedures</td>
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<td><strong>Mission:</strong></td>
<td><strong>Duration:</strong> 1.0</td>
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<tr>
<td><strong>MECH-1434</strong></td>
<td><strong>Prerequisites:</strong></td>
</tr>
</tbody>
</table>
| **Goal:** Introduce medium and low altitude GP Bomb profiles | • SMECH-1431  
• LAT-1424 |
| **Performance Standards:** | **Aircraft:** (1) TAV-8B |
| • Roll-in ACD ±0.1 NM, 200 ft <or> proper adaptive roll-in correction | **Ordnance:** (6) Mk-76 |
| • Set TPA ± 1 degree | **Range:**  
• TGT  
• WISS  
• LSR |
| • Dive deliveries ± 5° / 30 knots / 300 ft | **External Support:** None |
| • AUTO / LOFT deliveries on ASL and ± 20 KTAS | **Requirements:**  
**Introduce:**  
• Low altitude pop attacks to 10° delivery (2)  
• Cruise climb to a 30° or 45° dive delivery  
• Ramp to a 30° dive delivery  
• Loft delivery |
| • Proper off target maneuver (360 KCAS min) | **SPINS:**  
• Pop: 500' ingress / 10° / 500 KTAS delivery  
• Loft 500' ingress / 450 KGS / 38° loft angle  
• Cruise climb 500' ingress to 30° or 45° dive  
• Ramp to 30° dive |
| **Goal:** Introduce medium and low altitude GP Bomb profiles | **Threat:** SA-13 |
| **Sequence of Events:**  
• Marshal  
• Take-off  
• Departure / rendezvous  
• Area check-in  
• Tacadmin Checks  
  ◦ FELPG-F  
• GP Bomb Profiles  
  ◦ Pop to 10° delivery (2)  
  ◦ Loft delivery  
  ◦ Cruise climb to dive delivery  
  ◦ Ramp down to dive delivery  
• FENCE out  
• Recovery  
• Landings |
| **Goal:** Introduce medium and low altitude GP Bomb profiles | **Review:**  
• WARP weaponeering data  
• Tacadmin Checks  
  ◦ FELPG-F  
• Adaptive roll-in technique  
• Target placement angle  
• Curvilinear to straight path tracking  
• STOL flap FNSL  
• Decel VL |
| **Goal:** Introduce medium and low altitude GP Bomb profiles | **Evaluate:** None |
| **Goal:** Introduce medium and low altitude GP Bomb profiles | **Sequence of Events:**  
• Marshal  
• Take-off  
• Departure / rendezvous  
• Area check-in  
• Tacadmin Checks  
  ◦ FELPG-F  
• IP – MWSS checks  
• GP Bomb Profiles  
  ◦ Pop to 10° delivery (2)  
  ◦ Loft delivery  
  ◦ Cruise climb to dive delivery  
  ◦ Ramp down to dive delivery  
• FENCE out  
• Recovery  
• Landings |
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<th>Concepts and Discussion Topics:</th>
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<tr>
<td>• CRM</td>
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</tr>
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<td>• Cross checks during profiles</td>
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<td></td>
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<tr>
<td>• Target acquisition</td>
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<td>• Loft setup, cueing and timeline</td>
<td></td>
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<td>• Transition attack: scan for HUD info / target tally</td>
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<td><strong>Mission:</strong></td>
<td><strong>Duration:</strong></td>
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</tr>
<tr>
<td>Introduce section target area tactics at medium altitude</td>
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<td><strong>Performance Standards:</strong></td>
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<tr>
<td>• Fly attack geometry</td>
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<tr>
<td>• Roll-in ACD ±0.1 NM, 200 ft &lt;or&gt; proper adaptive roll-in correction</td>
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<tr>
<td>• Set TPA ± 1 degree</td>
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<td>• Dive deliveries ± 5° / 30 knots / 500 ft</td>
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<tr>
<td>• Proper off target maneuver (360 KCAS min)</td>
<td></td>
</tr>
<tr>
<td>• Adhere to deconfliction plan</td>
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</tr>
<tr>
<td>• Regain visual mutual support less than 45 seconds off target</td>
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</tr>
<tr>
<td><strong>Aircraft:</strong></td>
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<tr>
<td>(2) TAV-8B</td>
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<tr>
<td>• (6) Mk-76</td>
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</tr>
<tr>
<td>• (10) Flares</td>
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<td><strong>Range:</strong></td>
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<tr>
<td>• TGT</td>
<td></td>
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<tr>
<td>• WISS</td>
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<tr>
<td>45° / 500 KTAS delivery or 30° / 500 KTAS delivery (for range restrictions)</td>
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<td>Weather 30° / 500 KTAS delivery (for back-up only – event may be completed using this profile)</td>
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<td>Weapon Programming: Q1 / M1</td>
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</tr>
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<td>Perform (5) attacks to 30° or 45° dive deliveries</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
<td></td>
</tr>
<tr>
<td>• Medium altitude same side attack (2)</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude split attack (1)</td>
<td></td>
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<tr>
<td>• Medium altitude swept attack (2)</td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Tacadmin Checks</td>
<td></td>
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<tr>
<td>° FELPG-F</td>
<td></td>
</tr>
<tr>
<td>• Adaptive roll-in technique</td>
<td></td>
</tr>
<tr>
<td>• Target placement angle</td>
<td></td>
</tr>
<tr>
<td>• Curvilinear to straight path tracking</td>
<td></td>
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<tr>
<td>• RVL</td>
<td></td>
</tr>
<tr>
<td>• Decel VL</td>
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</tr>
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<td><strong>Concepts and Discussion Topics:</strong></td>
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<td></td>
</tr>
<tr>
<td>• Mutual support</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>• Sensor timeline / management</td>
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<td><strong>Threat:</strong></td>
<td>Roland II, ZSU-23</td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
<td></td>
</tr>
<tr>
<td>• Marshal</td>
<td></td>
</tr>
<tr>
<td>• Take-off</td>
<td></td>
</tr>
<tr>
<td>• Departure / rendezvous</td>
<td></td>
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<tr>
<td>• Area check-in</td>
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<tr>
<td>• Tacadmin Checks</td>
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<tr>
<td>° FELPG-F</td>
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<tr>
<td>• IP – MWSS checks</td>
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<tr>
<td>• Medium altitude standard attacks</td>
<td></td>
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<tr>
<td>• Egress</td>
<td></td>
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<tr>
<td>• FENCE out</td>
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<td>• Rejoin</td>
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<td>• Battle damage check</td>
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<td>• Recovery</td>
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<td>• FNSL</td>
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<tr>
<td>• Decel VL</td>
<td></td>
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<tr>
<td><strong>Emergency Procedures Discussion:</strong></td>
<td></td>
</tr>
<tr>
<td>• Inadvertent IMC</td>
<td></td>
</tr>
<tr>
<td>• On-scene commander checklist</td>
<td></td>
</tr>
<tr>
<td>Mission:</td>
<td>MECH-1436</td>
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<tr>
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</tr>
<tr>
<td>Goal:</td>
<td>Review section target area tactics at medium altitude</td>
</tr>
<tr>
<td>Performance Standards:</td>
<td></td>
</tr>
<tr>
<td>• Fly attack geometry.</td>
<td></td>
</tr>
<tr>
<td>• Roll-in ACD ±0.1 NM, 200 ft &lt;or&gt; proper adaptive roll-in correction</td>
<td></td>
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<tr>
<td>• Set TPA ± 1 degree</td>
<td></td>
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<tr>
<td>• IRCM – 70% execution minimum</td>
<td></td>
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<tr>
<td>• Employ sensor cascade plan on every pass where ordnance is released</td>
<td></td>
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<tr>
<td>• Dive deliveries ± 5° / 30 knots / 500 ft</td>
<td></td>
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<tr>
<td>• Proper off target maneuver (360 KCAS min)</td>
<td></td>
</tr>
<tr>
<td>• Adhere to deconfliction plan</td>
<td></td>
</tr>
<tr>
<td>• Regain visual mutual support less than 45 seconds off target</td>
<td></td>
</tr>
<tr>
<td>Aircraft:</td>
<td>(2) AV-8B</td>
</tr>
<tr>
<td>Ordnance:</td>
<td></td>
</tr>
<tr>
<td>• (6) Mk-76</td>
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<tr>
<td>• (10) flares</td>
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</tr>
<tr>
<td>Range:</td>
<td></td>
</tr>
<tr>
<td>• TGT</td>
<td></td>
</tr>
<tr>
<td>• WISS</td>
<td></td>
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<tr>
<td>• EXP</td>
<td></td>
</tr>
<tr>
<td>Duration:</td>
<td>1.0</td>
</tr>
<tr>
<td>Prerequisites:</td>
<td></td>
</tr>
<tr>
<td>• MECH-1435</td>
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<tr>
<td>External Support:</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
</tr>
<tr>
<td>SPINS:</td>
<td></td>
</tr>
<tr>
<td>• 45° / 500 KTAS delivery or 30° / 500 KTAS (for range restrictions)</td>
<td></td>
</tr>
<tr>
<td>• Weather 30° / 500 KTAS delivery (for back-up only – event may be completed using this profile)</td>
<td></td>
</tr>
<tr>
<td>• Weapon Programming: Q2 / M1 / INT = to reactive weaponeering</td>
<td></td>
</tr>
<tr>
<td>• Operable ARBS / TV is desired but not required for this event</td>
<td></td>
</tr>
<tr>
<td>• Review (5) attacks to 30° or 45° dive deliveries</td>
<td></td>
</tr>
<tr>
<td>Requirements:</td>
<td></td>
</tr>
<tr>
<td>Introduce:</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
</tr>
<tr>
<td>Review:</td>
<td></td>
</tr>
<tr>
<td>• WARP weaponeering data</td>
<td></td>
</tr>
<tr>
<td>• Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude same side attack (2)</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude split attack (1)</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude swept attack (2)</td>
<td></td>
</tr>
<tr>
<td>• Adaptive roll-in technique</td>
<td></td>
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<tr>
<td>• Target placement angle</td>
<td></td>
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<tr>
<td>• Curvilinear to straight path tracking</td>
<td></td>
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<tr>
<td>• CL</td>
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<tr>
<td>• Decel VL</td>
<td></td>
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<tr>
<td>Evaluate:</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td></td>
</tr>
<tr>
<td>• Section contracts</td>
<td></td>
</tr>
<tr>
<td>• Mutual support</td>
<td></td>
</tr>
<tr>
<td>• Map / imagery study, GEOREF and overlay use</td>
<td></td>
</tr>
<tr>
<td>• Sensor timeline / management</td>
<td></td>
</tr>
<tr>
<td>Threat:</td>
<td>SA-9</td>
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<tr>
<td>Sequence of Events:</td>
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<tr>
<td>• Marshal</td>
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<tr>
<td>• Take-off</td>
<td></td>
</tr>
<tr>
<td>• Departure / rendezvous</td>
<td></td>
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<tr>
<td>• Area check-in</td>
<td></td>
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<tr>
<td>• Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude standard attacks</td>
<td></td>
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<tr>
<td>• Egress</td>
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<tr>
<td>• FENCE out</td>
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<td>• Rejoin</td>
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<td>• Battle damage check</td>
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<td>• Recovery</td>
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<td>• CL</td>
<td></td>
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<tr>
<td>• Decel VL</td>
<td></td>
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<tr>
<td>Emergency Procedures Discussion:</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td></td>
</tr>
</tbody>
</table>
### Mission: MECH-1437

**Goal:**
Introduce section target area tactics at low altitude

**Performance Standards:**
- Fly attack geometry
- Roll-in ACD ±0.1 NM, 200 ft <or> proper adaptive roll-in correction
- Set TPA ± 1 degree
- IRCM – 70% execution minimum
- Employ sensor cascade plan on every pass where ordnance is released
- Dive deliveries ± 5° / 30 knots / 500 ft
- Proper off target maneuver (360 KCAS min)
- Adhere to deconfliction plan
- Regain visual mutual support less than 45 seconds off target
- Adhere to LAT ROC and MCT

**SPINS:**
- Pop: 500’ ingress / 10° / 500 KTAS delivery
- Weapon Programming: Q2 / M1 / INT = to reactive weaponeering
- Operable ARBS / TV is desired but not required for this event.
- Perform (1) chased single ship low pop to 10° delivery.
- Perform (2) same side attack and (2) split attacks to 10° deliveries

**Requirements:**

- **Introduce:**
  - Low altitude same side attack (2)
  - Low altitude split attack (2)

- **Review:**
  - WARP weaponeering data
  - Tacadmin Checks
    - FELPG-F
  - Low pop-up to low angle deliveries
  - Adaptive roll in technique
  - Target placement angle
  - Curvilinear to straight path tracking
  - RVL
  - Decel VL

- **Evaluate:**
  - None

**Aircraft:**
(2) AV-8B

**Ordnance:**
- (6) Mk-76
- (10) FLR

**Range:**
- TGT
- WISS

**Duration:**
1.0

**Prerequisites:**
- MECH-1434
- LAT-1425

**External Support:**
- None

**Threat:** SA-3

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- IP – MWSS checks
- Low altitude standard attacks
- Egress
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- RVL
- Decel VL
### Concepts and Discussion Topics:
- Section contracts
- Pop-up attacks
- Sensor timeline / management
- Low altitude target acquisition
- Target chart / imagery study, GEOREF and overlay use
- Lateral versus vertical sanctuary
- Terrain Masking
- Off target maneuver
- TCT / MCT
- Target fixation

### Emergency Procedures Discussion:
- Low altitude flameout
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MCAS-1440</strong></td>
<td>1.0</td>
<td>• MECH-1437</td>
</tr>
<tr>
<td>Goal:</td>
<td>Aircraft:</td>
<td></td>
</tr>
<tr>
<td>Introduce medium altitude Type 1 CAS, 9-line CAS briefing format, CAS page programming, MASAW PT procedures.</td>
<td>MTT</td>
<td></td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td>Ordnance:</td>
<td></td>
</tr>
<tr>
<td>PUI shall exhibit ability to perform a direct entry of 9-line information into the CAS page.</td>
<td>• (6) Mk-82 LD, parent stations</td>
<td></td>
</tr>
<tr>
<td><strong>Simulator Parameters:</strong></td>
<td>Range:</td>
<td></td>
</tr>
<tr>
<td>• SKC, 20 SM, 25C, 30.01</td>
<td>• Simulated</td>
<td></td>
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<tr>
<td><strong>SPINS:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tactical 30 deg / 500 KTAS delivery</td>
<td>• Weaponeering to include reactive weaponeering matrix</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Introduce:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Medium altitude Type 1 CAS</td>
<td><strong>Sequence of Events:</strong></td>
<td></td>
</tr>
<tr>
<td>• 9-line CAS briefing format</td>
<td>• Initialize airborne</td>
<td></td>
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<tr>
<td>• CAS page programming</td>
<td>• C3 Check in</td>
<td></td>
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<tr>
<td>• Alpha / system checks</td>
<td>• Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>• Combat holding</td>
<td>◦ FELPG-F</td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td>• 9-line brief</td>
<td></td>
</tr>
<tr>
<td>• Tacadmin Checks</td>
<td>• Attack preparation</td>
<td></td>
</tr>
<tr>
<td>◦ FELPG-F</td>
<td>• CAS attacks (4)</td>
<td></td>
</tr>
<tr>
<td>• ALSA communication</td>
<td>• Egress / IFREP</td>
<td></td>
</tr>
<tr>
<td>• Medium altitude same side attacks</td>
<td>• FENCE out</td>
<td></td>
</tr>
<tr>
<td><strong>Evaluate:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td><strong>Emergency Procedures Discussion:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
<td>• N/A</td>
<td></td>
</tr>
<tr>
<td>• JCAS check in format: “CMNPOP”</td>
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</tr>
<tr>
<td>• Initial system setup procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CAS page data entry</td>
<td></td>
<td></td>
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<tr>
<td>• MASAW PT procedures</td>
<td></td>
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</tr>
</tbody>
</table>
### Mission: SCAS-1441

**Goal:**
Introduce medium altitude CAS utilizing type 1 control, 9 line CAS briefing format, attack preparation checklist, and CAS page programming.

**Performance Standards:**
- Execute CAS IAW JP 3-09.3
- No unsafe / invalid weapons release.
- Proper corrections from the mark
- TOT +/- 90 seconds

**Simulator Parameters:**
- Data base that corresponds to planned execution (Yuma or Cherry point)
- SKC, 20SM, 25C, 30.01, 040/15

**Requirements:**

**Introduce:**
- Combat holding
- CAS check in brief
- 9-line CAS briefing format
- CAS page programming
- Attack preparation checklist
  - MASAW PT
- CAS communication
- Attack timing control
- Corrections from a mark
- Medium altitude CAS under type 1 control

**Review:**
- WARP weaponeering data
- Reactive weaponeering matrix
- Tacadmin Checks
  - FELPG-F
- ALSA communication
- Level entry to high angle delivery

**Evaluate:**
- None

**Duration:**
1.0

**Aircraft:**
RNAWST

**Ordnance:**
- (6) Mk-82 LD

**Range:**
- Simulated

**Prerequisites:**
- MCAS-1440
- CAS GS
- CAS lab

**External Support:**
- None

**SPINS:**
- Tactical 30 deg / 500 KTAS delivery
- CAS sortie planned in CAS planning lab
- 1:50,000 target area chart and objective area chart with applicable FSCMs, CPs and IPs required

**Sequence of Events:**
- Initialize in warm up with engine running
- Marshal
- STO
- Departure
- Area check in
- Tacadmin Checks
  - FELPG-F
- C3 sequencing
- Combat holding
- 9-line brief
- Attack preparation
- CAS attacks
- Egress / C3 sequencing - IFREP
- FENCE out
- Recovery
- Landing

**Threat:**
SA-16, S-60

**Emergency Procedures Discussion:**
- Damaged aircraft
**Concepts and Discussion Topics:**
- CRM
- Type 1 control requirements
- “Paperless” cockpit setup
- CAS page usage / data entry
- Command speed time
- JCAS communication requirements
- FAC corrections / HUD MIL relationships
- Re-attack considerations / procedures
- DASC – role / capabilities / limitations
- FAC / FAC (A) capabilities
- KY-58 / HAVEQUICK / SINCgars
- Secure vs. non-secure COMM
- Authentication procedures
**Mission:**

**SCAS-1442**

**Goal:**
Introduce medium altitude CAS under type 2 and 3 control, utilize PGMs to conduct attacks on targets utilizing ground based lasing and absolute JDAM deliveries.

**Performance Standards:**
- Execute CAS IAW JP 3-09.3
- CAS page programming done utilizing direct data entry
- All weapon releases valid IAW Air NTTP
- TOT +/- 60 seconds

**Aircraft:**
RNAWST

**Ordnance:**
- (2) GBU-12, FMU-139
- (2) GBU-38, FMU-139

**Range:**
- Simulated

**Prerequisites:**
- SCAS-1441

**Simulation Parameters:**
- OVC 200, 7SM, 25C, 29.98, 090/6
- Winds: FL 150 120/35
  - FL 100 100/12
  - FL 050 080/10

**SPINS**
- PGM delivery IAW PGM planning in CAS Lab
- 1:50,000 target area chart and objective area chart with applicable FSCMs, CPs and IPs required

**External Support:**
- None

**Requirements:**

**Introduce:**
- Medium altitude CAS under type 2 and 3 control
- PGM employment during CAS

**Review:**
- WARP weaponeering data
- Tacadmin Checks
  - FELPG-F
- 9-line CAS briefing format
- CAS page programming
- Attack preparation checklist
- ALSA communication
- RVL
- Decel VL

**Evaluate:**
- None

**Threat:**
SA-18

**Sequence of Events:**
- Initialize in line
- PGM programming
- Marshal
- STO
- Departure
- Area check in
- Tacadmin Checks
  - FELPG-F
- C3 sequencing
- Combat holding
- 9-line brief
- Attack preparation
- CAS attacks (2)
- Egress / C3 sequencing- IFREP
- FENCE out
- Recovery
- Landings

**Emergency Procedures Discussion:**
- Mission Computer failure
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Type 2 and 3 control definitions / procedures / communications</td>
</tr>
<tr>
<td>• Bomb on coordinate versus bomb on target considerations</td>
</tr>
<tr>
<td>• Terminal parameters</td>
</tr>
<tr>
<td>• JDAM symbology</td>
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<tr>
<td>• GBU-12 lasing considerations</td>
</tr>
<tr>
<td>• Target contributor use</td>
</tr>
<tr>
<td>• Ballistic release point / weapon time of fall considerations in relation to TOT</td>
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<tr>
<td>• JDAM target height considerations HAE / MSL</td>
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<tr>
<td>Mission:</td>
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<tr>
<td>---------</td>
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<tr>
<td>Goal:</td>
</tr>
</tbody>
</table>
| Performance Standards: | • Execute CAS IAW JP 3-09.3  
• CAS page programming done utilizing direct data entry  
• No unsafe / invalid weapons release.  
• Effective TCT and MCT  
• Proper corrections from the mark  
• TOT +/- 60 seconds |
| Duration: | 1.0 |
| Aircraft: | RNAWST |
| Ordnance: | • (6) Mk-82 HD ITERS 2/6 |
| Range: | Simulated |
| Prerequisites: | • SCAS-1442 |
| External Support: | • None |
| Simulator parameters: | • Database that corresponds to planned execution  
• Tactical target  
• OVC 070, 7SM, 25C, 29.98, 200/10 |
| Spins: | • Pop: 10 deg / 500 KTAS  
• Weapon programming: reactive weaponeering  
• CAS sortie planned in CAS planning lab  
• 1:50,000 target area chart and objective area chart with applicable FSCMs, CPs and IPs required |
| Requirements: | |
| Introduce: | • Low altitude CAS under type 1 control |
| Review: | • WARP weaponeering data  
• Reactive weaponeering matrix  
• Tacadmin Checks  
  ◦ FELPG-F  
• 9-line CAS briefing format  
• Attack preparation checklist  
• CAS page programming  
• Alpha / system checks  
• ALSA communication  
• Corrections from a mark  
• Low pop-up to low angle delivery |
| Evaluate: | • None |
| Threat: | SA-7, SA-14 |
| Sequence of Events: | • Initialize in warm up with engine running  
• Marshal  
• STO  
• Departure  
• Area check in  
• Tacadmin Checks  
  ◦ FELPG-F  
• C3 sequencing  
• Combat holding  
• 9-line brief  
• Attack preparation  
• CAS attacks  
• Egress / C3 sequencing- IFREP  
• FENCE out  
• Recovery  
• Landing |
| Emergency Procedures Discussion: | • Lost SA |
| Concepts and Discussion Topics: | • CRM  
• Scenarios for low altitude CAS (wx, threat)  
• TCT / MCT for low altitude CAS  
• Command speed time  
• Re-attack considerations at low altitude  
• Wounded bird procedures  
• Wingman of opportunity / lost comm.  
• LAT ROC / dive recovery rules / MSA |
### Mission: CAS-1444

**Goal:**
Introduce medium altitude CAS utilizing type 1 control, 9 line CAS briefing format, attack preparation checklist, and CAS page programming

**Performance Standards:**
- Execute CAS IAW JP 3-09.3
- CAS page programming done utilizing direct data entry
- No unsafe / invalid weapons release.
- Proper corrections from the mark
- TOT +/- 90 seconds

**Aircraft:** (1) TAV-8B

**Ordnance:**
- (6) Mk-76

**Range:**
- TGT

**Duration:**
- 1.0

**Prerequisites:**
- SCAS-1441

**External Support:**
- FAC/FAC(A)/SCAR

---

### SPINS:
- 45 deg / 500 KTAS delivery
- Tactical 30 deg / 500 KTAS backup
- Weapon programming: reactive weaponeering
- 1:50,000 target area chart with FSCMs, CPs and IPs required

---

### Requirements:

#### Introduce:
- Combat holding
- CAS check in brief
- 9-line CAS briefing format
- CAS page programming
- Attack preparation checklist
- Medium altitude CAS under type 1 control

#### Review:
- WARP weaponeering data
- Reactive weaponeering matrix
- Tacadmin Checks
- STOL flap FNSL
- Decel VL

#### Evaluate:
- None

---

### Threat:

**Sequence of Events:**
- Marshal
- STO
- Departure
- Area check in
- CAS attacks (2)
- Egress / C3 sequencing - IFREP
- FENCE out
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Hung ordnance
- Engine mechanical failure / engine vibration

---

**Concepts and Discussion Topics:**
- CRM
- MAP DATUM
- FSCMs (FEBA, FLOT, FSCL, CGRS, etc.)
- Target area GEOREF and environment
- Command speed time
- ALSA communications
- Re-Attack considerations / procedures
- FAC corrections / TAC abort
- Collateral damage estimates
- Danger close
<table>
<thead>
<tr>
<th>Mission: <strong>CAS-1445</strong></th>
<th>Duration: 1.0</th>
<th>Prerequisites: • SCAS-1442</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal:</strong> Introduce medium altitude CAS under type 2 and 3 control, utilize simulated PGMs to conduct attacks on targets utilizing simulated ground based lasing and absolute JDAM deliveries.</td>
<td><strong>Aircraft:</strong> (1) TAV-8B</td>
<td><strong>External Support:</strong> • FAC/FAC(A)/SCAR</td>
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<tr>
<td><strong>Performance Standards:</strong> • Execute CAS IAW JP 3-09.3 • CAS page programming done utilizing direct data entry • All weapon releases valid IAW Air NTTP • TOT +/- 60 seconds</td>
<td><strong>Ordnance:</strong> • (1) GBU-12 SIM • (2) GBU-38 SIM</td>
<td></td>
</tr>
<tr>
<td><strong>SPINS:</strong> • PGM planning done in CAS Lab • GBU-12 level and 30 degree dive delivery weaponeering • 1:50,000 target area chart with FSCMs and LAR plotted</td>
<td><strong>Range:</strong> • TGT</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements:</strong> <strong>Introduce:</strong> • Medium altitude CAS under type 2 and 3 control • PGM employment during CAS</td>
<td><strong>Threat:</strong> <strong>Sequence of Events:</strong> • PGM programming • Marshal • STO • Departure • Area check in • Tacadmin Checks • FELPG-F • C3 sequencing • Combat holding • 9-line brief • Attack preparation • CAS attacks (4) • Egress / C3 sequencing - IFREP • FENCE out • Recovery • Landings</td>
<td></td>
</tr>
<tr>
<td><strong>Review:</strong> • Tacadmin Checks • FELPG-F • CAS page programming • Alpha / system checks • ALSA communication • Corrections from a mark • RVL • Decel VL</td>
<td><strong>Evaluate:</strong> • None</td>
<td></td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong> • Type 2 and 3 control definitions / procedures / communications • Bomb on coordinate versus bomb on target considerations • JDAM stores programming • GBU-12 Lasing considerations • Target contributor use • Ballistic release point / weapon time of fall considerations in relation to TOT • JDAM target height considerations (MSL) • PGM Collateral Damage Estimates</td>
<td><strong>Emergency Procedures Discussion:</strong> • Degraded JDAM modes</td>
<td></td>
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</tbody>
</table>
**Mission:**

**CAS-1446**

**Goal:**
Introduce section medium altitude CAS utilizing type 1 control.

**Performance Standards:**
- Execute CAS IAW JP 3-09.3
- Effects on assigned target
- CAS page programming done utilizing direct data entry
- No unsafe / invalid weapons release.
- Proper attack geometry
- Proper corrections from the mark
- TOT 30 – 45 sec after Lead aircraft

**Aircraft:** (2) AV-8B

**Ordnance:**
- (6) Mk-76
- (20) flares

**Range:**
- TGT
- EXP

**External Support:**
- FAC/FAC(A)/SCAR

**SPINS:**
- Tactical 30 deg / 500 KTAS
- 30 deg WX backup
- Weapon programming: reactive weaponeering
- 1:50,000 target area chart with FSCMs, CPs and IPs required

**Requirements:**

**Introduce:**
- Section medium altitude CAS under Type 1 control

**Review:**
- WARP weaponeering data
- Reactive weaponeering matrix
- Tacadmin Checks
  - FELPG-F
- 9-line CAS briefing format
- Attack preparation checklist
- CAS page programming
- Alpha / system checks
- ALSA communication
- Corrections from a mark
- RVL
- Decel VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Contracts
- Map study and environment
- Systems management / MCT as a wingman
- Combat holding
- Re-attack considerations / procedures

**Sequence of Events:**
- Marshal
- STO
- Departure
- Area check in
- Tacadmin Checks
  - FELPG-F
- C3 sequencing
- Combat holding
- 9-line brief
- Attack preparation
- CAS attacks (2)
- Egress / C3 sequencing - IFREP
- FENCE out
- Rejoin
- BDA
- Recovery
- Landing (s)

**Emergency Procedures Discussion:**
- IGV failure
Mission: CAS-1447

Goal: Introduce section low altitude CAS under type 1 control.

Performance Standards:
- Execute CAS IAW JP 3-09.3
- CAS page programming done utilizing direct data entry
- No unsafe / invalid weapons release.
- Proper attack geometry
- Proper corrections from the mark
- TOT 30 – 45 sec after Lead aircraft
- Adherence to LAT ROC / TCT

Duration: 1.0

Aircraft: (2) AV-8B

Ordnance:
- (6) Mk-76
- (20) flares

Range:
- TGT
- EXP

External Support: FAC/FAC(A)/SCAR

Range:
- TGT
- EXP

Requirements:

Introduce:
- Section low altitude CAS under type 1 control
- Low pop-up entry to low angle delivery

Review:
- WARP weaponeering data
- Reactive weaponeering matrix
- Tacadmin Checks
  - FELPG-F
- 9-line CAS briefing form
- Attack preparation checklist
- CAS page programming
- Alpha / system checks
- ALSA communication
- Corrections from a mark
- STOL flap FNSL
- Decel VL

Evaluate:
- None

Sequence of Events:
- Marshal
- STO
- Departure
- Area check in
- Tacadmin Checks
  - FELPG-F
- C3 sequencing
- Combat holding
- 9-line brief
- Attack preparation
- CAS attacks (2)
- Egress / C3 sequencing - IFREP
- FENCE out
- Rejoin
- Battle Damage Check
- Recovery
- Landing

Concepts and Discussion Topics:
- CRM
- Scenarios for low altitude CAS (wx, threat)
- Low altitude combat holding / systems management
- TCT / MCT for low altitude CAS
- Command speed time
- Re-attack considerations at low altitude
- LAT ROC / dive recovery rules / MSA

Emergency Procedures Discussion:
- Ejection envelopes
- Airstart

Prerequisites: SCAS-1443, CAS-1446
### Mission:
**SAI-1450**

**Goal:**
Introduce Air Interdiction.

**Performance Standards:**
TOT +/- 20 sec. BCWD within TAC abort parameters and adherence to threat reaction matrix and preflight fuel plan.

**Aircraft:**
RNAWST

**Duration:**
1.5

**Ordnance:**
- Per AI Planning Lab

**Range:**
- Per AI Planning Lab

**Prerequisites:**
- CAS-1447
- AA-1507
- NS-1606

**External Support:**
- Per AI Planning Lab

**SPINS:** Per AI Planning Lab

**Requirements:**

**Introduce:**
- Air Interdiction
- JWS-derived weaponisation
- JMPS-derived fuel planning
- Plan and coordinate with external assets
- Threat analysis

**Review:**
- Ingress to target attack

**Evaluate:**
- Threat reaction gameplan
- Timing
- Target area mechanics

**Concepts and Discussion Topics:**
- Threat reaction
- Bingo: fuels and countermeasures
- What are DMPI and cascade plan

**Threat:**
Per AI INTSUM

**Sequence of Events:**
- Tacadmin Checks
  - FELPG-F
- Alpha Check
- Threat reaction
- Target area mechanics
- Off target maneuver
- Egress
- Knock-it-off
- FENCE out
- BDA
- RTB, landing

**Emergency Procedures Discussion:**
- Low altitude flameout
- MFS recovery
- Damaged aircraft
<table>
<thead>
<tr>
<th>Mission:</th>
<th>AI-1451 GRADUATION SORTIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal:</td>
<td>Review Air Interdiction.</td>
</tr>
<tr>
<td>Performance Standards:</td>
<td>BCWD within TAC abort parameters and adherence to threat reaction matrix and preflight fuel plan.</td>
</tr>
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<td>Duration:</td>
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<tr>
<td>Aircraft:</td>
<td>(2) AV-8B</td>
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<tr>
<td>Ordnance:</td>
<td>• Per AI Planning Lab</td>
</tr>
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<td>Range:</td>
<td>• Per AI Planning Lab</td>
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<td>External Support:</td>
<td>• Per AI Planning Lab</td>
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<tr>
<td>Prerequisites:</td>
<td>• SAI-1450</td>
</tr>
</tbody>
</table>

**SPINS:**

*Per AI Planning Lab*

**Requirements:**

**Introduce:**
- Air Interdiction
- JWS-derived weaponeering
- JMPS-derived fuel planning
- Plan and coordinate with external assets
- Threat analysis
- Holding

**Review:**
- Ingress to target attack

**Evaluate:**
- Target area mechanics
- Threat reaction game plan
- Weapon employment

**Concepts and Discussion Topics:**
- Target area mechanics
- Threat reaction
- SEAD
- ESCORT
- DMPI sort/bump plan

**Threat:** Per AI INTSUM

**Sequence of Events:**
- Start / marshal / taxi / takeoff
- Tacadmin Checks
  - FELPG-F
- Roll call
- Alpha check
- Ingress routing
- Threat reaction
- Target area mechanics
- Off target maneuver
- Off target rendezvous
- Knock it off
- FENCE out
- BDA
- RTB / decel VL

**Emergency Procedures Discussion:**
- Low altitude flameout
- CSAR
- EQD
<table>
<thead>
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<th>Mission:</th>
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<tbody>
<tr>
<td><strong>MAA-1500</strong></td>
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<td>• TACFORM 1324</td>
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<tr>
<td><strong>Goal:</strong></td>
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<tr>
<td>Introduce AIM-9 weapons setup, HOTAS usage, and HUD / symbology usage.</td>
<td></td>
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</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
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<td></td>
</tr>
<tr>
<td>Properly set up AIM 9 stores</td>
<td></td>
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<tr>
<td>Familiar with controls and displays</td>
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<tr>
<td><strong>Simulator Parameters:</strong></td>
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<td></td>
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<td>• Initialize airborne 15,000, 300KCAS</td>
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<td><strong>Introduce:</strong></td>
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<tr>
<td>• AIM-9 weapons setup</td>
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<td>• A/A HOTAS usage</td>
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<td>• A/A HUD / symbology usage</td>
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<td><strong>Review:</strong></td>
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<tr>
<td>• Tacadmin Checks</td>
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<tr>
<td>◦ FELPG-F</td>
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<td><strong>Evaluate:</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
<td></td>
<td></td>
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<td>• GAU-12 envelope / employment restrictions</td>
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<tr>
<td>• AIM-9 envelope / employment restrictions</td>
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<td></td>
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<tr>
<td>• ACM HOTAS</td>
<td></td>
<td></td>
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<tr>
<td>• ALE-39/47 set-up and employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sequence of Events:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Soft Freeze</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Introduce AIM 9 Store programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Review ALE programming</td>
<td></td>
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<tr>
<td>• Introduce proper acquisition and “lock on” of bandit</td>
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<tr>
<td>• Employ valid F-2 and Gun</td>
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<td><strong>Threat:</strong> None</td>
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<td><strong>Emergency Procedures Discussion:</strong></td>
</tr>
<tr>
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<td>• None</td>
</tr>
</tbody>
</table>
**Mission:**

**SAA-1501**

**Goal:**
Introduce AIM-9 boresight, high and low speed departure recoveries, Thrust Vector Control

**Performance Standards:**
- Proper execution of AV-8B NATOPS departure recovery procedures.
- Execution of drills and maneuvers IAW Air NTTP and FSG Standards.

**Aircraft:**
RNAWST

**Ordnance:**
- (2) AIM-9M
- SEL 5

**Range:**
- Simulated

**External Support:**
- None

**Simulator Parameters:**
- Initialize airborne 15,000 feet, 300 KCAS

**Requirements:**

**Introduce:**
- AIM-9 weapons setup
- TVC straight and level drill
- TVC assisted turn drill
- TVC slow speed / high AOA drill
- TVC hover stop push over
- TVC flop
- TVC hover stop wing over
- TVC spiral drill
- IR missile defense drill

**Review:**
- Tacadmin Checks
  - FELPG-F
  - Accelerated / high speed stalls
  - Low speed departure
  - ALE-39/47 employment

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- ACM specific limitations and prohibited maneuvers
- Aerodynamic changes with TVC
- Nozzle use techniques
- Engine management with TVC (25 counts max)
- Instantaneous AOA and AOA sensitivity with nozzle movement
- Departure / spin characteristics with TVC
- AOA and vane control with TVC
- Break turn technique and departure prevention

**Sequence of Events:**
- Initialize airborne
- Post take-off checks
- Combat checks
- Unfreeze
- Area check-in
- Tacadmin Checks
  - FELPG-F
  - Accelerated / high speed stalls
  - Low speed departure
  - TVC straight and level
  - TVC assisted turn drill
  - TVC slow speed / high AOA maneuvering
  - Hover stop push over (HSPO)
  - Hover stop wing over (HSWO)
  - Flop
  - TVC spiral drill
  - IR missile defense (IRMD) drill
  - FENCE out
  - Recovery

**Emergency Procedures Discussion:**
- Departure / spin recovery
- Compressor stall
- Airstart

**Duration:**
1.0

**Prerequisites:**
- MAA-1500

**SPINS:**
- None

**Threat:**
- None
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<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
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<tbody>
<tr>
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</tbody>
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**Goal:**
Introduce TVC maneuvers, aircraft handling and BFM drills.

**Performance Standards:**
- Proper execution of AV-8B NATOPS departure recovery procedures.
- Execution of drills and maneuvers IAW Air NTTP and FSG Standards
- Manage energy correctly
- Control airspeed and lift vector during redefine rate fight

**Aircraft:**
(2) AV-8B

**Ordnance:**
- CAIM-9M-8

**Range:**
- AA

**External Support:**
- None

**SPINS:** None

**Requirements:**

**Introduce:**
- AIM-9 preflight
- Oblique break turns
- Vertical break turns
- TVC straight and level drill
- TVC assisted turn drill
- TVC slow speed / high AOA drill
- TVC HSPO
- TVC HSWO
- Range estimation drill
- Separation / bug drill

**Review:**
- Tacadmin Checks
  - FELPG-F
- RVL
- Deck transition drills

**Evaluate:**
- None

**Threat:** MiG-21 / AA-2C / AA-8B

**Sequence of Events:**
- Preflight
- Marshal
- Take-off
- Departure / rendezvous
  - Range estimation drill
- Area check-in
- Tacadmin Checks
  - FELPG-F
- TVC straight and level
- TVC assisted turn
- TVC slow speed / high AOA maneuvering
- Break turns
  - 20’k – Vertical
  - 15’k – Oblique
  - 10’K - Oblique
- HSPO
- HSWO
- Separation / bug drill
- Rate fight mechanics
  - ERDT
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)
### Concepts and Discussion Topics:
- Departure / Spin Characteristics (conventional and TVC)
- Engine management during BFM (conventional and TVC)
- NATOPS Prohibited maneuvers
- $Q \times \alpha \times \beta$
- Aerodynamic changes with TVC
- Nozzle use techniques
- AOA control
- Airspeed control
- POM effects
- LERX effects
- Break turn technique/departure avoidance
- Deck transitions

### Emergency Procedures Discussion:
- Departure/Spin Recovery
- Compressor Stall
- Airstart
- Midair
- NORDO
**Mission:**
**AA-1503**

**Goal:**
Introduce 1V1 Offensive BFM.

**Performance Standards:**
- Adhere to ACM training rules.
- Recognize WEZ, select appropriate weapon and call only valid shots.
- 3000' Perch TTK less than 60 seconds.
- 6000' Perch TTK less than 90 seconds.
- No 3-9 line overshoots

**Duration:**
1.0

**Aircraft:**
(2) AV-8B

**Ordnance:**
- (2) CAIM-9M-8
- (20) flares

**Range:**
- AA

**Prerequisites:**
AA-1502

**External Support:**
None

---

**SPINS: Per A/A Spins and Profiles**

**Requirements:**

**Introduce:**
- Heat to guns drill
- Flat scissors drill
- Snap shot drill
- 3000 / 6000 foot perches
  - Turn entry
  - Attack window timing
  - Offensive break turn
  - Control zone entry / management
  - Mis-aligned turn circle maneuvering
  - Offensive rate fight
  - Ditch counter

**Review:**
- AIM-9 preflight
- Tacadmin Checks
  - FELPG-F
- RVL
- Decel VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Offensive objectives
- Turn circle entry
- Attack window timing
- Offensive break turn
- Control zone entry / management
- Lead / lag maneuvers & counters / redefines
- Mis-aligned turn circle maneuvering
- Offensive rate fighting
- Redefine rate fight (cooperative)
- Redefine rate fight (non-cooperative)
- Ditch counter
- Rolling scissors
- EM safety & performance

**Threat:** MiG-25 / AA-6 ACRID

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Snap shot drill
- Heat to guns drill
- Flat scissors drill
- 3000 ft perches (2)
- 6000 ft perches (2)
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Departure / spin recovery
- Compressor stall
- Airstart
- Midair
- NORDO
## Mission: AA-1504

**Goal:**
Review 1V1 Offensive BFM.

**Performance Standards:**
- Adhere to ACM training rules.
- Recognize WEZ, select appropriate weapon and call only valid shots.
- 3000' Perch TTK less than 45 seconds.
- 6000' Perch TTK less than 60 seconds.
- No in-close overshoots

**Aircraft:**
(2) AV-8B

**Ordnance:**
- (2) Captive AIM-9
- (20) flares

**Range:**
- AA

**Prerequisites:**
AA-1503

**External Support:**

---

### SPINS: Per A/A Spins and Profiles

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Threat</th>
</tr>
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<tbody>
<tr>
<td><strong>Introduce:</strong></td>
<td>MiG-29 / AA-10 ALAMO / AA-11 ARCHER</td>
</tr>
<tr>
<td>Rolling scissors drill</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Review</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AIM-9 preflight</td>
<td></td>
</tr>
<tr>
<td>Tacadmin Checks</td>
<td></td>
</tr>
<tr>
<td>○ FELPG-F</td>
<td></td>
</tr>
<tr>
<td>Flat scissors drill</td>
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</tr>
<tr>
<td>3000 / 6000 foot perch</td>
<td></td>
</tr>
<tr>
<td>○ Turn circle entry</td>
<td></td>
</tr>
<tr>
<td>○ Attack window timing</td>
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</tr>
<tr>
<td>○ Offensive break turn</td>
<td></td>
</tr>
<tr>
<td>○ Control zone entry / management</td>
<td></td>
</tr>
<tr>
<td>○ Mis-aligned turn circle maneuvering</td>
<td></td>
</tr>
<tr>
<td>○ Offensive rate fight</td>
<td></td>
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<tr>
<td>○ Ditch counter</td>
<td></td>
</tr>
<tr>
<td>STOL flap VNSL</td>
<td></td>
</tr>
<tr>
<td>Decel VL</td>
<td></td>
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<table>
<thead>
<tr>
<th>Evaluate</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

### Sequence of Events:

**Marshal**

**Take-off**

**Departure / rendezvous**

**Area check-in**

**Tacadmin Checks**
- ○ FELPG-F

**Heat to guns drill**

**Flat scissors drill**

**Rolling scissors drill**

**3000 ft perches (2)**

**6000 ft perches (2)**

**FENCE out**

**Rejoin**

**Battle damage check**

**Recovery**

**Landing(s)**

### Emergency Procedures Discussion:

- Departure / spin recovery
- Compressor stall
- Airstart
- Midair
- NORDO
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
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<tbody>
<tr>
<td>• Offensive objectives</td>
</tr>
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<td>• Turn circle entry</td>
</tr>
<tr>
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</tr>
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<td>• Lead / lag maneuvers &amp; counters / redefines</td>
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</tr>
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<td>• Redefine rate fight (cooperative)</td>
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<tr>
<td>• Redefine rate fight (non-cooperative)</td>
</tr>
<tr>
<td>• Ditch counter</td>
</tr>
<tr>
<td>• Flat scissors</td>
</tr>
<tr>
<td>• EM safety &amp; performance</td>
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</tbody>
</table>
**Mission:**

**AA-1505**

**Goal:**
Introduce 1V1 defensive BFM.

**Performance Standards:**
- Adherence to ACM training rules.
- Manage AV-8 energy to deny valid follow-on shot by offensive aircraft.
- Recognize bandit WEZ and conduct appropriate defense.
- Recognize overshoots.
- Execute timely expendable usage.
- Take valid shots.

**SPINS: Per A/A Spins and Profiles**

**Requirements:**

**Introduce:**
- 3000 / 6000 foot perch
  - Defensive break turn
  - Maintaining sight
  - Executing lost sight game plan
  - Sensor nose recognition
  - Ditch maneuver
  - Overshoot recognition / counters
  - Defensive rate fighting
  - Guns defense

**Review:**
- AIM-9 preflight
- Tacadmin Checks
  - FELPG-F
- Snap shot drill
- Heat to guns drill
- Rolling scissors drill
- Employ ALE-39/47
- RVL
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
AA-1504

**Aircraft:**
(2) AV-8B

**Ordnance:**
- (2) CAIM-9M-8
- (20) flares

**Range:**
- AA

**External Support:**
- None

**Threat:**
Mirage F1 / Super 530F

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Snap shot drill
- Heat to guns drill
- Rolling scissors drill
- 3000 ft perches (2)
- 6000 ft perches (2)
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Departure / spin recovery
- Compressor stall
- Airstart
- Midair
- NORDO
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
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<tbody>
<tr>
<td>• Defensive objectives</td>
</tr>
<tr>
<td>• Maintaining sight</td>
</tr>
<tr>
<td>• Lost sight gameplan execution</td>
</tr>
<tr>
<td>• Defensive break turn</td>
</tr>
<tr>
<td>• Sensor nose recognition</td>
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<td>• Ditch maneuver</td>
</tr>
<tr>
<td>• Overshoot recognition / counters</td>
</tr>
<tr>
<td>• Defensive rate fighting</td>
</tr>
<tr>
<td>• Guns defense</td>
</tr>
<tr>
<td>° Snap shot</td>
</tr>
<tr>
<td>° Tracking shot</td>
</tr>
<tr>
<td>• Rolling scissors</td>
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<tr>
<td>Goal:</td>
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<tr>
<td>Performance Standards:</td>
</tr>
</tbody>
</table>
- Adherence to ACM training rules.  
- Manage AV-8 energy to deny valid follow-on shot by offensive aircraft.  
- Recognize bandit WEZ and conduct appropriate defense.  
- Recognize overshoots.  
- Execute timely expendable usage.  
- Take valid shots.  |
| Aircraft: | (2) AV-8B |
| Ordnance: |  
- (2) CAIM-9M-8  
- (20) flares |
| Range:   | AA |
| Prerequisites: | AA-1505 |
| Duration: | 1.0 |
| External Support: | None |

**SPINS: Per A/A Spins and Profiles**

<table>
<thead>
<tr>
<th>Requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce:</td>
</tr>
<tr>
<td>Review:</td>
</tr>
</tbody>
</table>
- AIM-9 preflight  
- Tacadmin checks  
  - FELPG-F  
- Heat to guns drill  
- Flat Scissors drill  
- Rolling Scissors drill  
- 3000 / 6000 foot perch  
  - Defensive break turn  
  - Maintaining sight  
  - Executing lost sight game plan  
  - Sensor nose recognition  
  - Ditch maneuver  
  - Overshoot recognition / counters  
  - Defensive rate fighting  
  - Guns defense  
- RVL  
- Decel VL |
| Evaluate: | None |

**Threat:** Mirage 2000 / Magic II

**Sequence of Events:**

- Marshal  
- Take-off  
- Departure / rendezvous  
- Area check-in  
- Tacadmin Checks  
  - FELPG-F  
- Heat to guns drill  
- Flat scissors drill  
- Rolling scissors drill  
- 3000 ft perches (2)  
- 6000 ft perches (2)  
- FENCE out  
- Rejoin  
- Battle damage check  
- Recovery  
- Landing(s)  

**Emergency Procedures Discussion:**

- Departure / spin recovery  
- Compressor stall  
- Airstart  
- Midair  
- NORDO
Concepts and Discussion Topics:
- Defensive objectives
- Maintaining sight
- Lost sight gameplan execution
- Defensive break turn
- Sensor nose recognition
- Ditch maneuver
- Overshoot recognition / counters
- Defensive rate fighting
- Guns defense
  - Snap shot
  - Tracking shot
- Flat scissors
- EM safety & performance
### Mission:
**AA-1507**

**Goal:**
Introduce 1V1 Neutral BFM.

**Performance Standards:**
- Proper expendables usage.
- Adheres to ACM training rules.
- Control merge IAW gameplan
- 2 Circle: maintain sight and kill bandit within 60 seconds.
- 1 Circle: force 1C in-plane flow and kill bandit/deny WEZ greater than 60 seconds.
- 1 Circle: force 1C OOP flow and kill bandit/deny WEZ greater than 60 seconds.

**SPINS: Per A/A Spins and Profiles**

**Requirements:**

**Introduce:**
- Neutral setups controlling merge
- Neutral two circle fight
- Neutral one circle in plane fight
- Neutral one circle out of plane fight
- Forward quarter IRCM

**Review:**
- AIM-9 preflight
- Snap shot drill
- Heat to guns drill
- 3000 foot perch (1 – offensive)
- 6000 foot perch (1 – defensive)
- STOL flap VNSL
- Decel VL

**Evaluate:**
- None

**Duration:**
1.0

**Aircraft:**
(2) AV-8B

**Ordnance:**
- CAIM-9M-8
- TACTS Pod
- (20) flares

**Range:**
- AA
- TACTS

**Prerequisites:**
AA-1506

**External Support:**
- TACTS Debrief

**Threat:** Su-22

**Sequence of Events:**
- Marshal
- Take-off
- Departure / rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Snap shot drill
- Heat to guns drill
- 3000 ft perch (Offensive)
- 6000 ft perch (Defensive)
- Neutral sets
  - 2 Circle OOP
  - 1 Circle IP
  - 1 Circle OOP
- FENCE out
- Rejoin
- Battle damage check
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Departure / spin recovery
- Compressor stall
- Airstart
- Midair
- NORDO
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Neutral objectives</td>
</tr>
<tr>
<td>• Pre-merge weapons employment</td>
</tr>
<tr>
<td>• Forward quarter IRCM</td>
</tr>
<tr>
<td>• Controlling the merge</td>
</tr>
<tr>
<td>• Fight types / recognition</td>
</tr>
<tr>
<td>• One circle</td>
</tr>
<tr>
<td>• Two circle</td>
</tr>
<tr>
<td>• Advantages / disadvantages</td>
</tr>
<tr>
<td>• In-plane v. out-of-plane</td>
</tr>
<tr>
<td>• Game plan management</td>
</tr>
<tr>
<td>• Pressure</td>
</tr>
<tr>
<td>• Separation</td>
</tr>
<tr>
<td>• Performance &amp; energy cues</td>
</tr>
<tr>
<td>• Recognizing winning and losing</td>
</tr>
<tr>
<td>• EM Safety &amp; performance</td>
</tr>
</tbody>
</table>
**Mission:**
**SNS-1600**

**Goal:**
Introduce night V/STOL procedures and NVD usage.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Duration:**
1.0

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- None

**Prerequisites:**
- CAS-1447
- NITE Lab
- NS GS
  (Ground/Academic Training)

**External Support:**
- None

**Simulator Parameters:**
- Initial conditions: Unaided visuals, SKC, 25° C, 29.92, 310/10 32 L/R
- NVG conditions: NVG visuals, same weather
- Lunar data: 75%, 180° / 60°

**Requirements:**

**Introduce:**
- Unaided STOL flap STO
- Unaided continuous VTO accel
- Unaided STOL flap FNSL (2)
- Unaided STOL flap VNSL (2)
- Unaided SL touch and go procedure
- Unaided SL roll and go procedure
- Unaided RVL (2)
- Unaided decel VL
- Unaided press up
- Don / doff procedures airborne
- NVD environmental assessment

**Review:**
- None

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Interior lighting
- Exterior lighting
- APU use
- NAVFLIR, NVG
- Unaided night flying, visual cues and illusions
- Don / Doff NVGs airborne
- Airfield lighting
- Night crosswind limits

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- Unaided STO
- VFR Departure
- R5306A Entry
  (IOS - switch to NVG visuals)
- Don NVGs
- NVG environmental assessment
- Doff NVGs
  (IOS – switch to unaided visuals)
- R5306A Exit
- Unaided RTB
  - TACAN approach to low approach
  - VFR Straight-in
- Landing(s)

**Threat:**
- None

**Emergency Procedures Discussion:**
- Ejection
- Night electrical emergencies
- Lost communications
### Mission: SNS-1601

**Goal:**
Introduce night V/STOL procedures with NVDs.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Simulator Parameters:**
- NVG conditions: NVG visuals, SKC, 25° C, 29.92, 310/10 32 L/R
- Lunar data: 75%, 180° / 60°

**Requirements**

**Introduce:**
- Ground don and doff procedures
- Aided STOL flap STO
- Aided STOL flap FNSL (3)
- Aided RVL (3)
- Aided decel VL (2)
- Aided press up

**Review:**
- NVD environmental assessment

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Interior lighting (aided)
- Cockpit setup
- APU use
- NAVFLIR, NVG
  - Scan
- Aided night flying, visual cues and illusions
  - FOV
  - Depth perception
  - Scintillation
  - Albedo
  - Cultural lighting
  - Moon effects (LUX, azimuth, phase)
  - Atmospheric effects
- Don/Doff NVGs on ground
- Airfield lighting
- Night crosswind limits
- Aided familiarization

**Duration:**
1.0

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- None

**External Support:**
- None

**Threat:**
None

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- Unaided STO
- VFR Departure
- R5306A Entry
- (IOS - switch to NVG visuals)
- Don NVGs
- NVG environmental assessment
- Aided familiarization
- Doff NVGs
- (IOS – switch to unaided visuals)
- R5306A Exit
- Unaided RTB
  - TACAN approach to low approach
  - VFR Straight-in
- Landing(s)

**Emergency Procedures Discussion:**
- NVG Battery Failure
- NVG Tube Failure
- Flight in clouds (aided)
- Ejection with NVGs

**Prerequisites:**
- SNS-1600
<table>
<thead>
<tr>
<th>Mission:</th>
<th>NS-1602</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal:</td>
<td>Introduce night V/STOL procedures and NVD usage.</td>
</tr>
<tr>
<td>Performance Standards:</td>
<td>Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.</td>
</tr>
<tr>
<td>Duration:</td>
<td>1.3</td>
</tr>
<tr>
<td>Aircraft:</td>
<td>(1) TAV-8B</td>
</tr>
<tr>
<td>Ordnance:</td>
<td>None</td>
</tr>
<tr>
<td>Range:</td>
<td>MOA / RSTD</td>
</tr>
<tr>
<td>Prerequisites:</td>
<td>SNS-1601</td>
</tr>
<tr>
<td>External Support:</td>
<td>None</td>
</tr>
<tr>
<td>Threat:</td>
<td>None</td>
</tr>
<tr>
<td>Sequence of Events:</td>
<td>Preflight, Start, Taxi, Marshal, Unaided STO, VFR Departure, R5306A Entry, Area conduct: Don NVGs, NVG environmental assessment, NVG scene appreciation, Doff NVGs, R5306A Exit, TACAN approach to low approach, VFR straight-in, Unaided Landing(s)</td>
</tr>
<tr>
<td>Emergency Procedures Discussion:</td>
<td>CRM and night emergencies, NVG Battery Failure, NVG Tube Failure, Flight in clouds (aided), Ejection with NVGs</td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td>Night plane captain signals, Airfield layout and lighting, Unaided night visual cues and illusions, Aided night visual cues and illusions</td>
</tr>
<tr>
<td>Introduce:</td>
<td>Unaided STOL flap STO, Unaided continuous VTO accel, Unaided STOL flap FNSL (2), Unaided STOL flap VNSL (2), Unaided SL touch and go procedure, Unaided SL roll and go procedure, Unaided RVL (2), Unaided decel VL, Unaided press up, Don / doff procedures airborne, NVD environmental assessment, Unaided TACAN approach</td>
</tr>
<tr>
<td>Review:</td>
<td>None</td>
</tr>
<tr>
<td>Evaluate:</td>
<td>None</td>
</tr>
</tbody>
</table>
**Mission:**
**NS-1603**

**Goal:**
Introduce night unaided administrative formation.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Requirements:**

**Introduce:**
- Unaided stream STO
- Unaided parade formation
- Unaided cross under
- Unaided Lead change
- Unaided running rendezvous
- Unaided break up and rendezvous
- Unaided GCA (PAR) wingman / low approach
- Aided deployed echelon formation

**Review:**
- Unaided STOL flap STO
- Unaided STOL flap FNSL (2)
- Unaided RVL (2)
- Unaided decel VL (2)
- Don / doff procedures airborne
- NVD environmental assessment

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Light triangle
- Night lighting (unaided / aided)
- Night turn circle positioning
- Night illusions
- Systems fixation
- Night scan

**Duration:**
1.3

**Aircraft:**
(2) TAV-8B

**Ordnance:**
- None

**Range:**
- MOA / RSTD

**Prerequisites:**
- NS-1602

**External Support:**
- None

**Sequence of Events:**
- Pre-flight
- Taxi
- Marshal
- Unaided Stream STO
- Departure/Rendezvous
- R5306A Entry
- Area conduct
- Unaided formation
  - Cross under
  - Lead change
  - Break-up and rendezvous
- Don NVGs
- Environmental assessment
- Deployed echelon (aided)
- Doff NVG
- Running rendezvous
- R5306A Exit
- Unaided RTB
  - Section PAR to low approach
  - Tower downwind
- Landing(s)

**Threat:**
None

**Emergency Procedures Discussion:**
- CRM
- Night emergencies
- NVG Battery Failure
- NVG Tube Failure
- Flight in clouds (aided)
- Ejection with NVGs

**Evaluate:**
None
### Mission:
**NS-1604**

**Goal:**
Night system V/STOL consolidation.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Requirements:**

**Introduce:**
- Ground don and doff procedures
- Aided TACAN approach
- Aided STOL flap STO
- Aided STOL flap FNSL (2)
- Aided STOL flap VNSL (2)
- Aided RVL (2)
- Aided press up (2)

**Review:**
- NVD environmental assessment

**Evaluate:**
- None

### Sequence of Events:

- **Pre-flight**
- **Taxi**
- **Marshal**
  - Don NVGs
- **Aided STO**
- **VFR Departure**
- **R5306A Entry**
- **Area conduct**
  - NVG environmental assessment
  - Aided area familiarization
  - Level turns at 5K and 3K (350 KCAS, 4G)
- **R5306A Exit**
- **Aided RTB**
  - TACAN approach to low approach
  - VFR straight-in
- **Aided Landing(s) [airfield conditions permitting]**

### Emergency Procedures Discussion:

- CRM
- APU failure
- Generator failure
- NVG Battery Failure
- NVG Tube Failure
- Flight in clouds (aided)
- Ejection

### Concepts and Discussion Topics:

- NVG night airfield procedures
- Night aided scan
- Systems fixation
- Aided night visual cues and illusions
- APU use
- Aided area familiarization

### Duration:
1.3

### Aircraft:
(1) TAV-8B

### Ordnance:
- None

### Range:
- MOA / RSTD

### Threat:
None

### Prerequisites:
- NS-1602

### External Support:
- None
**Mission:**

**NS-1605**

**Goal:**
Introduce NS formation. Demonstrate lighting packages and perform formations including parade, deployed echelon, running rendezvous, and break-up and rendezvous.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Aircraft:**
(2) TAV-8B

**Ordnance:**
None

**Duration:**
1.3

**Prerequisites:**
• NS-1604

**Requirements:**

**Introduce:**
- Aided stream STO
- Lighting packages
- Aided parade formation
- Aided running rendezvous
- Aided break up and rendezvous
- Aided GCA (PAR) wingman / low approach

**Review:**
- Ground don and doff procedures
- Aided STOL flap STO
- Aided deployed echelon formation
- Aided STOL flap FNSL (2)
- Aided RVL (2)

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Light triangle
- Night lighting (aided)
- Night turn circle positioning
- Night aided scan
- Systems fixation
- NVG night airfield procedures
- Systems fixation
- Aided night visual cues and illusions
- APU use

**Threat:** None

**Sequence of Events:**
- Pre-flight
- Taxi
- Marshal
  - Don NVGs
- Aided Stream STO
- Departure/Rendezvous
- R5306A Entry
- Area Conduct
- Environmental Assessment
- Aided formation
  - Parade
  - Cross under
  - Lead change
  - Breakup and rendezvous
  - Running rendezvous
  - Deployed echelon
- Running rendezvous
- R5306A Exit
- Aided RTB
  - Section PAR to low approach
  - Tower downwind
- Aided Landing(s) [airfield conditions permitting]

**External Support:**
- None

**Ordnance:**
- None

**Range:**
- MOA / RSTD

**Emergency Procedures Discussion:**
- CRM
- NVG Battery Failure
- NVG Tube Failure
- Flight in clouds (aided)
- Ejection
**Mission:**

**NS-1606**

**Goal:**
Review night unaided procedures, takeoffs, and landings. Practice night unaided procedures and V/STOL.

**Performance Standards:**
Satisfactorily execute all procedures IAW AV-8B NATOPS and Air NTTP without exhibiting any unsafe trends.

**Requirements:**

<table>
<thead>
<tr>
<th>Introduce</th>
<th>Review</th>
</tr>
</thead>
</table>
| None      | Unaided STOL flap STO  
|           | Unaided continuous VTO accel  
|           | Unaided STOL flap FNSL (2)  
|           | Unaided STOL flap VNSL (2)  
|           | Unaided SL touch and go procedure  
|           | Unaided SL roll and go procedure  
|           | Unaided RVL  
|           | Unaided decel VL  
|           | Unaided press up |

**Evaluate:**

None

**Concepts and Discussion Topics:**

- Night plane captain signals
- Night solo procedures (ground and center mat)
- Night cockpit setup (NA / RADAR specific)
- Unaided visual cues and illusions
- SOP and NATOPS limits for night ops
- Standard paddles calls

**Duration:**

1.3

**Aircraft:**

(1) AV-8B

**Ordnance:**

None

**Range:**

MOA / RSTD

**Prerequisites:**

NS-1603

**External Support:**

None

**Sequence of Events:**

- Start
- Taxi
- Marshal
- STO
- Departure to IFR Climb
- TACAN Approach to low approach
- PAR
- Touch and go FNSL off PAR
- Landing(s)

**Threat:**

None

**Emergency Procedures Discussion:**

- CRM
- Techniques for handling emergencies
- Lost COMM procedures

**Concepts and Discussion Topics:**

- Night plane captain signals
- Night solo procedures (ground and center mat)
- Night cockpit setup (NA / RADAR specific)
- Unaided visual cues and illusions
- SOP and NATOPS limits for night ops
- Standard paddles calls
<table>
<thead>
<tr>
<th>Mission:</th>
<th>SNTPS-1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal:</td>
<td>Evaluate pilot knowledge of aircraft systems and normal and emergency procedures</td>
</tr>
<tr>
<td>Performance Standards:</td>
<td>PUI shall perform all maneuvers and procedures IAW AV-8B NATOPS, OPNAV 3710, and Air NTTP standards</td>
</tr>
<tr>
<td>Aircraft:</td>
<td>RNAWST</td>
</tr>
<tr>
<td>Ordnance:</td>
<td>(4) Mk-82 inert</td>
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<tr>
<td>Range:</td>
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<td>Simulator Parameters:</td>
<td>SKC, 20° C, 29.80, 350/10 32 L/R</td>
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<tr>
<td>External Support:</td>
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<td>Requirements:</td>
<td></td>
</tr>
<tr>
<td>Introduce:</td>
<td>None</td>
</tr>
<tr>
<td>Review:</td>
<td>None</td>
</tr>
<tr>
<td>Evaluate:</td>
<td></td>
</tr>
<tr>
<td>Introduce:</td>
<td>Conduct briefing</td>
</tr>
<tr>
<td>Review:</td>
<td>None</td>
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<tr>
<td>Evaluate:</td>
<td>Navigation procedures</td>
</tr>
<tr>
<td></td>
<td>Target attack</td>
</tr>
<tr>
<td></td>
<td>All takeoffs and landings types</td>
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<tr>
<td></td>
<td>Heavy Weight STO (&gt;30,000 lbs, OAT 30°C)</td>
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<td></td>
<td>SAAHS OFF</td>
</tr>
<tr>
<td></td>
<td>CRM</td>
</tr>
<tr>
<td></td>
<td>Instructor selected emergencies</td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
<td>Any aircraft systems listed in NATOPS Chapter I-02</td>
</tr>
<tr>
<td></td>
<td>Any aircraft limitations listed in NATOPS Chapter I-04</td>
</tr>
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<td>Threat:</td>
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</tr>
<tr>
<td>Sequence of Events:</td>
<td></td>
</tr>
<tr>
<td>Spins</td>
<td>Raked Range at BT-11</td>
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<td></td>
<td>VFR recovery at NKT</td>
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<td>CRM</td>
<td>Instructor selected emergencies</td>
</tr>
<tr>
<td>Emergency Procedures Discussion:</td>
<td>Any emergency procedures listed in NATOPS Chapters V-13 through V-18</td>
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<tr>
<td></td>
<td>AVIATE, NAVIGATE, COMMUNICATE</td>
</tr>
<tr>
<td></td>
<td>Emergency question of the day</td>
</tr>
<tr>
<td>Mission:</td>
<td><strong>RSFAM-1100</strong>  R M S S</td>
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<tr>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Goal:</td>
<td>Practice normal and emergency procedures.</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td></td>
</tr>
<tr>
<td>- Airspeed within 40 KCAS</td>
<td></td>
</tr>
<tr>
<td>- Altitude within 100 feet</td>
<td></td>
</tr>
<tr>
<td>- AOA within 3 units in landing configuration</td>
<td></td>
</tr>
<tr>
<td>- Accurate completion of all check lists</td>
<td></td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
<td>1.0</td>
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<tr>
<td><strong>Aircraft:</strong></td>
<td>RNAWST</td>
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<td><strong>Ordnance:</strong></td>
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</tr>
<tr>
<td><strong>Range:</strong></td>
<td>Simulated</td>
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<tr>
<td><strong>Prerequisites:</strong></td>
<td>FAM CBT complete</td>
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<td><strong>External Support:</strong></td>
<td>CSI</td>
</tr>
<tr>
<td><strong>Simulator Parameters:</strong></td>
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<tr>
<td>- Initialize in VMAT-203 line</td>
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<td>- SKC, 22°C, 30.00, 310/10 32 L/R</td>
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<td><strong>Requirements:</strong></td>
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<tr>
<td><strong>Introduce:</strong></td>
<td>None</td>
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<tr>
<td><strong>Review:</strong></td>
<td></td>
</tr>
<tr>
<td>- CTO</td>
<td></td>
</tr>
<tr>
<td>- STOL flap STO</td>
<td></td>
</tr>
<tr>
<td>- TACAN approach</td>
<td></td>
</tr>
<tr>
<td>- FNSL</td>
<td></td>
</tr>
<tr>
<td>- Auto flap VNSL</td>
<td></td>
</tr>
<tr>
<td>- STOL flap VNSL</td>
<td></td>
</tr>
<tr>
<td>- RVL (2)</td>
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<tr>
<td>- CL to full stop</td>
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<tr>
<td>- Continuous VTO-accel</td>
<td></td>
</tr>
<tr>
<td>- Decel-VL</td>
<td></td>
</tr>
<tr>
<td>- Press-up</td>
<td></td>
</tr>
<tr>
<td>- Instructor selected emergencies</td>
<td></td>
</tr>
<tr>
<td><strong>Evaluate:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Concepts and Discussion Topics:</strong></td>
<td></td>
</tr>
<tr>
<td>- CRM</td>
<td></td>
</tr>
<tr>
<td>- Techniques for handling airborne emergencies (aviate, navigate, communicate)</td>
<td></td>
</tr>
<tr>
<td>- Engine controls</td>
<td></td>
</tr>
<tr>
<td>- Engine Displays</td>
<td></td>
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<td>- Over rotation on take-off</td>
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<td>- Brake failure / Skid failure</td>
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**Goal:**
Practice normal and emergency and IFR procedures.

**Performance Standards:**
- Airspeed within 30 KCAS
- Altitude within 75 feet
- AOA within 2 units in landing configuration
- Accurate completion of all check lists

**Aircraft:**
RNAWST

**Ordnance:**
• None

**Range:**
• Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 line
- SKC, 15°C, 29.75, 07/010 05 L/R

**External Support:**
• CSI

**Requirements:**

**Introduce:**
- None

**Review:**
- CTO
- STOL flap STO
- TACAN
- PAR
- FNSL
- Auto flap VNSL
- STOL flap VNSL
- RVL (2)
- CL to full stop
- Continuous VTO-accel
- Decel-VL
- Press-up
- Instructor selected emergencies

**Evaluate:**
- None

**Sequence of Events:**
- Start
- Taxi
- Marshall
- CTO
- Departure to IFR Climb
- TACAN Approach
- Missed approach
- PAR
- FNSL Straight-in off GCA
- Landing Pattern Work

**Emergency Procedures Discussion:**
- Abort
- No liftoff on STO
- Main generator failure (GEN, DC, and STBY TR Caution LTS)
- Over rotation on STO
- Standby TRU failure (STBY TR Caution Light)
- Airstart
- SAS failure

**Threat:**
None
### Concepts and Discussion Topics:
- CRM
- Electrical system
- Water check procedures
- VSTOL Handling Techniques
  - Crosswind take-off techniques
- Difference and requirements for continuous v. non-continuous accelerating transitions
**Mission:**

**RSFAM-1104 R M SS**

**Goal:**
Practice normal and emergency and IFR procedures.

**Performance Standards:**
- Airspeed within 25 KCAS
- Altitude within 50 feet
- AOA within 1.5 units in landing configuration
- Accurate completion of all check lists

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**Simulator Parameters:**
- Initialize in VMAT-203 Line
- SKC, 26°C, 30.20, 120/10, 14 L/R

**Requirements:**

**Introduce:**
- None

**Review:**
- Non-continuous VTO-accel
- Cruise flaps decel-VL
- STOL flap STO
- TACAN approach
- PAR
- FNSL
- SL to roll and go procedure
- Auto flap VNSL
- STOL flap VNSL
- RVL (2)
- CL to full stop
- Decel-VL
- Press-up
- Instructor selected emergencies

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
- RSFAM-1103

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- Simulated

**Simulation Parameters:**
- Initialize in VMAT-203 Line
- SKC, 26°C, 30.20, 120/10, 14 L/R

**Requirements:**

**Introduce:**
- None

**Review:**
- Non-continuous VTO-accel
- Cruise flaps decel-VL
- STOL flap STO
- TACAN approach
- PAR
- FNSL
- SL to roll and go procedure
- Auto flap VNSL
- STOL flap VNSL
- RVL (2)
- CL to full stop
- Decel-VL
- Press-up
- Instructor selected emergencies

**Evaluate:**
- None

**Threat:**
- None

**Sequence of Events:**
- Start
- Taxi
- Marshall
- STO
- Departure to IFR Climb
- TACAN Approach
- Missed approach
- PAR
- FNSL Straight-in off GCA
- Landing Pattern Work

**Emergency Procedures Discussion:**
- Landing gear fails to retract
- APU generator failure (APU GEN Caution Light)
- Flap channel failure (flaps 1 or 2 caution)
- Flap failure (flap warning light)
- Nose wheel steering caster failure
- Uncommanded roll on VTO
- Uncommanded flap motion
- Uncommanded nose down pitch movement
- Landing gear unsafe fails to extend
- Reaction control failure
Concepts and Discussion Topics:

- CRM
- Engine operation and handling techniques
  - Short Lift selection and limits
  - Max Continuous / Combat selection and limits
  - 60kt check
  - JPTL Off considerations
- SAAHS system
  - AFC
  - DEPRES
- SAAHS-off handling characteristics
- VSTOL Handling Techniques
  - Crosswind decel and landing techniques
  - SAAHS off decel and landing techniques
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<td>• Departure to IFR Climb</td>
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<td>• TACAN Approach</td>
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</tr>
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<td>• FNSL Straight-in off GCA</td>
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<td>• EFC caution and JPTL warning lights on</td>
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<td>• Single DECS failure (EFC Caution Light)</td>
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<td>• Dual DECS failure (EFC warning light) or loss of engine control</td>
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<tr>
<td>• STOL flap VNSL</td>
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</tr>
<tr>
<td>• RVL (2)</td>
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<tr>
<td>• CL to roll and go procedure</td>
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<tr>
<td>• Continuous VTO-accel</td>
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<tr>
<td>• Press-up</td>
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<td>Concepts and Discussion Topics:</td>
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<tr>
<td>- SAAHS-off Decel-VL</td>
<td>- Start</td>
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<td>- STOL flap STO</td>
<td>- Taxi</td>
</tr>
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<td>- PAR</td>
<td>- Marshall</td>
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<td>- FNSL</td>
<td>- STO</td>
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<td>- RVL (2)</td>
<td>- FNSL Straight-in of GCA</td>
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<td>- CL to full stop</td>
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<td>- Non-continuous VTO-accel</td>
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<td>- Compressor stall</td>
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<td>- Fuel transfer failure (L trans / R trans caution light)</td>
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<td>- Fuel low level (L fuel / R fuel caution light(s) flashing)</td>
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<td>- Total electrical failure (GEN, APU GEN, DC, STBY TRU)</td>
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### Concepts and Discussion Topics:

- Conventional handling characteristics
- VSTOL handling characteristics
- Flight control system
  - Primary flight controls
  - Secondary flight controls
- Nose tuck during flap programming
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<td>• CTO</td>
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<td>• Start</td>
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<td>• Taxi</td>
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<td>• FNSL</td>
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</tr>
<tr>
<td>• CL to roll and go procedure</td>
<td>• STO</td>
</tr>
<tr>
<td>• Auto flap VNSL</td>
<td>• Departure to IFR Climb</td>
</tr>
<tr>
<td>• STOL flap VNSL</td>
<td>• TACAN</td>
</tr>
<tr>
<td>• RVL</td>
<td>• Missed approach</td>
</tr>
<tr>
<td>• Continuous VTO-accel</td>
<td>• PAR</td>
</tr>
<tr>
<td>• Decel-VL</td>
<td>• Tower downwind</td>
</tr>
<tr>
<td>• Press-up</td>
<td>• Landing Pattern Work</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Evaluate:</strong></th>
<th><strong>Emergency Procedures Discussion:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• None</td>
<td>• Hyd 1 failure</td>
</tr>
<tr>
<td></td>
<td>• Engine fire indications</td>
</tr>
<tr>
<td></td>
<td>• NORDO recovery procedures</td>
</tr>
<tr>
<td></td>
<td>• Emergency question of the day</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Concepts and Discussion Topics:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pit turn procedures</td>
</tr>
<tr>
<td>• Nozzle drive system</td>
</tr>
<tr>
<td>• IGV’s</td>
</tr>
<tr>
<td>• INS theory</td>
</tr>
<tr>
<td>• Designation options</td>
</tr>
<tr>
<td>• Scan and priorities on RVL</td>
</tr>
<tr>
<td>• Wind effects on rate of descent during VL</td>
</tr>
<tr>
<td>• VL loss of performance with LIDS failure</td>
</tr>
<tr>
<td>Mission:</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td><strong>Goal:</strong></td>
</tr>
</tbody>
</table>
| **Performance Standards:** | - Airspeed within 20 KCAS  
- Altitude within 40 feet  
- AOA within 1.0 units in landing configuration  
- Accurate completion of all check lists within Air NTTP time constraints |
| **Duration:** | 1.3 |
| **Aircraft:** | (1) TAV-8B |
| **Ordnance:** | None |
| **Range:** | MOA / RSTD |
| **Prerequisites:** | RFAM-1114 |
| **External Support:** | None |

<table>
<thead>
<tr>
<th>Requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduce:</strong></td>
</tr>
<tr>
<td><strong>Review:</strong></td>
</tr>
</tbody>
</table>
- STOL flap STO  
- PAR  
- FNSL  
- CL to full stop  
- Auto flap VNSL  
- STOL flap VNSL  
- RVL  
- Continuous VTO-accel  
- Decel-VL  
- Press-up |
| **Evaluate:** | None |

| Threat: | None |
| Sequence of Events: |  
- Start  
- Taxi  
- Marshall  
- STO  
- Departure to IFR Climb  
- TACAN  
- Missed approach  
- PAR  
- Tower downwind  
- Landing Pattern Work |

| Emergency Procedures Discussion: |  
- Flap failure  
- SAS failure  
- Emergency question of the day |

| Concepts and Discussion Topics: |  
- CRM  
- Oil system  
- Cruise flap landing differences  
- High, hot and heavy operations  
- VL exhaust gas re-ingestion  
- NATOPS aircraft limits and restrictions  
- SAAHS system  
- SAAHS-off handling characteristics  
- VSTOL Handling Techniques  
  - Crosswind decel and landing techniques  
  - SAAHS off decel and landing techniques |
### Mission: RSFAM-1119 RM

**Goal:**
Practice instrument and emergency procedures.

**Performance Standards:**
- Airspeed within 15 KCAS
- Altitude within 30 Ft
- AOA within 1 units in landing configuration
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

**Duration:**
1.5

**Aircraft:**
RNAWST

**Ordnance:**
- None

**Range:**
- None

**External Support:**
- CSI

**Simulator Parameters:**
- Initialize in VMAT-203 line
- 005 OVC, 3 SM, 22° C, 30.10, 280/10, 32 L/R

**Requirements:**

**Introduce:**
- None

**Review:**
- Airways navigation
- Instrument flight planning
- Instrument flight procedures
- Instrument climb profile
- Intermediate level-off procedures
- Max range cruise profile
- Partial panel
- Unusual attitudes
- Holding procedures
- IFR penetration procedures
- TACAN approach
- Missed approach procedures
- PAR

**Evaluate:**
- None

**Prerequisites:**
- RFAM-1115

**Sequence of Events:**
- Initialize engine running
- Taxi
- Marshall
- STO
- Departure to IFR Climb
- Intermediate level-offs
- En route cruise
- Unusual attitude recovery
- TACAN approach NAS Oceana
- Climb / level-off / cruise RTB NKT
- En route descent
- Partial panel PAR NKT
- Landing Pattern Work

**Threat:**
None

**Emergency Procedures Discussion:**
- Standby TRU failure in IMC
- APU advisory light / APU GEN caution light
- Emergency question of the day

**Evaluate:**
None
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• OPNAV 3710 Weather filing minimums</td>
</tr>
<tr>
<td>• Fuel planning considerations</td>
</tr>
<tr>
<td>• GTS / APU start and operating limits</td>
</tr>
<tr>
<td>• IFR supplement</td>
</tr>
<tr>
<td>• High altitude charts and approach plates</td>
</tr>
<tr>
<td>• GPS coupling and master mode selection for IMC flight</td>
</tr>
<tr>
<td>• Flight information handbook</td>
</tr>
<tr>
<td><strong>Mission:</strong></td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td><strong>Goal:</strong></td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
</tr>
<tr>
<td>• Airspeed within 15 KCAS</td>
</tr>
<tr>
<td>• Altitude within 30 ft</td>
</tr>
<tr>
<td>• AOA within 1 units in landing configuration</td>
</tr>
<tr>
<td>• Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710</td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
</tr>
<tr>
<td><strong>Aircraft:</strong></td>
</tr>
<tr>
<td><strong>Ordnance:</strong></td>
</tr>
<tr>
<td><strong>Range:</strong></td>
</tr>
<tr>
<td><strong>Prerequisites:</strong></td>
</tr>
<tr>
<td><strong>External Support:</strong></td>
</tr>
</tbody>
</table>

| **Simulator Parameters:** |  |
| • Initialize in VMAT-203 line |  |
| • OVC 005, 3 SM, 22° C, 30.10, 280/10, 32 L/R |  |

| **Requirements:** |  |
| **Introduce:** | None |
| **Review:** | Airways navigation on a round-robin flight |
| | Instrument flight planning |
| | STOL flap STO |
| | Instrument flight procedures |
| | Instrument climb profile |
| | Intermediate level-off procedures |
| | Partial panel instrument procedures |
| | Unusual attitude flight |
| | Max range cruise profile |
| | Holding procedures |
| | IFR penetration procedures |
| | TACAN approach |
| | GCA (PAR) |
| | Missed approach |
| | Auto flap VNSL |
| | RVL |
| **Evaluate:** | None |

| **Threat:** | None |

| **Sequence of Events:** |  |
| • Initialize engine running |  |
| • Ground checks / procedures |  |
| • STO |  |
| • IFR climb to ISO, J121 to WEAVR direct TABUE |  |
| • TACAN approach at NAS Oceana |  |
| • Missed approach to CLAPY |  |
| • En route descent to GCA (partial panel PAR) at NKT to full stop |  |
| • Auto flap VNSL |  |
| • RVL |  |

| **Emergency Procedures Discussion:** |  |
| • Standby TRU failure in IMC |  |
| • APU advisory light / APU GEN caution light |  |
| • Emergency question of the day |  |

| **Concepts and Discussion Topics:** |  |
| • CRM |  |
| • High altitude charts and approach plates |  |
| • Mission Computer |  |
| • ARC-210 |  |
| • GPS coupling and master mode selection for IMC flight |  |

**AV-8B FSG Ver 3.0**

**REFRESHER SORTIES - 16**
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>RINST-1124</td>
<td>1.3</td>
<td>RSFAM-1121</td>
</tr>
</tbody>
</table>

| **Goal:** |
| Practice instrument and emergency procedures. |

<table>
<thead>
<tr>
<th><strong>Performance Standards:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Airspeed within 15 KCAS</td>
</tr>
<tr>
<td>Altitude within 30 ft</td>
</tr>
<tr>
<td>AOA within 1 units in landing configuration</td>
</tr>
<tr>
<td>Accurate completion of all checklists within Air NTTP timeline</td>
</tr>
<tr>
<td>Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710</td>
</tr>
</tbody>
</table>

| **Aircraft:** |
| (1) TAV-8B |

| **Ordnance:** |
| None |

| **Range:** |
| None |

| **External Support:** |
| None |

<table>
<thead>
<tr>
<th><strong>Requirements:</strong></th>
</tr>
</thead>
</table>

| **Introduce:** |
| None |

| **Review:** |
| Partial panel procedures and approach |
| Instrument flight planning |
| Instrument climb profile |
| Intermediate level-off procedures |
| Airways navigation |
| Max range cruise profile |
| Holding procedures |
| IFR penetration procedures |
| TACAN approach |
| Minimum fuel PAR |
| Missed approach procedures |
| V/STOL: |
| RVL (1) |
| Decel-VL (1) |

| **Evaluate:** |
| None |

<table>
<thead>
<tr>
<th><strong>Sequence of Events:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
</tr>
<tr>
<td>Taxi</td>
</tr>
<tr>
<td>Marshall</td>
</tr>
<tr>
<td>STO</td>
</tr>
<tr>
<td>Departure to IFR Climb</td>
</tr>
<tr>
<td>Intermediate level-offs</td>
</tr>
<tr>
<td>En route cruise</td>
</tr>
<tr>
<td>TACAN approach Seymour Johnson</td>
</tr>
<tr>
<td>Missed approach</td>
</tr>
<tr>
<td>Missed approach</td>
</tr>
<tr>
<td>Missed approach</td>
</tr>
<tr>
<td>Climb / level-off / cruise RTB NKT</td>
</tr>
<tr>
<td>TACAN Z NKT</td>
</tr>
<tr>
<td>Missed approach</td>
</tr>
<tr>
<td>PAR</td>
</tr>
<tr>
<td>Simulated minimum fuel PAR</td>
</tr>
<tr>
<td>Landing Pattern Work</td>
</tr>
</tbody>
</table>

| **Threat:** |
| None |

<p>| <strong>Emergency Procedures Discussion:</strong> |
| ADC failure IMC |
| Oil light IMC |
| Mission computer failure IMC |
| Fire light in IMC |
| Emergency question of the day |</p>
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• VRST page</td>
</tr>
<tr>
<td>• AOA system</td>
</tr>
<tr>
<td>• Landing system</td>
</tr>
<tr>
<td>◦ Flap and aileron droop schedule</td>
</tr>
<tr>
<td>◦ LIDS</td>
</tr>
<tr>
<td>• ADC</td>
</tr>
<tr>
<td>• TAV-8 instrument locations</td>
</tr>
</tbody>
</table>
Mission: RSINST-1125

Goal: In-type instrument check.

Performance Standards:
- Airspeed within 10 KCAS
- Altitude within 20 Ft
- AOA within 1 units in landing configuration
- Accurate completion of all checklists within Air NTTP timeline
- Correctly filled out DD-175, fuel plan IAW GP and OPNAV 3710

Duration: 1.0

Aircraft: RNAWST

Ordnance: None

Range: None

Prerequisites:
- Inst GS
- RFAM-1124 (R)
- RSFAM-1121 (M)

External Support: None

Simulator Parameters:
- Center Mat
- 006 OVC, 3 SM, 25° C, 29.99, 300/10, 32 L/R

SPINS: Route NKT-NTU-NKT

Requirements:

Introduce:
- None

Review:
- None

Evaluate:
- Instrument flight
- Non-precision approach to an unfamiliar field
- Precision approach to that field or the home field
- Unusual attitude recovery
- Partial panel procedures and approach

Concepts and Discussion Topics:
- CRM
- Review flight publications
- Review of filing and flight weather minimums
- Lost comm. procedures

Sequence of Events:
- Start
- Taxi
- Marshall
- STO
- Departure to IFR Climb
- Intermediate level-offs
- En route cruise
- TACAN approach NAS Oceana
- Missed approach
- PAR NAS Oceana
- Missed approach
- Climb / level-off / cruise RTB NKT
- PAR NKT
- Landing Pattern Work

Threat: None

Emergency Procedures Discussion:
- Emergencies in IMC
- Emergency question of the day
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>RSFAM-1127 RMS</td>
<td>1.0</td>
<td>• NA</td>
</tr>
</tbody>
</table>

**Goal:**  
Practice compound emergencies.

**Performance Standards:**  
- Airspeed within 15 KCAS  
- Altitude within 30 feet  
- AOA within 0.5 units in landing configuration  
- Accurate completion of all check lists within Air NTTP time constraints

**Aircraft:** RNAWST  
**Ordnance:** None  
**Range:** Simulated

**Simulator Parameters:**  
- Initialize in VMAT-203 line  
- SKC, 30° C, 29.80, 020/010, 5 L/R

**Requirements:**  
**Introduce:** None

**Review:**  
- CTO  
- PAR  
- STOL flap STO  
- FNSL  
- CL to full stop  
- Auto flap VNSL  
- STOL flap VNSL  
- RVL  
- Continuous VTO-accel  
- Decel-VL  
- Press-up  
- Compound emergencies

**Evaluate:** None

**Threat:** None  
**Sequence of Events:**  
- Start  
- Taxi  
- Marshall  
- CTO  
- Departure to IFR Climb  
- PAR  
- FNSL Straight-in off GCA  
- Landing Pattern Work

**Emergency Procedures Discussion:**  
- Compound Emergencies  
- Midair  
- Bird strike procedures  
- Engine mechanical failure/engine vibration  
- IGV failures (full open and full closed)
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INS</strong></td>
</tr>
<tr>
<td>▪ NAV and IFA differences</td>
</tr>
<tr>
<td>▪ Update options</td>
</tr>
<tr>
<td><strong>Aircraft DATA page</strong></td>
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<tr>
<td><strong>GPS page</strong></td>
</tr>
<tr>
<td><strong>Stored GPS library</strong></td>
</tr>
<tr>
<td><strong>NSEQ programming</strong></td>
</tr>
<tr>
<td><strong>Plane captain signals</strong></td>
</tr>
<tr>
<td><strong>ECS</strong></td>
</tr>
<tr>
<td>▪ Air conditioning</td>
</tr>
<tr>
<td>▪ Pressurization</td>
</tr>
<tr>
<td>▪ Equipment cooling</td>
</tr>
<tr>
<td><strong>NATOPS aircraft limits and restrictions</strong></td>
</tr>
</tbody>
</table>
| Mission: RFAM-1128 R M SS | Duration: 1.3 | Prerequisites:  
- RSFAM-1127 (M, R)  
- RFAM-1115 (SS) |
|---------------------------|--------------|----------------------|
| Goal: Safe for solo check. | Aircraft: (1) TAV-8B | External Support:  
- None |
| Performance Standards:  
- Perform all maneuvers IAW NATOPS standards without exhibiting any unsafe trends  
- Airspeed within 10 KCAS  
- Altitude within 30 Ft  
- AOA within 1 units in landing configuration  
- Accurate completion of all checklists within Air NTTP timeline | Ordnance: None | Threat: None |
| Requirements:  
Introduce:  
- None | Range: MOA / RSTD | Sequence of Events:  
- Start  
- Taxi  
- Marshall  
- CTO  
- Departure to IFR Climb  
- HI TACAN  
- Missed approach  
- GCA Pattern  
- FNSL straight-in off approach  
- Landing Pattern Work |
| Review:  
- None | Evaluate:  
- CTO  
- STOL flap STO  
- FNSL  
- CL to full stop  
- Auto flap VNSL  
- STOL flap VNSL  
- SL to roll and go procedure  
- RVL (1)  
- Continuous VTO-accel  
- Decel-VL  
- Press-up | Concepts and Discussion Topics:  
- CRM – ODO and LSI  
- Check ride procedures  
- Lost comm. procedures  
- Any systems listed in NATOPS Chapter I-02  
- Any limitations listed in NATOPS Chapter I-04 |
| Emergency Procedures Discussion:  
- Any emergency procedures listed in NATOPS Chapters V-13 through V-18  
- AVIATE, NAVIGATE, COMMUNICATE  
- Emergency question of the day |
<table>
<thead>
<tr>
<th>Mission:</th>
<th>RFAM-1129 R M SS</th>
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<tbody>
<tr>
<td>Goal:</td>
<td>Solo flight.</td>
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<tr>
<td>Performance Standards:</td>
<td>Perform all maneuvers IAW NATOPS standards without exhibiting any unsafe trends.</td>
</tr>
<tr>
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<td>Airspeed within 10 KCAS</td>
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<td>Altitude within 30 Ft</td>
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<td>AOA within 1 units in landing configuration</td>
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<tr>
<td>Duration:</td>
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<td>Range:</td>
<td>RSTD / MOA</td>
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<td>Requirements:</td>
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<tr>
<td>Review:</td>
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<tr>
<td></td>
<td>GCA</td>
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<td>STOL flap STO</td>
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<td>FNSL</td>
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<td></td>
<td>CL to roll and go procedure</td>
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<td>Auto flap VNSL</td>
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<td>STOL flap VNSL</td>
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<td>SL to roll and go procedure</td>
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<td>RVL</td>
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<td>Decel-VL</td>
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<td>Press-up</td>
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<td>Evaluate:</td>
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<td>Emergency Procedures Discussion:</td>
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<td>Threat:</td>
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<td>Marshall</td>
</tr>
<tr>
<td></td>
<td>CTO</td>
</tr>
<tr>
<td></td>
<td>Departure to IFR Climb</td>
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<tr>
<td></td>
<td>GCA Pattern</td>
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<tr>
<td></td>
<td>Missed approach</td>
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<tr>
<td></td>
<td>GCA Pattern</td>
</tr>
<tr>
<td></td>
<td>FNSL straight-in off approach</td>
</tr>
<tr>
<td></td>
<td>Landing Pattern Work</td>
</tr>
<tr>
<td>Concepts and Discussion Topics:</td>
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<tr>
<td>CRM</td>
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<tr>
<td>Night Attack/Radar differences:</td>
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<td></td>
<td>Cockpit differences</td>
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<td></td>
<td>HOTAS</td>
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<td></td>
<td>Speed brake</td>
</tr>
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<td></td>
<td>Bore sight for DMT and FLIR</td>
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<tr>
<td></td>
<td>WINC</td>
</tr>
<tr>
<td></td>
<td>DAT button</td>
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<td>HUD layout</td>
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<tr>
<td></td>
<td>Warning and caution light differences</td>
</tr>
<tr>
<td></td>
<td>MPCD operation and flight set-up</td>
</tr>
<tr>
<td></td>
<td>MAP set-up and use</td>
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<td></td>
<td>GPWS system</td>
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<td>Standard LSI calls</td>
<td></td>
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<td>Solo wind and weather SOP limits</td>
<td></td>
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<tr>
<td>Fuel pit procedures</td>
<td></td>
</tr>
<tr>
<td><strong>Mission:</strong></td>
<td><strong>Duration:</strong> 1.3</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>RTACFORM-1320</strong></td>
<td><strong>Aircraft:</strong> (2) AV-8B or TAV-8B Lead</td>
</tr>
<tr>
<td><strong>Goal:</strong> Practice section tactical formation at medium altitude.</td>
<td><strong>Ordnance:</strong> None</td>
</tr>
<tr>
<td><strong>Performance Standards:</strong></td>
<td><strong>External Support:</strong> None</td>
</tr>
<tr>
<td>• Parade formation with no more than 20 ft deviations during level flight, through standard rate turns and configuration changes</td>
<td><strong>Sequence of Events:</strong></td>
</tr>
<tr>
<td>• Altitude ± 100 feet, airspeed ± 5 KCAS from target during rendezvous</td>
<td>• Taxi</td>
</tr>
<tr>
<td>• No more than 1 under-run/over-run during rendezvous</td>
<td>• Marshal</td>
</tr>
<tr>
<td>• Proper MCT scan for tactical formation</td>
<td>• Take-off</td>
</tr>
<tr>
<td>• Deviation detection – 10 sec</td>
<td>• Departure/Rendezvous</td>
</tr>
<tr>
<td>• Deviation correction – 20 sec</td>
<td>• Area check-in</td>
</tr>
<tr>
<td>• Out of turn, position regained – 20 sec</td>
<td>• Cross under</td>
</tr>
<tr>
<td>• Airspeed ± 15 KCAS / 0.04 IMN</td>
<td>• Lead change</td>
</tr>
<tr>
<td>• AOA ± 1 unit / G ± 0.3</td>
<td>• Break-up and rendezvous</td>
</tr>
<tr>
<td>• Correct comm. out turn interpretation</td>
<td>• Defensive combat spread</td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td>• Medium altitude comm-in turns:</td>
</tr>
<tr>
<td><strong>Introduce:</strong></td>
<td>° Check turns</td>
</tr>
<tr>
<td>• None</td>
<td>° NAV turns</td>
</tr>
<tr>
<td><strong>Review:</strong></td>
<td>° TAC turns</td>
</tr>
<tr>
<td>• Parade position</td>
<td>° Cross turns</td>
</tr>
<tr>
<td>• Cross under</td>
<td>° Hook turns</td>
</tr>
<tr>
<td>• Lead change</td>
<td>° Shackle turns</td>
</tr>
<tr>
<td>• Breakup and rendezvous</td>
<td></td>
</tr>
<tr>
<td>• Fighter wing</td>
<td><strong>V/STOL:</strong></td>
</tr>
<tr>
<td>• Offensive combat spread formation</td>
<td>° STOL flap VNSL</td>
</tr>
<tr>
<td>• Defensive combat spread formation</td>
<td>° Decel-VL</td>
</tr>
</tbody>
</table>
**Evaluate:**
- None

**Emergency Procedures Discussion:**
- Section emergency procedures
- Inadvertent IMC
- NORDO / LCLS
- Midair

<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM – wingman coordination and integration</td>
<td></td>
</tr>
<tr>
<td>Parade position reference points &amp; corrections</td>
<td></td>
</tr>
<tr>
<td>Formation comm. standards</td>
<td></td>
</tr>
<tr>
<td>Formation visual signals</td>
<td></td>
</tr>
<tr>
<td>Under-run &amp; over-run procedures</td>
<td></td>
</tr>
<tr>
<td>Approach speed v. aileron droop</td>
<td></td>
</tr>
<tr>
<td>Separation on final</td>
<td></td>
</tr>
<tr>
<td>Formation definitions</td>
<td></td>
</tr>
<tr>
<td>MCT in different formations</td>
<td></td>
</tr>
<tr>
<td>Deviation correction</td>
<td></td>
</tr>
<tr>
<td>Formation and turn standards – G, AOA, KCAS/IMN</td>
<td></td>
</tr>
<tr>
<td>COMM-out maneuvering rule of thumb</td>
<td></td>
</tr>
<tr>
<td>Indications of nozzles down during wingborne flight</td>
<td></td>
</tr>
</tbody>
</table>
## Mission: RSTCT-1351 RM

### Goal:
Practice low and medium altitude threat counter-tactics.

### Performance Standards:
- Execute TCT maneuvers IAW Air NTTP
- Adhere to TCT decision matrix
- Use proper comm. brevity
- Employ ASE equipment IAW Air NTTP and AV-8B NATIP

### Aircraft:
RNAWST

### Ordnance:
- 4 Mk-82LD PS
- ALQ-164
- SEL-1

### Range:
Simulated

### Simulator Parameters:
- Center mat
- SKC, 20 SM, 25° C, 30.00, 300/10, 32 L/R

### Requirements:

#### Introduce:
- None

#### Review:
- Medium altitude threat counter-tactics:
  - Lean / Notch
  - E-pole
  - Level S
  - Guns jink
  - SAM weave
- Low altitude threat counter-tactics:
  - Medium to low deck transition
  - Lean / Notch
  - E-pole
  - Level S
  - Guns jink
  - SAM weave
- Jettison criteria
- TCT communications
- Pre-emptive expendable game plan
- Reactive expendable game plan
- ALE-39 setup and employment
- ALR-67 setup and employment
- ALQ-164 setup and employment

#### Evaluate:
- None

### Duration:
1.0

### Prerequisites:
- RSFAM-1129

### Aircraft:
RNAWST

### Ordnance:
- 4 Mk-82LD PS
- ALQ-164
- SEL-1

### Range:
Simulated

### External Support:
- None

### Threat:
SA-2, S-60, SA-7

### Sequence of Events:
- Initialize in warm-up engine running
- ALR/ALQ BITs
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Threat counter-tactics
- FENCE Out
- Recovery

### Emergency Procedures Discussion:
- Dep / Spin recovery
- Compressor Stall
- Damaged aircraft
<table>
<thead>
<tr>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CRM</td>
</tr>
<tr>
<td>• Departure avoidance</td>
</tr>
<tr>
<td>• Allowable risk level v. threat –affects on mission</td>
</tr>
<tr>
<td>• Range known v. range unknown tactics</td>
</tr>
<tr>
<td>• E-Pole Determination</td>
</tr>
<tr>
<td>• INS smoothing – operation / pros / cons</td>
</tr>
<tr>
<td>• Medium to Low Deck transition point</td>
</tr>
<tr>
<td>• LAT Dive Recovery Rules</td>
</tr>
<tr>
<td>• Threat counter-tactics maneuver descriptions</td>
</tr>
<tr>
<td>° RF Pre-emptive / Reactive</td>
</tr>
<tr>
<td>° IR Pre-emptive / Reactive</td>
</tr>
<tr>
<td>° AAA Pre-emptive / Reactive</td>
</tr>
<tr>
<td>• Jettison criteria</td>
</tr>
<tr>
<td>• TCT comm</td>
</tr>
<tr>
<td>° Brevity terms</td>
</tr>
<tr>
<td>° Directive / Descriptive &amp; priority</td>
</tr>
</tbody>
</table>
**Mission:**
**RSAS-1403 R M**

**Goal:**
Practice low and medium angle deliveries.

**Performance Standards:**
- Roll-in ACD ±0.1 nm, 200’
- Set TPA ± 1 degree
- IRCM – 50% execution minimum
- Valid cascade plan on every pass
- Dive deliveries ± 5 degrees/30 knots/500’
- Proper off target maneuver (360 KCAS min)
- CEP about MPI < 14 mils

**Aircraft:**
NAWST / WST

**Ordnance:**
- (9) Mk-76
- TPOD
- SEL-1

**Range:**
- Simulated

**External Support:**
- IP

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma / LL or Cherry Point / BT-11)
- Scored target
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- 45° / 500 KTAS delivery
- 30° / 500 KTAS delivery (tactical)
- 10° / 500 KTAS delivery

**Weapon Programming:** Q1 / M1

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma / LL or Cherry Point / BT-11)
- Scored target
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- 45° / 500 KTAS delivery
- 30° / 500 KTAS delivery (tactical)
- 10° / 500 KTAS delivery

**Weapon Programming:** Q1 / M1

**Requirements:**

**Introduce:**
- None

**Review:**
- Brief weaponineering limitations
- Academic bombing pattern
- Medium angle ARBS/TV deliveries
- Medium angle LAUT deliveries
- Low angle RCIP/GCIP deliveries
- WARP weaponineering data
- Weapons system programming in CWAIVER
- Adaptive roll-in technique
- J-hook maneuver (no desg)
- Straight path to straight path tracking (AUTO)
- ARBS/TV, TPOD for height above target data
- (Initial) Target placement angle
- Curvilinear to straight path tracking (CCIP)
- Off target maneuver
- Selective / emergency jettison

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Clearing spacer pass
- MWSS / TACL checks
- Bombing pattern
- FENCE Out
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Flameout in bombing pattern
- Hung ordnance recovery

**Evaluate:**
- None

**Duration:**
1.0

**Prerequisites:**
- RFAM-1129

**Threat:**
None
### Concepts and Discussion Topics:

- CRM
- Local area ordnance procedures and course rules
- Pattern communication
- Curvilinear to straight path tracking
- Straight path to straight path tracking
- Upgrade / cascade plan
- ARBS designation criteria / rule of thumb
- TDC action and no action slewing
- Indications and actions for running designation
- Systems / target fixation
- Slewing below checkpoint altitude
- Settling time prior to release
- Jettison system
- A/S expendable usage
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSAS-1405 R M</td>
<td>1.0</td>
<td>• RSAS-1403</td>
</tr>
</tbody>
</table>

**Goal:**
Practice gun and rocket deliveries

**Performance Standards:**
- Roll-in ACD ±0.1 nm, 200’
- Set TPA ± 1 degree
- IRCM – 70% execution minimum
- Dive deliveries ± 5 degrees / 30 knots / 500’
- Off target maneuver (360 KCAS min)
- CEP about MPI < 14 mils

**Aircraft:**
RNAWST

**Ordnance:**
- (300) 25 mm
- (8) 5.00” Zuni Rockets
- TPOD

**Range:**
- Simulated

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma / LL or Cherry Point / BT-11)
- Scored target
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- 10° / 550 KTAS delivery (GAU-12)
- 20° / 550 KTAS delivery (5” Zuni)

**Requirements:**

### Introduce:
- None

### Review:
- Brief weaponeering limitations
- Academic bombing pattern
- Low angle GCIP / LCIP deliveries
- WARP weaponeering data
- Weapons system programming in CWAIVER
- Adaptive roll-in technique
- Height above target data
- Target placement angle
- Curvilinear to straight path tracking (CCIP)
- Off target maneuver
- Selective / emergency jettison

### Evaluate:
- None

**Concepts and Discussion Topics:**
- CRM
- Arm / de-arm procedures
- Gun firing techniques
- Rocket / Gun sight picture
- Rocket / Gun off target maneuver
- Safe escape maneuver
- Max frag envelope to ensure safe release
- Low altitude TPOD usage

**External Support:**
- None

**Range:**
- Simulated

**Simulator Parameters:**
- Database that corresponds to planned execution (Yuma / LL or Cherry Point / BT-11)
- Scored target
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- 10° / 550 KTAS delivery (GAU-12)
- 20° / 550 KTAS delivery (5” Zuni)

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Clearing spacer pass
- MWSS / TACL checks
- Gun / Rocket pattern
- FENCE Out
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Gun malfunction
- Fwd firing ordnance recovery
<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th><strong>Duration:</strong></th>
<th><strong>Prerequisites:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RAS-1408 RM</strong></td>
<td>1.0</td>
<td>• RTACFORM-1320</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• RSAS-1405</td>
</tr>
</tbody>
</table>

**Goal:**
Practice medium altitude deliveries.

**Performance Standards:**
- Roll-in ACD ±0.1 nm, 200’
- Set TPA ± 1 degree.
- IRCM – 70% execution minimum.
- Dive deliveries ± 5 degrees/30 knots/500’.
- Proper off target maneuver (360 KCAS min).
- Adhere to deconfliction plan.
- CEP about MPI < 14 mils.

**Aircraft:**
(2) AV-8B

**Ordnance:**
- 6 Mk-76
- 10 FLR

**Range:**
- RKD RNG
- EXP

**External Support:**
- Weapons scoring

**SPINS:**
- 45° / 500 KTAS delivery
- 30° / 500 KTAS delivery (Weather 30° if weather dictates)
- Weapon Programming: Q1 / M1

**Requirements:**

**Introduce:**
- None

**Review:**
- WARP weaponeering data
- Weapons preflight and ordnance line procedures
- Weapons system programming in CWAIVER
- Medium angle GCIP / LAUT deliveries
- Adaptive roll-in technique
- (Initial) Target placement angle
- Curvilinear to straight path tracking
- Straight path to straight path tracking
- Off target maneuvers
- Off target rendezvous
- Battle damage / ordnance check
- V/STOL:
  - RVL
  - Decel-VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- Local area ordnance procedures and course

**Sequence of Events:**
- Preflight
- Marshal
- Take-off
- Departure/Rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Clearing spacer pass
- MWSS / TACL checks
- Bombing pattern
- FENCE Out
- Off-target rendezvous
- Battle damage / ordnance check
- Recovery
- Landing(s)

**Threat:**
SA-7, SA-14, ZSU-23-4
<table>
<thead>
<tr>
<th>rules</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Adaptive roll-in</td>
<td>• ADC Failure</td>
</tr>
<tr>
<td>• Importance of good start and its effects on parameters</td>
<td>• RPM fluctuation</td>
</tr>
<tr>
<td>• Curvilinear to straight path tracking</td>
<td></td>
</tr>
<tr>
<td>• Straight path to straight path tracking</td>
<td></td>
</tr>
<tr>
<td>• Wind effects</td>
<td></td>
</tr>
<tr>
<td>• Airborne hit analysis and error corrections</td>
<td></td>
</tr>
<tr>
<td>• Pattern deconfliction</td>
<td></td>
</tr>
<tr>
<td>• A/S expendable usage</td>
<td></td>
</tr>
<tr>
<td>• Expendable arm / de-arm and expendable checks</td>
<td></td>
</tr>
<tr>
<td>• FMU-139 fuze</td>
<td></td>
</tr>
<tr>
<td>• TAV-8B limitations</td>
<td></td>
</tr>
</tbody>
</table>
**Mission:**

**RSMECH-1431 R**

**Goal:**
Practice transition profiles with GP ordnance.

**Performance Standards:**
- Roll-in ACD ±0.1 nm, 200’ <or> proper adaptive roll-in correction.
- Set TPA ± 1 degree.
- IRCM – 70% execution minimum.
- Dive deliveries ± 5 degrees/30 knots/500’.
- AUTO / LOFT deliveries on ASL and +/- 20 KTAS
- Proper off target maneuver (360 KCAS min).

**Duration:**
1.0

**Aircraft:**
RNAWST

**Ordnance:**
- 6 Mk-82 LD
  - BSU-86
  - FMU-139
- TPOD
- SEL-1

**Range:**
- East: BT-11
- West: R2507 N/S Abel N/S

**Simulator Parameters:**
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- Pop: 500’ ingress / 10 degree / 500 KTAS delivery
- Loft: 500’ ingress / 450 KGS / 38 degree loft angle
- Cruise climb: 500’ ingress to 30 or 45 degree dive
- Ramp to 30 dive
- Level entry to 30 dive

**Requirements:**

**Introduce:**
- None

**Review:**
- Pop attack
- Loft delivery
- Cruise climb
- Ramp down
- WARP weaponeering data
- Adaptive roll in technique
- Target placement angle
- Straight path to straight path tracking

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Heavy weight STO
- Reason for high-to-low transition maneuvers
- Canopy code / reference points
- Sensor timeline & sensor management
- Energy management during profiles
- Cross checks during profiles
- Error corrections for early / late to the ACD

**Prerequisites:**
- SAS-1405

**External Support:**
- None

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS / TACL checks
- Transition attacks
- Egress
- FENCE Out
- Recovery
- Landing(s)

**Threat:** SA-7 / 14 /16

**Emergency Procedures Discussion:**
- Bird strike
<table>
<thead>
<tr>
<th>Mission:</th>
<th>Duration:</th>
<th>Prerequisites:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RSMECH-1432 R</strong></td>
<td>1.5</td>
<td><strong>RSMECH-1431</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Aircraft:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice attack profiles with PGMs.</td>
<td>RNAWST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Standards:</th>
<th>Ordnance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Aimpoint</td>
<td>(2) GBU-38 2/6</td>
</tr>
<tr>
<td>Valid Release</td>
<td>(2) GBU-12 3/5</td>
</tr>
<tr>
<td></td>
<td>TPOD sta 4</td>
</tr>
<tr>
<td></td>
<td>SEL 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range:</th>
<th>External Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulated</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulator Parameters:</th>
<th>SPINS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVC 200, 7 SM, 25° C, 29.98, 200/10</td>
<td>LGB Auto delivery</td>
</tr>
<tr>
<td></td>
<td>JDAM BOC / BOT attacks</td>
</tr>
<tr>
<td></td>
<td>JDAM multi-rel attack</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements:</th>
<th>Threat:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SA-10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduce:</th>
<th>Sequence of Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Initialize in warm-up engine running</td>
</tr>
<tr>
<td></td>
<td>Marshal</td>
</tr>
<tr>
<td></td>
<td>Weapon programming in CWAIVER checks</td>
</tr>
<tr>
<td></td>
<td>STO</td>
</tr>
<tr>
<td></td>
<td>Departure</td>
</tr>
<tr>
<td></td>
<td>Area check-in</td>
</tr>
<tr>
<td></td>
<td>Tacadmin Checks</td>
</tr>
<tr>
<td></td>
<td>° FELPG-F</td>
</tr>
<tr>
<td></td>
<td>Holding</td>
</tr>
<tr>
<td></td>
<td>MWSS / TACL checks</td>
</tr>
<tr>
<td></td>
<td>PGM deliveries</td>
</tr>
<tr>
<td></td>
<td>° Capture</td>
</tr>
<tr>
<td></td>
<td>° Optimize</td>
</tr>
<tr>
<td></td>
<td>° Attack</td>
</tr>
<tr>
<td></td>
<td>° Support</td>
</tr>
<tr>
<td></td>
<td>Egress</td>
</tr>
<tr>
<td></td>
<td>FENCE Out</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
</tr>
<tr>
<td></td>
<td>Landing(s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review:</th>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARP weaponeering data</td>
<td>Asymmetric stores recovery</td>
</tr>
<tr>
<td>Reactive weaponeering</td>
<td></td>
</tr>
<tr>
<td>Mark point use for cataloging targets</td>
<td></td>
</tr>
<tr>
<td>MWSS checks</td>
<td></td>
</tr>
<tr>
<td>TACL checks</td>
<td></td>
</tr>
<tr>
<td>Valid Aimpoint (LGB, JDAM)</td>
<td></td>
</tr>
<tr>
<td>Valid Release (LGB, JDAM)</td>
<td></td>
</tr>
<tr>
<td>Laser marksmanship</td>
<td></td>
</tr>
<tr>
<td>Bomb hit assessment (BHA)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluate:</th>
<th>Concepts and Discussion Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Reason for low-to-high transition maneuvers</td>
</tr>
<tr>
<td></td>
<td>Canopy code / reference points</td>
</tr>
<tr>
<td></td>
<td>Sensor timeline &amp; sensor management</td>
</tr>
<tr>
<td></td>
<td>Energy management during profiles</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Error corrections for early / late to the ACD</td>
</tr>
<tr>
<td></td>
<td>Target acquisition</td>
</tr>
<tr>
<td></td>
<td>Loft setup, cueing and timeline</td>
</tr>
<tr>
<td></td>
<td>Transition attack: scan for HUD info / target tally</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Procedures Discussion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetric stores recovery</td>
</tr>
</tbody>
</table>
**Mission:** RMECH-1434 R

**Goal:** Practice low and medium altitude transition profiles.

**Performance Standards:**
- Fly attack geometry.
- Roll-in ACD ±0.1 nm, 200’ <or> proper adaptive roll-in correction.
- Set TPA ± 1 degree.
- Dive deliveries ± 5 degrees/30 knots/500’.
- Proper off target maneuver (360 KCAS min).
- Adhere to deconfliction plan.
- Regain visual mutual support less than 45 seconds off target.

**Duration:** 1.0

**Aircraft:** TAV-8B

**Prerequisites:**
- RAS-1408
- RSMECH-1432

**Ordnance:**
- 6 Mk-76

**Range:**
- TGT
- WISS
- LSR

**External Support:**
- Weapon scoring

**SPINS:**
- Pop: 500’ ingress / 10 degree / 500 KTAS delivery
- Loft: 500’ ingress / 450 KGS / 38 degree loft angle
- Cruise climb: 500’ ingress to 30 or 45 dive
- Ramp to 30 dive

**Requirements:**

**Introduce:**
- None

**Review:**
- Low altitude pop attacks to 10 degree delivery
- Cruise climb to a 30 or 45 degree dive delivery
- Ramp to a 30 degree dive delivery
- Loft delivery
- WARP weaponeering data
- Adaptive roll in technique
- Target placement angle
- Straight path to straight path tracking
- V/STOL:
  - STOL flap FNSL
  - Decel-VL

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- Section contracts
- Mutual support
- Map / imagery study, GEOREF and overlay use
- Sensor timeline / management
- Target acquisition
- Loft set-up / cueing
- Energy management during profiles
- Canopy reference points

**Threat:** SA-13

**Sequence of Events:**
- Marshal
- Take-off
- Departure/Rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS / TACL checks
- Transition attacks
- Egress
- FENCE Out
- Rejoin
- Recovery
- Landing(s)

**Emergency Procedures Discussion:**
- Hyd 1 failure
### Mission: RMECH-1436 R

#### Goal:
Practice target area mechanics at medium altitude.

#### Performance Standards:
- Fly attack geometry.
- Roll-in ACD ±0.1 nm, 200’ <or> proper adaptive roll-in correction.
- Set TPA ± 1 degree.
- IRCM – 70% execution minimum.
- Straight path to straight path tracking.
- Dive deliveries ± 5 degrees/30 knots/500’.
- Proper off target maneuver (360 KCAS min).
- Adhere to deconfliction plan.
- Regain visual mutual support less than 45 seconds off target.

#### Aircraft:
(2) AV-8B

#### Ordnance:
- (6) Mk-76
- (10) FLR
- TPOD

#### Range:
- TGT
- WISS
- EXP

#### Duration:
1.0

#### Prerequisites:
- RMECH-1432

#### External Support:
- None

#### SPINS:
- 45° / 500 KTAS delivery or 30 degree / 500 KTAS (for range restrictions)
- Weather 30° / 500 KTAS delivery (for back-up only – event may be completed using this profile)
- Weapon Programming: Q2 / M1 / INT = to reactive weaponeering
- Review 95) attacks to 30 or 45 degree dive deliveries

#### Requirements:

**Introduce:**
- None

**Review:**
- Medium altitude standard attacks:
  - Same side attack (2)
  - Swept attack (2)
  - Split attack (1)
- WARP weaponeering data
- Adaptive roll in technique
- Target placement angle
- Straight path to straight path tracking
- V/STOL:
  - CL to full stop
  - Decel-VL

**Evaluate:**
- None

#### Concepts and Discussion Topics:
- Section contracts
- Mutual support
- Map / imagery study, GEOREF and overlay use
- Sensor timeline / management

#### Threat: SA-9

#### Sequence of Events:
- Marshal
- Take-off
- Departure/Rendezvous
- Area check-in
- Tacadmin Checks
  - FELPG-F
- MWSS / TACL checks
- Medium altitude standard attacks
- Egress
- FENCE Out
- Rejoin
- Battle Damage Check
- Recovery
- Landing(s)

#### Emergency Procedures Discussion:
- Midair
**Mission:**
**RSCAS-1441 R**

**Goal:**
Practice medium altitude Type 1 and 2 CAS.

**Performance Standards:**
- Execute CAS IAW JP 3-09.3.
- Effects on assigned target.
- No unsafe/invalid weapons release.
- Proper corrections from the mark.
- TOT ± 30 seconds.

**Aircraft:**
RNAWST

**Ordnance:**
- TPOD
- (1) GBU-12
- (2) GBU-38
- GAU-12

**Range:**
- Simulated

**Prerequisites:**
- RSMECH-1432

**Simulator Parameters:**
- Tactical target
- SKC, 20 SM, 25° C, 30.01, 040/15

**SPINS:**
- Level delivery tables
- JDAM LAR predictions tables
- SOP JMPS CAS plan
- 1:50,000 target area chart and objective area chart, with CP’s and IP’s, required (JMPS)

**Requirements:**

**Introduce:**
- None

**Review:**
- Combat holding
- CAS check-in brief
- 9-line CAS briefing format
- CAS page programming
- Alpha checks
- Attack preparation checklist
- CAS communication
- Attack timing control
- Keyhole template
- Corrections from a mark
- Medium altitude CAS type 1 and 2 control
- Correct weapon selection
- LGB level self / buddy
- JDAM BOC / BOT

**Evaluate:**
- None

**Concepts and Discussion Topics:**
- CRM
- BOC vs BOT
- CAS page usage / data entry
- Command speed time
- Communications
- FAC corrections / HUD / mil relationships
- Re-attack considerations / procedures
- Wounded bird procedures
- Wingman of Opportunity / Lost COMM

**Duration:**
1.0

**Emergency Procedures Discussion:**
- Damaged aircraft

**External Support:**
- None

**Sequence of Events:**
- Initialize in warm-up engine running
- Marshal
- STO
- Departure
- Area check-in
- Tacadmin Checks
  - FELPG-F
- Combat holding
- 9-Line brief
- Attack preparation
- MWSS / TACL
- CAS attacks
- Egress
- FENCE Out
- Recovery
- Landing(s)

**Threat:**
SA-16, S-60
<table>
<thead>
<tr>
<th>Mission:</th>
<th>RSNTPS-1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal: Evaluate pilot knowledge of aircraft systems and normal and emergency procedures</td>
<td></td>
</tr>
<tr>
<td>Performance Standards: PUI shall perform all maneuvers and procedures IAW AV-8B NATOPS, OPNAV 3710, and Air NTTP standards</td>
<td></td>
</tr>
<tr>
<td>Duration: 1.5</td>
<td></td>
</tr>
<tr>
<td>Prerequisites: All stages complete</td>
<td></td>
</tr>
<tr>
<td>Aircraft: RNAWST</td>
<td></td>
</tr>
<tr>
<td>Ordnance: (4) Mk-82 inert</td>
<td></td>
</tr>
<tr>
<td>Range: Simulated</td>
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<tr>
<td>External Support: None</td>
<td></td>
</tr>
<tr>
<td>Simulator Parameters: SKC, 20° C, 29.80, 350/10 32 L/R</td>
<td></td>
</tr>
<tr>
<td>Spins: Raked Range at BT-11 VFR recovery at NKT</td>
<td></td>
</tr>
<tr>
<td>Threat: N/A</td>
<td></td>
</tr>
<tr>
<td>Sequence of Events: Take-off Departure En route procedures Tacadmin Checks FELPG-F R5306A / BT-11 entry Raked Range Egress FENCE Out Recovery Landing(s)</td>
<td></td>
</tr>
<tr>
<td>Emergency Procedures Discussion: Any emergency procedures listed in NATOPS Chapters V-13 through V-18 AVIATE, NAVIGATE, COMMUNICATE Emergency question of the day</td>
<td></td>
</tr>
</tbody>
</table>

**Requirements:**  
**Introduce:** None  
**Review:** None  
**Evaluate:**  
- Conduct briefing  
- Navigation procedures  
- Target attack  
- All takeoffs and landings types  
  - Heavy Weight STO (>30,000 lbs, OAT 30°C)  
  - SAAHS OFF  
- CRM  
- Instructor selected emergencies  

**Concepts and Discussion Topics:**  
- Any aircraft systems listed in NATOPS Chapter I-02  
- Any aircraft limitations listed in NATOPS Chapter I-04