FLIGHT TRAINING INSTRUCTION

SNFO FORMATION
T-6A

2020
CNATRA P-870 (Rev. 07-20)

Subj: FLIGHT TRAINING INSTRUCTION, STUDENT NAVAL FLIGHT OFFICER (SNFO) FORMATION T-6A

1. CNATRA P-870 (Rev. 07-20) PAT, “Flight Training Instruction, SNFO Formation T-6A” is issued for information, standardization of instruction, and guidance to all flight instructors and student naval flight officers in the Naval Air Training Command.

2. This publication is an explanatory aid to the T-6A Naval Flight Officer Training System (NFOTS) curriculum, and shall be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via the electronic Training Change Request (TCR) form located on the CNATRA website.

4. CNATRA P-870 (Rev 08-13) PAT is hereby cancelled and superseded.

S. E. HNATT
By direction

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FLIGHT TRAINING INSTRUCTION

FOR

SNFO FORMATION T-6A

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SAFETY/HAZARD AWARENESS NOTICE

This course does not require any special safety precautions other than those normally practiced on the flight line.

TERMINAL OBJECTIVE

Upon completion of this course, the Student Naval Flight Officer (SNFO) shall be able to direct, with instructor assistance, specified two-plane formation maneuvers in the T-6A aircraft.

ENABLING OBJECTIVE

Coordinate section formation maneuvers, with instructor assistance, recognize relative motion, and make recommendations to correct for deviations within the parameters of this Flight Training Instruction (FTI).

Given an oral examination and aircraft models/training aids, the Student NFO shall be able to describe standard formation maneuvers without error.

INSTRUCTIONAL OBJECTIVES

1. This is a flight training course and will be conducted in the simulator and aircraft.

2. The student will demonstrate a functional knowledge of the material presented through successful completion of the flight maneuvers.

INSTRUCTIONAL REFERENCES

1. T-6A NATOPS Flight Manual

2. Local Standard Operating Procedures (SOP) Instruction
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CHAPTER ONE
INTRODUCTION TO FORMATION

100. INTRODUCTION

For centuries, military strategists have been aware of the tactical value achieved via the concentration of forces. By flying in formation, aviation squadrons not only achieve concentration of force, but also gain the advantage of mutual support and improved command and control. Military aviators of all types routinely use formation in operational environments to leverage these advantages. There are many different types of formation and their uses are predicated on many factors including aircraft type, environmental conditions, mission planning factors, and mission objectives.

Formation flights, while obviously executed chronologically, are not briefed or structured like your earlier flights. Rather, the flight is broken up into pieces based on tactical significance and precedence. These pieces are: administration, tactical administration, and mission conduct. In naval aviation, this model is used universally by tactical aircraft and their supporting elements for execution of both training and combat missions. The primary and intermediate formation syllabus incorporates as many aspects of follow-on training and fleet operations as possible to help provide continuity in training and develop a solid foundation for future formation operations. Learning and applying this framework will enable you to easily incorporate administration, tactical administration, and conduct elements of future platforms and missions into your briefs, flights, and debriefs.

Administration ("admin"):

Generally, administrative portions are those that get the flight to and from the mission or involve elements of the flight that have nothing to do with mission conduct. This includes but is not limited to: startup, marshall, taxi, departure, transit, recovery, emergencies, contingencies, and the radio comms involved with all these phases. Chapters one through seven contained herein address all administration portions associated with the primary and intermediate formation syllabus.

Tactical Administration ("TAC Admin"):

TAC Admin elements are those that directly support or enable the mission conduct but aren’t the mission itself. Examples include: on-deck check in, nav check, FENCE-in, G-warm, training rules, working area, entry times, tactical squawks, etc. Chapter Eight contained herein addresses all TAC Admin portions associated with the primary and intermediate formation syllabus.

Mission Conduct ("conduct"):

Mission conduct is the main focus or objective of the flight. In primary and intermediate, conduct includes: parade sequences, tac form sequences, and low-level routes. Chapters Nine through Eleven contained herein address all conduct portions associated with the primary and intermediate formation syllabus.
101. FORMATION DEFINED

A formation consists of two or more aircraft flying in close proximity whose movements are both coordinated and conducted in unison. The smallest formation unit is a section. It consists of two aircraft: a Lead and a Wingman. The next largest unit is a division, consisting of two sections. From this point, a formation becomes larger by simply adding additional sections or divisions. It is important to remember that the basic unit of a formation is the section. During primary and intermediate training and thus for the purpose of this FTI, all discussions will deal solely with section formation procedures. Many section formation concepts and procedures translate directly to division operations. Since most of the content in this FTI can be universally applied to future formation operations, it is essential that SNFOs retain knowledge from this phase of training.

102. RELATIVE MOTION

Formation flying is simply a function of controlling relative motion. To maneuver safely in relation to another aircraft, both the direction and rate of motion must be controlled; likewise, to maintain a proper fixed position in relation to another aircraft, the relative motion between the two must be stopped. In a section, the Lead is considered to be fixed and any movement between aircraft is considered as movement of and controlled by the Wingman. In the Familiarization stage, the horizon was used as the aircraft’s attitude reference, while in the Instrument stage, an artificial horizon (attitude gyro) was used; however, when flying formation, Lead’s aircraft becomes the primary reference.
Relative motion can occur about any one or a combination of all three axes. Figure 1-2 depicts lateral movement relative to the Lead. Lateral movement can be controlled using power to move fore/aft or by using aileron to move left/right relative to the Lead.

Figure 1-2  Lateral Movement
Figure 1-3 depicts vertical movement relative to the Lead. Vertical movement is primarily controlled by elevator inputs to climb/descend relative to the Lead.

**103. RADIUS OF TURN**

It is also necessary to understand the concept of radius of turn and how it relates to controlling relative position during formation flight. As mentioned earlier, the Lead aircraft is the positional reference point of the flight; therefore, the Wing needs to anticipate any positional corrections in relation to the Lead’s radius of turn. For example, if the Wing is in the parade position and the Lead turns into the Wing, the Wing aircraft will require less power to complete the turn because they will have to fly a smaller radius of turn. Vice versa, when Lead turns away from Wing’s position, the Wing aircraft will require more power because they will be flying a larger turn radius. If both aircraft were to turn a full 360°, the aircraft on the inside will always scribe a smaller circle in the sky. Radius of turn becomes a major consideration when executing cruise turns, during the breakup and rendezvous exercises, and during the tail-chase exercise. Figure 1-4 shows the relationship between radius of turn and Angle of Bank (AOB) for a constant airspeed, level turn.
Flight discipline, as applied to formation flying, refers to the conduct of all flight members both as individuals and as part of a team. As a member of a team where individual errors will negatively affect the overall performance of the flight, each member of the flight must do their utmost to ensure the flight functions properly.

1. The Lead. The Lead aircraft is primarily responsible for communications and conducting the prescribed sequence of maneuvers in a safe and orderly manner. It is incumbent upon the Lead to:

   a. Keep the flight clear of other aircraft.
   
   b. Keep the flight clear of clouds unless under an Instrument Flight Rules (IFR) clearance.
   
   c. Keep the flight within the proper operating areas while complying with local course rules and Air Traffic Control (ATC) instructions.
   
   d. Be predictable. Maintain smooth, precise airwork.
   
   e. Maintain constant situational awareness of the Wingman's position by scanning outside!

Conducting the flight within the confines of the designated formation area presents problems, which must be considered both before and during the flight. Maintaining the flight within a
given area requires an understanding of the area boundaries combined with an awareness of how specific maneuvers cause the flight to track over the ground. SNFOs should be able to visualize how different combinations of turns can be used to maintain the flight within the area. During flight, the Lead SNFO must not only be aware of the flight’s position within the operating area, but also the sequence of maneuvers in order to determine a correct rollout heading to properly set up for the next maneuver. Additional factors to consider are wind direction, which will affect the track of the flight, and the position of the sun, which can adversely affect the Wingman’s ability to see the Lead aircraft.

NOTE

The Lead should conduct all maneuvers that minimize the Wing’s need to look into the sun. While in cruise, an intelligent Wingman will place their aircraft on the “sun side” of the formation therefore limiting the amount of time aircrew will stare into the sun.

2. The Wingman. The Wing aircraft is primarily responsible for maintaining flight integrity. It is incumbent upon the Wing to:

a. Keep the Lead in sight and maintain proper position at all times.

b. Comply with all instructions given by the Lead and, when required, be prepared to give a timely response.

c. Back up the Lead (e.g., communication, navigation, transponder, situational awareness, etc.).

d. Be prepared to assume the Lead at all times.

3. Crew Coordination. In any discussion dealing with flight discipline, it is essential to address Lead/Wing student responsibilities during the various phases of flight. To avoid unnecessary duplication of effort and optimize crew efficiency while accomplishing the tasks listed in Sections 104(1) and 104(2) above, follow a few general guidelines:

a. While Lead, the instructor’s primary focus is cockpit scan and visual lookout; thus, the Lead student’s greatest contribution to good Crew Resource Management (CRM) may be monitoring the Wing’s status/position. For example, during takeoff the Lead instructor will be concentrating on providing a smooth, predictable platform for the Wingman to reference; meanwhile, Lead SNFO will have the best perspective with respect to the Wingman’s position/status.

b. While Wing, the instructor will have an excellent awareness of Lead’s relative position since they are physically flying formation. This awareness will likely occur at the expense of cockpit scan; therefore, the Wing student might assist with the scan. For example, during a takeoff, the Wing instructor will be concentrating on Lead in order to achieve and maintain the proper takeoff position. The Wing student should
back up the instructor by monitoring gear retraction to ensure clean rendezvous parameters, to ensure a safe joinup, and monitor compliance with clearance limits such as assigned altitudes.

c. Just as in instrument flying, one’s scan should never fixate on any single item. Keep your scan moving, but use CRM to prioritize your areas of focus. In general, SNFOs should attempt to decouple their external scan from that of their pilots, therefore maximizing the total visual scan volume.

d. The SNFO shall monitor formation keeping by the pilot to include all parade and tactical formations. SNFOs shall utilize the ICS to report deviations to the pilot that are not being corrected. Voice inflection shall be used in accordance with the amount of deviation noted. During IMC conditions, SNFOs may call out altitude (in a descent), angle of bank and degrees to go (if in a turn), to help the pilot maintain situational awareness to formation maneuvering and terrain. If the aircraft exceeds normal flight parameters, it is imperative to verbalize the deviation assertively. For all tactical maneuvering, the SNFO should back up the pilot with general situational awareness (i.e., direction of turn if pilot goes the wrong way, degrees to go for any turns, or position of Lead aircraft with a clock code if pilot is blind out of the turn).

4. The Flight Leader. Sections/divisions will be under the charge of a command designated flight lead; typically, noted on the flight schedule. Although the flight lead may not be in the positional lead, the flight lead is the final authority in the formation and has total responsibility for all matters pertaining to the safe and orderly conduct of their flight.

105. FORMATION COMMUNICATIONS

The flight will use two call signs. One is the administrative call sign assigned on the flight schedule (i.e., KATT 16) used to communicate administratively with outside agencies (i.e., ATC, Base, CTAF, etc.). The section’s administrative call sign is always the same regardless of which aircraft has the positional Lead. If the flight splits up, the Wingman will use their own administrative call sign (e.g., KATT 17). The other is a tactical call sign, which is selected by the flight and used for intra-flight communication and tactical calls external to the section (i.e., entering VR/IR routes, communicating with range control, Airborne Intercept Controllers, Forward Air Controllers, etc.). Tactical call signs most commonly consist of a single, two-syllable word (e.g., Hammer, Tarbox, Vengeance, Ripper, Tofu) followed by two-digits, the second number of which correlates to the aircraft’s position in the flight. Wingmen tactical call signs are always sequential. For example, the tactical call signs of a flight of two using the tactical call sign “Raider” would be Raider 11 and Raider 12. When directing or referring to the flight as a whole, use “Raider.” When directing or referring to a specific member of the flight (including oneself), simply use the tactical call sign. For example:

“Raider, FENCE-in” directs the entire flight to execute FENCE-in procedures.
“Raider 11, FENCEd-in, 8.0, good G” describes that Raider 11 is FENCEd-in.
“Raider 15, PRI” directs the entire flight to switch to button 15 on UHF.
“Raider 12, knock it off,” indicates that Raider 12 is acknowledging and complying with a KIO.
Henceforth, the Ultra High Frequency (UHF) radio will be referred to as “PRI” (primary) and the Very High Frequency (VHF) radio as “AUX” (auxiliary). Sections will be assigned a TAC (tactical) frequency pair (PRI and AUX) on the flight schedule that will be used for intra-flight communication. If no TAC freq is assigned, select a TAC freq pair from the local comm card and deconflict with other sections on the flight schedule. TAC freq assignments include the associated backup frequencies. Intra-flight communication via TAC shall be maintained at all times. Short excursions off TAC (to gather ATIS, for example) are only allowed when initiated or directed by Lead. Flight members will always check back in once they have returned to TAC.

Flight flexibility and integrity dictate that the section should accomplish frequency changes simultaneously. The flight will switch frequencies when positively directed by ATC or the formation Lead. When Lead is directing a frequency change, the comm format shall be “[tactical call sign], [button/frequency], [radio].” For example: “Raider, 3, PRI,” “Raider, TAC, AUX,” “Raider, 122.8, AUX.” When briefed, frequency changes at specific points during the flight can be accomplished automatically. Ultimately it is the Wing’s responsibility to follow frequency changes; therefore, in the case that the Wingman misses a switch, Wing SNFO will verify the current ATC frequency over TAC. The method used for check-in on the new frequency is generally determined by the type of frequency to which the flight is switching:

1. Switching from one ATC frequency to another:

When the flight receives clearance to switch frequencies from ATC the Lead SNFO will respond normally, reading back the new frequency to ATC. Both aircraft in the flight will then switch to the new frequency. After a brief pause to allow the Wingman to make the switch, the Lead SNFO will check-in normally with ATC as “KATT XX, flight of two,” while simultaneously looking back at the Wing SNFO to see them pass a thumbs-up signifying that Wing heard the Lead SNFO’s transmission and both aircraft are on the same frequency. Upon initial check-in with a new controlling agency, Lead should use the flight’s admin call sign followed by “flight of two.” This phrase enhances the new controller’s SA. Subsequent calls to the same controller do not need to include the phrase “flight of two” unless Lead suspects that the controller has forgotten that the flight is a formation.

The following example involves a standard frequency change checking in with Sherman tower while on course rules:

Pensacola Approach: “KATT 16, switch tower, button 4.”

Lead: “KATT 16” or “KATT 16, switching” or “KATT 16, switching button 4.”

Once established on button 4:

Lead (while looking back at Wing): “Sherman Tower, KATT 16, flight of two, Pickens Gate for the break.”

Wing: Signal thumbs-up when Lead’s transmission is heard on button 4.
Sherman Tower: “KATT 16, Sherman Tower, report the numbers Runway 25L.”

Lead: “KATT 16.”

2. Switching to an uncontrolled tactical or safety-of-flight frequency:

In the case where the flight is switching to a tactical or safety-of-flight frequency (i.e., any working area, route common, or CTAF frequency) on which there will be no ATC response, a **positive check-in is required**. If such a frequency is assigned by ATC, Lead will read back the new frequency, allow time for the flight to switch, and then execute a timely positive check-in. If conduct dictates the flight switch from one uncontrolled frequency to another, the Lead will use TAC to direct the flight to switch frequencies. Here are some examples.

Example 1:

Switching from an ATC freq to a non-ATC freq:

On PRI button 6, after takeoff, transiting to work the Pensacola South MOA:

Pensacola Departure: “KATT 16, maintain 11,000. Cleared for 1A, 2A, frequency change approved.”

Lead: “KATT 16, 11,000, 1A, 2A, switching.”

Lead gives enough time for both aircraft to switch to PRI button 16.

On AUX:
Lead: “Raider, check PRI.”

On PRI:
Lead: “Raider 11.”
Wing: “Raider 12.”

Example 2:

Lead desires to switch from an uncontrolled UHF frequency to Monroe County CTAF, one radio at a time. The new TAC frequency should be established first.

On AUX:
Lead: “Raider, TAC, PRI.”
Wing: “Raider 12.”

On PRI:
Lead: “Raider, check PRI. Raider 11.”
Wing: “Raider 12.”
CHAPTER ONE

T-6A FORMATION

On PRI:
Lead: “Raider, 123.0, AUX.”
Wing: “Raider 12.”

On PRI:
Lead: “Raider, check AUX.”

On AUX:
Lead: “Raider 11.”
Wing: “Raider 12.”

Lead (at the appropriate time/distance): “Monroe County traffic, KATT 16, flight of two, 15 miles southwest of Monroe County, setting up for a left over-head RWY 3, Monroe County traffic.”

Example 3:

Switching both radios at the same time:

Often, due to the nature of the T-6’s single band radios, the need arises to switch both radios at the same time. This happens when a switch is directed or desired to a frequency that’s in the same band the flight is currently using for TAC. Simply input the newly assigned frequency in the appropriate radio, then input the tactical frequency into the other radio. If ATC offers a VHF and UHF option, it is incumbent on the Lead SNFO to read back only the frequency to which they are intending to switch, else Wing won’t know which radio to change. In this example, the flight is using PRI for ATC and AUX for TAC. ATC then directs a switch to 120.2. Both Lead and Wing switch AUX to 120.2 and PRI to TAC. As always, Lead should give adequate time for both aircraft to switch. After checking in normally with ATC, Lead will check in the flight on the new TAC.

On PRI:
Lead: “KATT 16, 120.2.”

On AUX:
Lead (while looking back at Wing): “Jacksonville Center, KATT 16, flight of two, 17,000.”
Wing: Gives a thumbs-up signifying he heard the transmission.

On PRI (when able, but in a timely manner):
Lead: “Raider, check PRI. Raider 11.”
Wing: “Raider 12.”

Lead directed frequency changes can also be passed via hand signal. To change a frequency in this manner, Lead will thricely pat the Wingman-side of their helmet near the earcup, indicate which radio they are changing via numeral hand signal (1 for PRI, 2 for AUX), and then pass via numeral hand signal the new two-digit channel or five-digit frequency. Ensure that signals are passed slowly and clearly since there are so many in a row. This method is obviously more cumbersome but can be advantageous in a saturated radio environment.
When switching ATC controlled frequencies from outside of hand signal range (i.e., combat spread or admin spread), it is assumed the Wingman has made the switch. It is incumbent on the Wingman to hear and comply with all switches and use TAC as a ‘get well’ frequency should they suspect they are not on the right frequency. For example, Wing may request that “Raider 12, say PRI freq” on TAC. When in signal range, should Lead look back inquisitively, Wing should always be ready to pass a thumbs up indicating all is copasetic in regards to radios. A well-timed thumbs up indicates to Lead that Wing has their radio set up correctly, heard Lead loud and clear.

Lead may request UHF or VHF control frequencies from ATC based on their preference. Sometimes it may be advantageous to use one band over the other. There is less chatter on UHF and it has a better range. However, VHF provides more situational awareness to civilian aircraft. The availability of destination ATIS on either band may also dictate which radio Lead prefers to use for ATC control. UHF frequencies are available for all center and approach sectors and may be requested at any time.

The goal of the aforementioned procedures is to execute professional transmissions using correct communication brevity while maintaining control of and high SA to the flight’s radios. Significant emphasis will be placed on communication procedures during your formation flights in the T-6A, specifically with regards to Wingman direction and awareness. The single band nature of the radios presents an extra challenge to SNFOs since multiple switches to both radios, often simultaneously, are frequently required. In future platforms, both radios can transmit on both bands (UHF and VHF), so TAC will always be on AUX, and outside/controlling agencies (ATC, CTAF, AIC) will always be on PRI. Examples of proper communications for specific procedures and maneuvers are included throughout this FTI. Proper frequency switches should occur effortlessly so that focus can be maintained on other important aspects of the flight.

When briefing or answering questions about radio calls on deck, always preface the call with which radio is in use. For example, briefing a double switch may sound like this:

“After we’re clear of Bay Minette’s airspace, Lead will a direct a switch to button 15. On PRI, ‘Raider, 15, PRI’. After allowing time for the flight to switch both radios, Lead will check in the flight on both frequencies. On AUX, ‘Raider check AUX, Raider 11’, ‘Raider 12’, ‘Raider check PRI.’ On PRI, ‘Raider 11’, ‘Raider 12’.”

Plan and practice communications thoroughly while studying for your formation event; chairfly comm just like anything else! Remember, as Lead, always look back for a thumbs up to ensure the Wingman is on the new controlled frequency and provide clear, concise direction on TAC when directing switches. As Wing, be ready with a clear thumbs up or a prompt roll call response.
CHAPTER ONE

T-6A FORMATION

INTRODUCTION TO FORMATION

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1-12 INTRODUCTION TO FORMATION
CHAPTER TWO
FORMATION VISUAL SIGNALS

200. INTRODUCTION

Good formation discipline depends on the proper use and execution of visual signals. A well-briefed and disciplined formation can conduct an entire flight with a surprisingly small amount of radio transmissions between the two aircraft. In general, there are two types of formation visual signals; those given by the aircrew (e.g., a shoulder pat), and those given using the aircraft (e.g., a porpoise).

Aircrew hand signals are used anytime the Wingman is close enough to see them, such as in the parade or cruise positions. Signals must be clearly visible to the other aircraft so therefore need to be slightly exaggerated and given above the canopy rail in plain view of the Wing. All signals will be cockpit to cockpit (i.e., SNFO to SNFO or IP to IP). As Lead, when initiating a hand signal, pass the signal first, pull the signal down, then look at the Wingman for a response (i.e., Wing returns a thumbs-up or executes the desired maneuver). This will reduce the time Lead spends looking aft and thus enhances both outside scan and basic airwork. SNFO shall demonstrate knowledge of all formation hand signals during the brief. While airborne, SNFO’s will only pass signals pertaining to radio communications, fuel, and HEFOE situations. In the training command, SNFOs will recommend to their IP to pass all other signals (i.e., “recommend crossunder,” “recommend cruise,” etc.). Pilots are the only crewmembers who may pass signals pertaining to formation management and configuration changes since they are the ones actually at the controls. SNFOs should inform their IP of the results of student-to-student signals. For example, “Wing is with us on button 6,” “Wing has 760 pounds of fuel,” etc.

Aircraft signals are reserved for when the Wingman is not close enough to see hand signals, such as when the Wingman is in combat spread. In the event the Wingman is outside hand signal range and an aircraft signal is not desired or doesn’t exist for the desired maneuver, use the tactical frequency to communicate.

201. AIRCREW VISUAL SIGNALS

<table>
<thead>
<tr>
<th>MEANING</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Affirmative (I understand, ready to go)</td>
<td>Thumbs-up, or head nod.</td>
</tr>
<tr>
<td>2. Negative (I do not know, not ready to go)</td>
<td>Thumbs-down, or head shake.</td>
</tr>
<tr>
<td>3. Wait</td>
<td>Fist held up with palm outward.</td>
</tr>
<tr>
<td>4. Ignore last signal</td>
<td>Hand waved in an erasing motion in front of face, with palm turned forward.</td>
</tr>
<tr>
<td>5. Numerals, as indicated</td>
<td>With forearm vertical, extend fingers to indicate desired number from one to five.</td>
</tr>
</tbody>
</table>
With forearm horizontal, extend number of fingers which, when added to five, gives desired number from six to nine. A clenched, upright fist indicates zero.

6. **Ejecting**
   Both clenched fists pulled downward across the face to simulate pulling a face curtain.

7. **Run-up**
   Extend arm vertically with two fingers extended. Rotate wrist forward and aft.

8. **Brake Release**
   Extend arm vertically with knifehand. Lower in a smooth chopping motion until horizontal. Once arm is parallel to deck or below canopy rail, release brakes.

9. **Fuel check**
   Raise fist with thumb extended in drinking motion.

10. **Cruise**
    Hitchhiking motion of thumb alternating over each shoulder.

11. **Crossunder**
    Extend forearm vertically with fist clenched, palm-side inward.

12. **Kiss off/Detaching**
    Fingers joined together on side of helmet (back of hand facing canopy), then make a splat motion toward Wingman, extending all fingers and back of hand against canopy.

13. **Rejoin to parade**
    Pat shoulder.

14. **Passing the Lead**
    Pilot taps the front of his helmet three times and then points across body to Wingman with a knifehand.

15. **Assuming the Lead**
    Pilot taps the Wingman-side of his helmet three times and then points forward with a knifehand.

16. **Prepare to extend/retract speedbrake**
    Open and close 4 fingers against thumb with fingertips pointing forward. Wing will extend/retract the speedbrake upon seeing Lead’s head nod.
17. Combat Spread
   Palm facing outboard, hand moved in a push away motion.

18. Battle Damage Check
   Cocked-gun signal.

19. Fan break
   Raise hand vertically (palm inboard), wave towards inside of cockpit in a “come with me” motion.

20. 3-second break
   3 fingers raised vertically.

21. Prepare to lower/raise gear
   Rotary movement of closed fist, fingers facing forward.

22. Lower/raise gear
   Move head forward, then sharply raise head up to headbox, actuating gear handle when helmet contacts head box.

   **NOTE**

   In the T-6, the landing gear and flaps are lowered and raised together. A separate raise/lower flap command is neither required nor expected. For gear extension, command flaps to the **TO** position after placing the gear handle in the **DOWN** position. For gear retraction, command flaps to the **UP** position after placing the gear handle in the **UP** position.

23. Prepare to lower/raise flaps
   Open and close four fingers against thumb with fingertips pointing aft simulating flaps.

24. Lower/raise flaps
   Following preparation signal, nod head forward then raises head sharply, actuating flap lever when helmet contacts the headbox.

25. Cleared to land
   Lead points to the runway then pats the glare shield several times.
Radio Communications:

**MEANING** | **SIGNAL**
---|---
1. Change radio to preset frequency | Tap ear, extend forearm vertically indicating PRI or AUX via numeral 1 or 2, then pass the one or two digit channel number.

2. Change radio to manual frequency | Tap ear, extend forearm vertically indicating PRI or AUX via numeral 1 or 2, then pass the 5 digit manual frequency.

Equipment Malfunction (HEFOE signals, used in the event of communications failure):

**MEANING** | **SIGNAL**
---|---
1. I am having difficulty | Arm bent across forehead in a “weeping” position. Followed by HEFOE numeral below, as appropriate.

2. Hydraulic trouble | One (1) finger extended upward

3. Electrical trouble | Two (2) fingers extended upward

4. Fuel trouble | Three (3) fingers extended upward

5. Oxygen trouble | Four (4) fingers extended upward

6. Engine trouble | Five (5) fingers extended upward

7. Radio receiver or transmitter inoperative | Tap ear or mouth, give thumbs-up or down, as appropriate.

**202. AIRCRAFT VISUAL SIGNALS**

**MEANING** | **SIGNAL**
---|---
1. Go to the parade position | Aircraft porpoise

2. NORDO or Knock-It-Off | Aircraft wing rock

**2-4 FORMATION VISUAL SIGNALS**
CHAPTER THREE
FORMATION EMERGENCIES

300. INTRODUCTION

Two general points can be made pertaining to formation emergencies. First, the aircraft with the emergency informs the other aircraft and handles the emergency in accordance with NATOPS. Secondly, each aircraft within the formation stands ready to lend assistance in an emergency situation. This assistance may be in the form of checklist backup, location of nearest airfields, communication coordination, exterior aircraft inspection, and/or a stable platform for Wing to reference. At the Lead’s discretion, as conditions permit, or as the emergency dictates, the aircraft with the emergency should be given the positional Lead (“bleeder is the Leader”) so that aircrew in the emergency aircraft can concentrate more fully on emergency procedures and checklists instead of flying formation. In a more serious or time sensitive situation, the emergency aircraft should simply fly as if they were a single in order to resolve the emergency. In this case, other formation members should simply get out of the way and assist only as requested. Position keeping should never be prioritized over interception of an ELP, descent below 10k,’ or any other immediate action item. Intraflight communication and mutual support is key to resolving any section emergency!

NOTE

Avoid the tendency to assist to the point of jumping in the emergency aircraft’s cockpit. A good technique is to be prepared to offer any assistance when requested.

As in previous training, the T-6A NATOPS Manual and NATOPS Pocket Checklist shall be used to address any emergency; however, there are a few unique considerations pertaining to formation flying which will be covered in the following paragraphs.

301. ABORTS

Serious thought must be given by the aircrew beforehand to the proper course of action that will be taken in the event of an aborted takeoff. There are two prime considerations. The first is the safe abort of the aircraft experiencing difficulty. The second is the safety of the remaining aircraft in the flight. For these reasons, the runway centerline is treated as a brick wall not to be crossed while another aircraft is in the vicinity. It is better to go off the runway than hit a Wingman. It is impossible to list all of the possible situations that might cause the flight to abort. The following are procedural guidelines that should be followed in the event of an abort.

These guidelines should be tempered with sound judgment combined with decisive action by the emergency aircraft’s aircrew.
For the T-6A aircraft, the following principles should be applied along with any applicable NATOPS procedures:

1. **Interval Takeoff.** If Lead aborts, Wing will abort. Lead must call, “Raider 11 aborting,” in order to alert Wing to abort his takeoff as well. This is known as a “sympathetic abort.” Wing should scan Lead’s takeoff roll for signs of abort or directional control issues.

2. **Section Takeoff.** Sympathetic aborts do not apply. If one aircraft aborts after brakes are released, the other aircraft should continue their takeoff. Do not transmit over the radio announcing the abort until after your Wingman is airborne (e.g., “Raider 11 aborting”). This will avoid confusion between the need for a single aircraft abort and a dual abort. Should a situation arise that requires both aircraft to abort simultaneously (e.g., another aircraft errantly taxis onto the runway); the person identifying that need shall call on TAC, “Raider, ABORT, ABORT, ABORT.” It is imperative that each aircraft maintain their own side of the runway and execute the abort procedures IAW the T-6A NATOPS. Maintaining directional control during the abort is crucial to its safety and success.

In either case, if Wing aborts, announce it over the radio only after the aircraft is under control and Lead is safely airborne. Lead will coordinate a plan to meet in the working area, return for landing, or may terminate the training event altogether.

### 302. MID-AIR/DAMAGED AIRCRAFT

The first consideration after a mid-air collision is to regain control of the aircraft and determine whether or not it can be flown. If control cannot be maintained, EJECT. Immediately separate the flight while keeping the other aircraft in sight if possible. Do not rejoin if the mid-air collision was with the Wingman. The aircraft with the most severe damage should be given priority to the closest landing site.

Damage can occur from a number of sources: mid-air collision, bird strike, stuck control surfaces, etc. If the damage was not due to a mid-air collision between the formation members, then the section may continue to fly formation and the ‘good’ aircraft can perform a visual inspection as necessary. The good aircraft should not attempt to fly parade, and configuration changes should be announced over the radio. Aircrew will follow the procedures for a controllability check from NATOPS, if required. In the final analysis, the pilot of the damaged aircraft must determine whether or not he/she can land safely and proceed to the nearest suitable field.

### 303. RADIO FAILURE

Before assuming a radio failure, both aircraft should check all radios, switches, circuit breakers, and connections. The NORDO (no radio) aircraft must communicate to the other aircraft, through hand signals, the exact nature of their problem. A NORDO Wingman will simply reposition to cruise or parade to pass the appropriate hand signals to Lead. A NORDO Lead will call the Wingman into parade to pass hand signals and subsequently relinquish the Lead. The aircraft with the operating radio will Lead the NORDO aircraft back to home field while
advising the appropriate ATC agencies of the situation. A desire by the NORDO aircraft to land immediately will be indicated to the Wingman by making a landing hand signal (repeatedly patting the glareshield).

In day VMC conditions, with no HEFOE signals passed, the Lead may take the NORDO Wingman into the break. The Wingman is cleared to land when Lead does a touch and go. If Lead does a low approach, the Wingman will waveoff and follow Lead into the downwind for another landing attempt.

In IMC conditions or when HEFOE signals are passed, the NORDO aircraft should expect an instrument approach at 120 KIAS and flaps takeoff. Lead will execute the NORDO Wingman Approach procedure to deliver Wing to a suitable landing position. Lead will be available for the NORDO Wingman to rejoin in the event they execute a missed approach or waveoff.

304. DOWN AIRCRAFT PROCEDURES

In the brief, assign the duty of On-Scene Commander (OSC) to the senior Naval Aviator or NFO in the flight.

In the event one aircraft in the formation develops difficulties to the extent that the crew is forced to eject or ditch, the responsibility of coordinating a Search and Rescue (SAR) is left with the remaining aircraft.

In the event of a SAR effort external to the section, the OSC identified in the brief may retain/be given the Lead, coordinate a flight split up or establish high/low orbits, make necessary voice reports, keep the downed aircrew and aircraft in sight, control the airspace, set a bingo fuel and formulate a recovery plan. The OSC may also follow procedures outlined in the In-Flight Guide or even assign OSC responsibilities to a member of the flight with more fuel and therefore greater on-station time.

Although it is important to get aid to the downed aircrew, the safe conduct of the remaining members of the flight is equally important.

305. LOST SIGHT

Lost sight is the term used when Wing loses sight of Lead due to encountering IMC, typically from the parade or cruise positions.

Lost sight when flying formation in IMC can be very disorienting and potentially dangerous. The two main priorities, in order, after losing sight are separation then communication. Procedures and associated communications are listed below for various situations. Both aircraft shall conform to the procedures below to ensure separation. Every second that Wing is “flying form” off a Lead he can’t see is another second closer to a mid-air collision. An uncontrolled, non-squawking Wingman alone in the weather is an emergency situation. Once separation is achieved, Lead must regain flight integrity by rejoining the section in VMC or establish ATC radar control of his Wingman as soon as possible and coordinate for a separate clearance.
Should the Wingman regain sight of Lead at any time, call “visual.”

1. Inadvertent IMC (flight on a VFR clearance) – Straight and level

Wing - Immediately transition to an instrument scan, execute a ½ Standard Rate Turn (SRT) away from the Lead for 30° of heading change, then call lost sight. Maintain the new heading for 30 seconds. When directed by Lead, turn another 150° away from the Lead using a ½ SRT.

Lead - Maintain straight and level flight for 30 seconds after Wing separates and communicates lost sight. Then, direct Wing to turn away from you to your reciprocal heading. Simultaneously, utilize a ½ SRT and turn away from the Wingman to your reciprocal heading. Once established on the new heading, the formation should visually reacquire each other as they return to VMC conditions. Direct a rejoin.

Example of communications:

Wing: “Raider 12, lost sight, heading 030.”

Lead: “Raider 11, heading 360.”

Wing: “Raider 12.”

After 30 seconds:
Lead: “Raider 12, you are cleared right to heading 180.”

Wing: “Raider 12.”

Wing turns right 150° to heading 180. Lead turns left 180° to heading 180.

2. IFR Clearance – Straight and level

Wing - Transition to instrument scan, execute a ½ SRT away from Lead for 30° of heading change, and call lost sight. Maintain new heading for 30 seconds, then turn to Lead’s heading when cleared.

Lead - Maintain heading and altitude and reply to Wingman’s initial call. After 30 seconds, clear Wing to turn back to your heading.

Example of communications:

Wing: “Raider 12, lost sight, heading XXX.”

Lead: “Raider 11, heading YYY.”

Wing: “Raider 12.”
After 30 seconds:

Lead: “Raider 12, cleared heading YYY.”

Wing: “Raider 12.”

3. Lead making a level turn INTO the Wingman

Wing – Transition to an instrument scan, slightly increase angle of bank, and call lost sight. In this case, separation occurs as a function of Wing’s “lost sight” call. It is imperative this call is made in a timely manner. Wing will continue the turn to 30° past Lead’s rollout heading. After 30 seconds turn to Lead’s heading when cleared.

Lead – Immediately roll wings level and notify Wing of your heading. 30 seconds after your ‘rolling out’ call, clear Wing to turn back to your heading.

Example of communications:

Wing: “Raider 12, lost sight.”

Lead: “Raider 11, rolling out heading XXX.”

Wing: “Raider 12.”

After 30 seconds:

Lead: “Raider 12, cleared heading XXX.”

Wing: “Raider 12.”

4. Lead making a level turn AWAY from Wingman

Wing - Roll wings level, transition to an instrument scan, and call lost sight. When directed, turn to Lead’s heading.

Lead – Acknowledge Wing’s lost sight call and continue turn to new heading (30° from Wing’s called heading). 30 seconds after Wing’s ‘rolling out’ call, clear Wing to turn back to your heading.

Example of communications:

Wing: “Raider 12, lost sight, rolling out heading XXX.”

Lead: “Raider 11.”

Lead: “Raider 11 rolling out heading YYY.”
Wing: “Raider 12.”

After 30 seconds:

Lead: “Raider 12, cleared heading YYY.”

Wing: “Raider 12.”

5. Climbs and Descents

Climbs

Wing - Level off then call lost sight with altitude.

Lead - Continue to climb to the cleared altitude or to an intermediate altitude ensuring at least 500 ft of separation from Wing.

Descents

Wing – Call lost sight. Continue descent to the cleared altitude or to an intermediate altitude at Lead’s direction.

Lead - Level off and provide direction to generate at least 500 ft of separation from Wing.

The previously discussed procedures for turns still apply. The guidance for climbs and descents provides a vertical deconfliction game plan in addition to the lateral deconfliction provided in sections 1-4. Here is a comm example for two compound lost sight situations.

Example 1:

Lead turning away from Wing and passing 6500 for 9000:

Wing: “Raider 12, lost sight, 6500, heading XXX.”

Lead: “Raider 11”

Lead: “Raider 11, passing 7000, heading YYY.”

Wing: “Raider 12.”

After 30 seconds:

Lead: “Raider 12, cleared heading YYY, climb to 8500. Raider 11 will be at 9000”

Wing: “Raider 12, 8500.”
Example 2:

Lead turning into Wing and passing 7500 for 5000:

Wing: “Raider 12, lost sight.”

Lead: “Raider 11, leveling 7500, heading XXX.”

Wing: “Raider 12, passing 6000 heading YYY.”

Lead: “Raider 12, cleared to 4500, Raider 11 will be at 5000.”

Wing: “Raider 12, 4500”

After 30 seconds:

Lead: “Raider 12, cleared heading XXX.”

Wing: “Raider 12.”

**NOTE**

In the above examples, Lead could have opted to level off at an intermediate altitude instead of the clearance altitude. Additionally, timing of turns and descents may necessitate that Lead direct heading’s prior to assigning altitudes or vice versa. In all cases, Lead must provide clear, timely direction to ensure a minimum 30° heading split for 30 seconds and/or 500’ of vertical separation.

6. Descending while established on an approach segment.

Wing – Transition to an instrument scan, execute a slight turn away to ensure separation, and call lost sight with altitude. Once altitude deconfliction with Lead is assured, honor the lateral guidance of the approach while establishing +500’ altitude separation from Lead. Commence the published or directed missed approach procedures at the appropriate point (MAP) while complying with the missed approach segment altitudes or missed approach instructions +500’.

Lead – Continue to descend on the approach.

Example of communications:

Wing: “Raider 12, lost sight, 900.”

Lead: “Raider 11, descending through 880, heading 070.”
CHAPTER THREE

T-6A FORMATION

Wing: “Raider 12, climbing to 1200.”

Lead: “Raider 11, passing 700.”

Wing: “Raider 12, level 1200.”

306. LOST COMM AND LOST SIGHT (LCLS)

If the formation goes lost comm and lost sight, flight members need some parameters to reference in order to attempt a rejoin. In the brief, provide a rendezvous point, assign altitudes for Lead and Wing (with at least 500’ of separation), and when to depart the rendezvous to recover as a single if a rejoin hasn’t been affected (usually joker fuel). The plan for LCLS will vary based on specific mission conduct. Adapt your plan to the mission/operating area/weather/training objectives of the day.

307. EJECTION

The most important consideration when ejecting is to clear your lift vector prior to initiating ejection. The lift vector is perpendicular to the Wing (i.e., “straight up”). Aircrew should avoid using the word “eject” over the radio to avoid potential confusion in other cockpits. Use euphemisms such as “pulling the handle,” “stepping out,” or “hitting the silk” if discussing ejection with your Wingman over the radio. However, if you have SA to a lethal situation for your Wingman (GLOC, impending collision with terrain, unrecognized fire, etc.), do not hesitate to command them to “EJECT!” over the radio in order to save their lives. Time permitting, notify the Wingman of your intentions so that they can provide support (backup with controlled ejection checklist, coordination with ATC, etc.). In a time sensitive/ immediate ejection required situation (e.g., unrecoverable OCF, catastrophic damage), don’t hesitate to clear your lift vector and eject immediately. The other aircraft will deduce/observe what has occurred and initiate OSC duties. If NORDO, pass the “face curtain” signal to communicate intentions.
CHAPTER FOUR
BRIEFING AND DEBRIEFING

400. INTRODUCTION

Formation stage presents the first opportunity for you to run a brief from start to finish. Your mentality when preparing and briefing should be that of a Mission Commander. Bring a practical, complete, and informed plan for executing the day’s mission to the brief. Gather all the pre-flight data you need to develop this plan. Examples include: training objectives for the specific event, individual required graded items for each student, FTI knowledge, weather, NOTAMs, instructor input, and schedule data (working area, times, side numbers, etc.).

Distribute products to each member of the flight. At a minimum this will consist of a kneeboard card (KBC); include a copy of the DD-175 and jet log as appropriate. Have contingency plans ready to go if your original plan won’t work anymore (e.g., bad weather in working area, original destination is closed, etc.) Use the briefing guide for the appropriate event and use it to ensure nothing is skipped and to keep the brief on track. Lead SNFO will Lead the brief overall, but work with your formation partner to divvy up portions of the brief and coordinate using models or the whiteboard to illustrate your talking points. When using models, illustrate as accurately as possible from your audience’s perspective, avoid “mid-air” collisions, and hold them by your side or set them aside on a table when not in use. Practice your brief and critique each other. “Teach” your instructors! SNFOs are expected to be able to brief every aspect of the flight, from time hack to the singles brief, step by step, with accompanying hand signals and radio communications, without error!

401. EXPECTATIONS

As you gain proficiency and experience, certain parts of the brief may be abbreviated or simplified since you have proven an understanding of and satisfactorily executed certain maneuvers and procedures in previous events. This does not absolve you from maintaining the level of knowledge and proficiency required to execute any maneuver or procedure. For example, just because you aren’t required to perform a NORDO Wingman approach procedure after your first two formation flights doesn’t mean that you can jettison that knowledge. As you move from primary to intermediate, your brief will evolve so that you have more time to discuss new maneuvers and procedures. These require in depth discussion and briefing. For your first brief, things are still new so expect to spend ~90 minutes briefing. Aim for no longer than 60 minutes for subsequent briefs.

For example, discussion of taxi admin for the first parade form flight should contain a level of detail similar to this: “Lead will taxi on the downwind side of the longest taxiway, centered on their half. Wing will offset, centered on the opposite side of the taxiway, and keep the tip of the horizontal stab over the inboard CFS door. Approaching the hold short or at Lead’s direction, Lead will switch the section to tower frequency. Lead will pull into the hold short as normal and Wing will taxi into position to match his example. Each aircraft will independently perform their Overspeed Governor check, give a departure brief, and conduct a Before Takeoff checklist. Lead and Wing will then simultaneously perform the STEPFALL checks on each other’s aircraft. STEPFALL stands for: Strut extension, Tire inflation, Engine cowling secure, Panels secure,
Flaps at takeoff. Antennas secure, no visible Leaks, and navigation and anti-collision Lights on. Each SNFO will notify their IP that STEPFALL is complete and that the other aircraft appears ready for flight. Wing IP will then pass a thumbs-up signal to Lead. Lead IP will return a thumbs-up. Lead SNFO will then switch to Base and call ‘KATT 21, flight of two, going flying.’ Then Lead SNFO will switch back to Tower frequency and call, ‘Tower, KATT 21, flight of two, takeoff IFR.’ Lead SNFO will look back to ensure that Wing SNFO passes a thumbs-up to signal they heard the radio transmission.”

Briefing a taxi on subsequent flights can be reduced to something like this: “We will taxi to the hold short and do our Overspeed Governor and Before Takeoff checklists. Then we’ll do the STEPFALL checks. Lead will return Wing’s thumbs up and then call Base for the ‘going flying’ call and then call Tower for takeoff.”

Of course, during the flight you will do everything from the first, longer example but there’s no need to hash it out in such detail every time you brief.

These examples are not a script for you to memorize, but instead shows the level of detail that needs to be explained for different flights. If it’s new to you, brief it in detail. If not, brief as required to accomplish the procedure or maneuver. As always, if you cannot perform in the brief, then you almost certainly will not be able to perform in the air. Practice and observation of other student form briefs are essential prior to your event. Both students must know the roles of both Lead and Wing. A well-practiced and polished brief tends to Lead to a smooth event.

Remember, “as goes the brief, so goes the sortie!”

When briefing the section, only brief those items that pertain to the section. For example, when briefing aborted takeoff emergencies, cover Lead’s and Wing’s responsibilities during a section and interval takeoff, but do not go into the boldface of “PCL-IDLE, Brakes-As required” because that procedure applies to the individual aircraft, not the section. Following the formation brief, each crew needs to conduct a “singles brief” to cover the remaining items applicable to each crew such as: CRM, comm/nav set up, signal passage cadence (if applicable), and NATOPS emergency brief.

Students will prepare kneeboard cards (KBC) for all crewmembers and distribute them at the beginning of the brief. Make sure that your KBC matches your brief and your plan! The KBC is a tool for you to use in the plane to keep the mission tracking, provide some reference information, and a dedicated place to annotate notes. Edit the conduct box so that it reflects exactly what you plan on doing. If there is information that you don’t know yet (side numbers, for example) simply leave the box blank. If, during the brief, you are able to fill in missing information, direct everyone to make a “pen-and-ink change.” Similarly, if you detect an error or need to change information on the KBC during the brief, that’s ok, simply tell everyone to “pen-and-ink” the change. Make the KBC as accurate and useful as possible.

In accordance with the General Planning FLIP, the number of aircraft must be included on the DD-175 along with the type of aircraft. For a T-6A section, “2/TEX2/G” should be filed.
Prior to the brief, sync your watch with the USNO so that you have a time reference that is accurate to the second. Begin the brief with an on-time hack at your scheduled brief time. For example, “In 30 seconds the time will be 1500 Zulu. 10 seconds. 3, 2, 1, hack. Time is 1500 Zulu. Good morning, welcome to our FRM4101.” Good time hacks have tactical implications in the future. The aircraft’s time reference (GPS) can be lost or jammed so it’s essential that every member of your mission have an alternate, synchronized time reference.

As applicable, training rules will be read as part of the TAC Admin portion of the brief. Ensure that you understand what they mean and can abide by them when airborne. “Inadvertent Departure from Controlled Flight Boldface” means that someone must recite the boldface.

For cross country and out/in flights, coordinate with your instructors to develop a plan. Each SNFO is required to perform a certain amount of approaches as Lead and Wing, so make sure to check the MCG for specific training objectives and develop a route and terminal approach plan that fulfills the training requirements. Off station briefs and debriefs will be conducted using the in-flight guide.

402. THE BRIEFING BOARD

The briefing board is used to convey important mission information to the members of the crew and provide a briefing tool for illustration of salient points. As such, it should be professional in appearance, neat, and legible. Reference the briefing guide for a template and adapt as needed for your brief. Use colors to identify various items pertinent to the flight. Blue and green are generally used for friendly forces, airfields, terrain, etc. Orange, red, and yellow for are used for opposing forces, targets, hazards, TFRs, etc.

403. DEBRIEF

After landing, reconvene the flight to conduct a debrief. Use the debriefing guide to keep the debrief on track. Do not simply recap the event, rather, bring out mistakes that were made and learning points gleaned from those mistakes. The bullets in the debriefing guide are there as memory joggers, not required items. For example, if everything went fine with the FENCE-out, there is no need to mention it at all. Try to be comprehensive in self-critique. Use your notes from the flight as needed to provide reminders in the debrief and feel free to annotate further notes for use in subsequent event preparation. Remember to ask for input following each section of the debrief. Instructors will fill in the gaps, answer questions, and identify learning points that were missed. Consider the wrap-up a short highlight reel of what was discussed in the debrief. Mission objectives should simply be identified as a success or failure. Similarly, training objectives are simply met or not met. For ‘goods/others’, pick a couple things you did well and a couple of the most important things that need improvement.
CHAPTER FIVE
GROUND PROCEDURES

500. INTRODUCTION

The ground procedures listed below allow a section to safely transit to the departure runway utilizing previously mentioned flight discipline.

501. GROUND PROCEDURES

The following ground procedures will be common to all formation flights:

1. Aircraft issue and preflight will be conducted in the same manner as previous syllabus flights; however, students should note the position of their Wingman’s aircraft on the flight line. Often, the aircraft will be parked next to each other, enabling the aircrew to observe if an aircraft in the flight is having difficulties prior to check-in. Regardless of where the flight is parked, always remain apprised of your Wingman’s progress.

2. Once the formation aircraft have been located in relation to each other, all normal checklists will be completed through the Taxi Checklist (holding on ‘Turn and Slip Indicators’ if marshalling in the line). Both aircraft will copy ATIS. Wing will monitor Clearance Delivery while Lead requests/copies the clearance. Prior to check-in, aircraft will marshall as briefed. After completing the check-in/nav check, Lead will switch to base for the “taxi outbound” call with both side numbers before requesting taxi clearance from ground for the flight. Wing switches to ground and plans his taxi to follow Lead. During the start-up process but prior to taxi, should Wing require more time than normal before proceeding (troubleshooting, changed airplanes, etc.), they should keep Lead apprised on TAC (i.e., “Raider 12 needs two mikes for troubleshooting”). Lead will wait until both aircraft are ready to proceed before initiating taxi.

3. The request for clearance to taxi will be made to ground control per standard local area operations. All aircraft in the flight will copy clearances and dial in the appropriate transponder code and altimeter setting.

4. While taxiing to the hold-short area, Lead will choose the downwind side of the longest taxiway in use and comply with the taxi instructions. Each subsequent member of the flight will taxi an equal distance but on the opposite side of the centerline from the aircraft directly in front of them for FOD considerations. The visual cue for proper taxi position is having the tip of the near elevator aligned over the yellow Canopy Fracturing System (CFS) door; however, under no circumstance should the aircraft be closer than 1 plane length (33 feet). When in the line or on narrow taxiways where Lead chooses to taxi on centerline, Wing will match Lead’s example and follow no closer than 100 feet in trail for FOD avoidance.

Approaching the hold short, Lead will switch the section to tower frequency. A positive check-in on Tower frequency is not required. The Lead aircraft will position themselves in the run-up area leaving sufficient room for Wing. Wing will taxi into a matching position next to Lead, matching his orientation. At this point, each SNFO will direct an Over-Speed Governor
and Before Takeoff Checklists, and give their Departure Brief. When ready for takeoff, aircraft will conduct an integrity check on each other. A subsequent “thumbs-up” signal signifies that the aircraft is on tower frequency, has completed all checklists satisfactorily, and that the other aircraft appears ready for takeoff through the following integrity checks (STEPFALL):

a. Struts: observe proper extension
b. Tires: observe proper inflation
c. Engine Cowlings: secured
d. Panels: secured
e. Flaps: set in T/O position
f. Antennas: secured
g. Lights: anti-collision lights on
h. Leaks: none visible

5. Wing IP will pass thumbs up to Lead IP upon completion of the integrity check. Lead IP will return a thumbs up. Lead SNFO will switch Base for the “going flying” call prior to contacting tower for takeoff for the flight of two. When calling for takeoff, the Lead SNFO will ensure Wing is on frequency by looking for a thumbs up during the transmission.

6. If, while issuing the takeoff clearance, Tower clears the flight to “Change to Departure frequency,” the flight will switch as directed. Neither a positive switch from Lead nor check-in on departure is required.

7. The entire flight will comply with tower’s instructions. All aircraft will complete the Lineup Checklist while taxiing into position on the runway. Lead will squawk “altitude” and all other aircraft will squawk “standby.”
CHAPTER SIX
SECTION DEPARTURES

600. INTRODUCTION

The departure phase of flight consists of the following:

1. Takeoff (Section/ Interval/ Individual)
2. Rendezvous/ Join-up
3. Transit to working area

In order to execute a takeoff involving more than one aircraft operating under the same clearance (e.g., a formation takeoff), the flight must have circling minimums for the runway in use or 1000 foot ceilings and 3 miles visibility in the event circling is not authorized (CNAF M-3710).

601. TAKEOFF

Ceiling and visibility are the primary factors determining which type of takeoff the flight will use. When weather is greater 1000/3, there is sufficient space below the ceiling for the Wingman to accomplish a rendezvous so an interval takeoff is preferred. When weather is less than 1000/3 but greater than circling minimums, there is insufficient space for the Wingman to execute a rendezvous. The section must therefore depart together via a section takeoff. If the weather is less than circling minimums, the section must depart under separate clearances as singles.

Think of the interval takeoff as the default way to depart an airfield. If weather dictates otherwise, flex to a section or singles takeoff. Keep in mind that departing as singles will require coordination of a second clearance and squawk for the Wingman. A section takeoff may also be accomplished simply to complete a training objective, such as during a primary parade formation event. If a section takeoff is required, remember that there are certain restrictions associated with performing a section takeoff in the T-6A.

Whether executing an interval takeoff or a section takeoff, taking the runway and performing the run up are accomplished in the same manner.

1. The Lead will call for and receive clearance for takeoff for the entire flight using the procedures outlined in Chapter 1. Lead should check the wind sock for prevailing winds, or make a mental note of the winds provided by tower in the takeoff clearance.

When cleared, Lead should taxi onto the active runway and center themselves on one half of the runway according to the following criteria (Figure 6-1):

a. If there is a crosswind, the Lead will position his aircraft on the downwind side of the runway (the wind sock will point to Lead’s side which puts the “Wingman into the wind”). This will allow the wind to blow his prop wash off the runway, avoiding adverse effects on Wing’s takeoff roll.
b. If the winds are calm or straight down the runway, the Lead will position on the far side of the runway.

2. The Wing will follow the Lead, center their aircraft on the other half of the runway, and move forward until the leading edge of their Wing is in line with the trailing edge of the Lead’s horizontal stabilizer. This is the position Wing will maintain during the takeoff roll on a section takeoff. Both aircraft should work expeditiously to complete the lineup checklist, switch to appropriate departure frequency (as directed by tower), and get into position. If cleared to “line up and wait,” the section will pause after positioning on the runway and completing the line-up checks. After subsequently receiving takeoff clearance, Lead will respond to tower and Wing IP will pass a thumbs-up signal to the Lead IP signifying their line-up checks are complete, they are in position, and are ready to continue the takeoff sequence.

3. Upon receipt of Wing’s thumbs-up signal, Lead IP will give the run-up signal. Both aircraft will set 30% torque, check their aircraft gauges for normal indications, and perform a quick visual inspection for anomalies on the other aircraft. If Lead’s aircraft looks good and when ready for takeoff, Wing IP will pass a thumbs-up to Lead.

602. INTERVAL TAKEOFF

The Interval Takeoff is commonly known as the “5-second go” in the T-6 due to the time spacing required between aircraft. It accomplishes a formation takeoff without the risk of the aircraft being in close proximity to each other on the takeoff roll, mitigating the risk of a dual high-speed abort. It also allows for the Wingman to execute a join and, in future platforms, perform certain radar and weapons checks immediately after takeoff. All aircraft in a flight takeoff in order and accomplish their join-up while the Lead is departing. If done properly the result is a safe, expeditious, and economical formation takeoff and departure.
1. When cleared on to the runway, the flight will position and run-up as discussed in Section 601.

2. Lead: Upon receipt of Wing’s thumbs-up, Lead IP will give the kiss off signal to Wing and then execute a normal takeoff maintaining the proper half of the runway. When safely airborne, Lead will clean up, reduce power to 90%, and maintain 160 KIAS to facilitate the initial join-up. The Lead will comply with appropriate departure procedures, making any required turns utilizing 30º AOB or less. If level-off should be necessary prior to rejoin, Lead will maintain 160 KIAS. Lead SNFO will contact departure once he sees looks back and sees Wing is safely airborne. If a cloud layer is encountered during the climb that might cause Wing to lose sight, Lead will level off below the cloud layer. Once Wing is aboard and stable in the parade position or the flight path above is clear of clouds, Lead will continue the climb to the assigned altitude.

3. Wing: As Lead kisses off Wing and starts his takeoff roll, Wing will wait 5 seconds, release the brakes and conduct a normal takeoff on the appropriate half of the runway. Wing should monitor the progress of Lead’s takeoff for signs of abort or directional control issues. Wing will use a running rendezvous, CV rendezvous, or combination of the two to affect a join.

**WARNING**

Wake turbulence or Lead aircraft propeller wash may result in severe degradation of trailing aircraft controllability during takeoff.

603. SECTION TAKEOFF

The section takeoff has two practical advantages. Firstly, it eliminates the need for a rendezvous. This is advantageous and often required in marginal weather conditions. Secondly, and less importantly, the section takeoff is more expeditious than an interval takeoff.

The following conditions must be met in order to perform a Section Takeoff:

a. The maximum crosswind is 10 knots for a dry runway and 5 knots for a wet runway.

b. No standing water on the runway.

c. Minimum runway width is 150 ft.

1. When cleared on to the runway, the flight will position and run-up as discussed in Section 601.

2. Lead: the Lead pilot will raise his/her arm vertically above the canopy rail. After a slight pause, the Lead pilot will drop their arm smoothly in a karate chop motion. When the pilot’s arm reaches horizontal or drops below the canopy rail, Lead will release the brakes and set 90% torque.
3. **Wing:** At the completion of the Lead pilot’s karate chop motion, the Wing pilot will release brakes and set max power. During the takeoff roll, the Wing pilot will remain centered on his half of the runway and stay in proper position utilizing Power Control Lever (PCL) adjustments (minimal differential braking may be used until the rudder becomes effective). In situations where the Wing pilot cannot maintain position with available PCL settings, they can transmit “power” on the tactical frequency to tell the Lead to add power and “gimme a couple” to tell the Lead to slightly reduce power.

4. During the takeoff roll, the Lead SNFO has the responsibility of monitoring the Wingman’s position and progress while the Lead pilot calls the standard takeoff dialogue on ICS. Wing SNFO is responsible for the standard takeoff dialogue on ICS while the pilot maintains proper position. Obviously, both SNFOs should monitor the overall progress of the takeoff for safety as well. As per the Takeoff Checklist, the “MIN POWER at 60 KIAS” will not be 100% when power is set at 90%; instead, call the percentage displayed.

5. Approaching 85 KIAS, the Lead pilot will smoothly rotate to the takeoff attitude. Wing will match the Lead's attitude. As both aircraft reach flying speed, they should become airborne at the same time, both having approximately the same attitude, weight, and airspeed.

6. Once airborne, the Wingman will continue to maintain the same position on Lead. Reaching a safe altitude, the Lead SNFO will survey the Wingman ensuring they are safely climbing away from the ground and are in position to see the gear retraction signal. The Wing SNFO will inform their pilot “Above 110 knots” over ICS in preparation for the raise gear signal. Passing 110 KIAS, the Lead SNFO will report “Above 110 knots, Wingman in position” over the ICS. The Lead pilot will then give the “head nod” signal to raise the landing gear and flaps. Both pilots will raise their gear and flaps simultaneously. The Wing IP will pass a “thumbs-up” signal to inform Lead that Wing’s landing gear and flaps indicate up and locked and that Lead’s gear and flaps appear to be up and locked. Each SNFO will notify their pilot on ICS that their respective aircraft is clean by saying “Gear and flaps up at ____ knots.” Wing will then transition to the parade position. Throughout this phase, both students will continue to monitor position and instruments, paying particular attention to airspeed.

Steps for the Section Takeoff are:

a. Lead SNFO receives clearance for takeoff and the flight switches to departure.

b. While taxiing onto the runway both aircraft complete Line-up checklists.

c. Wing IP lines up utilizing visual cues off Lead and gives a thumbs-up when on departure frequency, in position and ready for run-up.

d. Lead IP gives the run-up signal, sets 30% torque; checks engine instruments, and then monitors Wing IP for a thumbs-up.

e. Wing IP sets 30% torque; checks engine instruments, and gives Lead IP a thumbs-up when ready for takeoff.
f. The Lead pilot will give the section takeoff “karate chop” signal and set power to 90%.

g. Once airborne, Wing SNFO will report “Above 110” and Lead SNFO will report “Above 110 knots, Wingman in position” over ICS to notify each pilot a safe airspeed is attained for gear retraction. The Lead pilot will then give the raise gear and flaps “head nod” signal. Both aircraft will raise the gear and flaps simultaneously.

h. When Wing’s gear and flaps indicate up and Lead appears up and locked, the Wing IP will give a “thumbs-up” to Lead IP. Each SNFO will announce, “Gear and Flaps up at ____ knots” over the ICS. Wingman will move to parade position.

i. The Lead SNFO contacts departure.

604. RENDEZVOUS

A rendezvous is the means by which a flight joins together. The briefed departure rendezvous can be a CV (circling) rendezvous, a running rendezvous, or combination thereof.

1. CV Rendezvous. The CV Rendezvous is used to join a flight in a turn. After takeoff, Lead begins a 30º AOB climbing turn at a briefed airspeed. When safely airborne and cleaned up, Wing executes a turn inside the Lead’s turn to intercept the 45º bearing line. Wing must maneuver to place Lead on the horizon, while maintaining rendezvous bearing and control of proper closure rate. The Wingman should monitor airspeed until close enough to visually discern relative motion. When the Wing is on the bearing line and within three wingspans, he will consummate the join-up by executing a crossunder into the VMC parade turn away position. If performing a level rendezvous, Lead will maintain constant airspeed, altitude, and AOB until the Wingman is in the parade turn away position.

2. Running Rendezvous. Also known as a “runner.” The running rendezvous is used to join a flight while proceeding straight on a course. It is normally the initial procedure following an interval takeoff. Lead will climb at a reduced power setting (maximum 90%) in order to allow the Wingman to close sufficiently. Once sufficient closing airspeed has been attained, Wing should place Lead on the horizon for the duration of the running rendezvous.

The most important aspect in a running rendezvous is for the Wingman to set the appropriate lateral distance from the Lead’s longitudinal axis. This distance is critical because visual closure cueing is derived from the Lead’s aircraft tracking aft on the Wingman’s canopy. If too wide, the Wingman will arrive on bearing line with a large distance to traverse in order to join. If too narrow, the Wingman may not recognize closure early enough when approaching the bearing line; also, closure on any aircraft is most difficult to perceive when approaching from directly behind and could result in a flight hazard due to an excessive closure rate. Wing will offset laterally approximately 200 ft (six wingspans). Once attained, the Wingman should concentrate on flying the aircraft on a straight line that parallels Lead’s flight path until arriving on the 45 degree bearing line. Airspeed must be monitored to control closure until relative motion can be visually discerned. Wing should remain on bearing line with no more than 10 knots of closure.
Once stabilized on bearing line with closure under control, the Wingman will complete the join by moving up the bearing line into the parade position.

Most departures consist of a series of turns and straightaways. Should Lead enter a turn during a running rendezvous, Wing will move to the inside of the turn and transition to a CV rendezvous. Likewise, should Lead roll out of a turn during a CV rendezvous, Wing should transition to a running rendezvous until joined. If operating without external control (i.e., not under ATC control) or executing a join in the working area for training, the Lead can control which side of the formation the Wingman ends up on by transitioning from a turn to straight and level or vice versa, thus forcing the Wing to transition from CV to running rendezvous or from runner to CV. If a full join to parade is not required for training objectives or weather reasons, the Lead SNFO may brief a join to cruise. However, a full, professional join all the way to the parade position is the default for a rendezvous. If parade position is not required (i.e., for weather penetration), the Wingman should be released to cruise once the join is complete.

**605. OPERATIONS CHECK**

After contacting departure on the climb out each aircraft will individually accomplish their first operations check. Subsequent operations checks should be individually accomplished at least every 20 minutes, and after each section fuel check.

**606. INDIVIDUAL CLEARANCES**

When weather conditions at the field prohibit a formation takeoff or training requirements require individual departures, the flight should file and brief separate takeoff clearances then execute a join-up airborne.

On start-up, each aircraft needs to contact clearance. Following check-in, Lead SNFO will clear Wing to taxi as a single. For example, “Raider, no questions, cleared outbound as singles.”

When executing an instrument route, Lead will request to hold at a clear altitude (usually at the first enroute point) for flight join up. When using an ATC controlled working area (MOA, Warning Area), Lead will check-in, get established in the area, and inform ATC that Wing will be joining momentarily. If ATC asks if Lead will assume MARSA (Military Assumes Responsibility for Separation of Aircraft), respond in the affirmative. Lead may preemptively inform ATC that they will assume MARSA.

On initial check-in, Wing will inform ATC that they are joining with the Lead. Aircraft will coordinate on TAC to ensure 500’ of vertical separation and comply with navigation or geographic rendezvous procedures, as applicable. Once Wing has Lead in sight, they will call as such to ATC, cancel their IFR clearance, secure their transponder, and proceed with the join. From ATC’s perspective, the flight has joined at this point. Once Wing is aboard, the Lead will either 1) coordinate with ATC to exit the hold and continue on the route or 2) continue with briefed conduct in the working area.
607. NAVIGATION/GEOGRAPHIC RENDEZVOUS

Navigation Rendezvous

A navigation rendezvous is a visual, turning rendezvous employed to join a flight using a fix that can be defined by the aircraft’s navigation system. This fix may be a NAVAID, radial/DME combination, intersection, airport, or even a lat/long.

Rendezvous parameters define the size and position of the turn circle. These include the fix itself, turn direction, radial inbound or outbound from the fix, AOB, airspeed, and altitude. 30 degrees AOB and 200 kts can be assumed if not directed otherwise.

In the below example, the rendezvous can be defined as “BFM 131/13, left turns inbound, 14,000 feet” if using the radial/DME method to define the fix.

If using any other point as the rendezvous fix, such as Sonny Callahan airfield (KCQF) in the below example, the rendezvous can be defined in two ways: “KCQF, 131 radial, left turns inbound” -or- “KCQF, 311 radial, left turns, outbound.”

For Figure 6-2, the GPS could be set to either BFM with the 131 radial in OBS or KCQF with the 131 radial in OBS mode. For the former, you would fly to 13.0 DME and the latter, overfly the waypoint.

Reference points around the rendezvous circle are numbered one through four, with point one located at the fix and remaining points located at 90° intervals around the circle.
Figure 6-2 Navigation Rendezvous

Procedures:

Lead:
- Pass rendezvous parameters to Wing, if changed from brief or executing an ad hoc rendezvous.
- Set up an orbit, complying with the parameters and ensuring you cross the fix on each orbit.
- Transmit each 90° position number until Wing calls "visual." Ex. "Point 2" on TAC.
- Monitor the rest of the rejoin and maintain a stable platform.

Wing:
- Ensure a minimum 500 foot stepdown from the rendezvous altitude.
- Cross point one tangent to the rendezvous circle by tracking the prescribed radial prior to the fix then set the turn parameters. Use Lead’s position reports to narrow the visual search area. Talk the pilot’s eyes onto Lead, and report “visual” over TAC once both crewmembers have sight.

The mechanics of a navigation rendezvous may be completed with a visually significant landmark as the rendezvous fix but the rendezvous will be less precise since the navigation system won’t be available to provide exact guidance.
Geographic Rendezvous

A geographic rendezvous is accomplished using a visually significant geographic feature that is placed at the center of the Lead’s turn circle (also known as the “post”). It differs from the navigation rendezvous in that the parameters aren’t as strictly defined and aircraft systems aren’t required to define the rendezvous.

To coordinate a geographic rendezvous, Lead may simply provide a rendezvous point, altitude, and airspeed. Lead will maintain an angle of bank at the directed airspeed to orbit about the landmark. Points about the circle won’t be called since there is no radial reference point.

Wing will fly to the point at the appropriate altitude, gain visual, then join.

Consummating a Navigation or Geographic Rendezvous

When visual, the Wing SNFO will direct the aircraft to intercept Lead’s rendezvous bearing line, monitor closure and fuselage alignment, direct a climb to rendezvous altitude, and direct the remainder of the join.

Wing should cut to the inside of Lead’s turn and maneuver to put his nose just in front of Lead (Lead pursuit) then roll wings level in order to close distance. This will cause Lead’s aircraft to track across Wing’s canopy. When Lead’s aircraft has moved approximately 30° across Wing’s nose, Wing should make another level turn to put his nose back in front of Lead to continue closing. Continue these turns until close enough to visually breakout the vertical stabilizer and opposite wingtip in order to maintain bearing line. With closure under control (200 +/- 10 KIAS) and fuselage alignment between the two aircraft achieved, Wing can climb to Lead’s altitude and complete the remainder of the rendezvous just like a breakup and rendezvous.

If Wing gains visual of Lead and Lead is aft of Wing’s wing line, Wing must first fly to the post before starting the level turns to close distance. Without this step, the intercept angles generated become excessive for a normal, safe rendezvous.

608. SECTION INSTRUMENT NAVIGATION/IMC OPERATIONS

Administratively transiting from place to place as a section operating under IFR with ATC control is mostly the same as single-ship operations with some additional considerations and caveats. Section capabilities in the instrument environment are robust. It is entirely reasonable and possible for the section to depart via section takeoff into circling minimums, fly the entirety of the route in IMC, and then break out at circling minimums at the destination for a section drag recovery.

Intermediate students should use the full capability of the aircrafts navigational system during instrument flights and use the GPS to augment their instrument procedures, navigation solutions, and calculations. Intermediate students should also use GPS Map mode to the maximum extent practical. Additionally, Intermediate SNFOs shall adopt an owning mindset for manipulation of the RMU, GPS, and HSI map. Pilots should not manipulate any of these systems unless a
Discussion takes place with the SNFO or for safety of flight reasons. SNFOs shall manage the HSI map content so that the scale and information displayed are SA enhancing and pertinent to the aircrafts phase of flight.

ATC may ask if you are in standard or non-standard formation. The FAA Pilot/Controller Glossary defines a standard formation to be one in which each Wingman is within 1 mile laterally or longitudinally and 100 feet vertically of the flight Leader. Nonstandard formations may be approved by ATC if the flight Leader requests it. When in clear air and cleared to the cruise position, the Wingman may utilize the cruise position or the “ATC Spread” position. ATC spread in the T-6A is 0.5 miles abeam +/- 100’ from Lead. Lead may append “standard” to the end of their enroute check-ins if they so desire. For example, “Jacksonville Center, KATT 16, flight of two, level 230, standard.”

Choose cruising altitudes that keep the section out of IMC, if possible. For example, if in the last 1000’ of your climb to FL240 you encounter IMC for the first time, it is prudent to request a new final cruising altitude of FL220 since you know it is clear. The effects on fuel use are negligible, it complies with hemispheric cruising altitude rules, and it will significantly reduce your Wingman’s workload (e.g., IMC parade). Always check the new cruise parameters (fuel burn, flight level winds, etc.) against your original plan via standard INAV turnpoint procedures.

Remember, Lead maneuvering performance is limited while the Wingman is in parade (30 degrees AOB, 20-90% torque). Let Wing utilize the cruise position as much as possible. Bring Wing into parade only as needed. Keep an eye on upcoming cloud layers and weather obscurations. Direct the Wingman into parade with plenty of time to spare prior to penetrating any weather. Wing should scan ahead of the section and proactively move into a close cruise position if anticipating weather penetration, even if not directed by Lead.

While in IMC parade, the pilot’s task loading can be extremely high, especially when position keeping is made difficult by heavy rain, dense clouds, or turbulence. Simple tasks like manipulating the GPS or studying charts and plates can become difficult or even impossible. Pilots are much more vulnerable to vestibular disorientation and visual illusions in IMC or nighttime when nearly their entire scan is outside the cockpit. NFOs can make a huge positive impact to safety and situational awareness in these situations. Monitor position keeping and if you think your pilot is becoming disoriented or admits as much, give SA enhancing calls like “we’re level,” “200 knots,” “600 fpm descent”, etc. It can be nearly impossible to “feel” these attitude changes when flying close formation. Timely calls like these can reset a pilot’s understanding of the aircraft attitude and prevent disorientation. Since it may be harder for your pilot to scan your system setup, verbalize your inputs. For instance, say which ILS you tuned, the GPS’s current configuration, course selected, etc. That way, when they glance down, the pilot can discern quickly what the instruments are displaying. Breakup your briefs into smaller chunks so that the information is easier to process. Effective CRM can be as much an art as it is a science so use your best judgement or ask your pilot when deciding how much to assist or verbalize.
PARs are available to flights operating in section. In addition to “proceeding visually,” the approach may also be terminated by simply detaching the Wingman. The controller will observe target separation, terminate the approach, and instruct the flight to contact tower.

If touch and go landings or a break are required or desired following instrument approaches, the Lead SNFO will add “followed by tower downwind” or “depart and re-enter for the break” to the initial approach line up request. When switched to tower on the last approach, Lead will check-in and request either “tower downwind for touch and go landings” or “depart and re-enter for the break.” Sections may continue to operate under one call sign or ask tower to provide individual landing clearances. Once complete with pattern work, the section may rejoin on deck and taxi together.
CHAPTER SEVEN
SECTION RECOVERY

700. INTRODUCTION

The recovery phase will commence once TAC Admin is complete and conclude upon engine shutdown. Since most formation flight will normally be flown as “out-and-ins,” SNFOs must be prepared to Lead the flight into airfields other than home field. In order to be familiar with airfield operations, SNFOs should review applicable publications (VFR/IFR Supplement, General Planning (GP), Read and Initial (R&I), Fixed Wing Operating Procedures (FWOP), etc.). There are a number of ways to proceed from the working area to the airfield (depending on traffic, weather, etc.). These include VFR navigation, VFR flight following, and ATC control.

701. RECOVERY OVERVIEW

Upon completion of TAC Admin, the flight will be ready to initiate the recovery phase. This phase will consist of the following:

1. Working area check-out procedures (if applicable)
2. Radio frequency changes and gathering ATIS/AWOS/ASOS
3. Descent
4. Request to ATC or CTAF call
5. Required checklist(s) and briefs (e.g., descent checks, field brief, approach brief)
6. Break or instrument approach

702. WORKING AREA CHECK-OUT PROCEDURES

It is imperative that SNFOs develop a suitable game plan for the radios in order to smoothly exit the working area and execute the recovery. Things to consider when the flight is preparing to leave the working area for the destination airfield are the need to get ATIS, required exiting/ATC coordination calls, and transition with the controlling agency (if applicable). If the Lead SNFO does not have a good plan for the radios, it will quickly become apparent. If there isn’t sufficient time to retrieve ATIS while in transit to the field, ensure that ATIS is retrieved prior to leaving the working area. ATIS may be retrieved several ways. The Wingman may be directed to get ATIS on the controlling band or tactical band or Lead may retrieve ATIS on either the controlling or tactical band. For example:

1. Wingman directed to get ATIS on controlling band or tactical band:

   Lead: “Raider 12, cleared off [PRI or AUX] for ATIS.”
Wing: “Raider 12.”

Once ATIS is obtained, Raider 12 switches back to the previous controlling frequency or TAC frequency and passes ATIS to Lead on TAC:

On TAC:

Wing: “Raider 12, up with information Foxtrot.”

Lead: “Raider 11, ready to copy.”

Wing: “Winds 120 at 10, better than 5000 and 5, 3009, Runway 7R.”

Lead: “Raider 11.”

Keeping both flight members on the tactical frequency is preferred but short excursions may be made from TAC at Leads direction. For example:

2. If the Flight is being controlled by ATC on AUX and Lead elects to use the Wingman to get UHF-only ATIS.

On PRI:

Lead: “Raider 12, cleared off PRI one mike for weather.”

Wing: “Raider 12.”

Wing subsequently tunes ATIS in PRI, copies the information (Alpha, in this example), and switches back to PRI TAC.

On PRI:

Wing: “Raider 12, back up with Alpha.”

Lead: “Raider 11, ready to copy”–or– “Raider 11, send it”–or– “Standby.”

3. If the Lead elects to retrieve VHF-only weather while being controlled by a UHF frequency.

On AUX:

Lead: “Raider 11, off TAC one mic.”

Wing: “Raider 12.”

Lead subsequently switches off TAC to retrieve the weather then returns to TAC.
On AUX:

Lead: “Raider 11 back up with Alpha, winds xxx/xx, altimeter xx.xx, runway xx in use, plan on [overhead, approach, etc.].”

Wing: “Raider 12.”

4. Lead directs Wing to retrieve ATIS in conjunction with a double switch while switching from a UHF controlling frequency to a VHF controlling frequency.

Lead: “Raider 12, cleared off for ATIS, meet me on 6 PRI.”

Wing: “Raider 12.”

Wing tunes ATIS in either band, copies the information, then switches to 6 PRI, TAC AUX to pass the weather.

If required, Lead will pass a recovery game plan so that Wing can setup their cockpit and give the appropriate briefs to their pilot. If the recovery is exactly what was briefed during pre-flight, Lead need not say anything. If the plan has changed, Lead will pass the new recovery game plan. For example, “Raider, plan on the RNAV 27, section missed; followed by the ILS 27, drag.”

703. THE BREAK

When recovering via the break, the Lead SNFO should keep the formation in the cruise position (to maximize lookout and maneuverability) until around the initial (~3NM from the numbers). This leaves enough time to get into the parade position on the proper side of the Lead, receive the appropriate visual break signal (3-second or fan), and stabilize their aircraft prior to executing the break.

There are two methods of executing a section break. Both types of breaks generate about 1500’ of separation between aircraft when executed correctly.

1. 3-second break. Prior to the break, the Lead will pass the 3-second break signal. The Wing will respond with either a head nod or thumbs-up. At the appropriate point, Lead will kiss off the Wingman and execute a normal break just like in contact stage. When 3 seconds have elapsed, Wing will then execute a normal break. Lead will call, “KATT 16, abeam, gear, full stop.” Both aircraft are cleared to land after Lead has read back the landing clearance. Wing SNFO will call their gear by stating, “Dash-2, gear.” Tower will likely reply, “Dash-2, roger gear.” If “gear” wasn’t part of Lead’s initial abeam call, the Wing will wait until Lead calls their gear status to tower and hears the towers response prior to making their own “gear” call. The flight will rejoin on deck after crossing the hold-short and then taxi as a flight.

2. Fan break. Prior to the break, Lead will pass the fan break signal. When ready, Lead will execute a parade rate of roll towards 90° AOB and Wing will match Lead’s roll rate. The Lead
will leave their power set through 90° of turn before reducing it to IDLE, extending the speed brake, gradually increasing the pull to 3-4 Gs. Wing will match Lead’s roll rate but will smoothly reduce their power to IDLE and extend their speed brake at the beginning of the maneuver. This energy difference will create the requisite separation. Wing will pull to roll out in trail of Lead. From this point, the procedures and radio calls are the same as the 3-second break.

704. SECTION APPROACHES

There are two types of recoveries to get a section through IMC to a landing environment. One is the section drag, in which both aircraft plan to full stop, and the other is the NORDO Wingman approach, which is the procedure to bring a NORDO Wingman back through IMC to the field. In order to commence a section approach, CNAF M-3710 requires circling approach minimums or 1000-3 if no circling approach minimums are available. If the weather is below these minimums, the formation cannot perform a section approach and would have to split up for individual approaches or choose a different airfield.

Since we are training for IMC during section approaches, all turns are made using IMC parade position (i.e., keep the same checkpoints as straight-and-level parade). In IMC, it is imperative the Wing safely stay in visual contact in order to maintain section integrity. Prior to conducting an actual section approach, consideration should be given to the approach, missed approach, and the procedures for separating the flight on final.

1. It is important to remember that tasks take longer to accomplish in a formation than in a single aircraft instrument flight. Since Lead cannot set below 20% torque and intentions must be communicated to Wing before being executed, the SNFO should strive to get well ahead of the aircraft. The following items should be completed no later than 8-10 NM from the runway:

   a. Slow the flight down.

   b. Bring the Wingman into the proper parade position.

   c. Configure the flight.

Although these tasks may appear simple at first glance, they can quickly become task saturating when the appropriate visual signals are combined with the required INAV briefings and checklists and/or talking with a PAR controller. Get ATIS, formulate the recovery game plan, and complete required briefs as soon as possible! Studying, planning, and practicing (chair-flying) will greatly help the SNFO during this phase of a formation flight.

2. 8-10 miles from the field but no later than 3 miles from the FAF and within 30° prior to the FAC, transition the flight to Basic Approach Configuration (BAC). From parade, and when below 150, the Lead SNFO will recommend the “prepare to lower gear signal” to his pilot. Lead IP will pass the signal. Wing SNFO will quickly cross-check the airspeed, call “below 150” over the ICS. Wing IP will return a thumbs-up to Lead. The Lead pilot will then give the head nod signal to simultaneously lower the gear and place flaps to takeoff. Each SNFO should check
both aircraft for good gear and flap indications and inform their respective IP. Lead IP will look to Wing IP for a thumbs-up, signifying that Wing’s aircraft indicates properly and Lead’s gear and flaps appear to be down-and-locked. Lead IP will return a similar thumbs-up and Lead SNFO reports “6 down and locked” to ATC when queried. The Lead may use a crossunder to manage which side of the formation the Wingman is on.

3. **NORDO Wingman Approach.** This maneuver recovers a NORDO Wingman on an approach. The landing environment must be considered when choosing which side to place the Wingman. If wind is the only consideration, then place the Wingman on the upwind side of the formation. If there are other aircraft in a VFR landing pattern, place the Wingman on the pattern-side of the formation so that Lead is not beak-to-beak with downwind traffic. If executing an approach to a parallel runway, place Wing on the “inside” of the parallels so that Lead is not overflying the other runway. Lead SNFO will direct a normal instrument approach and recommend the pilot to detach the Wingman approximately 1-2 NM from the runway threshold, with clearance to land and the runway in sight. To initiate this, the Lead pilot will point an index finger toward the runway in a stabbing motion then pat the dash twice while looking at Wing IP for acknowledgement (thumbs up), to be followed by a “kiss off” signal and turning away smartly. This signifies the landing environment is in sight and Wing is cleared to land. Wing’s acknowledgement indicates they have visually acquired the runway and can land. After kissing off, the Lead shall leave the gear extended, flaps at takeoff, remain VMC, climb to 600 feet AGL or just below overcast, parallel runway/final bearing at 120 KIAS, and move to the Wingman’s 10 or 2 o’clock position. The Lead will remain available for the Wingman to rejoin if he waves off the landing. In the case of a wave off/go-around, Wing will raise gear and flaps and rejoin Lead using running rendezvous or CV rendezvous procedures as necessary. Lead will match Wing’s configuration (in case of a gear retraction malfunction). The Lead SNFO will inform the IP that Wing is retracting gear and flaps, upon which the Lead pilot will raise the gear and flaps. Lead will accelerate to 160 KIAS and maintain that airspeed until Wing has rejoined into parade. Should Lead need to begin a climb for airspace considerations, maintain 160 KIAS and not more than 90% power until the formation is rejoined and coordinate another approach attempt with ATC. If executing a practice NORDO Wingman approach, Wing will execute a touch and go then rejoin the formation as described above.

4. **Section Drag.** The section drag is used to land both aircraft at the completion of a single section approach. The Lead SNFO will direct a normal instrument approach, placing Wing on the upwind side of the formation. After the flight has received clearance to land and with the runway in sight, the Lead SNFO will recommend that the pilot detach the Wingman. This may be accomplished via a “kiss off” signal or “Cleared to detach” transmitted on TAC. At this point the Wing SNFO will immediately direct the pilot to lower the flaps to LDG and slow to 100 KIAS (but no slower than on-speed). Initiating the separation 2.5-3 NM from the landing threshold provides the Wing with ample time to establish the required 1500 feet of landing separation. If, after separating, Lead receives a cancelled landing clearance, Lead will direct the section to waveoff, coordinate a rejoin, and re-attempt. If the Wing realizes they will not have sufficient separation, they will execute a waveoff.

If parallel runways are in use, Lead may request to “split the duals” or “split the parallels” to finish the approach. The flight will be cleared to land on both runways by tower. Lead will
detach the Wingman 1-2 NM from the threshold and each aircraft will execute a normal landing on their respective runway. Lead will need to be ready for slightly more complicated instructions as the aircraft clear and cross the two runways in order to rejoin each other for taxi. Normally, tower will only accommodate this request during actual IMC conditions.

**NOTE**

CNAF M-3710 specifically prohibits the Wingman from trying to obtain proper interval (separation on final) by slowing to less than normal approach speed by “S” turning.

5. Section Missed Approach. When executing multiple practice approaches or in the event of an actual missed approach, the Lead shall smoothly increase power to arrest the sink rate and gradually raise the nose to normal climb attitude. Lead IP may pass a “climbing” signal or pat his shoulder (indicating Wing should stay aboard) to give the Wingman SA that they are executing a missed approach. Once a rate of climb is established, the Lead SNFO will report, “aircraft climbing” to the pilot. Above 110 knots, the Lead SNFO will then recommend the Lead pilot pass a head nod to signal both aircraft to simultaneously raise their gear and flaps. Once clean, Wing IP will give Lead a thumbs up to signal their gear and flaps are up and they are ready to proceed past 150 KIAS.

6. Recovery as individual aircraft. Should the flight Lead determine that a section recovery is not desirable, for weather or any other reason, they have the option to split the formation for individual recoveries. Prior to detaching the Wingman under IFR control, Lead should coordinate intentions with ATC to facilitate positive radar separation of the aircraft. This call should include the Wingman’s admin call sign, recovery intentions, which aircraft is to recover first (typically the aircraft with the lowest fuel state), and which side of the formation the Wingman is on. Once ATC addresses the Wingman by their admin call sign and provides direction (vector, descent, etc.), they are automatically cleared to detach from the formation. If recovering VFR, the Lead will simply detach the Wingman over TAC at the appropriate time (“Raider 12, cleared to detach”). It is a good idea to coordinate recovery intentions with each other in order to avoid overtaking one another during the recovery.

### 705. LANDING

Runway Ops. The Lead aircraft will land on the center of the downwind half of the runway and the Wingman will land on the center of the upwind half of the runway. During the landing phase, the runway centerline is once again treated like a brick wall until both aircraft are safe on deck and have slowed to a safe taxi speed. With strong crosswinds or narrow runways, Lead has the option of directing both aircraft to land on centerline. In this event, Wing must ensure at least 3000 ft of separation before touching down.

If Lead is required to exit the runway by crossing in front of the Wingman, they will wait until the Wing IP calls “Raider 12, slow” on TAC. This call signifies the Wingman has adequate spacing and speed control to ensure it is safe for Lead to cross.
For Wing consideration, Lead should not rapidly apply brakes on rollout unless necessary. There is no rush to make an early turnoff from the runway, potentially compromising formation safety.

Once clear of the runway, Lead SNFO will switch the formation to ground ("Raider, 3, PRI, when clear") and immediately obtain the flight’s taxi clearance. Be especially mindful of Wing’s position when talking to ground. Don’t say that the flight is “clear the active” if Wing is still on the runway. Instead, use “clearing” or simply ask for taxi. Once Wing is clear of the runway, he/she will switch to ground frequency to join Lead. Once clear of the duty runway, it is Wing’s responsibility to establish and maintain the proper visual cues previously discussed for formation taxi. Each aircraft will individually complete their own After Landing and Engine Shutdown Checklists; additionally, Wing will report aircraft status as “up” or “down” to Lead during the taxi so that a base on-deck call can be accomplished by Lead, as required.
CHAPTER EIGHT
TAC ADMIN

800. INTRODUCTION

TAC Admin elements are those that directly support or enable the mission conduct but aren’t the mission itself. Examples include: on-deck check in, nav check, FENCE-in, G-warm, training rules, working area, entry times, tactical squawks, etc. Chapter 8 contained herein addresses all TAC Admin portions associated with the primary and intermediate formation syllabus.

801. ON-DECK CHECK-IN/NAV CHECK

Once established in marshall or at an appointed check-in time, the flight Lead will initiate check-in. Instructors will check-in on PRI TAC, followed by the students on AUX TAC, to ensure all radios are loud and clear. At this point, the Lead SNFO will initiate a “Nav Check” to a pre-briefed waypoint off of the Global Positioning System (GPS), then switch the flight to ground frequency. If Wing is ready to proceed, the Wing SNFO will respond with their tactical call sign and switch to ground. The Nav Check will be performed to the first point on the route (if departing IFR) or to another tactically relevant point (if departing VFR).

The following example demonstrates the communications check-in procedures:

On PRI TAC (instructors):

Lead: “Raider check PRI…Raider 11.”

Wing: “Raider 12.”

On AUX TAC (students):

Lead: “Raider check AUX…Raider 11.”

Wing: “Raider 12.”

Lead: “Raider, Nav Check [waypoint], [radial], [DME].”
(e.g., “Raider, nav check TEEZY, 170, 36.6”)

Wing: “Raider 12, same.” Or if there is a disagreement of more than 3 radials and 0.5 Nautical Miles (NM), “Raider 12 showing [radial] at [DME].”

Lead: “Raider, no questions, 3, PRI.” (If there has been a change in plan, inform the flight here.)

Wing: “Raider 12.” (If Wing has a question or other issue, inform Lead here.)
802. FENCE CHECKS/G-WARM

Two ways aircrew prepare their body and aircraft for dynamic maneuvering and mission conduct are through FENCE Checks and the G-warm exercise. FENCE is a mnemonic for: Fire-control system, Electronic counter measures, Navigation, Communication, and Emitters (which includes transponder). In the T-6A, the SNFOs will FENCE-in by completing the Pre-Stalling, Spinning, Aerobatic Checklist, and confirming the proper transponder setting over ICS.

The G-warm will be paired with the FENCE-in and both are required prior to dynamic conduct such as aerobatics, tail-chase, low altitude flying, and/or any other time aircrew plan to pull over 3Gs. The G-warm is accomplished from combat spread and consists of two 90° turns. The first 90° turn will be at 3 Gs and the second at 4 Gs. The turns can be accomplished in any direction.

The example below illustrates how the FENCE-in and G-warm should be conducted.

Lead SNFO: “Raider, FENCE-in.”

Both aircraft will complete the Pre-Stalling, Spinning, Aerobatic Checklist and check transponder code and mode. Lead should push the Wing to combat spread as necessary. After the spread signal is passed, the following calls will be made on TAC:

Lead IP: “Raider, reference 270, accel G-warm.”

Wing IP: “Raider 12.”

Both aircraft will then apply power and accelerate to 220 KIAS. Once stable in combat spread at 220 KIAS, the Lead pilot will call the turns:

Lead pilot: “Raider, 90 Left (or Right), Go.”

At the “go” command, both aircraft simultaneously execute a 3G, level turn at max power in the called direction for 90° of heading change.

Lead pilot: “Raider, Resume” -or- “Raider, 90 Left (or Right), Go.”

Both aircraft now simultaneously execute a 4G turn at max power to the original heading (if “resume” is commanded) or in the called direction for 90° of heading change and visually reacquire all members of the flight. After the final G-warm turn, the flight will call “FENCEd-in” in roll call order. “Good G” on FENCE-in means that aircrew are ready to proceed with dynamic maneuvering and aircraft systems (mainly the G-suit) are functioning normally.

Lead SNFO: “Raider 11, FENCEd-in, 8.6, good G.”

Wing SNFO: “Raider 12, FENCEd-in, 8.4, good G.”
After the FENCE-in, Lead will direct the Wing via TAC into whatever position is necessary to begin the conduct.

At the completion of the mission conduct (including BDCs in Intermediate, Section 807), the Lead SNFO will direct the flight to FENCE-out as soon as practicable. “Good G” on FENCE-out means the aircraft has not been overstressed and can recover normally.

Lead SNFO: “Raider, FENCE-out.”

Wing SNFO: “Raider 12.”

Each SNFO will comply by individually completing an Operations Check. After giving both aircraft enough time to complete the checks, Lead will initiate reporting the FENCE-out as follows:

Lead SNFO: “Raider 11, FENCEd-out, 6.2, Good G.”

Wing SNFO: “Raider 12, FENCEd-out, 6.0, Good G.”

803. BLIND

Blind is the term used when the aircrew in one aircraft cannot see the other aircraft and the lack of visual is not due to weather obscuration.

An aircraft is blind when crewmembers expect to see the other aircraft but both crewmembers do not. If either the pilot or SNFO is blind, they shall first query each other over ICS to re-establish a visual via ICS talk-on. If both aircrew are blind, the IP shall call “blind” on TAC without delay. IPs may elect to append an altitude to the initial blind call to enhance SA or in anticipation of a double blind situation. It is then the other aircraft’s responsibility to provide a talk-on over TAC. If the other aircraft is also blind, they should immediately call a KIO (as appropriate) and provide ownship altitude. The first time an altitude is mentioned, it is incumbent on the other aircraft to ensure altitude separation by immediately vacating the first aircraft’s altitude, if required, and establishing an altitude difference +/- a minimum of 500’. Once off-altitude, the risk for a midair collision has been eliminated. Once deconfliction is assured, the flight Lead will use directive comm to rejoin the flight or provide an alternate course of action. In the following example, Raider 12 has gone blind. Note that standard KIO comm is slightly modified due to the time-sensitive nature of a double-blind situation.

Raider 12 IP: “Raider 12, blind.” or “Raider 12, blind, 13,000”

If Raider 11 has visual contact:

Raider 11 IP: “Raider 11, visual, continue.” (if maneuvering is governed by training rules) then...

“Raider 11 is at your 2 o’clock, 1 mile, slightly high.” (regardless of training rule status).
Raider 12: (once visual contact regained) “Raider 12, visual.”

Raider 11: “Raider 11.”

If Raider 11 is also blind:

Raider 11: “Knock it Off” (if maneuvering is governed by training rules) then…
   “Raider 11, blind, 9000 ft.” (regardless of training rule status)

Raider 12: “Raider 12, Knock it Off”, (if maneuvering is governed by training rules) then…
   “9500 ft.” (regardless of training rule status)

804. TERMINATE AND KNOCK-IT-OFF (KIO) PROCEDURES

When operating under training rules (i.e. tail-chase, low-level, etc.) there may be times when a member of the flight deems it necessary to stop maneuvering. The individual may utilize either the phrase “terminate” or “knock-it-off.” “Terminate” is used to cease a local engagement without stopping the overarching event. For example, use terminate in the T-6 to end a tail-chase or tac form turn sequence. “Knock-it-off” is more emphatic and is used to cease the entire evolution and applies to all members involved in the overall exercise. It is used when safety of flight is in question or to end to the overarching event or mission portion of an event.

To initiate a “terminate,” any member of the formation will state “[flight call sign], terminate.” or, more simply, “terminate.” To initiate a “knock-it-off,” any member of the formation will state “[flight call sign], knock-it-off” or “Knock-it-off”. Regardless of which individual called terminate or KIO, either type of call initiates a roll call of the entire flight. For section operations, this roll call is very simple: Lead then Wing.

Example of a “knock-it-off” call that was initiated by the flight Lead:

Lead IP or SNFO: “Raider, knock-it-off.”

Lead IP: “Raider 11, knock-it-off.”

Wing IP: “Raider 12, knock-it-off.”

Example of a “terminate” call initiated by Wing:

Wing IP or SNFO: “Raider, terminate.”

Lead IP: “Raider 11, terminate.”

Wing IP: “Raider 12, terminate.”

When either of these calls is made, Lead will maneuver in a predictable manner to a safe flying attitude. Lead will use TAC to gather information about the nature of the terminate/KIO and
provide a plan of action to the flight. This may be as simple as continuation of the conduct or might warrant an RTB.

805. LEAD CHANGE

The Lead change is a maneuver designed to affect a change of the *positional* formation Lead. Lead changes may be accomplished with hand signals or over the radio from any position with the correct coordination. Generally, the Lead will ensure that the formation is in stable flight (altitude, airspeed, and heading) and will remain clear of other aircraft and weather while remaining in the working area (if applicable) prior to relinquishing the Lead.

Lead changes are executed visually from the parade or cruise formation by the pilots with the appropriate hand signals. If Wing is not ready to accept the Lead, he will refuse by shaking his head. The exact moment of the Lead change is when the old Wing turns his head and points forward. The new Wingman, now out of position and flying form off of the new Lead, shall move smoothly away to establish sufficient lateral separation, slide aft to the bearing line, then redress to parade or cruise position.

For a Lead change over the radio, the Lead pilot will simply make the following radio call on TAC:

Current Lead: *“Raider 12, you have the Lead on/in the left/right/front/back.”*

New Lead: *“Raider 12 has the Lead on/in the left/right/front/back.”*

The new Lead assumes the responsibility for communications, navigation, and running mission conduct. The new Lead will place their aircraft’s transponder to “ALT” and ensure the Traffic Avoidance System (TAS) is set to “Norm.” The new Wingman will transmit “*good hits*” on TAC when a TAS hit and “traffic, traffic” call have been produced by the TAS, indicating the new Lead has an operable transponder. Following this call, the Wing may place their transponder to NORM (to enhance SA to traffic outside the section) or STBY (to stop nuisance “traffic” calls from Lead’s transponder), as desired.

**NOTE**

When working in a controlled warning area, range, or other type of area, both aircraft may be required to retain their ATC assigned transponder code with altitude mode on.

**NOTE**

Even after changing the Lead, each aircraft retains its original tactical call sign. Each aircraft owns its administrative and tactical call sign for the entirety of the flight. For example, after a Lead change, Raider 11 will be flying in the Wing position while Raider 12 Leads the flight.
NOTE

For obvious safety reasons, there can be no confusion who has the Lead and when, exactly, the Lead is assumed. Anytime there is doubt as to who has the Lead, quickly and accurately use the radio to resolve the situation.

806. FUEL AWARENESS

Fuel shall be referred to in decimal hundred pounds of fuel remaining. For example, 800 pounds of fuel is referred to as “8.0,” pronounced “eight point oh.” 530 pounds is “5.3” pronounced “five point three.”

A section fuel check shall be conducted after the conclusion of each Lead change and at a minimum of every 20 minutes. Lead SNFO will query Wing for fuel state by either passing the fuel check signal or initiating a fuel check on TAC by transmitting their fuel state, e.g., “Raider 11, 8.5.” Wing SNFO will either pass their fuel state using number hand signals or pass their fuel state on TAC, as appropriate.

Knowing the fuel state of both aircraft at all times is Lead’s responsibility; as such, a few terms concerning fuel state need to be discussed. SNFOs will need to calculate MCF, Joker, Bingo, and divert fuel prior to each event, as they apply. Unless otherwise noted, plan fuel to transit at 240 KTAS.

1. Mission Completion Fuel is the fuel required to complete planned mission conduct (route of flight, low-level, or tactical maneuvering) and return to planned destination via standard routing (including approaches for training or weather) to arrive with:

   a. VMC: SOP minimum fuel on deck (200 lbs.) or fuel to proceed to an alternate and arrive above SOP emergency fuel (120 lbs.), whichever is higher.

   b. IMC: Divert Fuel

2. Joker fuel is a pre-briefed fuel state that allows for heightened fuel awareness prior to arriving at Bingo. In the fleet, a joker fuel state means that that aircraft can do one more tactical run prior to reaching Bingo fuel. In the T-6A, joker is 100 lb. above Bingo. This provides approximately max power for 10 minutes. Wing SNFO will notify Lead upon reaching joker (“Raider 12, Joker”).

3. Bingo fuel is the fuel required to fly from the farthest point of a working area or route point to your planned destination via standard routing to arrive with:

   a. VMC: SOP minimum fuel on deck (200 lbs.) or fuel to proceed to an alternate and arrive above SOP emergency fuel (120 lbs.), whichever is higher.

   b. IMC: Divert Fuel
If bingo fuel is reached by any member of the flight, that aircraft will immediately initiate a knock it off call and state reason for knock it off.

4. Divert fuel is the fuel required to fly direct to the planned alternate and fly an approach (if required, based on weather) to land above SOP emergency fuel on deck.

5. Emergency Divert fuel is the fuel required to fly an emergency profile from present position and make it to the nearest suitable divert with the published NATOPS reserve fuel.

For instrument flights, use standard INAV fuel planning, accounting for taxi, takeoff, climb, cruise, and approach, divert, and bingo fuel. For VFR flights, account for the planned flight time, transit, conduct, approach requirements, and low-level route (if applicable).

807. BATTLE DAMAGE CHECK

Battle Damage Checks (BDCs) are conducted following the mission in order to provide an external, visual check of each aircraft in the formation prior to recovery. During a BDC, aircrew should look for missing panels, fluid leaks, bird remains, or anything out of the ordinary. In future aircraft, you will also look for external store status (hung/expended ordnance, leaking fuel tanks, or FLIR stowage) and actual battle damage. BDC will be conducted on all applicable Intermediate events before the section FENCEs-out.

Lead SNFO will direct Lead IP to initiate BDC via a cocked-gun hand signal. If not in cruise, Wing will establish a cruise distance from Lead, step-up to check the top of Lead's aircraft, step-down then cross under, checking the belly, elevate on the other side checking the top again, then reset to cruise, remaining on that side. Wing IP will pass a thumbs-up or communicate any problems on TAC. The Section Lead will then pass the Lead to the Wingman. The new Lead's SNFO will then direct their IP to request BDC via hand signal. New Wing will execute a BDC and be given the Lead back upon completion. The original Lead will maintain responsibility for safety of flight/ATC communications throughout the BDC.

At the completion of the BDC, Lead SNFO will initiate the “FENCE-out” call.
CHAPTER NINE
SECTION PARADE

900. INTRODUCTION

Parade formation is used to transit instrument meteorological conditions (IMC), conduct formation instrument approaches, and recover via the break. Advantages are: it offers the Wingman the best opportunity to maintain visual contact on Lead in poor weather conditions; facilitates good visual communications between aircraft in the flight; is easily and positively controlled by the Lead; and presents a neat military appearance. The disadvantages of parade are a lack of maneuverability and hindrance of proper lookout doctrine by the Wingman.

901. PARADE POSITION

Figure 9-1 Parade Checkpoints

The parade position is a fixed position on Lead’s 45° bearing line that results in 3 feet of wingtip clearance and 5 feet of stepdown.

1. Visual Reference Points. Parade is maintained through the use of two visual reference points: aligning Lead’s prop arc with its inboard pitot tube and placing Lead’s UHF antenna over the opposite wing’s inboard aileron cutout (Figure 9-1). Proper stepdown is visually confirmed when a triangle of air forms between the UHF antenna, fuselage, and wing. If too much stepdown exists, there will be a large gap between the fuselage and opposite wing; additionally, the Wing will likely see the bottom portion of the Lead aircraft’s opposite wing (Figure 9-2).
2. If there is insufficient stepdown, the normal parade checkpoints will not be visible as the Lead aircraft’s fuselage will cover the opposite wing’s reference points (Figure 9-3).

Figure 9-2 Excessive Stepdown

Figure 9-3 Insufficient Stepdown
3. Maintaining Position. While in the parade position, it is Wing’s responsibility to maintain proper stepdown and bearing line and to keep any relative motion smooth and slow. Wing accomplishes this through use of AOB and/or power while cross-checking the two visual cues in order to achieve and maintain the precise parade position relative to Lead’s aircraft. Wing should ensure that all relative motion between the two aircraft occurs along the 45º bearing line and not purely forward or horizontal. Due to the close proximity of the two aircraft, the vast majority of the Wing pilot’s scan is devoted to maintaining position. Lead should avoid setting less than 20% torque in T-6A formation to allow Wing to maintain position.

4. Safety. While in the parade position it is Wing’s responsibility to:
   a. Maintain the proper stepdown and bearing line.
   b. Keep any relative motion smooth and slow.

902. PARADE TURNS

Parade turns are usually performed using 30º AOB or less, but in no circumstance will the flight exceed 45º AOB. The formation Leader must use slower than normal rates of roll when entering and exiting the turns to allow the Wingman to maintain position. Turns are always referenced as into or away from the Wingman.

Turns away from the Wingman are conducted in two different ways depending on whether or not the flight is IMC or VMC. In the case of the VMC turn away, Wing will roll about their own longitudinal axis and visually place Lead’s fuselage on the horizon, thereby remaining co-altitude with the Lead. In this position, the parade visual reference points line up vertically, as if connected on a plumb line.

For VMC turns into the Wingman and all IMC turns, the Wingman rolls about Lead's longitudinal axis in order to maintain the proper parade visual cues. This means that Wing’s aircraft will always be lower than Lead’s on a turn into the Wingman, and higher than Lead’s on an IMC turn away.

Lead will take the Wingman through a series of parade turns that will result in a heading change between 90 - 180 degrees. The amount of heading change may be adjusted due to area constraints or environmental factors (e.g., sun angle, clouds, etc.).

Student Duties:

1. Lead. Prior to commencing a parade turn, the Lead SNFO will clear the area and ensure the wingman is in position. The Lead SNFO will be expected to direct parade turns as well as subsequent rollouts and/or reversals. Remember, flight Leadership involves planning ahead with consideration given to any subsequent maneuvers and area boundaries.

2. Wing. The Wingman will maintain flight integrity throughout the parade sequence; additionally, the Wing SNFO will continue to clear the area for the flight, maintain SA on area orientation, and monitor internal cockpit instruments.
903. CROSSUNDER

A formation must be flexible to achieve maximum maneuverability; therefore, the Lead must be able to change the position of the Wingman within the formation. The crossunder is the maneuver by which the Wingman moves from parade position on one side of the Lead to parade position on the opposite side of the Lead.

1. Lead. The Lead SNFO will clear the area, ensure the Wingman is in position, and recommend a crossunder to the Lead IP. Once again, consideration shall be given to keeping the formation clear of obstructions and within the area limits. The Lead IP will then give the crossunder signal (Figure 9-4), maintaining a steady platform while the Wingman is crossing under.

![Figure 9-4 Crossunder Signal](image)

2. Wingman. The Wingman will reduce power to slide down and aft to achieve 20 feet of nose-to-tail separation and enough step down to see the Lead's exhaust stacks. At this point, the Wing will use angle of bank to cross Lead's 6 o'clock position, and increase power to maintain nose-to-tail separation. Once the Wing is safely established on the proper side with the correct wing tip separation, he/she will move up and forward into parade position.

   a. The Lead will maintain a stable platform.
   b. Wing will avoid any rapid lateral motion.
   c. Wing will maintain the proper stepdown and keep Lead’s exhaust stacks in sight. This position will keep Wing clear of any prop wash that may be encountered while executing the crossunder.
904. LOST SIGHT EXERCISE

The Lost Sight Exercise is used to simulate a Wingman losing sight of Lead in instrument meteorological conditions and may be accomplished any time during the parade turn sequence. The formation Lead SNFO will initiate the exercise from a turn into or away from the Wingman as follows:

Lead SNFO: “Raider, standby lost sight exercise."

Wing SNFO: “Raider 11.”

When ready to initiate the exercise and defining the exact moment when simulated weather obscuration causes the Wingman to go lost sight:

Lead SNFO: “Recommend send Wing lost sight”

Lead IP: “Raider 12, go simulated lost sight.”

The Wing SNFO will comply with the correct lost sight procedure and then make the appropriate lost sight call over TAC. Both SNFOs will direct their instructor through the appropriate procedure for the current flight regime (i.e., climb, descent, turn into or away).

The following example is for a level turn away from Wingman:

Wing SNFO (over ICS): “Roll out.”

Wing IP: “Raider 12 lost sight, rolling out heading 120.”

Lead IP: “Raider 11.”

After continuing the turn for 30 past Wing’s called heading:

Lead IP: “Raider 11, rolling out heading 090.”

Wing IP: “Raider 12.”

Lead IP: “Simulated climbs and descents, simulated 30 seconds, Raider 12 cleared to heading 090.”

The exercise should only take 10-15 seconds from initiation. This is used instead of the normal 30 seconds to control separation between the aircraft.

NOTE

This exercise shall only be accomplished in VMC conditions. The Instructor pilots will remain vigilant during the separation maneuver while the SNFOs direct the appropriate aircraft.
maneuvers. The SNFOs are expected to know and be able to brief all lost sight procedures and scenarios.

905. BREAKUP AND RENDEZVOUS

The breakup and rendezvous, or B&R, is used to practice a co-altitude, co-airspeed rejoin. From the parade position, the breakup establishes the required interval for the rendezvous. Lead then initiates a turn and maintains a constant angle of bank and airspeed. The Wingman uses angle of bank to fly along the 45° bearing as the distance between the two aircraft is closed. Using a shallower angle of bank than Lead creates a larger radius of turn, which moves the Wingman closer to Lead. Conversely, a steeper angle of bank moves Wingman away from Lead. Through the continual manipulation of this principle, the joining aircraft is able to maintain a steady bearing line as it approaches the Lead aircraft.

1. Lead. Prior to initiating the maneuver, the Lead must ensure that the 180º breakup and rendezvous can be accomplished from the present heading. It is important to understand the ground track that this maneuver will take the formation through. For instance, if the breakup turn is commenced from a northerly heading, the track of the formation will be in either an easterly or westerly direction, depending on the direction of the rendezvous turn. The 180º breakup and rendezvous may be executed from either the right or left parade position. The Lead SNFO will:

   a. Check to ensure the Wingman is in position.

   b. Check the area is clear.

   c. Recommend Lead IP gives the run-up signal (Figure 9-5).

   d. Ensure the Wing IP acknowledges the signal.

   e. Once again check the area is clear.

Figure 9-5 Breakup and Rendezvous
f. Recommend Lead IP kisses off the Wingman and break away (Figure 9-6).

![Image of T-6A aircraft with Kiss Off Signal]

**Figure 9-6  Kiss Off Signal**

After giving the kiss off signal, Lead will smartly break away from the Wingman and execute a level 180º turn utilizing maximum power and maintaining airspeed with positive Gs (e.g., an energy sustaining turn) to roll out at the base airspeed (200 KIAS). Once Wing is in trail, they will transmit “in trail” on TAC. The Lead will then establish a 30º AOB turn left or right, on altitude and airspeed. Throughout the maneuver, the Lead SNFO will continue to monitor Lead pilot's airwork, while observing the Wingman for a safe rendezvous, informing the Lead pilot of relevant deviations in any condition and calling for the Wingman to underrun in the event safety is compromised.

2. Wingman. After a 3-second interval, the Wingman will break, matching Lead’s AOB and pull. When established straight and level and directly in trail of the Lead, the Wing SNFO will transmit “in trail” over TAC. When the Lead begins their turn, Wing will wait until the Lead’s aircraft is outside of the propeller arc, then roll in the same direction and proceed until they are established on Lead’s 45º bearing line. The Wingman is on the bearing line when Lead’s vertical stabilizer aligns with Lead’s outboard wingtip (Figure 9-7). If Wing observes Lead’s vertical stabilizer moving forward and inboard along the wing, then Wing is behind the 45º bearing line and said to be sucked (Figure 9-8). When sucked, the Wingman must increase AOB to fly toward the center of the rendezvous circle to get back onto bearing line. On the other hand, should Wing observe Lead’s vertical stabilizer moving aft and eventually sky appearing between the vertical stabilizer and the wing, then Wing is ahead of the 45º bearing line and is said to be acute (Figure 9-9). To correct for an acute position, Wing must decrease AOB to increase his radius of turn, move away from the center of the rendezvous circle, and back onto the 45º bearing line. Wing will use multiple, small adjustments to his/her AOB to maintain this bearing line and close to one plane width. Once there, Wing will cross underneath and behind Lead and join in the VMC Turn Away position.
Figure 9-7  On Bearing Line

Figure 9-8  Sucked
Wing should use the “ABCs” to continuously correct for position during rendezvous. “A” stands for Altitude. The Lead should remain on the horizon as depicted in Figure 9-7. “B” stands for Bearing. The Wingman should evaluate the visual cues discussed above and also depicted in Figure 9-7. Strive to be on the bearing line at all times. “C” stands for Closure. A safe closure rate is that of a fast walk. From a long distance it is difficult to visually judge closure, so Wingman should maintain 200 KIAS +/- 10 until closure is visually discernable. The Wing SNFO is responsible for regularly calling out airspeed to the pilot during the join up, and also responsible for monitoring the progress of the rendezvous by reporting deviations of altitude and bearing line over ICS. Voice inflection should be proportional to the amount of deviation. Aircrew coordination and safety are paramount throughout the maneuver.

3. Underrun Procedure. In the event Wing’s aircraft becomes excessively acute, acute in close, or has an excessive closure rate resulting in an inability to execute a safe join-up, Wing shall discontinue the rendezvous and use the underrun procedure. Any crewmember in the flight recognizing the need for an underrun can direct it by announcing, “[tactical call sign], underrun” over TAC. The Wing SNFO in the underrunning aircraft shall command his/her pilot to underrun by stating, “UNDERRUN” over the ICS and then monitoring that the pilot executes the proper underrun mechanics. Once deconfliction is assured, Wing IP informs Lead by stating “[tactical call sign], underrun” over the TAC.

The Wing pilot will fly the underrun by:

a. Lowering the aircraft’s nose to achieve 20 ft. of stepdown.
b. Leveling their wings.

c. Reducing their power to idle in order to pass behind Lead. Speedbrakes may be used as required.

Wing will pass below and behind Lead and then fly up to the “perch” position, located on the extended 3-9 line, four plane widths directly abeam lead. Since Lead is in a turn, directly abeam of Lead’s wing line means that the Wing will be stepped up in relation to the horizon. Do not get too wide.

Lead IP will visually acquire Wing and acknowledge the underrun call with their call sign, simply “Raider 11.” Once Wing is stable in the perch, Lead IP will direct Wing, “Raider 12 cleared back inside when stable.”

Wingman will reply: “Raider 12.”

Once cleared by the Lead, Wing will proceed below and behind Lead to the inside of the formation and reestablish the proper altitude, bearing line, and closure to complete the rendezvous. A common error is to “rush” to the inside of the turn thereby putting yourself in a bad position to rejoin because it is not controlled.

4. Wing Safety Considerations.


   b. Recognize the need and call for the underrun procedure when applicable.

5. Planned Underrun. As part of mission conduct, the flight may execute a planned underrun to accomplish a specific training objective and provide a demonstration of excessive closure. With the Wing in trail, the Lead will execute a normal rendezvous turn then slow to 180 KIAS. The Wing will maintain 200 KIAS. The resulting airspeed differential will force excessive closure during the join-up. Wing shall execute normal underrun procedures outlined above when the excessive closure becomes apparent. When clearing Wing back inside the turn, Lead IP should also announce “resetting 200.”

906. CRUISE POSITION

Compared to parade, cruise provides the formation with increased maneuverability, enhanced lookout doctrine, and a reduced Wingman workload. Lead can use faster rates of roll and more G when making turns. When properly positioned, Wing will be between the Lead’s 45° and 60° bearing line, 1-3 plane widths from Lead with approximately 20 feet of stepdown (Figure 9-10). The 45° bearing line can be identified by an extended parade bearing line, placing the pitot tube on the prop arc. The 60° bearing line can be maintained by aligning the tip of Lead’s near horizontal stabilizer with the top of the white star on the fuselage. During straight and level flight, the Wingman should be able to receive visual signals and may fly on either side of Lead unless otherwise directed.
Figure 9-10 Cruise Position

The basic principal of cruise is that all flight members are free to maneuver in the 90° cone behind Lead and can maintain position during maneuvering by moving to the inside of Lead’s turn. Constantly repositioning to the inside of turns allows Wingmen to use less power (saving fuel), and make position keeping easier (radius of turn advantage). At no time should the Wing be stepped up on Lead.

Lead should release Wing to cruise whenever another position is not required for the current phase of the flight. For example, parade is only required for IMC penetration, lowering landing gear, breaks, other training objectives, etc. Don’t keep Wing in parade or spread unless there is specific reason! In addition to using cruise formation during transits to/from the area, the section may perform aerobatics in cruise. Lead shall maintain between 1 and 4 G’s and airspeeds between 120-250 KIAS. Outside of aerobatic cruise maneuvering, Lead should restrict his angle of bank to 90°.
907. TAIL-CHASE EXERCISE

1. Tail-Chase Exercise. From parade position, the Lead IP will run-up up the section and kiss off just as in a breakup and rendezvous after receiving Wing IP's thumbs up or head nod. Lead will break away for 180°. Both aircraft will set max power, and the Wingman will follow 3 seconds in trail. Once established in this position the Wing IP will call “in trail” on TAC. The Lead IP will call “Fights On” to initiate tail-chase. The student will learn through the instructors' demonstration of lead, lag, and pure pursuit the basics of how flight paths relate to each other during high-G, dynamic maneuvering; additionally, the students will gain an appreciation for how proper body positioning will aid them in keeping the other aircraft in sight. Review and practice the Anti-G straining maneuver before these events.

2. Tail-Chase Maneuvers. During tail-chase, the Lead will start maneuvering with a series of steep turns and reversals. The series will include at least one fairly level turn to allow the Wingman to demonstrate lead, lag, and pure pursuit in a relatively benign flight regime. This will be followed by wingovers and barrel rolls designed to increase Situational Awareness (SA) in a dynamic flight regime; eventually, the flight will progress through the over-the-top aerobatics such as a loop, half Cuban eight, and split S. The following are some specific responsibilities for the SNFOs during tail-chase:

3. SNFOs will:

   a. Maintain sight of the Wingman. The SNFO may brace their hand on the canopy while rotating their upper body and neck in order to look directly behind the aircraft. The SNFO shall apprise the pilot any time the Wing switches sides or if the SNFO goes blind.

   b. Maintain a proper lookout doctrine external to the section.

   c. Monitor and honor pertinent parameters (altitude, airspeed, AOA) governed by the training rules. Verbalize deviations that may Lead to training rule violations. Call “500” on ICS when within 500 feet of the hard deck and then every hundred feet thereafter. Use “watch the deck” and “SAVE THE DECK!” calls as appropriate to keep your pilots deck SA high. Monitor the ceiling of the working area and advise the pilot if you think the aircrafts attitude and energy state will result in departing the confines of the area.

   d. Report approaching minimum or maximum Gs.

When training objectives have been met, the tail-chase exercise shall end using a “terminate” call. Lead will coordinate a rejoin over TAC using circling or runner mechanics as required.
908. PARADE FORM CONDUCT FLOW

Recommended Parade Formation Conduct:  Once established in the working area and TAC Admin is complete, the mission conduct may be commenced. Both SNFOs must complete the following sequence of maneuvers from the Lead and Wing positions during the event (unless otherwise noted).

1. Parade turns into and away - VMC
2. Crossunder
3. Parade turns into and away - IMC
4. Lost Sight Exercise and directed rejoin
5. 2x Breakup and rendezvous (B&Rs)
6. B&R to a planned underrun
7. Tail-chase and directed rejoin
8. Lead change
9. Repeat sequence (minus G-warm & lost sight exercise)
10. Lead change
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CHAPTER TEN
SECTION TACTICAL FORMATION

1000. INTRODUCTION

In this chapter, we will teach the basics of maneuvering while in combat spread through the use of tactical formation. SNFOs will learn how to establish and maintain combat spread (the basic formation positioning of tactical formation), tactically turn a section up to 180°, and develop and practice positive lookout doctrine.

1. Combat Spread Position. A traditional combat spread position is 1-2 nautical miles abeam the Lead with 1000 to 3000 feet of altitude difference. Due to the T-6A’s smaller size and turn radius, its combat spread position is reduced to an abeam distance of 1/2 NM, and altitude of +/- 200 feet of Lead. Wing is in proper position when directly abeam Lead, with the aircraft just outside the edge of the wing, visible to both crewmembers, and roughly the same length as the flash guard (the vertical card that sticks up from the wingtip and blocks the anti-collision light). Aircrew should be able to discern that there is a white spot on the side of the aircraft (but not a star) and there are two people in the cockpit. If there is more detail than this, Wing is too tight; not enough detail and Wing is too wide. Alternately, if the TAS hit from Lead is a white diamond, Wing is too wide. Wing may be commanded to spread via hand signal or “deploy” call on TAC.

2. Lookout Doctrine. Success in air-to-air combat begins with early detection of the enemy. Each crewmember must develop an effective scan pattern in coordination with the other aircraft. Figure 10-1 delineates pilot and student lookout areas of responsibility for each aircraft. Notice the lack of a section blind area. Primary attention must be in the direction of the suspected threat (threat axis) and the Wingman’s six o’clock position, effectively providing visual mutual support.

Figure 10-1 Primary Lookout Responsibilities
3. Combat Spread Procedures

a. Priorities. The first priority when flying combat spread is for Wing to maintain proper bearing (abeam or 00 bearing line). If Wing becomes sucked or acute, the lookout doctrine suffers. The second priority is maintaining the 1/2 NM abeam distance. Should Wing become too wide, an enemy aircraft may be able to engage a Wingman undetected. If too close, the scanned area is reduced; it’s easier for the enemy to gain sight of both aircraft and may be able to engage both simultaneously. The third priority is altitude. Altitude can easily be traded for airspeed and thus used to maintain bearing.

b. Taking Combat Spread From the Parade or Cruise position. Lead SNFO will recommend combat spread. Lead IP will pass the combat spread signal. Wing should smartly reposition to combat spread using max power and a slight cut away while simultaneously referencing the current heading, altitude, and airspeed to establish a reference that aids in position keeping.

c. Once in combat spread the Wingman will return to the noted heading and begin position keeping via visual cues. In order to correctly determine the abeam position, Wing should look straight out over his/her shoulder directly at the Lead. The tendency is to become sucked since it is easier to look forward at Lead. To maintain a good combat spread requires a good scan both inside and outside the cockpit. The outside scan must encompass the Lead’s relative position as well as the Wingman’s lookout area of responsibility. The inside scan compares reference airspeed, heading, and altitude in order to recognize early deviations and make necessary adjustments.

d. If the Wingman becomes slightly sucked, they should add power and move forward back into position. If the Wingman is very sucked, they may lower their nose and add power to expeditiously drive forward to the abeam bearing. The Wingman may dissipate as much altitude as required to regain the proper bearing line. Approaching the bearing line, the Wing will raise their nose, trade airspeed for altitude, and adjust power proportionately to arrive on bearing at 200 KIAS, 200’ stepped up from Lead. When in position, reset power to stabilize.

e. If the Wingman becomes slightly acute, they should reduce power and slide aft back into position. If the Wingman is very acute, they may execute a nose-up pull to dissipate forward velocity and regain the bearing line. Approaching the abeam position, the Wing’s nose should be lowered to arrive on bearing with 200 KIAS. Wing may also execute s-turns to regain position. The s-turn is accomplished by using power as required while smartly turning at least 30° away from Lead followed by an immediate return to base heading. The Wingman should use caution since a sucked position may develop if the correction is too aggressive.

f. If bearing line and abeam distances are correct but the altitude is off, add power while descending or climbing in order to preserve downrange-travel and, consequently, longitudinal position (bearing line). Remember, maintaining proper altitude is the last priority.
g. If altitude and position are correct but abeam distance is off, add power while simultaneously taking a 5 degree cut away or into Lead, as appropriate. Every degree of heading differential between Wing and Lead results in a differential downrange travel velocity. Wing must compensate for the change in their downrange travel vector with power in order to stay on bearing. Beware the situation in which, after correcting for being wide or tight, the Wing accepts a sight picture where the Lead remains slightly in front or behind the Wing. It’s possible that the Lead appears stable due to heading and power setting differential not because the Wing is simply sucked or acute. The Wing has created a constant bearing, variable range situation and must diligently scan so that, following a correction, their abeam distance is stable.

h. The amount of any correction is directly proportional to the amount of positional error. Small errors require minor corrections to finesse the aircraft into proper combat spread while gross errors will require more aggressive maneuvering.

4. Tac Form Voice Calls. Turns (except the Cross Turn) will be commanded as follows:

“[section tactical call sign], [turn type], [direction] (if required).”

For example:

SNFO over ICS: “Recommend tac left.”

IP over TAC: “Raider, tac left.”

After the IP commands the turn, the flight immediately complies.

5. Tactical Formation Assumptions. Turns are executed from combat spread to expeditiously reorient the sensor nose of the section into the threat sector. In order for the formation to remain in position post-turn, execute proper turn geometry, maintain safety of flight, and coordinate with each other, each aircraft must comply with these assumptions while maneuvering.

a. All turns are max power, energy-sustaining turns. After pilots set the initial AOB (~75-85 degrees) they must set and vary +Gs via longitudinal stick deflection to maintain airspeed. When performed correctly, the aircraft will experience 2-3 Gs. Refinement of AOB will be used to maintain altitude. Reduce AOB slightly from the initial setting and point the lift vector higher above the horizon to climb. Increase AOB (90+ degrees) and place the lift vector on to slightly below the horizon to descend. G must be maintained in the turn in order to preserve turn performance.

b. All turns are level.

c. Wingman is responsible for deconfliction. Remember, the Lead isn’t “flying” form, per se, that’s the Wingman’s job. Primary intra-flight deconfliction responsibility falls on the Wing aircraft.
6. SNFO Responsibilities:

Lead SNFO:

- Recommend the type of turns
- Monitor Wing’s performance and progress through turns.
- Manage training area.
- Monitor aircraft parameters (altitude, airspeed, heading, fuel, etc.)
- Scan outside the section for interlopers and weather.
- Verbalize checkpoints and ensure the pilot turns and rolls out as appropriate for the turn that was commanded.

Wing SNFO:

- Verbalize checkpoints and ensure the pilot turns and rolls out as appropriate for the turn that was commanded.
- Monitor aircraft parameters, position, and ensure deconfliction.
- Maintain visual lookout.
- Maintaining situational awareness in order to take the Lead at any time or offer a recommendation to Lead (approaching working area boundaries, altitudes, etc.)

1001. TAC TURNS

TAC turns are the elemental tactical turn and are used to turn the formation from 60°-120°, with 90° being the default. The “outside” aircraft (i.e., the aircraft on the left side of the formation if a right turn is called, and vice versa) is always the first aircraft to maneuver following the command of execution. The “inside” aircraft waits for the visual cue, then executes the turn.

1. Tac Turns

   a. Command: “Raider, Tac (Left/Right).”

   b. Geometry: The outside aircraft will turn into the inside aircraft for 90 degrees of heading change (or the prescribed degrees of turn). The inside aircraft will delay until the outside aircraft is on the 45° bearing line (visual cue is looking down the outside aircraft’s intake) before turning 90 degrees (or the prescribed degrees of turn).
Figure 10-2 Tac Turn (Into the Wingman)

Figure 10-3 Tac Turn (Away from the Wingman)
1002. 45° TURNS

Forty-five degree (45°) turns are used anytime the formation requires a turn between 31-60° of heading change, with 45° being the default. Just like TAC turns, the outside aircraft will maneuver first and the inside aircraft waits for the visual cue, then executes their turn.

1. 45° Turns

   a. Command: “Raider, 45 (Left/Right).”

   b. Geometry: Outside aircraft will turn into the inside aircraft and roll out on the desired new heading. Inside aircraft continues straight ahead until the outside aircraft crosses their tail (visual cue is when the outside aircraft passes from one side of the inside aircraft to the other) and then executes a 45° turn.

Figure 10-4 45° Turn (Into the Wingman)
Figure 10-5  45° Turn (Away from the Wingman)
1003. IN-PLACE TURNS

In-place turns (Figure 10-6) are used for 120°-240° of heading change where both aircraft turn in the same direction, default being 180°. In-place turns result in some lateral displacement over the ground in the direction of turn.

![In-Place Turn Diagram]

**Figure 10-6 In-Place Turn**

- In-place Turn
  a. Command: “Raider, In-place (Left/Right).”
  b. Geometry: Both aircraft execute a turn in the called direction for 180° of heading change.

**NOTE**

The inside aircraft will momentarily go blind due to being belly up to the outside aircraft. The outside aircraft assumes separation responsibility for the first 90° of turn. As the outside aircraft goes blind to the inside aircraft during the second 90° of turn, the separation responsibility shifts to the inside aircraft. Since this loss of visual contact is expected and briefed, a “blind call” is not required unless the Wing does not reacquire Lead when expected (e.g., rolling out of the turn).
1004. SHACKLE

The Shackle is a cooperative, stacked merge maneuver used to rapidly redress the formation or to switch sides of the formation.

1. Shackle
   a. Command: "Raider, shackle."
   b. Geometry: Both aircraft execute a 45° turn into each other. When their flight paths cross, both aircraft reverse their turns back to the original heading (Figure 10-7).

2. Using a shackle to redress the formation.
   - When a shackle is used to expeditiously re-establish combat spread (i.e., the Wingman is egregiously out of position), the aircraft that is farthest downrange will turn greater than 45°, while the trailing aircraft turns less than 45°. The shackle is still a cooperative effort between aircraft to arrive at a stacked merge with roughly a 90° angle between flightpaths. Post-merge, both aircraft should play out the turn to re-establish combat spread. The aircraft that has more degrees to the original heading will have to maneuver more aggressively, possibly leading the turn so that abeam distance doesn’t get too wide. If the shackle is used to fix a very wide or tight abeam position, the merge will simply be prefaced by a long or short period in which the aircraft are driving towards each other.
1005. CROSS TURNS

Cross turns (Figure 10-8) are used to turn the section 180° while maintaining combat spread, clearing each other’s “six,” and retaining sides of the formation. Unlike in-place turns, there is no lateral movement of the formation over the ground.

1. Cross turns
   a. Command: “Raider, cross turn, Raider [11 or 12], [low/high].”
      Response: “Raider [11 or 12], [low/high].”
   b. Geometry: Each aircraft executes a 180° turn into the other. Each aircraft will be on altitude and execute a level turn to ensure at least 200 feet of vertical separation. Pilot’s will “stack” the merge (place aircraft directly above/below one another) to ensure neither aircraft goes blind.

1006. CHECK TURNS

Check turns are used to change the formation heading 30° or less.

1. Check Turn
   a. Command: “Raider, Check [XX] [Left or Right].” XX being degrees of turn.
b. **Geometry:** The Lead will simply change course to the new heading. Wing remains on the same side of the Lead and will adjust as required to maintain the proper bearing line.

c. **Redressing:** When a check turn is conducted with the Wing in position, it will drive the Wing acute (check turn into) or sucked (away). The Lead may use check turns to help redress the formation by checking away from an acute Wingman or into a sucked Wingman. Nevertheless, it is the Wing’s responsibility to make adjustments as required to maintain the proper formation position.

### 1007. EXECUTING TACTICAL FORMATION TRAINING OBJECTIVES

SNFOs must direct at least one of each type of turn both into and away from their Wingman.

The SNFO is responsible for managing the turn sequence. Execute turns for training but also to keep the section clear of the clouds and inside the working area. For example, approaching an area boundary, it would be prudent for an SNFO to recommend an in-place turn, despite what part of the turn sequence the section is currently executing.

The Lead SNFO will preface a set of turns with: “[section tactical call sign], the following will be a sequence of called turns.” Wing SNFO will respond with their tactical call sign.

Once turn sequences are complete, the Lead SNFO shall recommend Lead IP ends the set via standard terminate verbiage.
CHAPTER ELEVEN
SECTIONAL OPERATIONAL NAVIGATION FLIGHT SUPPORT PROCEDURES

1100. INTRODUCTION

The purpose of the formation operational navigation flight is to introduce SNFOs to the basic considerations and procedures required for maneuvering a formation in the low altitude environment in order to execute a planned strike on a target at a specific time. The section ONAV flights are very involved and require significant preparation, as well as a detailed brief and debrief. You will be introduced for the first time to the network of low altitude routes you will use for the rest of your career: Military Training Routes (MTRs), specifically Visual Routes (VRs). The execution of these routes will require you to leverage all of the skills you have learned thus far in flight school. SNFOs will assume the role of mission commander and execute the flight with minimal intervention from instructors. Instructors will fulfill their tactical roles as pilots but also act as safety observers and evaluators.

1101. FLIGHT PREPARATION

Route descriptions, administrative details, scheduling information, and other data for MTRs can be found in the AP-1/B. Chapter 1 lays out the general requirements for aircraft using the MTR system. The AP-1/B goes on to describe each MTR in detail and lists specific procedures required for their use. Any VR may be used in the completion of syllabus events as long as proper JMPS planning is completed and the flight is operationally feasible and complies with MCG flight sequencing. Use the MTR overview chart available from the DOD FLIP program for a visual representation of the all the routes in the U.S. In the Pensacola area, VR-1024, 1020, and 1021 are available as out/in options from NAS Pensacola. Other MTRs may be used as part of a cross-country that includes both instrument and low-level legs. Pay special attention to alternate entry and exit points when formulating a plan to use an MTR.

MTRs are official routes that any military aircraft can fly. In order to ensure aircraft de-confliction, route entry times must be scheduled and strictly adhered to. You do not want to accidentally get on the route a couple of minutes in front of an F/A-18 doing 480 KTS. Reference the AP-1/B and contact the appropriate scheduling authority in order to get an entry time for the route you want to use. CTW-6 is the scheduling authority for VR-1024, 1020, and 1021 and uses an online scheduling tool to manage these routes. If you’re using one of those three routes, let the squadron scheduling office know and they will schedule the route for you. On the day of your flight, ask the SDO to confirm that route entry times are properly entered online.

This will be the first time in your training that you will need to get your section to a specific point at a specific time, also known as Time on Target (TOT). TOT is a UTC value derived by the mission commander based on multiple factors. In the T-6A, these factors include routescheduling, transit distance, route distance, and attack profile. In a real-world attack, a pre-planned TOT may be determined by factors such as enemy air defense activity, blue force positioning and coordination, environmental factors, strike route selection, and weapon time-of-fall. Accurate flight planning is required to determine the time it will take to fly the planned...
route from takeoff to the target. The flight schedule is a good place to start when determining the flight’s timeline. For MTRs, the acceptable entry point window is +/- 4 minutes from the scheduled entry time. Lead SNFO shall determine an appropriate takeoff time to reach the briefed entry time via normal routing with time to accomplish normal enroute tasks (e.g., G-warm). Reasonable accommodation should be made to avoid undue delays and ensure the section returns to base by the scheduled land time. As a mission commander, your focus is the TOT (entry time plus elapsed time to target). You have been allocated two aircraft, four aircrew, and a period of time in which to accomplish your training objectives. Use a TOT that falls on :30 or :00 and accounts for the elapsed route time and results in an entry time within the entry window. Work backwards from the derived entry time to compute an appropriate takeoff time. Plan an enroute airspeed of 270 KTAS. For example, if the section was scheduled for a 1400Z entry and the planned route elapsed time was 45+46, a good TOT could be 1446+00 or 1445+30. The entry times for these TOTs would be 1400+14 and 1359+44, respectively.

Your low-level chart will be constructed similar to the ones in the ONAV stage, but with a few differences:

1. Plan for 210 KTS ground speed instead of 180 KTS.
2. The route dimensions are fully defined by the AP-1/B. Place a copy of the AP-1/B route summary on the back of your chart.
3. The AP-1/B defines the center of the route corridor by establishing turnpoints, charted by latitude and longitude. We then choose a significant visual feature near the published turnpoint to use as our visual turnpoint. The turn circle is centered on this feature, not the published turnpoint. The route centerline that you will fly is drawn from the centers of the turn circles, not the published turnpoints in the AP-1/B.

Remember, as the Mission Commander, you are expected to drive all aspects of the conduct of the flight, from brief to simulated weapons release to recovery. In the brief, special attention should be paid to weather and BASH. Per the AP-1/B, the required weather to fly a Visual MTR is a minimum of 3000 ft. ceiling and 5 miles of visibility. Check bird hazard information for specific MTRs on USAHAS. Products required are kneeboard cards and jet logs for all crewmembers, flip charts, and a DD-175. Review local SOPs and training rules that apply to low-level flights.

1102. CREW COORDINATION

Crew coordination is an essential skill for any mission, but communication in the fast-paced, task-saturated, low-level environment needs to be clear and concise. For this reason, you are expected to start minimizing your communications as you work through your procedures. Attempt to have your answers formulated before you start talking. Do not express units such as knots, feet, or psi unless there might be confusion. Standardizing terminology and the order of the calls will help in this manner.
HEADINGS are to be spoken as three single digits. For example, a heading of 295 is spoken as “two-nine-five.” Do not preface a heading with the word “to.” “Turn to two-five-five” could make the pilot ask if the heading you want is 225 instead of 255. Directive calls of 10° or less of heading change should be prefaced with the term “new heading.” Calls of 11° or more should be prefaced with “Left (or Right) two-four-two.”

AIRSPEEDS are given as a “one” number. For example, a speed of 225 is said “two-twenty-five.” Preface all airspeed calls with the word “set.” “Set two-twenty-five.”

ETA’s will be spoken as four digits in “minutes plus seconds.” Ex: “ETA to Bravo is one four plus two zero.”

An ideal wings-level call will now sound like:

“Three-five-five”
“Two-hundred”
“One thousand, two hundred”
“We are 120 above MCF, continue”
“We are a half mile left of course, new heading zero-zero-five for two minutes. Time out one-three plus three-zero.”
“We are 10 seconds early. New ETA one-eight plus one-zero.”
“We were left of course and fast. Winds are two-two-five at 10. New heading zero-zero-three. Set one-ninety-five.”

Do not sacrifice accuracy for brevity, but you are expected to start working toward this standard. Also, avoid pointing to features or using the phrase “over there.” Instead, use descriptive words and clock codes. Simple additions such as near, far, low, mid, or high can expedite a crewmember’s visual search greatly. An example of a good descriptive call is, “The intersection is at 2 o’clock low, just right of the tower.”

1103. ADMIN

1. Ground procedures will be the same as previous formation flights. Choose a formation takeoff appropriate for the weather conditions and runway requirements.

2. Adjust flight path geometry or adjust airspeed as necessary to manage time gates and meet your route entry time +/- 4 minutes. If it will not be possible to make your route entry time, coordinate with the SDO to get a new entry time or abort the mission. Maintain timeline SA and verbalize to your pilot where you are on timeline. Develop a solid plan, execute it, and make your entry time!

3. Cancel IFR (if required) prior to entering the route. Direct the section to the entry point.

4. Update the weather and winds by dispatching the Wingman to check the weather at a nearby field.
5. Recovery: After flight is rejoined post-attack and the TAC Admin tasks are complete, focus shifts to the administrative recovery. Leverage your previously mastered skills of VFR and IFR recovery to safely and expeditiously recover the section. Pre-flight, reference the MCG when formulating a recovery game plan. For training objectives, SNFOs may need to lead instrument approaches and/or complete VFR touch and go landings. Have a plan ready to go for the brief and be ready to flex airborne if conditions dictate a change. Strive to stay ahead of the plane, gain SA to the FAF or airfield, switch frequencies as appropriate, gather weather information, make ATC or CTAF calls, inform the section of your game plan, and proactively manage the section to execute a seamless recovery.

1104. TAC ADMIN

1. FENCE-in and accomplish a G-warm prior to route entry

2. Five minutes prior to entering the MTR, make an entry call on 255.4. The call should sound like: “99, KATT XX, flight of two Navy T-6’s, entering VR-1024 Point A at 1215, exiting point G at 1245, 1000 feet, 210 KTS.” Note that the times are in Zulu and the altitude is AGL.

3. Perform a tactical turn from combat spread to enter the route or keep the Wing in cruise position until aligned with the course of the first leg. Once aligned with the first leg, push the Wing out to combat spread. In the air-to-surface environment (and for safety reasons), Wing shall remain 200 feet above Lead while in spread. Set airspeed for 210 KTS ground speed and remember to descend to the planned route altitude!

4. Flight elements flying a VR route are required to squawk 4000. Lead’s transponder will be set as such no later than the entry point.

5. Lead will direct an elapsed timer hack over TAC at the briefed route entry time. The call may sound like: “Raider standby hack 10 seconds” then “3, 2, 1, hack, 1, 2, 3.” The section may or may not have arrived at the entry point but, nevertheless, the clock must be hacked at the entry time or an error will be induced into your elapsed time that you must compensate for the rest of the route. Ideally, the Lead will have managed the entry so that the hack occurs directly overtop the entry point (i.e., an exactly on-time entry). If not, the Lead will use standard timing corrections to work back to on-time.

6. Both aircraft will monitor 255.4 for the entire low-level route in order to deconflict with other aircraft using the same or crossing routes.

7. The post-attack off-target rendezvous (OTR) plan should be covered in the brief and usually consists of a CV/running rendezvous enroute to the destination airfield at a VFR cruising altitude. A CV rendezvous at the target point may also be used but be wary of aircraft following you on the MTR. Once off-target, Lead may elect to start a turn on course in order to facilitate the Wingman’s rejoin. Once both off-safe calls have been made and the Wingman is visual, Lead will execute the briefed OTR (or direct the section otherwise) and immediately begin to accomplish TAC Admin tasks while the rejoin is progressing. At the Lead pilot’s discretion, a running rendezvous can be facilitated by setting 200 KTS until the join is nearly complete.
Weather conditions may require the section to maintain VMC and coordinate with ATC for IFR pickup and activation of a flight plan. If both aircraft are blind post-attack, Lead will immediately deconflict the section by assigning separate altitudes and direct a nav/geo rendezvous, most likely using the target point.

8. Post-attack TAC Admin tasks include making an “off-route” call on 255.4 and directing the section to FENCE-out (including switching the transponder back to 1200, if VFR).

9. Should the need arise to abort the route due to weather, the Lead pilot will direct an in-place turn to avoid the weather (if appropriate) and then climb off the route. If VMC cannot be maintained or rapidly deteriorating weather conditions exists, both aircraft will begin a max power climb to the MSA (Lead) and MSA+200’ (Wing) while taking a slight check turn away from each other. Lead will squawk 7700. Minimum Safe Altitude (MSA) within 350 miles of Navy Pensacola is 3200 ft. MSL. Lead will switch the flight to a local ATC frequency and begin coordinating IFR clearances for both aircraft.

1105. LOW-LEVEL CONDUCT

1. Normal ONAV turnpoint procedures will be used by both aircraft on the low-level with a few exceptions:

   a. The route will be flown at 210 KTS ground speed in combat spread using standard tactical formation to affect turns. At the two-minute prior call to the route entry point, determine the base airspeed to set for 210 KTAS. For IOATs of 34°C and above set 200 KIAS, below 34°C set 205 KIAS. Adjust the base airspeed to compensate for the expected winds.

   b. The two standard course corrections that will be used will be 10° of heading change for 1 minute to correct for 0.5 NM off course and 20° of heading change for 1 minute to correct for 1 NM off. Apply the smallest heading change necessary. Even though the base airspeed is different, it remains a close enough approximation. There will be no BDHIs in formation.

   c. The priority for the formation low-level is to overfly the turnpoints. Therefore, if the Lead aircraft has the turnpoint in sight, they may turn the formation to overfly the turnpoint.

   d. Speed adjustments for timing corrections will be in 20 knot increments (10%). The formation will not fly slower than 180 KIAS.

   e. SNFOs should lead turns by recommending the appropriate tactical formation turn before the section arrives at the turnpoint so that the section rolls out on course after the turn is completed.

   f. Z diagrams (to be addressed later in this chapter) will be adjusted for terrain elevation, depicted in the chart margin near the target, and annotated in MSL altitudes.
SNFOs may use the full GPS capability of the aircraft to augment and QA airwork calculations and turnpoint acquisition. HSI GPS mode is authorized but must be used in MAP mode. ADI composite mode is authorized. The intent of this allowance is to provide SNFOs additional mission crosscheck time (MCT) to devote to outside scan, heightened SA, and enhanced Wingman awareness.

2. The route will be flown at or above 1000 ft. Above Ground Level (AGL) unless route restrictions dictate otherwise. During the preflight route study, SNFOs will determine the highest terrain on a route leg (+/- 5 NM from route centerline) and add 1000 ft. to it to determine a Mean Sea Level (MSL) altitude to fly for each leg. Wing will fly in combat spread.

3. At the target point, the section will execute one of two target attacks listed below.

1106. TARGET ATTACKS

Typically, strikers will be concerned with air-to-air threats until near enough to the target to commit to and focus on the ground attack. While many factors are used to derive this point, in the T-6A, the attack point will be ~10 NM from the target. Pick a visually significant feature as an attack point. Upon reaching this point, the Lead SNFO will direct the section to switch to an air-to-surface (A/S) mindset through a directive “[section tac call sign], attack” call on TAC. SNFOs will then ensure the A/S checks are completed, switching the section from a simulated A/A (air-to-air) sanitization game plan to an air-to-surface mindset.

Air-to-Surface Checks

1. Set EHSI NAV mode to GPS with the #2 needle selected to GPS.

2. Review the type of attack and Z-diagram on ICS: Shift or crossing, number of degrees nose up, apex altitude, dive angle, planned release altitude, and minimum altitude. For example, “Shift attack, 20 up to 1700, 10 down to 1200, min alt 1000.”

Pop Attacks

Pop attacks enable an attacker to ingress at low altitude and then rapidly climb to a higher altitude in order to achieve weapons release parameters. In VT-10, we will introduce two basic pop attacks from combat spread - the Shift Attack and the Crossing Attack.

Pop Z Diagrams

1. In the fleet, preflight planning will involve determining the proper flight parameters (airspeed, altitude, dive angle, etc.) needed at the instant of weapons release to successfully deliver your ordnance to the target. Z diagrams are useful presentations of this information and are to be included on briefing boards and kneeboard cards (Figure 11-1/2). To make an analogy, if releasing the ordnance is akin to pulling the trigger on a rifle, then the Z diagram details how to position and aim that rifle.
2. Since the T-6A does not have a heads-up display (HUD), radar altimeter (RADALT), or actual ordnance, this pop diagram is simplified from what you will see in future aircraft, but the concepts are the same. The T-6A Pop Attack Z diagram uses a 20° climb and 10° dive angle. First, determine the elevation of the target and then use the diagram to plan the target attack while staying inside the confines of the route structure. The diagrams will be labeled with MSL altitudes to be denoted by an ‘M’ after the number.

**Figure 11-1 T-6A Pop Diagram**

a. **INGRESS ALT (MSL) / AIRSPEED (KGS)** – Plan for 1000 feet AGL and 210 KTS groundspeed.

b. **PULL-UP-POINT (PUP) (NM)** – Distance from target. Use 2.0 NM.

c. **POP ANGLE** – 20° nose up (Dive Angle plus 10 degrees).

d. **APEX Altitude (MSL)** – Max altitude of the pop. Plan to climb 500 ft. or to the top of the route structure, whichever is lower.

e. **DIVE ANGLE** – 10° nose low.

f. **NO LATER THAN RELEASE ALT (MSL)** – Plan for 200 ft. above ingress altitude.

g. **MINIMUM ALTITUDE (MINALT) (MSL)** – Must stay above this altitude. Use 1000 ft. AGL.

**Figure 11-2 T-6A Pop Diagram (target elevation 200-ft)**
Pop Mechanics

At the PUP, pilots will call “[tac call sign], popping” on TAC and begin the pop attack by setting max power, sharply executing a level turn 30° away from the target, rolling wings level momentarily, then using 2-3 Gs to pitch nose-up, setting the required degrees of climb. Just prior to the apex altitude, pilots will roll 135° towards the target, place the aircraft’s lift vector on the target, and aggressively pull the nose of the aircraft to the target, setting the required dive angle, then rolling wings level. During this pull, the aircraft should go no higher than the apex altitude. During the pull to the target, pilots will call “[tac call sign], in, heading XXX”, indicating the aircraft’s ultimate attack heading.

SNFOs will monitor the aircraft’s compliance with the Z-diagram and also have required ICS calls to make during the attack and dive recovery. At the planned release altitude, SNFOs will say “mark” on ICS, and then ensure that their pilots go no lower than the minimum altitude by using “level” or “PULL!” commands, as appropriate. SNFOs will note the UTC time when passing directly over the target (simulated weapon impact). After weapons release, pilots will immediately apply positive G to stay above the MINALT and establish a climb (also known as a “safe escape” maneuver).

After safe escape is assured (positive rate of climb), SNFOs will deselect the #2 needle to simulate “safe-ing” a weapon system. Once the aircraft is climbing and the simulated weapon system is safed, IPs will call “[tactical call sign], off safe, sim one away” on TAC in sequence (Lead then Wing). Wing IP will append “visual” or “blind” to their off-safe call to let Lead know their visual status. The Lead should also attain a visual on Wingman as soon as possible to monitor the Wing’s safe escape and be prepared to talk Wing back on in the event Wing is blind. With a diligent lookout, Wing should be able to keep Lead in sight throughout the attack.

Shift Attack

A shift pop attack is a tactic that enables a section to create temporal separation between the two attacking aircraft in order to prosecute the same target. This has certain advantages and safety considerations that make it a viable and practiced tactic in the fleet. One of the main reasons is that the separation between aircraft allows for fragmentation avoidance from the explosion of the first aircraft’s attack. Also, mutual support is maximized by the non-maneuvering aircraft providing cover to the attacking aircraft. Lead’s attack gives the added benefit of identifying the target area for the Wing aircraft, which allows the Wing to adjust his aim off of Lead’s hits.

We will target 30 seconds of separation between aircraft (a common time separation for bomb fragmentation avoidance). In T-6s, this separation will be created at 5 NM from the target (action point) by a “[tac call sign], action” call made by the Lead IP on TAC. Wing will maneuver their aircraft to turn 90° toward the Lead’s flight path; in other words, Wing will cross behind Lead’s tail. After rolling out, the Wing will time 15 seconds before turning to put the target back on the nose. Meanwhile, Lead will continue toward the target point and execute the pop attack on timeline. Wing will execute their attack on timeline in the same direction as Lead. Wing’s initial 90° offset generates approximately 30 seconds of spacing.
Comm example for a shift attack:

1. Lead SNFO: “Raid, attack” at 10 NM.

2. Lead IP: “Raid, action” at 5 NM.

3. Lead at PUP:
   Lead IP: “Raid 11, popping” at 2 NM.

4. During roll-in:
   Lead IP: “Raid 11, in, heading 330.”

5. At planned release altitude:
   Lead SNFO (ICS): “Mark”

6. Approaching MINALT:
   Lead SNFO (ICS): “PULL!” (if necessary, i.e., descent through MINALT is imminent)

7. Safe-escape complete, aircraft “safed”:
   Lead IP: “Raid 11, off safe, sim one away.”

8. Wing at PUP (30 sec later):
   Wing IP: “Raid 12, popping.”

9. During roll-in:
   Wing IP: “Raid 12, in, heading 345.”

10. At planned release altitude:
    Wing SNFO (ICS): “Mark”

11. Approaching MINALT:
    Wing SNFO (ICS): “PULL!” (if necessary, i.e., descent through MINALT is imminent)

12. Safe-escape complete, aircraft “safed”:
    Wing IP: “Raid 12, off safe, sim one away, visual/blind.”
A crossing pop attack is a tactic that enables a section to conduct simultaneous attacks on the same target (Figure 11-4). Unlike a shift attack, a crossing pop attack masses firepower on the target while minimizing exposure to target area defenses. The crossing attack does not have a large separation maneuver; instead, the Lead will orient the geometric center of the section straight towards the target (bisecting the section to enable proper attack geometry). At the appropriate distance (0.5 NM from the PUP), the Lead IP will call “[section tac call sign], action” on TAC. Both aircraft will make an aggressive level turn away from each other for 30 degrees. At the PUP, the Lead pilot will execute a pop attack. Wing will execute a pop attack after a 2-second delay, appending “visual” to the “in” call. This delay is designed to keep Lead slightly forward of Wing and ensure de-confliction. Wing will not roll-in on the target without a visual. If blind, Wing will call as such with their altitude and pull away from the target.

Comm example for a crossing attack:

1. Lead SNFO: “Raider, attack” at 10 NM.
2. Lead IP: “Raider, action” at 2.5 NM.
3. At PUP:
   Lead IP: “Raider 11, popping.”
   After 2 second delay:
   Wing IP: “Raider 12, popping.”

4. During roll-in:
   Lead IP: “Raider 11, in, heading 030.”
   Wing IP: “Raider 12, in, heading 330, visual.”

5. At planned release altitude (both aircraft):
   SNFO (ICS): “Mark.”

6. Approaching MINALT (both aircraft):
   SNFO (ICS): “PULL!” (if necessary, i.e., descent through MINALT is imminent)

7. Safe-escape complete, aircraft “safed”:
   Lead IP: “Raider 11, off safe, sim one away.”
   Wing IP: “Raider 12, off safe, sim one away, visual/blind.”

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Figure 11-4 Crossing Attack

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APPENDIX A
GLOSSARY

ABEAM: A position, either on the left or right side, which is 90º off the longitudinal axis of the aircraft.

ACUTE: A condition in which the Wingman is positioned forward of a designated bearing line.

AIRBORNE INTERCEPT CONTROLLER: Individual qualified to run ground or airborne radars to provide coordination and targeting guidance for air-to-air intercepts.

BANDIT: Term used for a hostile aircraft.

BEARING LINE: An imaginary line drawn aft from the Lead's 3/9 line. The bearing line is the angular difference between the Wingman's aircraft and Lead's 3/9 line (i.e., being established on the 60º bearing line means the Wingman is offset 30º from Lead's six o'clock position).

BINGO: The fuel required to fly from the farthest point of a working area or route point to your planned destination via standard routing to arrive with:

   a. VMC: SOP minimum fuel on deck (200 lbs.) or fuel to proceed to an alternate and arrive above SOP emergency fuel (120 lbs.), whichever is higher.

   b. IMC: Divert Fuel

BLIND: A term used by Wing to communicate that he has lost visual contact with the Lead aircraft when VMC.

BREAKUP: A maneuver utilized to separate the formation aircraft and establish them in trail or column.

CARRIER BOX: Painted area left of runway centerline that depicts the size and shape of an aircraft carrier’s landing area.

CHECK SIX: A visual lookout to check the aircraft or formation’s six o’clock position for a potential adversary.

CHECKPOINT: A selected point or set of points, on the Lead aircraft, which are utilized by the Wingman to determine relative position.

CLOSURE RATE: The relative rate at which the Wing aircraft is approaching (or “closing on”) the Lead aircraft.

CROSSUNDER: A maneuver utilized to change the position of the Wing aircraft from one side of the Lead to the other.
CUTOUT: A visual checkpoint on the T-6A referring to the outermost or innermost corner of that portion of the wing that has been cut out to allow installation of the aileron.

DASH TWO: A radio communication term used to refer to the Wingman in a formation.

FLIGHT INTEGRITY: The ability of the Wingman to maintain the proper relative position while the formation is performing maneuvers.

Forward Air Controller (FAC): Individual qualified to guide and clear attack elements during the execution of close air support.

IFLOLS/FLOLS: Improved Fresnel Lens Optical Landings System. Visual landing aid placed on the left side of the runway or aircraft carrier landing area. A vertical amber or red light (“the ball”) appears above, aligned with, or below a set of horizontal green lights indicating the aircraft’s position above, on, or below glideslope.

JOKER: Joker fuel is a pre-briefed fuel state that allows for one more tactical run/set, or 1 minute at max power (whichever is higher), prior to reaching Bingo fuel. In the T-6A, Joker will be set at 100 lb. above Bingo fuel.

KNOCK-IT-OFF: A radio call used by a flight member to alert the formation to cease maneuvering. This radio call should be used when safety of flight is in question and may be initiated by any flight member.

LOST SIGHT: A term used by the Wingman to communicate that he has lost visual contact with the Lead aircraft when IMC.

MARSHALL: Location where flight elements will stage themselves prior to comm check-in.

MIKES: Minutes

NEW SIX: This is the formation’s new six o’clock position at the conclusion of a tactical turn or maneuver. Checking this position will normally be assigned to a specific crewmember during a tactical turn, to maximize visual lookout opportunities and enhance visual lookout doctrine.

NOSE-TO-TAIL: The distance from the nose of the Wing aircraft to the tail of the Lead aircraft.

OLD SIX: This is the formation’s current or old six o’clock at the conclusion of a tactical maneuver or turn. Checking this position will normally be assigned to a specific crewmember during a tactical turn, to maximize visual lookout opportunities and enhance visual lookout doctrine.

ON-SPEED: Resultant airspeed used by aircraft when setting optimum AOA (indicated by amber donut on AOA indexer) to land aboard aircraft carriers. Speed that generates the highest lift-to-drag ratio given an aircraft’s weight.
PARADE POSITION: A fixed position on the 45º bearing line on either the left or right side of the Lead aircraft with 5 ft of stepdown and 3 ft of wingtip separation.

PLAYMATE: A term used when referencing aircraft participating in your formation.

PROP ARC: A visual checkpoint on the T-6A, referring to the outermost portion of the circle created by the tips of the propeller blades in motion.

RATE OF ROLL: Degrees per second that the aircraft lateral axis changes about the longitudinal axis.

RENDEZVOUS: A maneuver where the formation aircraft are maneuvered into a position where a join-up may be performed.

SHAKE OFF: A visual signal (negative head shake) given by the Wingman to indicate he is not prepared to execute the next maneuver or required action.

STACK: A visual checkpoint on the T-6A, referring to the trailing edge of the exhaust stacks.

STAGNATED ON THE BEARING: A condition during the rendezvous where the Wing aircraft ceases to continue closing on the Lead aircraft.

STEPUP/STEPDOWN: The vertical distance between the Lead and Wing aircraft.

SUCKED: A condition in which the Wingman is positioned aft of a designated bearing line.

TAIL-CHASE: An exercise designed to demonstrate the concepts of Lead, lag, and pure pursuit while dynamically maneuvering the section.

TERMINATE: A radio call (normally initiated by the flight Lead) to terminate an exercise or maneuvering. This differs from the knock-it-off call in that it is anticipated/expected (e.g., after tail-chase).

TRAIL: A formation pattern where Wing is directly behind the Lead aircraft.

UNDERRUN: A maneuver utilized to allow the Wing aircraft to pass below, behind, and outside the Lead aircraft's radius of turn in the event that the rendezvous becomes unsafe.
APPENDIX B
ACRONYMS

A/A - Air-to-air

AGL - Above Ground Level

AGSM - Anti-G Straining Maneuver

AOB - Angle of Bank

AP - Area Planning

A/S - Air to Surface

ATC - Air Traffic Control

ATIS - Automated Terminal Information Service

AUX - Auxiliary Radio (VHF Radio)

BAC - Basic Approach Configuration

BDC - Battle Damage Check

CFS - Canopy Fracturing System

CRM - Crew Resource Management

CTAF - Common Traffic Advisory Frequency

DME - Distance Measuring Equipment

ETA - Estimated Time of Arrival

FAF - Final Approach Fix

FOD - Foreign Object Damage

FSS - Flight Service Station

FTI - Flight Training Instruction

GP - General Planning

GPS - Global Positioning System
HEFOE - Hydraulic, Electrical, Fuel, Oxygen, and/or Engine

IAW - In Accordance With

ICS - Internal Communication System

IFR - Instrument Flight Rules

IMC - Instrument Meteorological Conditions

INAV - Instrument Navigation

KIAS - Knots Indicated Airspeed

KTAS - Knots True Airspeed

KTS - Knots

MOA - Military Operations Area

MSA - Minimum Safe Altitude

MSL - Mean Sea Level

NATOPS - Naval Air Training and Operating Procedures Standardization

NFO - Naval Flight Officer

NM - Nautical Miles

NORDO - No Radio

NOTAM - Notice to Airmen

ONAV - Operational Navigation Flight Support

OPNAV - Office of the Chief of Naval Operations

OSC - On Scene Commander

OTR - Off Target Rendezvous

PCL - Power Control Lever

PRI - Primary Radio (UHF Radio)
QOD - Question of the Day
RTB - Return to Base
SA - Situational Awareness
SAR - Search And Rescue
SDO - Squadron Duty Officer
SNFO - Student Naval Flight Officer
SOP - Standard Operating Procedures
SRT - Standard Rate Turn
TAC – Tactical frequency
TAS - Traffic Avoidance System
UHF - Ultra High Frequency
VFR - Visual Flight Rules
VHF - Very High Frequency
VMC - Visual Meteorological Conditions
VOR - VHF Omni-directional Range
VR - VFR Military Training Route