NAVAL AIR TRAINING COMMAND

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FLIGHT TRAINING INSTRUCTION

NAVIGATION TH-73A

2022

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1. CNATRA P-479 (05-22) PAT, "Flight Training Instruction, Navigation, TH-73A" is issued for information, standardization of instruction, and guidance to all flight instructors and student military aviators within the Naval Air Training Command.

2. This publication is an explanatory aid to the Helicopter 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 Chief Naval Air Training (CNATRA) web site.

T. P. ATHERTON
By direction

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FLIGHT TRAINING INSTRUCTION

FOR

NAVIGATION

TH-73A

(CIN NUMBER)

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Dates of issue for original and changed pages are:
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INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

SAFETY/HAZARD AWARENESS NOTICE

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

INTRODUCTION

Congratulations! You are now about to enter the Visual Navigation (VNAV) stage of flight training. Despite the widespread use of GPS and moving maps, navigating off a chart is still an integral part of a Naval Aviator's skill set. You will begin by navigating off a Sectional, both during the day and at night, on your cross-country flights. These flights will take you out of the local area and introduce you to different aspects of the National Airspace. The instrument stage will culminate in your navigation solo, one leg of which will be flown under VFR. Later on, you will be introduced to the Low-Level and Terrain Flight (TERF) environments. On these flights, you will navigate off a map while flying at or below 500 feet Above Ground Level (AGL). At these altitudes, you will refine your CRM skills, particularly communication, Situational Awareness (SA), and decision-making. By the end of this stage, you will have gained valuable skills that will serve you well during your aviation career.

SCOPE

This publication contains maneuver descriptions encompassing the Navigation events for both aircraft and simulator listed in the Advanced Multi-Service Pilot Training System Curriculum (CNATRAINST 1542.186 series); however, it does not contain maneuver descriptions previously covered in other FTI publications. It is your responsibility to have a thorough knowledge of the contents within all FTIs.

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CHAPTER ONE
VISUAL NAVIGATION

100. INTRODUCTION

VFR navigation flights intend to be cross-country flights to familiarize the Student Naval Aviator (SNA) with navigation procedures outside the local area. The goal is to transit from one airfield to another as expeditiously as possible while navigating around all en route obstacles. The focal points of the cross-country are flight planning, navigating through different types of airspace, and proper external communications.

Cross-country flights require significantly more planning than regular syllabus flights. At times, the amount of planning that goes into a cross-country may seem excessive, but proper planning ahead of time helps pilots negotiate issues as they arise. Cross-country flights rarely go exactly to plan due to unforeseen circumstances such as weather or maintenance. Having a solid plan to begin with allows the pilots to easily be more flexible instead of coming up with an entirely new plan from scratch.

Over the course of the cross-country flights, the SNA should use both Dead Reckoning (D/R) navigation and pilotage to remain oriented along the route of flight. D/R is a method for determining the helicopter's position using the heading indicator and calculations based on speed, elapsed time, winds, and direction flow from the last point. Helicopters frequently use D/R to find ships at sea. Pilotage is a method of navigation that requires the pilot to correlate ground references with landmarks depicted on a map.

101. ROUTE SELECTION

When signing up for a cross-country, ensure that you will complete all of the cross-country prerequisites, including classes, simulator events, and flights, before departing on the first cross-country flight. Prior to beginning preflight planning for a cross-country flight, the SNAs shall contact the instructor for specific guidance and flight expectations. The instructor and the SNAs will decide on the ultimate destination of the cross-country. They may also decide on an alternate destination in case of inclement weather. Some instructors may specify which airports to use as intermediate stops, and other instructors may leave that decision up to the students.

After determining the destination and intermediate airports, plan a rough outline of the route to be flown between them. The first draft of the route is only an estimate, used to plan the departure from and arrival to the airports along the route. When making the first draft of the route, look for any large obstacles along the route of flight, such as restricted areas, and plan to avoid them.

After outlining the route, return to the departure airfield and begin detailed planning. Consider how the flight will depart the airfield. If departing from South Whiting, think about which course rules the flight will utilize to get clear of Whiting's airspace. The course rules to the Western Area, Eastern Area, and East Bay enable the flight to exit the local area and transition to the en route portion of the flight. If the departure airport is a civilian airfield, note where the Fixed-Base Operator (FBO) is located and plan a taxi route from the FBO to the expected takeoff position. At large airfields, taxi instructions can be long and complex. Studying the airfield diagram ahead of time and determining a likely taxi route will decrease confusion when calling Ground.

When finished with planning the departure, begin detailed planning of the destination airport. First, ensure that the destination airfield offers military contract fuel by checking the AIR Card® website. SNAs should call ahead to confirm information about the FBO. Next, ensure that the FBO has a working Ground Power Unit (GPU) that is compatible with the TH-73A. Then, double-check the FBO operating hours. An FBO with contract fuel and a GPU is of little use if it closes before you arrive. Determine where the FBO offering contract fuel and aircraft parking is located. At larger airfields, there may be more than one FBO, but only one offers contract fuel. Lastly, SNAs should also confirm that the destination FBO has enough ramp space to park the helicopter over the weekend, especially at busy airports. Some small FBOs run out of parking if there is an event taking place in town over the weekend.

After gathering all the information concerning the FBO, consider the arrival at the airport. Large airports use VFR reporting points to allow VFR aircraft to easily enter the airspace and transit to the airport. If the destination is a Class B airport or under a Class B shelf, plan on using a VFR reporting point during the arrival. At smaller airports, ensure there are no noise sensitive or wildlife areas that must be avoided upon arrival.

Once the departure and destination airport planning is complete, begin the detailed route planning. The flight path should be relatively straight. Use prominent, easily identifiable landmarks as checkpoints when changing direction along the route, or for time and distance calculations. Note any hazards or airspace that you wish to avoid and choose checkpoints that will keep you clear of them. Airfields often make good checkpoints because they are large, provide contrast with the surrounding terrain, and have distinctive layouts. It is permissible to fly through Class D and even Class C airspace as long as you contact Tower or Approach control within an appropriate distance for the type of airspace. If the route of flight takes you in the vicinity of uncontrolled airfields, note the Common Traffic Advisory Frequency (CTAF). Have all en route Tower, Approach control, and CTAF frequencies readily available in the cockpit during the flight.

102. CROSS-COUNTRY PREPARATION

A significant portion of cross-country flight planning is preparing the products that will be used in flight. Many SNAs elect to create a smart pack that contains much of the relevant information for the flight in an organized manner. Items that may be included in a smart pack include an administrative cover sheet or airfield diagrams for each of the stops with the FBO location circled. Make enough smart packs so that each SNA and the instructor have their own copy. Additionally, SNAS shall prepare a Navigation Log (NAV Log) for the VNAV cross-country flights, obtain a DD 175-1 Weather Brief, and prepare a sectional for at least one leg of the route.

1. Cover Sheet

An administrative cover sheet provides pertinent information for each leg of the flight at a glance, an example of which is shown in Figure 1-1. The cover sheet should include the following information for each airfield: International Civil Aviation Organization (ICAO) identifier, airfield elevation in Mean Sea Level (MSL), and all relevant airfield frequencies, including Automatic Terminal Information Service (ATIS), Clearance, Ground, Tower, and Departure.

Additionally, the cover sheet should leave room to annotate the takeoff and land times, the current ATIS information, and any other notes along the route of flight. For each leg, the cover sheet should include any GPS waypoints or NAVAID frequencies to be used along the route, as well as en route radio frequencies. The en route radio frequencies may include CTAF frequencies for untowered airfields along the route of flight or tower and approach frequencies the pilots will contact in order to transit through Class D or C airspace. Include Flight Service Station (FSS) frequencies, as well, to open flight plans or obtain en route weather.

Date:	PIC:		CP:		CP:			
LEG 1								
	ICAO	ELEV	ATIS	CLRN	GND	TWR	DEP	T/O
DEP A/F								
GPS WPT								
EN FREQ								
VOR/TCN								
	ICAO	ELEV	ATIS	APP	TWR	GND	FBO	LAND
DEST A/F								
Notes								
LEG 2								
	ICAO	ELEV	ATIS	CLRN	GND	TWR	DEP	T/O
DEP A/F								
GPS WPT								
EN FREQ								
VOR/TCN								
	ICAO	ELEV	ATIS	APP	TWR	GND	FBO	LAND
DEST A/F								
Notes								
LEG 3								
	ICAO	ELEV	ATIS	CLRN	GND	TWR	DEP	T/O
DEP A/F								
GPS WPT								
EN FREQ								
VOR/TCN								
	ICAO	ELEV	ATIS	APP	TWR	GND	FBO	LAND
DEST A/F								
Notes								

Figure 1-1 Administrative Cover Sheet Example

2. NAV Log

SNAs shall create a NAV Log for at least one leg of the route, as pictured in Figure 1-2. SNAs may complete the NAV Log by hand or electronically via flight planning software. Most flight planning programs will create a NAV Log based on the route the pilot has designed on the map. After creating the route, double-check the NAV Log to ensure it is correct. Then, print it out and bring it to the brief.

Waypoint	Route / Altitude	wDir / Temp (dev)	wSpd	TAS	Track / WCA	TH / Var	MH	GS	Dist	ETE / ETO	ATE / ATO	Fuel / EFR	Fuel / AFR
KGNV N 29°41.40° W082°16.31°													
	·D·	6° / 19°C(+4°)	9	85	207° / +2°	210° / +6°	216°	94	3.2	2.0 / 2.0		0.0 / 400	
TOC N 29°38.58° W082°17.99°													
	·D· / 2000	8° / 14°C(+3°)	11	130	207° / +2°	209° / +6°	215°	140	19.4	8.3 / 10		0.0 / 400	
X60 N 29°21.28° W082°28.23°													
	·D· / 2000	358° / 14°C(+3°)	11	130	166° / +1°	165° / +6°	171°	141	33.9	14 / 25		0.0 / 400	
KINF N 28°28.22° W082°19.10°													
	·D· / 2000	346° / 14°C(+3°)	11	130	113° / -4°	109° / +6°	115°	136	57.8	25 / 50		0.0 / 400	
KMCO N 28°25.76° W081°18.54°													

Figure 1-2 NAV Log Example using Flight Planning Software

Bear in mind that flight planning tools are only as accurate as the pilot's information. Double-check the planned true airspeed and leg time to ensure the helicopter can carry enough fuel to complete the leg. Regardless of what planning method is used, the pilot is still responsible for checking weather and NOTAMs along the route of flight.

3. Airfield Diagrams

You can print airfield diagrams from commercially available websites or make a copy from the Department of Defense (DoD) Approach Plates. Mark the FBO location on the airfield diagram as well as expected taxi routes to and from parking. If the FBO frequency is not annotated on the airport diagram, consider drawing it in so it will be readily available in flight.

4. DD-1801

SNAs shall prepare a DD-1801 flight plan for any flight departing from a military airfield, including Whiting Field (unless using one of the Whiting stereotype flight plans). The DD-1801 shall be prepared In Accordance With (IAW) the General Planning (GP) publication. Always make two copies of the DD-1801; carry one copy in the cockpit, and leave the other copy with the squadron duty officer.

SNAs may use a Whiting stereotype flight plan for a cross-country flight if available for the route of flight. If there is no stereotype flight plan for the destination, the SNA shall file the DD-1801 with Base Operations.

5. DD-175-1

The SNA shall obtain a DD-175-1 for every cross-country leg that departs from a military airfield, including South Whiting Field. If the destination is on the canned route DD-175-1 list, the SNA may use it. If the destination is not on the canned route DD-175-1, the SNA must request one through the Flight Weather Briefer website. It takes an hour or two for a forecaster to complete a custom DD-175-1, so plan ahead and make the request early.

A copy of the DD-175-1 shall be carried in the cockpit. If the flight is delayed and the DD-175-1 is due to expire prior to departure, obtain a new or updated DD-175-1.

103. CHART PREPARATION

Although most cross-country planning is completed using flight planning software, SNAs are still required to prepare a paper sectional for at least one leg of the cross-country. SNAs will use the prepared sectional to navigate during the flight. Each SNA is responsible for preparing his or her own chart.

When preparing any map, neatness is important. A well-prepared map will enhance SA, while a poorly prepared chart will detract from it. Use straightedges, stencils, and a fine tip pen when marking the chart.

At a minimum, the sectional shall include circled checkpoints and doghouses with the heading, distance, and timing from checkpoint to checkpoint.

1. Checkpoints

Mark each checkpoint with a circle, as indicated in Figure 1-3. Mark route checkpoints with a circle about the size of a nickel. If the route includes Whiting course rules, mark the course rules checkpoints with a circle about the size of a dime. Connect the checkpoints with a line using a straight edge. Make all checkpoint and route marks with a fine tip black marker. When marking a sectional, try to avoid drawing over any potentially important information, such as frequencies, identifiers, or obstacles.

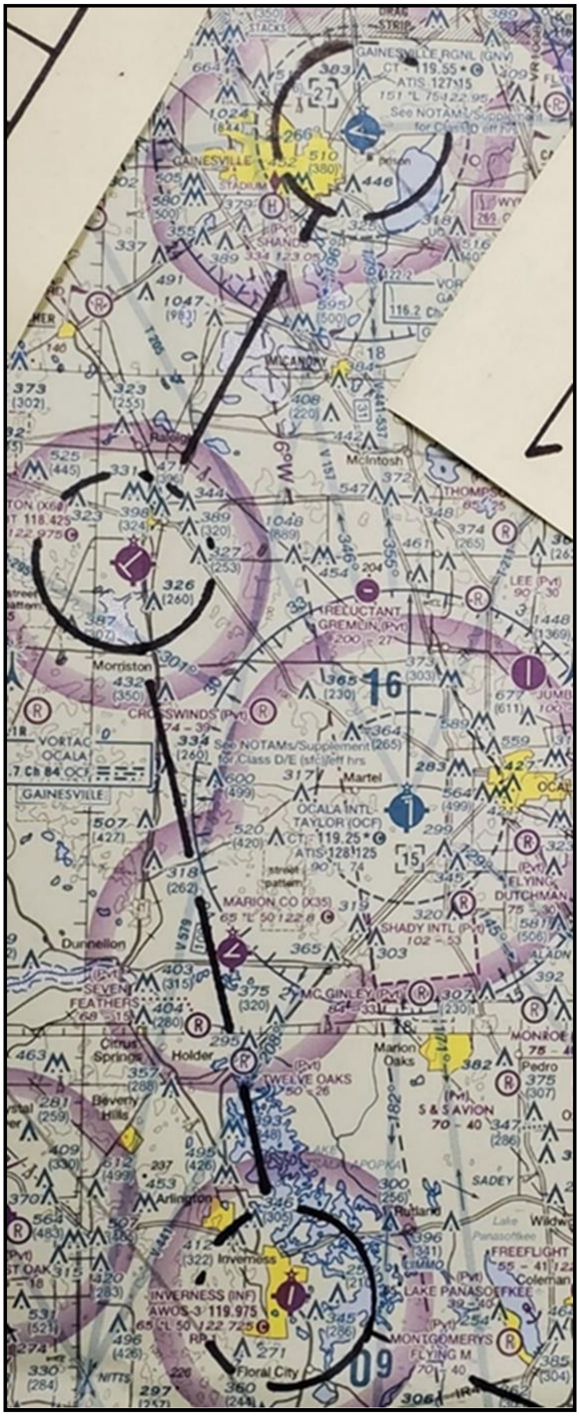

Figure 1-3 Checkpoints and Route Lines on a Sectional

2. Doghouses

SNAs shall draw doghouses (Figure 1-4) for each leg of the route annotated on the sectional. There are two types of doghouses that may be used during a cross-country flight. The first type of doghouse is a simple arrow with the heading, distance, and leg time annotated above the line.

Arrow doghouses are acceptable for use on sectionals during cross-country flights. However, when preparing maps for TERFs, SNAs shall use traditional doghouses.

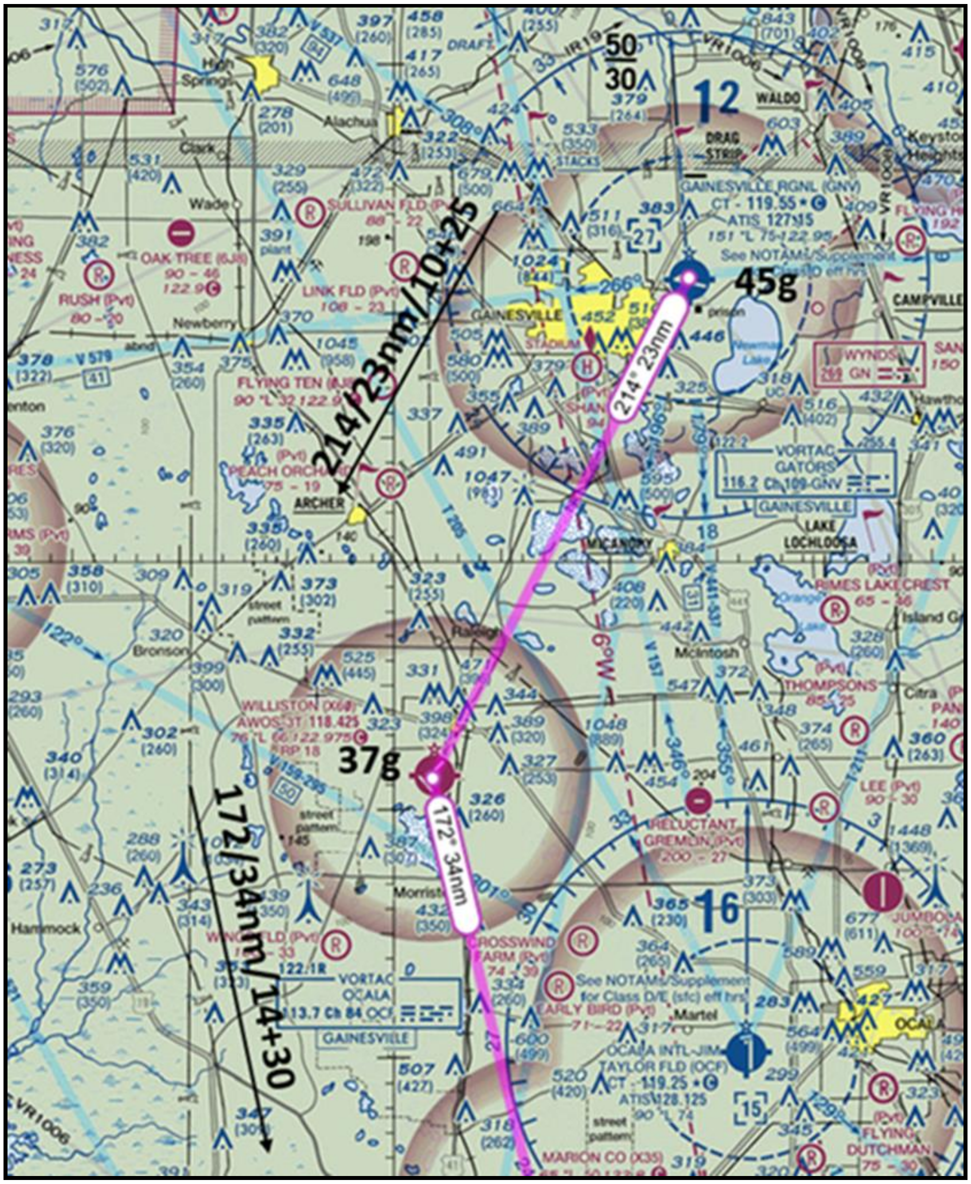

Figure 1-4 Example of an Arrow Doghouse on a Sectional

The second type of doghouse is the traditional doghouse-shaped navigation box that includes the heading, distance, leg time, total time, and planned fuel remaining information, as seen in Figure 1-5.

Figure 1-5 Traditional Doghouse Example on a Sectional

Doghouses should be neat and legible. Orient the doghouses in the direction of travel so that the information contained therein will be facing upright as you navigate along each leg. Allow a few inches of space between the doghouse and the route line. This will prevent the doghouse from covering up any important navigation features along the route of flight.

3. Final Map Preparation

Be familiar with all the symbology on a sectional chart. Study the route of the flight. If there is a symbol or mark that you do not recognize or understand, look it up in the legend ahead of time. This will prevent needing to unfold the map in flight to check an unfamiliar symbol.

Fold the map so the PNAC may follow the helicopter's position along the route of flight while transferring from one fold of the map to the next. The key to folding a map is to ensure that the whole route can be visible without completely unfolding and refolding the map in flight.

104. FLIGHT EXECUTION

1. Brief

Bring the sectional, NAV Log, DD-1801 (if required), DD-175-1, and any smart pack products to the brief. Additionally, have the current NOTAMs and Temporary Flight Restrictions (TFR) for the route. Discuss the route of flight, including a quick overview of any obstacles or airspace that have specific communication requirements. Additionally, discuss those airspaces that must be avoided, such as restricted areas and TFRs. Take time to review the fuel requirements along the route of flight and any alternate airfields that may need to be used due to weather or an inflight emergency. Lastly, conduct a quick review of the terminal environment of the destination airfield, including frequencies, the FBO location, and other considerations unique to the airport.

2. Filing the Flight Plan

When departing from a military airfield, the crew shall file through Base Operations using a DD-1801. When departing from a civil airfield, the crew may use any other authorized method of filing the flight plan, such as calling FSS at 1-800-WXBRIEF, via the FSS website, or via an approved aviation planning application.

3. Departure Considerations

Departure communications at civil airfields differ slightly from that at Whiting Field. When calling Ground to request taxi at a civil airfield, there is no need to state the time en route or souls on board. However, the Ground controller may want to know the direction of departure to better position the helicopter for takeoff. When departing from Tallahassee, the call to Ground will be similar to, *"Tallahassee Ground, Navy 8E610, VFR to Gainesville, ready for taxi, with information Sierra."* At uncontrolled airfields, use standard CTAF calls when taxiing around and departing from the airfield, *"Marianna traffic, Navy Helicopter 610, taxiing from the FBO to runway 18 via taxiway delta, Marianna traffic."* If you are ever unsure of what to say on the radio, practice the call over the Intercommunication System (ICS) first, so the instructor can help you.

At civil airports, helicopter VFR departures may be conducted from the runway, taxiway, designated helicopter pad, or a non-movement area (often called a present position takeoff). Non-movement areas are any portion of the surface of an airfield that is not controlled by Ground or Tower, such as the FBO ramp. When requesting takeoff from a non-movement area, tower will not be able to clear you for takeoff. That said, if the controller believes that it is reasonable and safe, tower will allow you to takeoff using the following phraseology, "Departure from (requested location) will be at your own risk (additional instructions as necessary). Use caution (as necessary). When departing from a non-movement area, the pilot assumes responsibility for obstacle clearance and the safety of surrounding aircraft and personnel.

However, pilots are never required to takeoff from non-movement areas. If there is any doubt about the safety of a takeoff or departure path, request to takeoff from the runway in use.

Takeoff clearances and permission to depart from a non-movement area often come with additional instructions, such as fly a certain heading or do not overfly a particular area of the airfield. Before transitioning to forward flight, ensure that you understand those instructions. If there is any doubt about the instructions, ask Tower for clarification.

When departing from a runway, takeoff and departure will be in accordance with local SOP, Course Rules, or Tower instructions. If the tower has instructed you to maintain runway heading, remain on that heading until Tower clears you to turn. If departing from anywhere other than a runway, follow Tower's instructions. Do not turn on course until cleared to do so. If taking off from a non-movement area, such as the ramp, be careful not to overfly other aircraft, personnel, or buildings.

At uncontrolled airfields, helicopters may take off from wherever the pilot deems a safe departure can be made. However, in order to remain predictable for other traffic in the area and avoid overflying any personnel, aircraft, or obstacles, it is highly recommended that helicopters use a runway, parallel taxiway, or designated helicopter pad for takeoff and landing.

4. Inflight Navigation

At least one leg of the cross-country shall be navigated using the VFR sectional. The remaining legs may be navigated using an approved Electronic Kneeboard (EKB) or the Flight Management System (FMS). However, when using any electronic means of navigation, the sectional shall be readily available in the cockpit as a backup. Likewise, an EKB or the FMS may be used as a secondary reference while navigating via the sectional.

Time and distance checks should be made at each checkpoint, including a note of the actual fuel remaining compared to the fuel required to complete the flight. A fuel burn calculation should be conducted at least once every 15 minutes over the course of the flight.

In addition to navigating, the PNAC must maintain SA of radio frequencies and upcoming radio calls. For example, as the helicopter approaches an uncontrolled airfield, the PNAC should have the CTAF ready on the radio to make traffic advisory calls. The PNAC should also have upcoming Approach or Tower frequencies ready in order to call and obtain clearance through the airspace. As the helicopter approaches the destination, have the ATIS frequency ready in the backup so that the crew can obtain ATIS, Automated Surface Observation System (ASOS), and Automated Weather Observing System (AWOS) prior to contacting Tower or Approach control.

5. VFR Arrival Considerations

If the destination airport is in Class C airspace, contact Approach control no later than 20 Nautical Miles (NM) from the primary Class C airfield. When contacting Approach for the first time, state the helicopter's location and the current ATIS information for the destination. If possible, use a VFR reporting point from the sectional to describe your location. If a VFR reporting point (Figure 1-6) is unavailable, describe your position relative to the destination airfield or a local TACAN or VOR station. For example, when approaching Tallahassee, the radio call would be, *"Tallahassee approach, Navy 8E206, 20 miles northwest of Tallahassee International, 1,500 feet, information Zulu for a full stop at Tallahassee."* Approach control may clear the helicopter directly to the airport or provide vectors to avoid other traffic. As soon as you see the airport, report *"field in sight"* to Approach control. They will switch you to the Tower frequency, who will give you any additional guidance required and clear you to land.

If the destination airport is in Class D airspace with no surrounding Approach control, obtain ATIS and contact Tower within 10–15 NM. Follow the same procedures as with Class C airspace.

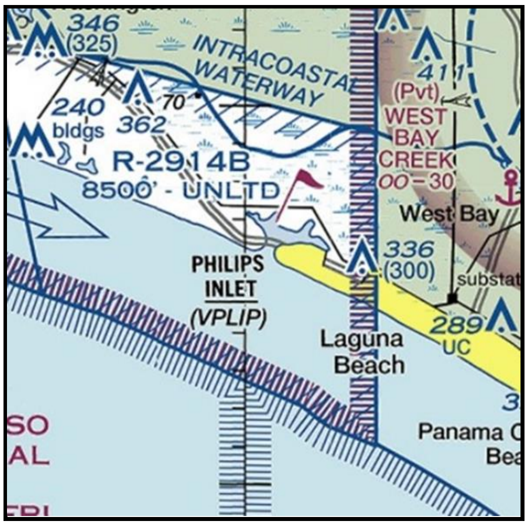

Figure 1-6 VFR Reporting Point

When landing at an uncontrolled airfield, obtain the current weather through ASOS or AWOS. Tune in the CTAF frequency and begin making traffic calls no closer than 10 NM from the airport. Coordinate and de-conflict with other traffic at the airfield as necessary.

At towered airfields, the Control tower will provide directions on how to enter the pattern and land. During preflight planning, you should have noted the forecasted winds, predicted the runway in use, and estimated how Tower would instruct you to enter the pattern. Tower may clear the helicopter to land on the runway, a taxiway, a designated helicopter pad, or another portion of the airfield. If Tower approves a helicopter to land in a non-movement area, the phrase *"landing at (requested location) will be at your own risk"* will be used instead of "*cleared to land."* This means that the pilot is responsible for maintaining a safe distance from any obstacles, personnel, or aircraft. If directed to land in a non-movement area, the pilot is not required to accept the clearance. If there is any doubt about the safety of a landing or you are unsure of where Tower is directing the helicopter to land, request the runway or a taxiway with which the crew is familiar.

At uncontrolled airfields, remain predictable when entering the pattern and landing. Announce your intentions on the CTAF and de-conflict with other traffic as necessary. At busier uncontrolled airfields, helicopters frequently land on parallel taxiways near the FBO to remain clear of the runway for fixed-wing traffic.

105. CRM DURING CROSS-COUNTRY FLIGHTS

During cross-country flights, the PAC and the PNAC work together as a team to navigate. The PAC flies the helicopter and describes the topography and landmarks along the route. The PNAC aids in the outside scan, references the map to remain oriented, and directs the PAC to look out for specific features along the route. The PAC and PNAC must communicate effectively in order to navigate successfully.

In addition to navigating, the PNAC takes care of the majority of tasks around the cockpit, including conducting groundspeed and fuel checks, updating the PAC along the route, and having the next radio or frequency ready for the PAC as soon as he or she needs it. The observer in the back of the helicopter is also a member of the crew. The observer can aid in finding ground references for navigation and calculating fuel burn or groundspeed. In the event of an emergency, the observer can break out the Pocket Checklist (PCL) while the PAC and PNAC focus on flying the helicopter and handling the emergency.

When the plan begins to change due to unforeseen weather or other circumstances, the entire crew needs to remain adaptable and flexible in order to perform accurate mission analysis and make appropriate decisions concerning the flight.

106. NIGHT VISUAL NAVIGATION

Much of the preparation, planning, and execution for night VNAV remains the same as the day flights. However, there are a few additional considerations that pilots must take into account when navigating at night.

1. Map Preparation for Night Flights

When preparing a chart for a night flight, use the same procedures as for day navigation. Additionally, mark all obstructions along the route of flight, both lighted and unlighted. Select a pen tip that is thick enough to be seen when reading a map at night, but not so thick, that it will block important navigation information. Whenever possible, use black ink. Black ink will be visible regardless of what color flashlight is used. Using the same color ink and flashlight will wash out the ink and make it very difficult to read. For example, blue ink is very difficult to see under a blue flashlight.

Highlighters are another excellent way to mark important information on the map. Neon yellow and orange highlighters show up well under colored flashlights, particularly blue. Before marking a map with a highlighter, take the time to test how the highlighter will appear in a dark room under different colors of a flashlight.

2. Night Navigation Considerations

Many terrain features and landmarks that make good checkpoints during the day may not be visible at night. When choosing checkpoints for night navigation, select landmarks that are well lit or otherwise visible at night. Do not count on moonlight to aid in finding a checkpoint. Plan each flight as if it will be flown without moon or starlight. Even if the flight is to be flown during a full moon, an overcast layer may obscure the moon and stars.

Common unaided night navigation checkpoints are often brightly lit or have distinct lighting, such as airports. Some examples of well-lit checkpoints include airport beacons, airfield lighting systems, lighted obstructions (such as towers), bridges, major roadways, or uniquely lit buildings or sports complexes.

When navigating at night, consider using other forms of navigation to help remain oriented. Tuning in nearby NAVAIDS provides radial and Distance Measuring Equipment (DME) cuts that can help a pilot estimate the helicopter's position on a chart. Additionally, programming the flight plan into the FMS will help the pilot navigate the route successfully.

3. Spatial Disorientation

As with any night flight, there is an increased risk of becoming spatially disoriented due to the lack of visible horizon and loss of many peripheral cues. Scanning quickly between the map and outside can cause Spatial Disorientation (SD), particularly if the pilot uses large head movements. In order to avoid becoming spatially disoriented while navigating, take time to scan the instruments. A deliberate instrument scan will help the PNAC remain oriented along the flight and help prevent SD in the night environment.

4. Communication

Communication is a critical factor in the success of a night navigation flight. The PNAC must communicate what features, objects, or landmarks they are looking for along the route. The PAC must tell the PNAC what they are actually seeing outside the helicopter and aid the PNAC in locating checkpoints along the route of flight. Communication becomes especially important when the PNAC is heads down looking at the map, tuning a radio, or adjusting the flight plan in the FMS.

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CHAPTER TWO
NAVIGATION SOLO GUIDELINES

200. INTRODUCTION

The Radio Instrument stage culminates with the cross-country solo. One leg of the solo is an Instrument Navigation (INAV) flight. The other leg will be a day VNAV flight. Either leg may be flown first.

201. PREFLIGHT PREPARATION

Plan the two legs of the cross-country flight to the same level of detail as any other syllabus flight. For the INAV leg of the solo, the SNA shall prepare a Jet Log and a DD-1801 flight plan. Make two copies of the DD-1801. Leave one with the Flight Duty Officer (FDO) at the squadron and the other with you. For the VFR navigation leg, the SNA shall bring a sectional prepared with the intended route of flight or have the intended route of flight saved on an EKB so that the FDO can review and approve it.

Prior to briefing with the FDO, the solo SNA shall also obtain a DD-175-1, complete a weight and balance, and check NOTAMs for the route of flight.

202. FDO BRIEF AND FLIGHT PLAN APPROVAL

Bring a copy of the DD-1801, the DD-175-1, NOTAMs, and weight and balance to the FDO brief. Keep a second copy of each of those items and take them to the helicopter. Be diligent when planning for a solo. If the FDO is not satisfied with the SNA's level of preparation, they may cancel the solo.

Pay attention during the FDO brief. Listen to the FDO's instructions and write them down if you need to. If you have any questions, do not hesitate to ask. NOTAM abbreviations can sometimes be confusing. If you are not sure what they mean, seek clarification before walking to the helicopter.

Prior to walking to the helicopter, ensure that you have/do the following:

- Fuel Packet
- All required VFR and IFR publications for the route of flight
- NATOPS PCL
- DD-1801/DD-175-1/NAV Log
- Wallet and Military ID Card
- Check NOTAMS

- Scheduled a Prior Permission Required (PPR), if required

- Received an FDO brief

203. PREFLIGHT

When screening the Aircraft Discrepancy Book (ADB), ensure the helicopter has no downing discrepancies or any outstanding chip lights. If the helicopter does have any issues, contact the squadron FDO, and another helicopter will be issued. The SNA solo shall sign for the helicopter as the Pilot In Command (PIC). Whichever student is functioning as the PIC shall sit in the right seat, start the helicopter, take off, and land.

Perform a thorough preflight of the helicopter. If you are unsure of any possible discrepancy, ask! Ask a nearby Instructor Pilot (IP), use the “T” symbol to call a troubleshooter, or call the squadron FDO.

Before contacting Ground for taxi, call outbound with the FDO on the squadron base frequency. If necessary, call Whiting Pilot-to-Metro (PMSV) and extend the DD-175-1 void time. As a courtesy, always have the weather brief number ready when calling PMSV.

Place the position lights STEADY BRIGHT and make the call to Ground. Remember to use the word “solo” after the callsign on every radio transmission.

204. WEATHER CRITERIA

The VFR Navigation Solo required weather is 1,500/3 for the departure airfield, the entire route of flight, and the destination airfield forecast +/- one hour of the Estimated Time of Arrival (ETA). If the weather at the destination airfield degrades unexpectedly while en route or Air Traffic Control (ATC) suggests an alternate, contact the squadron FDO as soon as it is safe to do so; keep in mind you may be too far out of radio range. If the en route weather deteriorates below 1,500/3 due to an isolated thunderstorm or smoke, the SNA solo may navigate around the area of decreased ceilings or visibility and continue the flight. If the SNA solo is unable to maintain 1,500/3 while circumnavigating, the solo shall return to the departure airport. Remember to inform ATC of your intentions when circumnavigating an area of reduced visibility or returning to the departure airfield. If weather deteriorates and circumnavigating or Return to Base (RTB) will not keep you in VMC, request an IFR clearance from approach control. Be mindful of fuel remaining when circumnavigating or obtaining an IFR clearance.

NOTE

> At no time shall the SNA solo fly into an area below the basic VFR minimums of 1,000/3.

The IFR Navigation Solo requirements are 1,500/3 at the departure airfield and 1,500/3 at the destination airfield +/- one hour of the ETA. The weather may be below 1,500/3 along the route of flight, provided the destination remains above 1500/3. If the weather deteriorates below 1,500/3 at the destination airport, contact the FDO when safe to do so. SNA solos are permitted to enter IMC while en route.

205. EN ROUTE PROCEDURES

It is strongly recommended that solos request flight following for the entire route of flight. When talking to ATC on a VFR flight, keep all calls concise and professional. Upon initial check-in with ATC, tell them who you are, where you are, and what your intentions are. If you do not understand ATC instructions, ask for clarification. Monitor squadron base within 40 NM of South Whiting unless assigned another UHF frequency.

When navigating along the coastline, do not fly further than one-half mile (autorotative glide distance) from the beach. If ATC directs you to fly further off the coast, tell them you are unable. When transiting VFR across large bodies of water, such as Mobile Bay, choose the shortest distance from landmass to landmass. At all times, maintain 500 feet AGL and above, unless directed otherwise by ATC.

Do not Flat Hat! Flat Hatting is flying at a low altitude and/or high rate of speed for thrill purposes.

206. AT THE DESTINATION

When parking the helicopter, note the wind direction. Do not allow the line personnel to guide the helicopter into a landing more than 45 degrees out of the wind line or with too little clearance from obstacles or other aircraft. After shutting down, ensure that the flight plan is closed out.

After refueling, ensure you sign the receipt, take the credit card back, and retain a copy of the receipt marked customer. Check to see that the receipt reflects the correct amount of fuel requested. Ensure the fuel cap is secure and double-check the fuel level on the cockpit indication prior to start up. Complete the summary sheet included in the fuel packet after returning to South Whiting.

Plan for one hour on deck. If you are hot seating to another crew after returning to South Whiting, be on time but not at the expense of safety. Prior to departing, check to make sure that the weather is still greater than 1,500/3. File the flight plan and obtain a weather brief through one of the approved weather sources when departing from a civil airfield. The return flight plan may be filed through approved flight planning software or by contacting FSS. If a return Stereotype flight plan is available, you may call Base Operations and file it.

If the helicopter requires maintenance during the stopover, contact the squadron FDO prior to taking any action. If the helicopter requires fluids, ask the line personnel for the required fluid. Consult the NATOPS to determine the correct fluid type. Contact the squadron FDO before adding any type of fluid.

NOTE

Mixing oils of different brands, types, and manufacturers is prohibited.

Before starting the helicopter, perform a thorough preflight. Ensure the grounding wire used during refueling has been removed. Double-check that all panels are closed and secure, and servicing caps are secured. Ensure that the fuel cap is secured. Line personnel at civil airfields do not conduct a walk-around inspection of a helicopter, so it is incumbent upon the pilot to carefully preflight the helicopter.

207. UPON RETURN TO SOUTH WHITING

After shutting down at South Whiting, log the Naval Aircraft Flight Record (NAVFLIR) in maintenance control. Next, divide the flight time between the first pilot and the second pilot as necessary. Then, log any actual or simulated instrument time and log the approach on the instrument leg of the flight. If you have any questions about completing the NAVFLIR, ask an instructor or the squadron FDO.

Finally, return the fuel packet and any other items checked out from maintenance. If you encountered any unusual circumstances during the flight, debrief them with the FDO and Operations Duty Officer (ODO).

208. EMERGENCY PROCEDURES

During the NATOPS brief with the solo observer, delineate the duties each pilot will perform in the event of an actual emergency. Most emergencies encountered by SNAs on their navigation solos are single instrument indications or caution lights. Do not enter an autorotation in the event of a single instrument indication or caution light. Ensure the twist grip is fully open throughout the entire approach.

When dealing with an emergency, remember to Aviate, Navigate, and Communicate. First and foremost, the PAC shall fly the helicopter (Aviate) and execute any memory items requiring flight control input. Allow the PNAC to perform the memory items not requiring flight control input and perform any necessary troubleshooting steps. Working as a team, the PAC and the PNAC shall choose an appropriate place to land, based on the NATOPS landing criteria associated with the emergency (Navigate). Plan the approach into the wind whenever practical and be vigilant for power lines and other manmade obstacles in populated areas. After the immediate action items have been completed, the PNAC shall tune-up guard, squawk 7700, and transmit an emergency radio call (Communicate). State your callsign, position, and intentions. For example, *"Approach, Navy 8E610 solo declaring an emergency. Engine chip light, two miles North of Barin Field. Landing in a farmer's field."* When it is safe to do so, the PNAC shall break out the PCL to review the EP and perform the landing checklist. Ensure the PCL is put away prior to 200 feet AGL, regardless of whether or not the EP is complete.

When a helicopter declares an emergency, ATC may start asking the pilots questions to better understand their situation. It is permissible to tell ATC to standby and to call them back once safely on deck.

After landing and informing ATC that the helicopter is safe on deck, shut the helicopter down. Perform a post flight inspection and call the FDO on the phone. One pilot must remain with the helicopter at all times.

CHAPTER THREE
TERRAIN FLIGHT

300. INTRODUCTION

TERF describes tactical flights conducted at or below 200 feet AGL. TERF utilizes terrain, vegetation, and manmade objects to enhance survivability by degrading the enemy's ability to visually, optically, and electronically detect or track the aircraft. TERF includes low-level, contour, and Nap of the Earth (NOE) flight.

301. TYPES OF TERRAIN FLIGHT

1. Low-Level Flights

Low-level flights are conducted at an altitude at which detection along the route can be minimized or avoided, usually between 100 and 200 feet AGL. The flight route is pre-planned and flown at a constant airspeed and altitude.

2. Contour Flight

Contour flights are conducted at low altitudes conforming to the contour of the Earth's surface. It is characterized by varying airspeed and altitude as terrain and obstacles dictate. Altitudes will range between 50 and 100 feet AGL.

3. Nap of the Earth Flight

NOE flights are flown as close to the Earth's surface as terrain and obstacles permit. It is characterized by varying airspeed and altitude influenced by terrain, vegetation, weather, ambient light, and enemy situation. Airspeed varies from 0–40 knots, and the altitude varies from 10 to 50 feet AGL.

302. LOW-LEVEL NAVIGATION

Low-level navigation is the least work-intensive of the three types of TERF. The terrain contours depicted on the map are more readily identifiable at low-level altitudes. Contour and NOE provide greater threat avoidance over low-level flight, but they are significantly more challenging. SNAs will practice low-level navigation in both the aircraft and the simulator. They will conduct contour and NOE flight in the simulator only.

Proficient navigation during low-level flight requires training and practice. Checkpoint identification is critical. The PNAC must be proficient in map reading, terrain interpretation, and correlating terrain features with map symbols. PNAC must continuously integrate cockpit instrumentation (heading, airspeed, and timing information) with map and geographic information to maintain SA and orientation.

To navigate effectively, both pilots must be proficient at visual scanning. Visual scanning is the ability to recognize ground reference points within the field of vision. To scan visually, the pilots must first be prepared for what they will see along the route. The route must be thoroughly analyzed and briefed before the flight. However, both pilots must be prepared for the terrain to look different from expected and adjust as necessary. While navigating, pilots must not focus only on close features. Instead, they should begin by scanning the bigger, broader features and move to the smaller, more precise terrain features.

NOTE

Maps and charts may not always depict features accurately. For example, routes that are flown after periods of drought or heavy rains may have water features or lack thereof, which is drastically different from the depiction.

303. CRM DURING TERF FLIGHTS

CRM is a prerequisite for safe and effective TERF. It is used to establish individual pilot responsibilities and to organize cockpit duties.

The PAC has two primary responsibilities: controlling the helicopter and avoiding obstacles. The PAC must keep their vision outside the helicopter and avoid distractions, particularly cockpit-related duties. During the route, the PAC shall assist the PNAC in navigation by calling out prominent terrain features and maintaining pre-briefed parameters, including direction of flight, altitude, and airspeed. After identifying a landmark called out by the PNAC, the PAC will call it out with the direction and distance to the feature. Additionally, the PAC retains control of the helicopter during aircraft or system emergencies and completes the critical memory items requiring flight control input IAW the NATOPS brief.

The PNAC is primarily responsible for accurate navigation. They must remain oriented at all times, monitor cockpit instruments, and perform assigned cockpit duties as briefed. The PNAC is also responsible for all switchology, including radio frequency, NAVAID, and squawk changes. This allows the PAC to focus on controlling the helicopter and avoiding obstacles. During night TERF, task delegation is essential where any momentary distraction inside the cockpit may place the aircraft in danger due to an unrecognized descent or an unseen obstacle. During an aircraft or system emergency, the PNAC executes the critical memory items not requiring flight control input IAW the NATOPS brief.

The PNAC should relay navigation information to the PAC to enable the PAC to maintain an outside scan. Providing information to the PAC is not just a running commentary about what the crew is looking for. It is finding recognizable terrain features to determine if the helicopter is on course and then using that information to guide the PAC.

When providing information to the PAC, the PNAC should employ the following techniques:

- Provide the PAC with incremental guidance. Information does not need to be provided beyond the next turning point. When available, provide multiple references, natural or manmade, to help identify a checkpoint.

- Provide heading information in such a manner that the PAC does not have to continually reference the instruments. Instruct the PAC to turn to a "clock position" or a recognizable terrain feature or aim point. Use instructions such as *"turn left, stop turn"* to keep the helicopter on course. Provide the PAC with the backup heading, as well. *"Turn right to your three o'clock, and I'll call your roll out... Roll out, backup heading 286."*

- Navigation direction to the PAC should remain the same for each type of TERF, regardless of whether it is conducted during the day or night.

- If the airspeeds need to be adjusted, the PNAC should tell the PAC to increase or decrease airspeed, as applicable.

304. FLIGHT SAFETY

During low-level flight, aircraft control is more critical due to terrain and hazards associated with the low altitude. Aircraft handling requires the ability to judge rates of closure to obstacles and rates of change in bearing or altitude. The timely and accurate determination of bearing and distance changes enables the PAC to determine the best route for obstacle avoidance.

Thorough map preparation and study is of paramount importance during low-level flight to aid in identifying possible hazards along the route. Hazards must be accurately annotated on the map prior to the mission brief. The following flight safety factors must be considered:

- **Birds:** A momentary climb or gradual turn is often enough to avoid a bird strike. PAC should utilize VFR see and avoid procedures.

- **Wires:** Wire hazards include power lines, communication wires, and transportation cables such as gondolas. To prevent wire strikes, both pilots shall conduct a detailed map study of the operating area to identify and mark wire hazards. The safest place to cross a wire is *at the stanchion*, particularly when unable to visually acquire the wires or when crossing wires strung across a valley or saddle. Visual clues to wire locations during flight include a swath through vegetation, poles or stanchions, and wires along roads, near towers, or leading to buildings.

- **Vertical Obstacles:** Vertical obstacles include towers, poles, stanchions, and trees. In-flight, they are often difficult to see until extremely close, but they can be identified early during a thorough map study. Towers and associated guy-wires are especially hazardous and can be avoided by maintaining an outside scan during all flight profiles.

Specific emergencies, such as an engine failure or tail rotor drive/control failure, are more critical during TERF. The crew must constantly keep a lookout for landing sites in the event of an emergency.

305. ENVIRONMENTAL CONSIDERATIONS

TERF flights can be conducted under low ceilings. However, pilots must remember that ceilings will restrict the ability to climb along the route. The inability to climb may restrict the pilots' options in an emergency or mission change.

Flight into a rising or setting sun makes it challenging to see details for navigation or visually acquire hazards. On NVGs, flights into a rising or setting moon cause similar difficulties.

Visibility is the primary limiting factor that determines whether a flight can be conducted. Adequate visibility is required for all phases of flight. The pilots must keep visual reference with the ground while maintaining an appropriate airspeed to avoid obstacles along the route. Anytime visibility is reduced, airspeed should be decreased to provide the added response time required to avoid obstacles.

Adverse effects of current and forecasted weather, as well as sun and moon position, shall be considered and briefed before the flight.

CHAPTER FOUR
MISSION PLANNING

400. INTRODUCTION

All missions are divided into four phases: Planning, Brief, Execution, and Debrief.

- **Planning** – The planning phase includes all flight preparation, from the receipt of the mission order to the delivery of the mission brief.

- **Brief** – The briefing phase is when the Mission Commander communicates his or her mission plan to all mission participants.

- **Execution** – The execution phase is when the Mission Commander’s plan is in action.

- **Debrief** – The debrief phase is when all phases are analyzed of the successes and failures of the previous three phases.

The Mission Planning phase includes all the tasks that must be completed for a successful mission and the development of a brief to convey necessary information to other members of the flight. For all operations, Mission Planning always begins with the Mission Analysis or the mission commander’s study of the assigned mission.

Helicopter pilots must be proficient at power management, timing, fuel planning, route selection, checkpoint selection, and Objective Area procedures. These areas are the foundation for both planning and executing an array of military helicopter missions.

For training purposes, low-level flights shall be conducted on designated preplanned routes and routes developed by the SNA. Prior to planning for a TERF event, SNAs should check the Multi-Service Pilot Training System (MPTS) event notes to determine the required route. When the MPTS specifies that the SNA is responsible for developing their own route, the SNA should contact the instructor as soon as possible to receive planning guidance. At a minimum, instructor guidance will include the Outlying Field (OLF) or airfield where landings will be conducted. Guidance may also include additional points of interest to find or areas to avoid. Routes must consist of a minimum of eight checkpoints and be a minimum of 40 NM.

401. POWER MANAGEMENT

When planning a mission, SNAs must have a firm understanding of the relationship between Power Required (Pr) and Power Available (Pa). Although Pr is calculated for home field before every flight, SNAs should also calculate Pr for the intended Landing Zone (LZ). In areas more mountainous than Florida, the LZ for the mission may be at a significantly higher altitude than the departure airfield. In addition to Pr, SNAs must determine the Pa at the LZ. As temperature and altitude increase, the engines do not produce as much power, so the Pa to the pilot in a higher altitude LZ may be significantly lower than the takeoff Pa. SNAs should also calculate the Max Endurance and Max Range power settings for the flight profile.

During operational missions, the aircraft may not have the power to Hover In Ground Effect (HIGE) or Hover Out of Ground Effect (HOGE) at certain altitudes and weights. The level flight envelope (the airspeeds at which the helicopter can fly without drooping N_R or descending) may be truncated due to environmental considerations or the aircraft's configuration. Imagine attempting to bring more than 4,000 lbs. of food, supplies, and medical equipment up to a mountain village in Haiti while participating in Humanitarian Assistance and Disaster Relief (HADR) efforts following a hurricane. Calculations indicate that the MH-60S has the Pa to make the lift at sea level, but at the temperature and altitude of the mountain LZ, Pr will exceed Pa. In this case, the helicopter must take fewer supplies, less fuel, or find an LZ at a lower elevation.

402. TIMING

Missions are typically planned to be either event-driven or timing-driven. When conducting a timing-driven mission, each asset relies on every other asset to complete its tasks on a detailed timeline. If one asset fails to complete its tasks within a few seconds of the planned time, it may place friendly personnel in a dangerous position and negatively impact mission success. Every naval aviator should be able to quickly determine the time needed to proceed on course to make a required event time.

In the planning phase, aviators may be assigned a specific time to execute a mission event. This may be a Time on Target (TOT) for ordinance delivery or an L-Hour – the time the helicopter must touch down in the LZ. Once a TOT or L-hour has been assigned, a mission commander will work backward from the TOT to determine the precise time the helicopters need to launch in order to arrive on time given the planned groundspeed.

On navigation routes, SNAs will manage timing to achieve a TOT at the last checkpoint. To facilitate flexibility in the training environment, the TOT will be the total route time based on the planned groundspeed. For example, if the SNA intended to execute the Green Route Reverse in 33:27, the TOT will be 33:27 from the time the helicopter crosses the first checkpoint. There are two timers in the TH-73A: the count-up feature on the timer’s page and the elapsed time function on the clock. In-flight, SNAs will use one clock to track total route time and the other for individual leg timing. At each checkpoint on the route, SNAs will compare the current time with the planned time at the checkpoint to determine if the PAC needs to increase or decrease airspeed to achieve the assigned TOT.

It is impossible to achieve a TOT without accurate time information. GPS time is used to ensure all ground and airborne units are using the same time hack. However, all crewmembers shall get an accurate time hack prior to walking in case a loss of GPS occurs. If GPS is available in flight, it should be considered the most accurate source of timing information.

During event-driven missions, the mission commander will have a detailed list of events that must be completed in a specific order to achieve mission success. In event driven missions, events will be assigned as a trigger for another event. For example, the troop transport helicopters will not land until the escort helicopters have cleared the LZ. Advanced helicopter training focuses on time-driven missions rather than event-driven missions.

403. FUEL PLANNING AND FUEL COMPUTATION

Fuel planning must include all portions of the mission: course rules, planned route, time at the LZ for DLAs or pattern work, and course rules back to KNDZ. Successful fuel planning will be accomplished by utilizing accurate burn rates. To calculate an accurate burn rate for a route, the pilot must account for the IAS, forecast winds, and temperature. The preferred method for calculating mission fuel is by using Joint Mission Planning Software (JMPS). If JMPS is unavailable, fuel flow can be calculated for the different flight profiles and ambient conditions using the NATOPS charts. Regardless of which method is used in preflight planning, the pilot must use accurate ambient conditions data, including temperature, altitude, aircraft weight, and airspeed.

Ensure that the flight profile to be flown on each leg – max range, max endurance, or groundspeed – is appropriately accounted for in the fuel plan. TERF routes are planned at a specific groundspeed, so the Indicated Airspeed (IAS) will vary in relation to the relative wind. Manually determining the planned fuel burn for each leg of the route based on the differing IAS is time-consuming. However, JMPS accounts for varying IAS when calculating the fuel burn for each leg.

There are two ways to display fuel burn on the JMPS route cards. The preferred method is to enter the desired landing fuel at the destination, usually NATOPS minimums. JMPS will calculate the fuel required at takeoff and each checkpoint to complete the mission and land with NATOPS minimums. This technique provides the pilots with the continuation fuel, sometimes referred to as a running Bingo. To use the alternate fuel planning method, enter the planned takeoff fuel. JMPS will then calculate the expected fuel at each checkpoint along the route.

When using route cards with continuation fuel, pay attention to changes in excess fuel throughout the route. For example, at checkpoint 1, the continuation fuel is 600 pounds, and the actual fuel is 800 pounds. At checkpoint 4, the continuation fuel is 520 pounds, but the actual fuel is 690 pounds. In this case, the excess fuel at checkpoint 1 was 200 pounds, but the excess fuel at checkpoint 4 was 170 pounds. The fuel burn rate is higher than planned, so the PNAC must now confirm that there is sufficient fuel to complete the mission.

If the fuel burn is significantly greater than planned, consider why the fuel burn is higher than expected. Did the flight circle to look for a checkpoint? Did a strong headwind increase timing between checkpoints? Is there a fuel leak?

404. BINGO AND JOKER FUELS

Every mission must include a Bingo Fuel. The Bingo Fuel is the fuel required to fly from the furthest point on the route to the nearest fuel source at maximum range airspeed. For standardization during flight school, Bingo Fuel will be planned from the furthest point on the route directly to a course rules entry point and then to South Whiting via course rules. If conducting weekend prepo operation, use the most direct route to the airfield where you planned to refuel or shutdown. The Bingo Route shall be calculated at the maximum range airspeed.

Joker Fuel is a pre-briefed fuel state (above Bingo) selected by the mission planner at which separation, bugout, or event termination should begin. Think of Joker Fuel as a "prepare to do something else" advisory. A Joker Fuel may be included in mission fuel planning; one mission may require several Joker Fuels. For example, Joker Fuel may be used to depart flying overwater search patterns to ensure enough fuel remains to accomplish pattern operations.

405. OBJECTIVE AREA CONSIDERATIONS

Objective area actions are the most important part of any mission. As a result, all planning begins in the objective area. Once the objective area plan has been solidified, pilots then plan the routes to and from the objective area. After the route plan is finished, then develop the plan at the departure airfield. This technique is called backwards planning and ensures that the planning occurs in a logical progression.

Ingress (the route into the objective area) and egress (the route out of the objective area) are complex and critical phases of the flight that must be carefully planned. At Training Wing FIVE, SNAs should treat the OLF or civil airfield as the objective area and develop plans accordingly.

1. Ingress and Egress

Plan the route to enter the landing pattern at the LZ. The preferred ingress for most tactical missions is a straight-in approach that balances landing into the wind with threat avoidance. A straight-in approach is the quickest way to get into the LZ and provides the simplest maneuver for large formations. However, straight-in approaches are not always feasible. When a straight-in approach is not possible, Naval Aviators plan for a 90, 180, or 360 Dynamic Landing Approach (DLA).

In training, the objective area will be either an OLF or civil airfield. At an OLF, use course rules to plan the ingress into the objective area. If operating at a civil airfield, approach the airfield using standard traffic pattern rules. Determine whether the aircraft will enter the pattern via the downwind, base, or final. In either case, plan the track over the ground and select reference points to assist orientation along the route.

The egress route should take the aircraft from the objective area, back to the planned route, or to South Whiting course rules. Egress from an OLF objective area will be via course rules. If utilizing a civil airfield in the objective area, determine how to depart the local traffic pattern. As with the ingress, plan the track over the ground and select reference points to aid in navigation along the way.

2. Communications

Plan the communication requirements for entering the objective area, including switching the transponder code, obtaining ATIS/AWOS/ASOS, and tuning up the correct radio frequency for the LZ. The frequency may be the OLF frequency, the airfield CTAF, or Tower. Ensure that any frequencies used in the objective area are depicted on the map and the LZ diagram. Determine when the frequency switch must occur. For OLFs, mark the change on the map at the appropriate course rules point. At uncontrolled civil airfields, begin making traffic calls when 10 NMs from the airfield. At towered airfields, contact Approach Control within 20 NM of the airfield or with sufficient time to gain clearance prior to entering Class D airspace. In all cases, select or create a checkpoint where the frequency change will be made and annotate it clearly on the map as a memory aid.

3. Landing Zone

Landing Zone considerations shall be planned and briefed using the SWEEP acronym (Size/Slope/Suitability/Surface, Winds, Elevation, Egress/Obstacles, Pa/Pr) that has been introduced during Land Logistics. During planning, use SWEEP as a checklist to avoid overlooking any aspect of the LZ. Use the SWEEP acronym in the brief so that the LZ information is presented in a standard format. In flight, the crew will conduct a real time LZ evaluation via SWEEP checks by exception, meaning the crew will only discuss those aspects of the LZ that differ from what was stated in the brief.

406. ROUTE SELECTION

In the fleet, aviators conduct objective area planning before route selection, since the objective area plan will effect route selection. In Training Wing 5, this is not always necessary, and we will discuss objective area planning after first discussing route selection. When selecting a route for operational missions, the aircrew either plans the most time and fuel-efficient route or plans for threat avoidance. Criteria to consider include enemy location and weapon engagement zone, environment, terrain, and time. Routes should be planned to keep higher terrain or thicker vegetation between the aircraft and the enemy. Avoid densely populated areas and linear manmade features.

When selecting route checkpoints, terrain features are preferred over manmade objects because manmade features are subject to change or destruction. Newly constructed features may be confused for intended checkpoints. Terrain features change less frequently over time.

Photographic and satellite imagery can aid Naval Aviators in determining the route and selecting checkpoints by providing up-to-date information on topographic changes. Imagery offers greater detail, is usually more current than a map, and shows man-made features that do not appear on maps. Imagery also provides an objective record of the day-to-day changes within the area. However, some features may be hidden by other details within the imagery, such as a new building or dense vegetation. Also, the location, scale, and elevation may be challenging to interpret depending on how the image is presented. Lastly, imagery is often displayed in black and white or low-contrast color, making it difficult to use in low light situations. Both imagery and maps provide excellent, complementary information, and they should always be used in conjunction with one another.

407. CHECKPOINT SELECTION

After a general route has been determined, select checkpoints to control movement along the route. Checkpoints are used to help navigate and maintain orientation along the route and trigger important cockpit tasks like switching radio frequencies or squawks. A good checkpoint should be easy to locate and identify, meaning that it should be large, contrast with the area around it, and have distinct characteristics. The first two items make it easy to see. The last item, uniqueness, ensures that it cannot be mistaken for a similar feature.

When selecting a checkpoint, look for limiting and funneling features that will make the checkpoint easier to identify. A limiting feature is any manmade or terrain object that defines the end of a leg of the route. For example, a road running perpendicular to the route of flight just beyond a checkpoint is an excellent limiting feature. If the aircraft reaches the road, it has passed the checkpoint. Funneling features are any linear object that leads to the next checkpoint. If a checkpoint is a bridge over a river, the river is a funneling feature because the pilot can follow it to reach the bridge.

Detailed considerations for checkpoint selection include:

- Checkpoints should be easily identifiable from the air.
- Checkpoints should contrast with surrounding terrain by shape, size, color, or elevation.
- If possible, checkpoints should not be selected near metropolitan areas. Towns invariably grow and may alter the checkpoint or make it difficult to detect.
- When possible, a checkpoint should be easy to confirm by association with adjacent prominent features, such as limiting and funneling features.
- Make a note of the MSL altitude of each checkpoint during planning to aid in checkpoint confirmation when flying in mountainous or hilly terrain.
- Select intermediate reference points between checkpoints to ensure course confirmation and route timing.
- The first and last checkpoints of a route are the most important. An easily identifiable feature must be utilized at the beginning and end of each route.

At times pilots will be forced to use a checkpoint that does not meet the above criteria. Tactical scenarios may dictate the use of an LZ in a remote, hard to find location. An enemy target may be located in an area with no distinct terrain features or manmade objects. Naval Aviators must hone their navigational skills by practicing routes with difficult to find checkpoints. Some of the preplanned routes flown in the TH-73A incorporate challenging checkpoints to build student navigation skills as well as demonstrate the characteristics that define good and bad checkpoints.

Take time to study the route and use the criteria listed in this chapter to determine whether a checkpoint will be particularly hard to locate. During planning, formulate a plan to identify difficult checkpoints by working from big to small. Start with large, nearby features that will be easy to identify, and then look for minor, subtle features that will lead into the actual checkpoint.

408. NVG ROUTE SELECTION

To help offset difficulties encountered in navigating on NVGs, routes should be planned to be as simple as tactically allowable, using straight lines between checkpoints. Use the following guidelines for NVG route and checkpoint selection.

1. Cultural Area Considerations

Avoid large areas of cultural lighting. Bright lights increase NVG halos and cause the goggles to degain, resulting in decreased scene detail.

Anticipate wires, including parallel sets, near roads, towers, and buildings isolated in open fields. Wires may not be visible, so look for associated posts, poles, and stanchions. Plan to fly directly over poles and stanchions to ensure the helicopter remains clear of all wires. Large linear cuts through vegetation may aid in identifying large power lines.

Towers should not be used as checkpoints but may aid in orientation along the route. Towers may be lit with conventional incandescent lights that are so bright that they degrade the NVG image. Alternately, towers may be illuminated with LED lights that are not visible under NVGs.

2. Solar and Lunar Considerations

Plan to transit large valleys on the illuminated side with respect to the moon’s position. This will avoid shadows cast by terrain and silhouette terrain features for navigation.

Avoid a route that leads directly into a rising or setting moon/sun. If the timing of the launch forces this condition, plan to proceed in a zigzag advance across the route of flight using an approximate 30-degree offset to either side. This technique helps counter the degrading influence of the sun or moon on the NVGs.

409. NVG CHECKPOINT SELECTION

The same considerations for checkpoint selection during the day still apply at night, but pilots must also consider how the checkpoint will appear on the NVGs. When selecting a checkpoint, consider the limitations of the NVGs: lower visual acuity, monochromatic image, and blooming caused by cultural lighting. To determine how the checkpoint will look from the air through NVGs, consider the following:

1. Terrain Contrast

Choose checkpoints that will contrast with the surrounding areas. Since NVGs provide a monochromatic image, checkpoints should have greater contrast than is necessary during the day. For example, an asphalt road across an open desert provides a lot of contrast that will be easy to see at night. However, that same asphalt road would have little contrast in an area of heavy vegetation and may be difficult to discern through NVGs. Consult the common scene descriptions in the NVG FTI for detailed information about the contrast between various features and different types of terrain.

2. Cultural Lighting

Cultural lighting can be both helpful and detrimental. Nearby cultural lighting may degain the NVGs and make it difficult to see the checkpoint. On the other hand, isolated cultural lighting associated with a checkpoint may help call attention to it. For example, if the checkpoint is a small bridge over a creek near a busy highway, the car headlights from the highway will likely make it difficult to see the bridge due to the degaining effect on the NVGs. However, if the checkpoint is an intersection of two small rural highways, the lights from a cluster of buildings near the intersection may call attention to the intersection.

Car headlights are often visible even through vegetation, so they can help locate small roads through forests. However, there may not be much traffic on a rural road late at night, so pilots should not count on headlights to help them identify isolated intersections.

3. Atmospheric Impacts

Consider how the ambient conditions will affect a checkpoint. Fog or haze may reduce visibility, particularly in low-lying areas. If the checkpoint is a bridge across a creek, it may be obscured by fog sooner than a checkpoint on higher ground. Cloud cover can create shadows that can hide or confuse a checkpoint. Strive to select checkpoints that will be visible without direct moonlight.

4. Moon Phase

The phase of the Moon, elevation, and azimuth throughout the flight can significantly affect the appearance of checkpoints. Avoid choosing checkpoints that fall within the shadow cast by a terrain feature.

5. Masking by Terrain and Vegetation

When choosing a checkpoint, look at the terrain and vegetation that surrounds it. Good checkpoints should be identifiable from several miles away. Avoid checkpoints that are masked by terrain or vegetation for a significant portion of the leg.

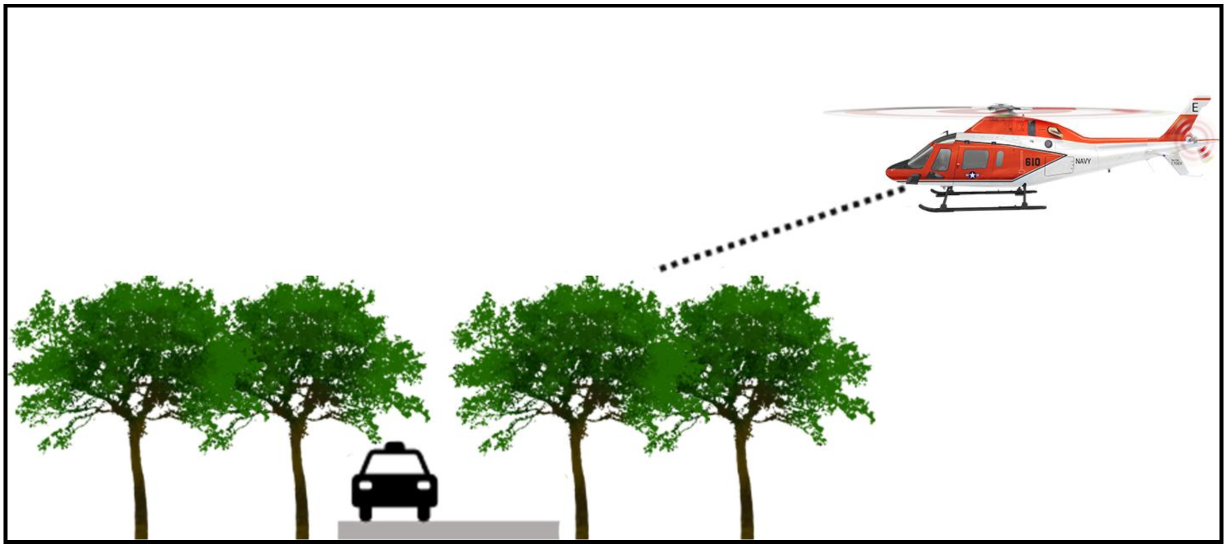

Figure 4-1 Masking Due to Vegetation

A concrete road with high contrast to the forest around it will still be challenging to see if the trees have grown over the road. The pilot will be unable to pick the road out from among the trees until the helicopter is directly on top of the checkpoint.

410. GO/NO-GO CRITERIA

Go criteria are the prerequisites that must be met (equipment, personnel, or conditions) prior to mission commencement and are based on friendly disposition. For example, a mission may require two TH-73As. If one of the TH-73A goes down for maintenance and no backup is available, the mission will not be executed. Go criteria also include required weather. If a mission requires 1,000 foot ceilings and 3 miles of visibility, it will not launch if the weather is below 1,000/3.

No-Go criteria are those same prerequisites based on enemy disposition. For example, a mission might require that an enemy radar defense system be disabled or destroyed. If that radar defense system is still operating, the aircraft will not launch.

NOTE

No-Go criteria do not apply to TW-5 aircraft.

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CHAPTER FIVE
MISSION PRODUCTS

500. INTRODUCTION

A mission Smart Pack ensures the entire flight is referencing the same information and material throughout the flight. It may include, but is not limited to, such items as a communications card with frequencies, and frequency assignments for each aircraft, troop, and ordinance load outs for the flight, power calculations specific to each aircraft, and an Execution Checklist that represents the entire sequence of events for the mission. The Smart Pack is essentially a gouge packet for the mission that can be crucial for ensuring each member of the mission understands their role and can execute it.

501. SMART PACKS

At a minimum, SNA Smart Packs shall include a cover sheet as shown in Figure 5-1, the JMPS route card for the entire route to be flown, a JMPS route card for the Bingo route of flight, and an LZ Diagram for the location where DLAs will be conducted.

The cover sheet shall include the names of all the pilots in the flight, aircraft assignments, frequencies expected on the route, a timeline of events, and power calculations. For the timeline, check the schedule to determine if the flight is a hot seat or a cold go and plan accordingly. If the schedule is unclear about the hot seat, ask the instructor or the Squadron FDO. When planning a timeline, bear in mind that it may change depending on weather, maintenance, or other squadron operations.

HT-X EIGHTBALL

JULIAN DATE: 355 MISSION: TRF4201A EXTERNAL C/S: EB614

A/C	SPOT	C/S	AIRCREW	MPTS
614	C9	EB614	CAPT LAZENBY LTJG HABA	TRF4201A

TIMELINE	EVENT	VHF	UHF	NOTES
1735	BASE	121.95	5	NAVAIDS 70X WHTING (NDZ) 60X GATESWOOD (NBJ) SEQ OF EVENTS AT LZ: 3X NORMAL LANDINGS 3 X STEEP APPROACHES
1740	TAXI	121.95	3	
1745	TAKE OFF KNDZ	121.95	4	
1805	BEGIN GREEN ROUTE	121.95	19/14	
1835	END GREEN ROUTE	121.95	14	
1915	EGRESS SITE X	121.95	13/5/4	
1935	LSND KNDZ	121.95	4	

BN	AGENCY	FREQ	BN	AGENCY	
1	NDZ ATIS	273.575	M	INSTR CMN	121.95
3	NDZ GND	317.65	M	PENS APP	118.6/127.35
4	NDZ TWR	348.675	M	BAY MINETTE	122.8
5	HT-8 BASE	303.6	M	MOBILE APP	118.5
13	SITE X	327.4	M	ATMORE CTAF	122.8
14	GREEN	328.2			
19	WESTERN AREA	311.4			

METRO				BINGO
SR: N/A	MR:1159	EENT: 1748	HLL: 1748-2345	GREEN / SITE
SS: 1651	MS:2356	ILLUM:50%	LLL:2345-0623	

ATIS:

ATIS:

LOC	HIGE	HOGE	END Q/AS	RNG Q/AS	
TAKE OFF	65%	76%	43% / 68 KIAS	63%/ 114	
HAROLD	64%	75%	43% / 68 KIAS	63%/ 114	

NOTES

Page 1 of 6

Figure 5-1 Example Cover Sheet

The timeline on the coversheet should be based on the takeoff time, or **Time T**. All events prior to takeoff should work backward from Time T. For example, if the pilot determines that it will take 55 minutes to brief, 30 minutes to sign for the aircraft and walk to the flight line, 20 minutes to preflight, 10 minutes to start, and 5 minutes to taxi, the coversheet timeline for a 1500 takeoff should look like this:

1300 Brief

1355 Walk

1425 Preflight

1445 Start

1455 Taxi

1500 Takeoff

The JMPS route card shall cover the entire route of flight beginning at KNDZ and covering course rules to the route, the route itself, course rules to the OLF, 20 minutes of DLAs, and course rules back to KNDZ. Route cards shall be printed using the Marine Aviation Weapons and Tactics Squadron (MAWTS) #1/NVG format. Ensure that the name or a brief physical description of each checkpoint is annotated on the route card.

The JMPS Bingo route card shall include a route from the Bingo Checkpoint direct to a course rules entry point and then course rules to KNDZ, all flown at max-range airspeed.

SNAs shall produce two Smart Packs: one for the instructor and one for the SNA. Each page shall include the page number and the total number of pages centered at the bottom of the page as shown in Figure 5-2.

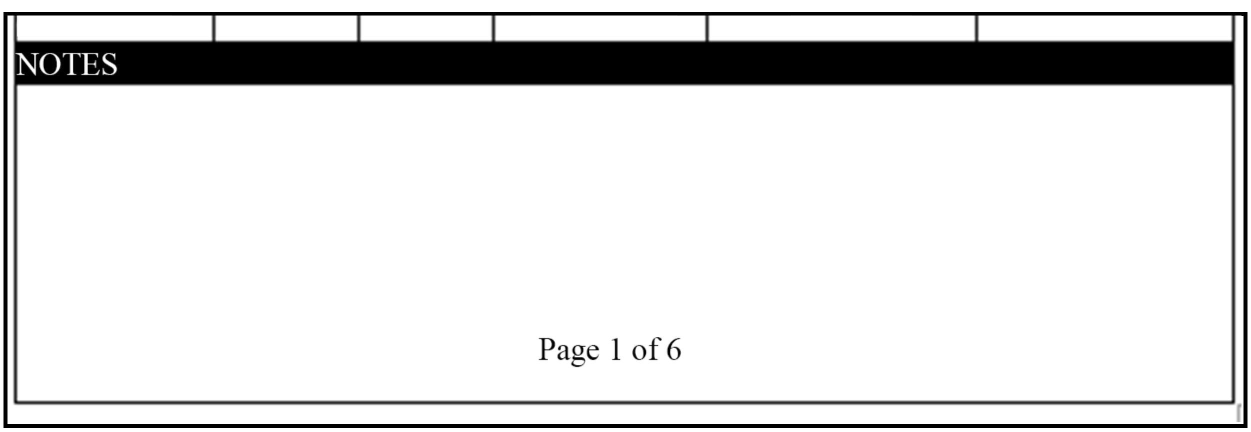

Figure 5-2 Smart Pack Page Numbers

502. LANDING ZONE DIAGRAM

The LZ diagram, as shown in Figure 5 2 Smart Pack Page Numbers, visually depicts the landing plan that supports the mission commander's scheme of maneuver.

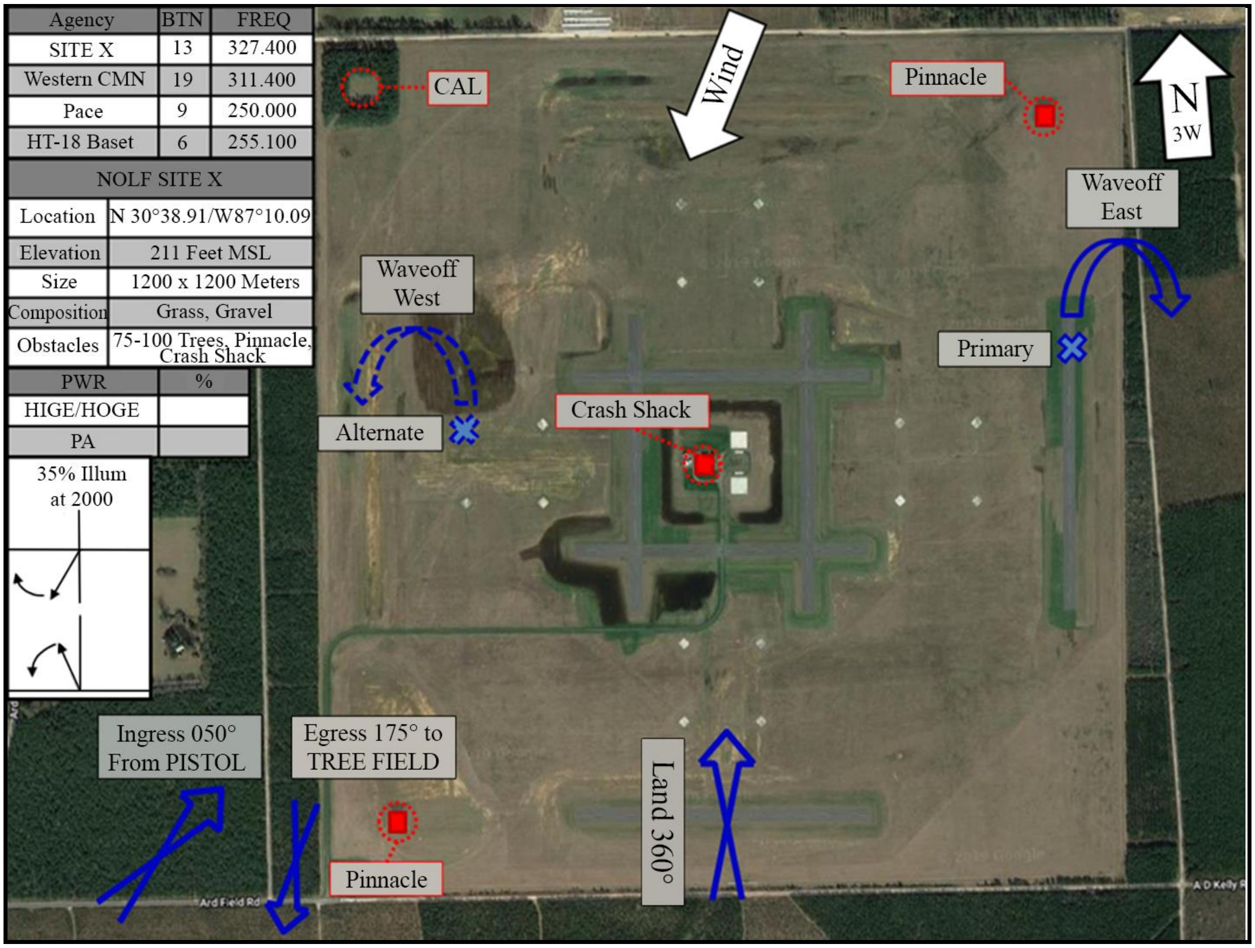

Figure 5-3 Example LZ Diagram

The diagram should be a single source document containing all pertinent information relative to the zone's approach, landing, and actions.

Table 5-1 shows a list of items to include in an LZ diagram.

ITEM	DESCRIPTION
Location (Grid or Lat/Long)	Enables quick LZ identification and confirmation in navigation equipment.
LZ Imagery	A visual depiction of the LZ shall be provided. The imagery may be photographic, map, or even a drawing if no other imagery is available. Still, it must give the crew a depiction of significant visual features in the LZ to facilitate crew orientation.
LZ Size	Provides a scale reference, helps the aircrew determine what type of approach to use, and determines how many aircraft can land in the LZ at one time.
Magnetic North Reference	Allows crewmembers to orient themselves.
Topography	Alerts the crew slope of the LZ. In some areas of the LZ, the terrain may be too steep or rough to accommodate a landing.
Soil Composition	Alerts the crew to a potentially degraded visual environment due to blowing dust or snow. It also alerts the crews to soft soil in which a helicopter might sink, particularly if it has rained recently.
Elevation	Provides a quick reference to the MSL altitude of the elevation for approach planning and power calculations.
Hazards	Include any hazard to flight, such as trees, fence lines, walls, and power lines.
Buildings	Buildings can be hazards to flight but may also be used to orient crews within the zone. Label the buildings and annotate any specific hazard to flight, such as church steeples or minarets.
Winds	Annotate the forecasted winds for the LZ. Provides a quick reference for ingress planning and power calculations.
Ingress Direction	Annotate the ingress direction on the LZ. Ingress direction should consider winds, the tactical environment, obstacles, and ease of approach.
Landing Formation, Direction, and Points	Depict the point each aircraft in the formation should land in the LZ and the direction they should be pointing. Landing points are determined by the terrain and obstacles in the zone and the ground element's scheme of maneuver. In addition to primary landing points, alternate landing points should be marked on the LZ diagram.
Egress Direction	Annotate the egress direction on the LZ. Egress direction should consider winds, the tactical environment, obstacles, and ease of approach.
Wave-off Direction	Annotate the wave-off direction for quick reference by the crew. When selecting a wave-off direction, consider obstacles, winds, and other aircraft in the LZ.
Sun/Moon Position	Annotate the sun and moon position on the LZ diagram so crews will be able to anticipate shadowing within the zone and avoid flying directly into the sun or moon when low on the horizon.
Frequencies	Annotate all the necessary frequencies on the LZ diagram for quick reference.
Pr vs Pa	Calculate the HIGE and HOGE at the LZ based on forecast environmental conditions, planned gross weight, and Pa.

Table 5-1 Items to Include in LZ Diagrams

CHAPTER SIX
MAP PREPARATION

600. INTRODUCTION

There are two critical considerations in map preparation: size and detail. Size is important because the map should be large enough to include as many terrain features and obstacles around the route as possible, yet it must be manageable in the cockpit. Detail is important because the route and other critical navigation information must be drawn on the chart without covering vital map information.

Map Preparation Equipment:

- Maps
- Straightedge
- Protractor (to identify grid locations)
- Stencil (with circles, triangles, and doghouses)
- Transparent Tape
- Scissors
- Ultrafine Tip Marker (red)
- Fine Tip Markers (red, blue, and black)

NOTE

When writing on the map, the SNAs shall use a straightedge to ensure the information is neat and legible.

601. TYPES OF MAPS

Low Level and TERF navigation use three types of maps: VFR Sectionals, Joint Operational Graphic – Air (JOG-A), and Topographic Line Maps (TLM). The different maps are used depending on the kind of mission and the phase of the mission. Many missions begin using a small-scale map (1:500,000) for navigation to the objective area and then switch to a large-scale map (1:50,000) during actions in the objective area. After leaving the objective area, the pilots transition back to the small-scale map. The number and type of maps used during a mission depend on the mission, aircraft altitude, and planned groundspeed.

1. VFR Sectional 1:500,000 Scale

Sectional Aeronautical Charts include current data at a 1:500,000 scale which is large enough to be read easily by pilots navigating under VFR. Sectionals are named after a major city within its area of coverage. They are updated frequently but are not detailed due to their large scale. The lack of detail makes the VFR Sectional less effective in the TERF environment.

2. JOG-A 1:250,000 Scale

The JOG-A is a 1:250,000 scale Mercator projection, aeronautical chart for international and joint service air/ground tactical operations that identifies horizontal control points and low altitude air navigation hazards. The JOG-A is used for tactical air support and assault missions with ground forces. Ground units commonly use the JOG-A as a strategic/operational map to complement the 1:50,000 topographic line map. The JOG-A has more detail than the VFR Sectional does, but less than the TLM.

The JOG-A is the primary map for planning and flying the en route portion of the mission. The map scale provides a wide area of coverage, has latitude/longitude markings, and includes Universal Transverse Mercator (UTM) map features. The JOG-A should not be confused with the JOG Ground map, sometimes used by ground units. The JOG-A has aviation-related information such as airport elevation, airport beacons, terrain clearance altitudes, and magnetic variation lines. The JOG Ground map is less cluttered because it does not include aviation information, and terrain contours are not shaded. Both the JOG-A and JOG Ground maps show the Military Grid Reference System (MGRS) with 10,000-meter grids superimposed in blue on the map.

3. TLM 1:50,000 Scale

The 1:50,000 TLM portrays topographic and cultural detail to the level required for infantry and reconnaissance units to navigate various terrain environments. Relief is shown by contours and spot elevations measured in meters. The map is an accurate representation of terrain detail. Features are plotted to correct orientation and location. The 1:50,000 TLM is the primary map used for low level and TERF routes in the objective area.

4. Chart Updating Manual

Paper maps are printed periodically, so the maps available during planning and execution may not have the most current aviation hazards, manmade features, or other topography information. To ensure that they have the most up-to-date data on their maps, pilots must hand draw newer obstacles on the map. This practice is called chumming after the Chart Updating Manual (CHUM).

The CHUM is a supplementary publication with quarterly bulletins that can be consulted for the most current information on low-level hazards, such as towers and power lines. It is available on the National Geospatial-Intelligence Agency (NGA) website. Use the JMPS electronic CHUM (ECHUM) tool to obtain accurate obstacle information to copy onto the map. If neither the JMPS ECHUM tool nor the NGA website are available, use a current VFR Sectional to find and plot new towers and to confirm published tower heights. For visually significant features, compare the map to satellite imagery and check for new roads, buildings, or farmers' fields.

6-2 MAP PREPARATION

602. STEP ONE: TAPE THE MAPS TOGETHER

Tape the maps together using transparent tape. Some navigation routes will require more than one map. Before marking the map, attach the maps together, ensuring that the features line up correctly. Appendix A of the RWOP contains a list of what maps are required for each route.

- JOG-A (1:250,000) - Ensure Latitude and Long Longitude (Lat/Long) lines and terrain features are appropriately aligned.

- 1:50,000 TLM - Ensure the gridlines and terrain features are aligned to the max extent possible.

NOTE

Due to differences in the publish dates of the maps, some minor features may be misaligned when the Lat/Long or grids line are correctly aligned. Maps shall be joined with the Lat/Long or gridlines aligned, regardless of any inconsistency in map features.

603. STEP TWO: PLOT AIRSPACES ON THE MAP

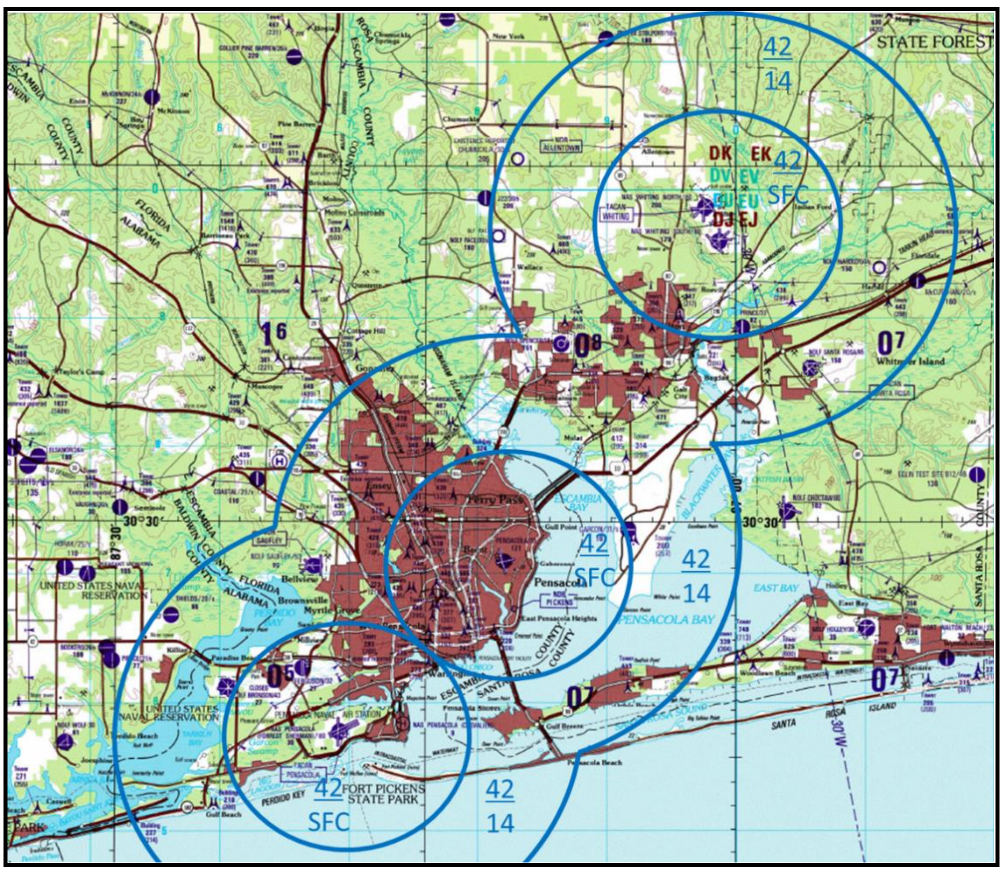

Figure 6-1 Class C Airspace

Plot the airspaces on the map. Class C, as shown in Figure 6-1, and D Airspaces shall be chummed using a fine tip blue marker designating the boundaries of the airspace.

Prohibited Areas, Restricted Areas (Figure 6-2), and No-Fly Areas shall be chummed using a fine tip red marker designating the boundaries of the airspace with parallel lines through the middle of the airspace.

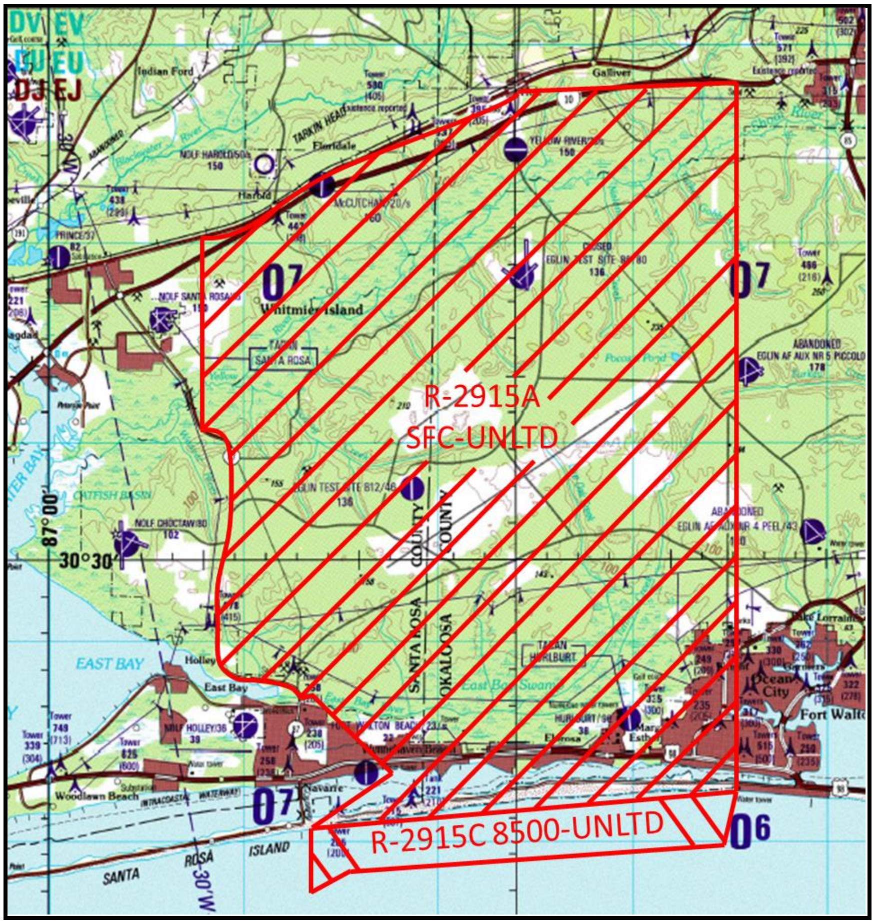

Figure 6-2 Restricted Area

All airspaces should include the name of the airspace and altitude limitations to the max extent possible.

604. STEP THREE: CUT EXCESS AREAS FROM MAPS

Cut excess areas from maps. The map shall be cut to a manageable size but not so small that essential details near the route are removed. A good rule of thumb for the topographic line maps is to keep six grid squares as a border between the checkpoints and the edge of the map. The six grid squares provide 3.6 miles of navigational features that can assist the pilot in remaining oriented.

If the grid numbers on the 1:50,000 are listed within +/- one grid from the edge, the grid numbers should be kept to assist with navigation. For JOG-A charts, leave enough mapped area for navigation and orientation. For both types of maps, leave the grid numbers and Lat/Long information on the edge of the chart. If leaving the edge information makes the map too large for cockpit use, write the margin information on the edge of the map in black marker.

605. STEP FOUR: PLACE MARGIN INFORMATION ON THE CHART

Place marginal information on the chart. Margin information should be cut from the map legend area and glued or taped to the map. The more critical data is placed on the front of the map; amplifying information will be attached to the back of the map.

Additionally, SNAs shall copy the checkpoint table from Appendix A of the RWOP and place it on the front of each map.

1:250,000 JOG-A

- ***Front*** – The Map Scale and Low-Level Navigation Route Checkpoint Table shall be placed on the front of the chart in a location that does not cover other important details.

- ***Back*** – All other information shall be placed on the back of the map.

1:50,000 TLM

- ***Front*** – The Map Scale, Declination Diagram, and Low-Level Navigation Route Checkpoint Table shall be on the front of the chart in a location that does not cover other important details. When placing the Declination Diagram, align the grid north line with one of the north-south grid lines. Remember that magnetic variation changes so that the declination diagram may be out of date. Check the magnetic variation by finding the nearest isogonic line on a current VFR sectional. Write the current magnetic variation on the declination diagram.

- ***Back*** – All other marginal information shall be placed on the back of the map. When two maps are joined together, attach the name, scale, and edition (Crestview, Florida 3645 I V747 Edition 6-NIMA) for both maps as well as the coordinate conversion information. The information for each map should be placed on the part of the map to which it pertains. Only one legend is required for the entire map.

NOTE

If using more than one 1:50,000 TLM chart and there is a discrepancy between the maps' marginal information, use the most current data.

606. STEP FIVE: ANNOTATE TITLE INFORMATION

Place map type, scale, route name (if applicable), student name, and date on the chart. Do not cover up important terrain features. If possible, place this information over water. If the map is laminated, this information should be under lamination.

JOG-A, 1:250,000:
GREEN ROUTE
PREPARED BY LTJG CHAMBLESS
7 JUL 21

1:50,000 TLM:
ORANGE ROUTE
PREPARED BY 1stLt SNYDER
7 JUL 21

607. STEP SIX: LAMINATE

Laminate the map (optional). Lamination is not always available, but if it is, SNAs should laminate their maps to preserve the map's longevity. Consider completing Step 12 (CHUM obstacles) prior to laminating the map. The area within 10 NM of all routes shall be chummed. Bear in mind that these maps will be used for the SNA-selected routes, not just the pre-planned routes, so CHUM accordingly. If the map is laminated prior to chumming, mark the obstacles on the lamination later in planning.

608. STEP SEVEN: PLAN THE FULL ROUTE

Use JMPS to plan the entire route of flight. Routes shall be planned using course rules from KNDZ to the first checkpoint on the route, first checkpoint to last checkpoint on the route, from the last checkpoint to the LZ, and from the LZ along course rules back to KNDZ. If conducting an out-and-in or weekend operations from other than KNDZ, consult the instructor and plan a VFR departure to the route and arrival to the destination airfield, with consideration for airspace and obstacles. Airspeeds prior to and after the route shall be planned IAW local course rules. Airspeed from first checkpoint to the last checkpoint on the navigation route shall be planned at 90 knots groundspeed—plan for a twenty-minute delay at the LZ to conduct DLAs, if applicable.

Print two copies of the entire route cards for the Smart Packs.

NOTE

To obtain accurate fuel planning from JMPS, ensure that the forecasted environmental data, planned groundspeed, and altitude changes are input accurately. Aircraft configuration will have to be changed to calculated, required fuel at takeoff.

FIRST CHECKPOINT	LAST CHECKPOINT	AIRSPEED
KNDZ	First Route Checkpoint	100 KIAS
First Route Checkpoint	Last Route Checkpoint	90 KIAS
Last Route Checkpoint	Landing Zone	100 KIAS
Landing Zone	Landing Zone	Delay 20 minutes
Landing Zone	KNDZ	100 KIAS

Table 6-1 Planned Airspeeds

609. STEP EIGHT: PLAN THE NAVIGATION ROUTE

Use JMPS to plot the low-level navigation route only using 90 knots of groundspeed. The route should be planned from the first checkpoint on the route to the last checkpoint on the route.

Print only one copy of these route cards. This information is used to calculate the route timing that will be placed on doghouses. The navigation route only route cards should not be included in the Smart Packs.

610. STEP NINE: MARK THE CHECKPOINTS AND LZS ON THE MAP

Place the route checkpoints and LZs on the map. Plot checkpoints using a protractor and mark them with a circle about the size of a nickel. Course rules checkpoints are marked with a smaller circle about the size of a dime. LZs shall be marked with a triangle about the same size as the route checkpoint circles as shown in Figure 6-3. All checkpoint and LZ marks shall be made using a fine tip black marker. Use a stencil for circles and triangles to ensure that they are drawn neatly.

611. STEP TEN: MARK THE ROUTE ON THE MAP

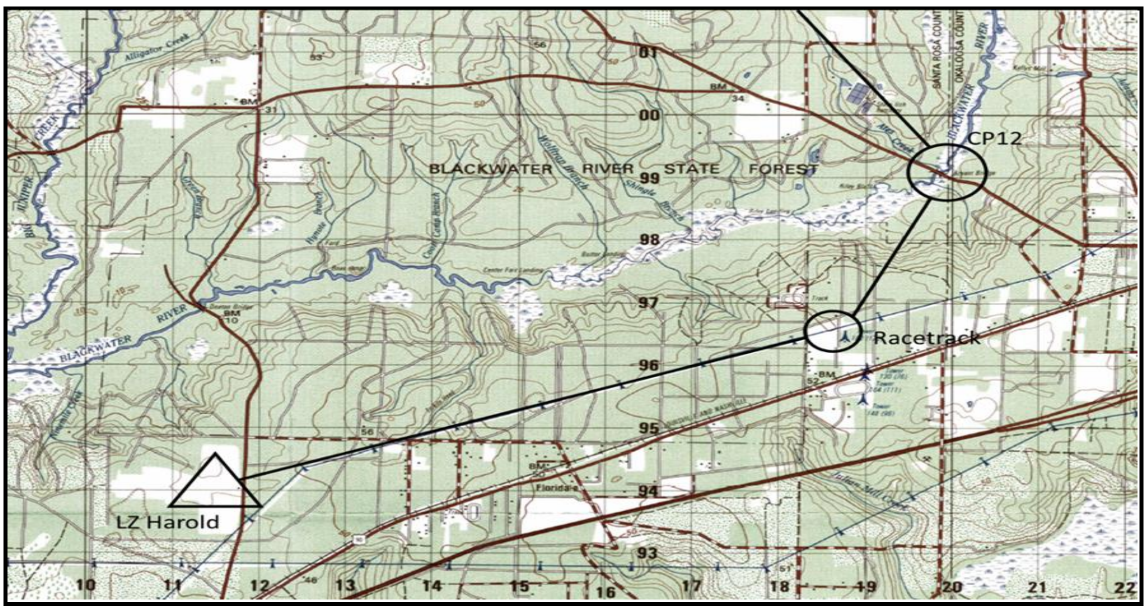

Figure 6-3 Route Checkpoints

Connect the checkpoints and LZs. Use a single black line drawn with a straight edge from one checkpoint to next checkpoint.

612. STEP ELEVEN: LABEL THE CHECKPOINTS

Label the checkpoints. Route checkpoints shall be labeled using the number of the checkpoint and include a brief description. LZs should be labeled by name, preceded by LZ, i.e., LZ Harold or LZ Bay Minette. Course rules checkpoints may be labeled, but it is not required.

613. STEP TWELVE: CHUM OBSTACLES

Chum all the obstacles within a 10 NM of the route with an ultrafine tip red marker. Towers shall be marked by an ultrafine tip red marker with the elevation in feet AGL at the base. Many of the most current 1:50,000 and JOG-A maps are several years old. New towers and power lines, as shown in Figure 6-4, have been built since these maps were printed. Some towers that are on the map may be taller, and some may have been removed. Use up-to-date CHUM tools to ensure that all hazards are accurately depicted.

NOTE

> All elevations on the 1:50,000 TLM are in meters and shall be converted to feet when annotated on the map. Power lines shall be marked with an ultrafine tip red marker.

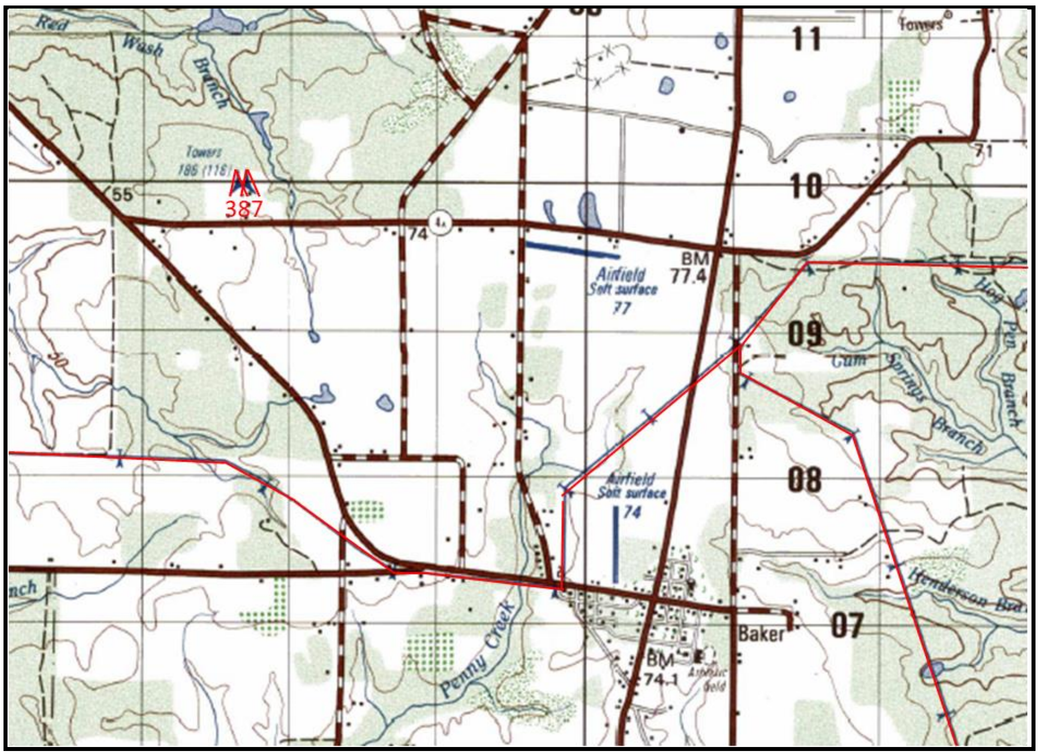

Figure 6-4 Power Lines and Towers

614. STEP THIRTEEN: ADD ADDITIONAL ROUTE INFORMATION

Place additional route information on the map, including Map Changeover Points (MCPs), tic marks, and intermediate checkpoints. MCPs, as shown in Figure 6-5, are required anytime the navigation route requires more than one map. The MCP is the transition point at which the pilot will change from one map to the next. An MCP should be a natural or manmade feature that is easily identifiable on both maps. Additionally, it should be far enough away from the last checkpoint on the first map and the first checkpoint on the next map to allow the pilot to transition between maps without becoming disorientated. Avoid selecting an MCP on the edge of either map so that the pilot can navigate on either map before or after the MCP. MCPs shall be marked with a square about the size of a quarter using a fine tip black marker and labeled "MCP."

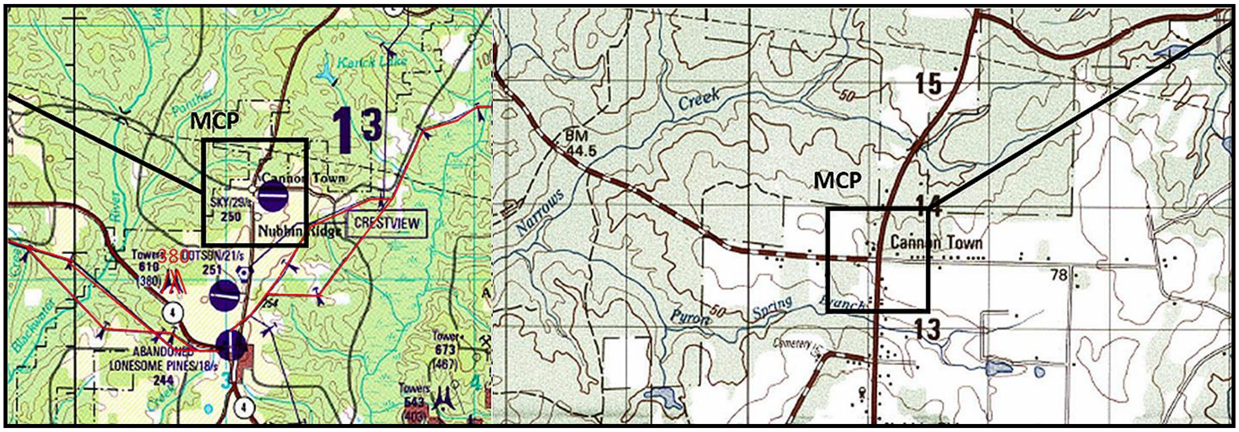

Figure 6-5 MCPs

Tic marks should be used along the route of flight to assist with time or distance measurement. Two types of tic marks can be used: mileage tic marks or time tic marks. Although tic marks are not required, SNAs are strongly encouraged to use either type of tic marks. Do not use both mileage and time tic marks on the same route. Using too many tic marks will clutter the map and may lead to confusion and disorientation in flight.

Mileage tic marks are small lines drawn perpendicular to the course line at one NM increments as shown in Figure 6-6. Mileage tic marks are useful for range estimation along the route. Also, mileage tic marks remain accurate regardless of groundspeed. However, it may be difficult to correlate mileage tic marks to time. At 90 knots groundspeed, the aircraft will pass the first tic mark at 40 seconds, the second at one minute 20 seconds, and the third at two minutes. The time intervals will change every time groundspeed changes.

Time tic marks are marked along the route of flight at specific time intervals, usually 30 seconds or one minute, depending on groundspeed and leg length. Time tic marks indicate exactly where the helicopter should be on the route after a given amount of time. However, if the pilot adjusts groundspeed, the tic marks are no longer valid because the helicopter is now traveling along the route at a different pace than anticipated. Additionally, timing tic marks do not aid in distance estimation to the next checkpoint.

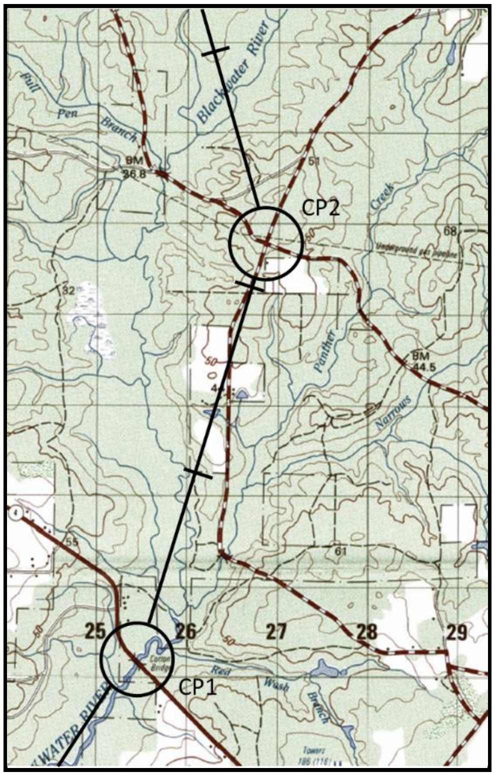

Figure 6-6 Mileage Tic Marks

Both time and mileage tic marks are reset at every checkpoint. Begin measuring the tic marks at the first checkpoint. Place the marks along the route at the appropriate interval, by either time or distance. At the second checkpoint, start the tic marks over using the same interval as the first leg.

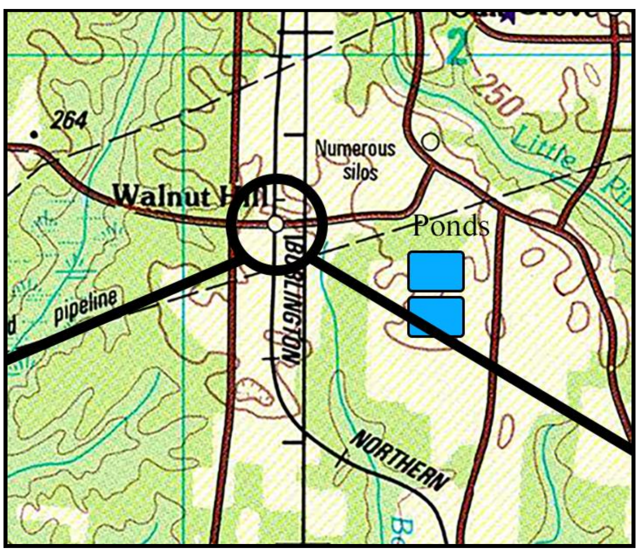

Figure 6-7 Intermediate Checkpoints

An **intermediate checkpoint** is a landmark selected along the flight route and used to verify aircraft position as shown in Figure 6-7. Intermediate checkpoints should be a unique feature or group of easily recognizable features. A lake, open field, road intersection, and even towers may be used as intermediate checkpoints. They do not need to be directly under the flight path. Confirming the helicopter location by noting a large lake passing one NM to the West is as effective as flying directly over a road intersection. Mark the most prominent intermediate checkpoints on the map, but avoid adding so many that the map becomes cluttered and confusing. The longer the leg, the more critical intermediate checkpoints are. If a leg is very short, intermediate checkpoints may not be necessary.

Roads running perpendicular to the flight path make good intermediate checkpoints to confirm timing, but they do not provide precise navigation information. On a straight road, it is difficult to determine if the helicopter is crossing the road on the flight path or a mile to one side or the other. When using a road, identify a unique feature, such as a bend or building that will help determine if the helicopter is on course. Intermediate checkpoints may be features printed on the map, or hand-drawn features noted transcribed from satellite imagery.

615. STEP FOURTEEN: PLACE DOGHOUSES

Place doghouses on the chart. Doghouses provide all the information required for each leg of the flight in an organized manner as shown in Figure 6-8. They should not be used for the checkpoints from South Whiting to the route, only on the route itself. Place the doghouses along the route, positioning them so they are not too close to the route or covering important navigation features. Doghouses shall contain the following information: Magnetic Heading, distance between checkpoints, Leg Time, Total Time, Continuation Fuel State, and Reverse Magnetic Heading.

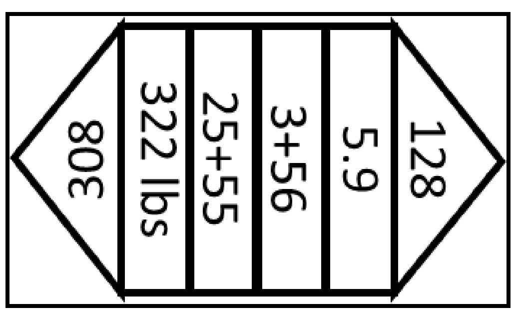

Figure 6-8 Single Direction Doghouse

Draw the doghouses using a fine tip black marker. If the route will be flown both forward and reverse, SNAs should extend the doghouses to include Total Time and Continuation Fuel information for both directions as shown in Figure 6-9. The leg time and distance will remain the same and does not need to be repeated. When filling in the doghouses, orient the information in the same direction as the route to be flown. Two separate sets of doghouses for the forward and reverse routes should be avoided because excess doghouses clutter the map and lead to confusion.

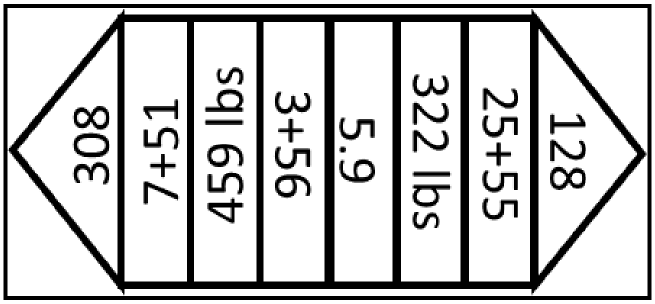

Figure 6-9 Forward and Reverse Direction Doghouse

616. ADDITIONAL CHART PREPARATION CONSIDERATIONS

Each SNA is responsible for preparing their own map for each route. SNAs may keep prepared maps that will be utilized on future training events. However, SNAs may not use maps created by someone else, nor may they loan maps to other SNAs for use on syllabus events.

Maps shall be legible and clean. Straightedges and stencils shall be used. Good map preparation will enhance SA in all missions.

Maps shall be prepared for the most challenging flight conditions, such as low light levels on NVGs. A delicate balance exists between using pen marks that are too thin to be seen at night and so thick that they cover essential navigation features.

Fold the map so the navigator may follow the helicopter's position along the route of flight while transferring from one fold of the map to the next.

617. MAP STUDY

After completing the map preparation, conduct a thorough map study. Map studies provide the crew with an advanced look at the route and terrain features that will be encountered when operating at TERF altitudes. A detailed map study includes an examination of the following:

- Topography and terrain elevation
- Hydrography include lakes and rivers
- Manmade and natural hazards, such as towers, power lines, tall buildings, mountain peaks, and trees
- Airspace, including Class C and D, Restricted Areas, and noise-sensitive areas

For each leg of the route, establish left and right lateral limits and select funneling features, limiting features, aim points, and intermediate checkpoints. Determine possible hazards along the route and plan deviations if necessary.

Mentally fly the route and visualize the flight path. Consider how seasonal changes will affect the appearance of a checkpoint. Note the position of the sun and moon in relation to each checkpoint. Flying into a rising or setting sun or moon may make a visual acquisition of checkpoints, navigation features, and hazards challenging.

The map study should include analysis using JMPS and other imagery resources. JMPS provides satellite imagery that is sometimes more current than the JOG-A and 1:50,000 TLM. Additionally, JMPS consists of an application called Sky View. Sky View provides a 3D view of the route flown at the pilot's selected altitude. The satellite imagery and Sky View can be used in conjunction with the CHUM to update maps and select prominent intermediate checkpoints.

Commercial satellite imagery available on Google Earth or ForeFlight can also update route maps and perform a map study. This imagery is often more current than the imagery available on JMPS. However, when using any satellite imagery, check the date of the image. Satellite imagery can be months or even years old.

In addition to consulting satellite imagery, consider looking at different maps of the route, including both the JOG-A and the 1:50,000 TLM. The goal of the map study is to visualize how each checkpoint on the route will look and how to recognize important features. The map study enables pilots to reach the objective area on time and alleviates some cockpit tasks in a high workload environment.

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CHAPTER SEVEN
LOW-LEVEL MISSION BRIEF

700. INTRODUCTION

The mission brief sets the tone for the flight and relays all necessary information regarding the mission to the crews executing the flight. Military mission briefs follow a standard format that follows the Five Paragraph Order template, often called SMEAC: Situation, Mission, Execution, Administration and Logistics, and Communications.

Initial mission planning should focus on how the mission will be conducted. When the plan is complete, transcribe it into a brief using the SMEAC format. Well-developed templates help pilots build their briefs and ensure all topics are covered in a standardized format. However, the templates are to construct the brief, not to plan the mission itself. Pilots should plan the mission independently from the brief and then put a brief together to communicate the plan, not construct a brief, and then plan a mission that matches the brief. Naval Aviators will be reminded of this frequently throughout their careers by the adage, "Brief your plan, do not plan your brief."

The briefing skills honed in Advanced Helicopter Training provide the building blocks for mission briefs in the fleet. Regardless of service, aviators are responsible for giving professional mission briefs. Proper mission planning is critical, but to complete a mission safely and successfully, the mission plan must be communicated to every member of every crew.

701. MISSION BRIEF PREPARATION

Aviators must be thoroughly prepared for every mission brief. This includes rehearsing the brief ahead of time and setting up a clean and professional briefing space.

1. Rehearsal

A mission brief is a detailed presentation. To successfully communicate with the audience, the briefer must practice several times. Rehearse the most complicated portions of the brief, such as the route and objective area, more often. Do every rehearsal as close to an actual brief as possible. Stand up, post the map on the wall, and speak aloud. This helps identify weak spots in the brief and ensures the entire presentation flows well. If possible, practice in front of peers and ask them to provide feedback. Avoid using comfort words, slang, or filler words such as "um," "ah," and "ok." DO NOT use profanity during a professional brief.

2. Briefing Space Setup

Select an appropriate briefing space that has sufficient space for every member of the crew and has adequate privacy to reduce noise and distractions from other briefs. Keep the briefing space neat, including maps and imagery hung on the wall. A sloppy briefing space distracts from the brief and sets a negative tone for the flight. Crew members may wonder if the mission planning is as careless as the briefing space.

Place the required maps where they can be seen clearly by all members of the crew. The entire route must be depicted, including South Whiting and course rules. This may require more than one map. The LZ diagram must be placed where it is easily visible to all members of the crew. The briefer will frequently reference both the map and the LZ diagram throughout the brief, and the audience should be in a position where they can see the area referenced.

The **Lunar Daily Illumination (LDI)** and **Lunar Elevation/Azimuth Angles (LEAA)** from the Solar/Lunar Almanac Prediction (SLAP) Data shall be posted for all night flights. On both documents, highlight essential times, such as takeoff, actions in the objective area, and landing. Satellite imagery is not required, but it can bring added value to a brief. Imagery may help the audience visualize what the briefer is trying to convey. All satellite imagery shall have a North-seeking arrow depicted.

3. Mission Products

Ensure that smart packs are available for every member of the crew. The weight and balance should be placed with the PIC's smart pack. Do not staple the weight and balance; just place it under or next to the smart pack.

4. Briefing Techniques

The mission briefing guide is used similarly to the NATOPS. Briefers may write notes directly on the briefing template for reference during the brief. However, the template is an outline, not a script. The bullets and handwritten notes are meant to jog the speaker's memory, not be read verbatim.

During the brief, speak clearly and confidently. Public speaking is a skill that requires practice. The goal of every brief is to sound like an expert on the day's mission. If the briefer does not radiate confidence while speaking, the audience will find it challenging to commit to the plan. Speak loudly and enunciate so that everyone in the briefing space will be able to hear. Variations in tone and tempo emphasize important points. Avoid using a monotone voice, which may lull the audience to sleep. Speak at a moderate pace. If the briefer speaks too fast, the audience will have difficulty gleaning all the information. If the briefer speaks too slowly, the audience's attention may wander.

When speaking, face the audience. Avoid looking at the map or down at notes for an extended period of time. Notes should be quickly referenced, not read like a script. Make eye contact with the audience while speaking. This will help keep individuals engaged in the brief.

Always use a pointer when referencing a map or another visual aid. NEVER point with a hand or finger. Avoid crossbody pointing. When drawing attention to items with the pointer, a good briefer uses the arm closest to the map, so their body always faces the audience. Do not smack the pointer against the map or board. Many audience members find this distracting, and it can cause some visual aids to fall. When finished with the pointer, set it down to avoid fidgeting with it and distracting the audience.

702. SITUATION

The Situation paragraph describes the conditions in the operating environment that will affect the mission. The Situation covers the Area of Interest, Area of Operation, Enemy Forces, and Friendly Forces in the fleet. The TH-73A Mission Brief focuses on the Area of Operation and the Friendly Forces.

The Situation begins with an introduction:

> *"Attention to brief. I am (Rank and Last Name). Please hold all questions to the end."*

Following the introduction, the briefer should give a time hack. Many missions require multiple elements to execute at synchronized times. The time hack ensures all assets attending the brief are referencing the same time. Obtain an accurate time prior to the brief by calling the Naval Observatory Master Clock. Always announce one minute until the hack, and then give a thirty-second and ten-second warning. Count down from five seconds to the hack.

> *"Time Hack: In one minute, the time will be 1545 local… Thirty seconds to hack… Ten seconds to hack…5, 4, 3, 2, 1, hack. At the hack, the time was 1545. If anyone requires an additional time hack, see me after the brief."*

Do not continue the brief until the time hack is complete. Briefing additional items, such as aircraft assignment and location, is a distraction. Crewmembers who are trying to set their watches may miss the information.

Give the aircraft assignment, the parking spot, and the callsign. If the aircraft is a hot seat, state where the hot seat will occur.

> *"We will be in aircraft 614 on spot C9. Our callsign today is Eightball/Factoryhand/Lucky 614."*

The smart pack inventory is to ensure that all aircrew have the same information. Operational missions typically require several aircraft, sometimes from different type/model/series. The smart pack is essential to ensure all players have the correct callsigns, squawks, and frequencies. The inventory begins with the first page and continues in order to the last page.

If an item of information is not printed in the smart pack, a pen and ink change will be required. Pen and ink changes should be briefed as the page it occurs on is inventoried. Although pen and ink changes are allowed for last-minute changes or additions, they should be avoided to the maximum extent practical.

> *"Page one of five is the cover sheet. Pen and ink changes are the current winds are 170 at 12. Page two of five is the route card beginning at NAS Whiting Field and ending at checkpoint 3. Page three…"*

List all the maps or charts to be used for the flight.

> *"The map required for the flight is the Pensacola 1:250,000 JOG-A."*

Obtain current and forecast weather prior to the brief and state the current weather and required weather for the mission. Cover the weather for the origin, route of flight, and destination if the weather differs along the route of flight. If the mission involves an LZ that does not have weather observations, use the TAF from a nearby airfield.

> *"Current weather is scattered at 3,500, better than six statute miles visibility and winds 170 at 12 knots. Forecasted weather for KBFM at 1945 local is broken at 2,500, greater than 6 statute miles visibility and winds 200 at 9 knots. Weather required for the flight is 1000 and 3, winds no more than 20 gusting 25 knots."*

SLAP Data shall be briefed on all night flights. Brief the solar and lunar events that may affect the flight, such as sunset, End of Evening Nautical Twilight (EENT), moonrise, moonset, and percent illumination. Brief the azimuth and elevation angles of the moon and discuss any significant impacts they may have on the flight.

> *"Sunset is 1651, EENT is 1748, moonrise occurred at 1159, and moonset is 2356. The moon is at 50% illumination. At takeoff, the moon azimuth will be at 175º azimuth and 55º elevation. It will be descending and moving West throughout the flight, but will still be high in above the horizon when we land. The entire flight will be highlight, but we will see some shadows on the East side of terrain."*

703. MISSION

State the complete mission including the who, what (task), when, where, and why (purpose). The why is the most important part of the mission brief. It should clearly indicate the reason the mission is taking place.

> *"At 1745 local, HT-8 will launch a single TH-73A in order to safely complete a TRF4201A."*

704. EXECUTION

The Execution portion of the brief describes the commander's intent for accomplishing the mission. It consists of the Concept of Operations, Control Measures, Obstacles to Flight, Scheme of Maneuver, and Coordinating Instructions.

1. Concept of Operations

The concept of operations gives a general overview of the mission. It provides the audience with a broad sweep of the operation from start to finish. Describe the point of departure, area of operations, and mission in a sentence or two.

> *"We will launch from NAS South Whiting Field to conduct a training flight in the*

Western Operation Area. Landings will be conducted at LZ Bay Minette. The flight will recover at Mobile Downtown Airport."

2. Control Measures

The control measures are those features that define the working area for the mission, including boundaries, airspace, and LZs. Boundaries can be natural or manmade features and should be linear features that are readily identifiable from the air. Large highways, rivers, and coasts make excellent boundaries. Small streams or dirt roads should not be used as boundaries because they may be easily missed.

"Control measures: Boundaries – Our working area today is bounded by Highway 31 to the North, the Escambia River to the East, I-10 to the South, and highway 59 to the West."

The briefer should describe any regulatory airspace in the vicinity of the operating area, including the lateral and vertical limits of the airspace. If the route transits through any airspace, brief how the flight will coordinate entry. For Class C airspace, include the feature that defines the center (NAVAID or airfield) and the dimensions of the airspace. Brief any Restricted or Prohibited areas in the vicinity of the route. If the RWOP lists a noise-sensitive area near the route, brief its dimensions and any visual references that will keep the aircraft clear.

"Airspaces – Class C. There are three Class C airspaces in the Pensacola area. The Whiting Class C is centered on the Whiting TACAN. The Pensacola Class C is centered on Pensacola International Airport. The NAS Pensacola Class C is centered on the Pensacola TACAN. All three have an inner core from the surface to 4,200 feet MSL out to 5 nautical mile radius and an outer shelf from 5–10 nautical mile radius from 1400–4200 feet MSL."

"Restricted Areas – The Eglin Restricted Area 2915A is located south of HWY 90 from the surface to unlimited."

List the LZs that will be used during the mission. Do not go into detail about the LZs during the control measures. The detailed LZ brief occurs during the scheme of maneuver.

3. Obstacles to Flight

This is only a general discussion of obstacles and how to avoid them. Individual obstacles will be briefed chronologically during the scheme of maneuver. At a minimum, the obstacles to flight brief shall include power lines, towers, aircraft, and birds. Discuss any areas where other aviation traffic is expected, such as near an uncontrolled airfield. If the route passes within 10 NM of an uncontrolled airfield, monitor the traffic advisory frequency and make calls as necessary.

"Obstacle Avoidance – Our best defense is to maintain an active VFR scan and call out all obstacles using a clock code and state the action necessary to avoid the obstacle."

"Power lines – There are multiple power lines running through the operating area today, but while flying at 500 feet, they will not be a factor. If we are forced to a lower altitude, we will cross them at the stanchion to the maximum extent possible."

"Towers – We will offset from any towers, understanding that we have to avoid the guywires as well as the towers themselves."

"Aircraft – We will make calls at each checkpoint along the route of flight and coordinate as necessary to avoid other aircraft."

"Birds – We will make control inputs as required to avoid a bird strike."

4. Scheme of Maneuver

The scheme of maneuver is the most critical part of the brief. This is where the briefer gives a detailed description of the conduct of the mission. The scheme of maneuver begins with a timeline of preflight actions and continues until the aircraft has shut down, and the mission is debriefed.

Begin the scheme of maneuver with the sequence of events from preflight to takeoff. Brief the specific time the crew should conduct preflight, start the aircraft, and taxi. If the aircraft is a hot seat, brief the time the crew should expect to meet the aircraft and where the hot seat will occur.

"We will walk at 1355 and begin preflight at 1425. We will start the aircraft at 1445 and taxi at 1455 for a 1500 takeoff."

Course rules shall be briefed in the same detail as the route itself. The course rules brief shall include headings, checkpoint names, and any changes to airspeed, altitude, transponder codes, or radio frequencies. Additionally, the course rules brief shall include visual descriptions of each checkpoint and any funneling features, aim points, or limiting features. Navigation is graded throughout the flight, not just on the route, so the SNAs must ensure that they can successfully navigate the route, the OLF, and back to South Whiting.

The purpose of the route brief is to orient the crew along the route. The goal is to provide a mental picture of how the route will look from the cockpit and how the crew will remain oriented and identify checkpoints. A good route brief finds a balance between providing enough detail that the crew will be able to visualize the route but not so much that it overwhelms them. In addition to covering navigation, the route brief must also discuss the procedural actions required along the route, such as changes in airspeed, altitude, squawk, and radio frequencies.

To ensure nothing is forgotten, many briefers use the acronym FALCON: Formation, Airspeed/Altitude, Lighting, Communications/Squawk, Obstacles/Terrain, and Navigation/NVG Considerations. If some FALCON considerations changed, but others did not, only brief those considerations that changed.

- **Formation:** During single ship flights, the briefer only needs to state, *"We will be single ship throughout the flight."* In formation flights, the briefer will state the type of formation the flight will use, such as cruise, parade, or combat cruise.

- **Airspeed/Altitude:** Brief any airspeed or altitude changes along course rules or the route.

- **Lighting:** Brief the lighting scheme to be used throughout the flight. If it does not change, lighting only needs to be briefed at the beginning of the scheme of maneuver. During NVG flights, lighting should be briefed every time the lighting condition changes.

- **Communications/Squawk:** Brief all radio frequency and transponder code changes throughout the flight.

- **Obstacles and Terrain:** Discuss any features that might be a hazard to the aircraft. This includes towers, power lines, aircraft, and birds. Brief each obstacle individually as it occurs on the route and the plan to avoid it. Many pilots combine obstacles with the navigation and NVG considerations to provide a logical, chronological flow along the route.

- **Navigation/NVG Considerations:** Navigation shall be briefed for every checkpoint. It begins with a statement of the direction of turn to a clock position, backup heading, time, and expected distance to the next checkpoint. It continues with a detailed description of the route to the next checkpoint. The goal is to provide the crew with a comprehensive mental picture of the route.

There are several techniques to help briefers describe the route in an organized and predictable way.

- Develop a plan for the brief by chair flying the route. Use the map and satellite imagery to visualize the route from the cockpit, and then use that information to write and rehearse the brief.

- Brief the route from big to small. First, brief the most prominent visual features, and then increase the detail to focus on the specific checkpoint. This technique is particularly important for small, difficult checkpoints that do not contrast well with the surrounding area.

- Use limiting features, aim points, and intermediate points to highlight aids to navigation along the route. When describing features, consider how they will appear from the cockpit, not just as they appear on the map. You may use directional terms such as left and right or north, south, east, and west. When selecting the directional terms you will use, consider which one or combination of left/right and compass directions will most clearly communicate your intent.

- When describing a linear feature, use cardinal and semi-cardinal directions. Instead of saying, *"We will follow that road,"* say, *"We will follow this East to West running road."*

- Describe roads using standardized terminology, as shown in Table 7-1 Standardized Road Descriptions below. This eliminates confusion in the brief and gives every member of the crew a shared mental picture.

CORRECT TERMINOLOGY	DEFINITION
All-Weather or Hardball	Concrete or Asphalt
Improved Surface	Level and packed down, but not paved. Includes bridges and culverts
Unimproved Surface	Loose surface
Jeep Trails	Narrow tracks across terrain

Table 7-1 Standardized Road Descriptions

Develop a rhythm to brief each checkpoint the same way. After each checkpoint, begin by briefing the direction of turn and rollout clock position to the next checkpoint. Then give the backup heading, distance, and time to the next checkpoint. Move the brief along the route chronologically; briefing intermediate, funneling, and limiting features along the way. Touch on any obstacles along the route and how to avoid them. Lastly, describe the next checkpoint and start the process over for the next leg of the route.

> *"From checkpoint six, we will make an easy left turn to the 11 o'clock, back up heading of 165 for a distance of 9.8 nautical miles and timing for 5 minutes 54 seconds to checkpoint seven which is a bridge. Leaving checkpoint six, there will be a series of three tall towers off our nose. We will aim for the center tower. As we approach checkpoint seven, look for a North/South running road paralleling our route off the left-hand side. This road will lead us into the checkpoint. We will also look for an East/West running creek roughly perpendicular to our course. Checkpoint seven is the bridge where the North/South running road crosses the East/West stream. I-10 is our limiting feature for this checkpoint. It runs East/West, South of the stream. If we reach I-10, we have passed our checkpoint. At checkpoint seven, we will make a left-hand turn to 10 o'clock."*

When briefing an NVG route, include applicable NVG considerations along the route. NVG considerations include details such as terrain contrast, cultural lighting, atmospheric obscuration, relative moon position, and shadowing.

At the completion of the route, brief course rules to the OLF in the same detail as the route. It is NOT acceptable to simply say, *"Following checkpoint ten, we will fly course rules to Site X."*

The LZ brief is a detailed description of the LZ using the SWEEP format (Size/Slope/Surface/Suitability, Winds, Elevation, Egress Route, and Power). The SWEEP format covers the pertinent information to operate safely in and around an LZ. The LZ information passed during the brief is an estimation based on a thorough map study and satellite imagery. SWEEP checks are conducted again during the flight to determine if anything about the LZ differs from what was expected. After completing the SWEEP brief, list the planned maneuvers, primary and alternate landing spots, and time on station at the LZ.

> *"LZ Site X is roughly a 1 mile by 1-mile grass field. There are 16 gravel spots, four located near midfield on each side. There are six paved runways, three north/south, and three east/west. There is slightly elevated terrain on the west side between the gravel landing spots. A depression surrounds the center runways and infield. The LZ is suitable for a single TH-73. Winds are expected from the NE at 15 knots. The LZ is 211 feet MSL. Our egress on a waveoff is straight ahead, with departure egress in the SW corner. Our power required at the LZ is calculated as HIGE of XX% and HOGE of XX%."*

During NVG flights, include NVG considerations in the LZ brief. These considerations may include cultural lighting, varying contrast in different parts of the LZ, and moon position in relation to the traffic pattern.

Always conduct the LZ brief where it will occur chronologically in the flight. If the flight is performing pattern work in the middle of the route, the LZ brief should occur in the middle of the route brief.

Actions in the LZ begin with procedures on entering the landing pattern and where the flight expects to conduct pattern work. The anticipated landing points should be based on the forecasted winds and expected landing direction. Actions in the LZ also include a detailed plan for what types of approaches and landings will be conducted.

> *"We will approach LZ Site X from the Southwest and circle to split the field for a course of 360, avoiding the Southwest departure corner. We will split to the normal side on the right. Our first landing will be a normal approach to a hover over the duty runway in the 180 lane. We will then conduct DLAs for 20 minutes, beginning with 90-degree DLAs and progressing to 180 and 360-degree DLAs. At the completion of the DLAs, we will re-split the LZ at altitude and depart via the Southwest corner."*

The final portion of the scheme of maneuver covers the course rules back to South Whiting. The course rules shall be covered in the same detail as the rest of the route, including how the flight will maneuver to land at South Whiting and which landing spot will be utilized. Brief all details up to and including the shutdown or hot seat, such as taxi, refueling, and parking location. Although this information may be obvious when operating at South Whiting, it becomes vital when operating away from home field.

5. Coordinating Instructions

Coordinating instructions cover contingencies for unplanned situations and issues that may arise during the flight. The following are examples of contingency briefs, not templates that must be followed word for word.

Give a broad description of what the flight will do during an emergency or system failure. This should not include any specific emergencies, just a set of general guidelines that the flight will follow if a failure arises.

> *"Coordinating Instructions – Emergencies/System Failures – If we have an emergency or system failure during the flight, we will handle it in accordance with NATOPS. We will always endeavor to turn a flying emergency into a ground emergency."*

Describe how the flight will handle Inadvertent Instrument Meteorological Conditions (IIMC). Brief a safe heading to which the crew can turn to avoid any obstacles. Depending on the obstacles in the working area, there may need to be different heading for different phases of the flight.

> *"IIMC – If we go IIMC, the PAC will switch to an instrument scan, level the wings, level the nose, center the ball, and start a standard rate climb to 2500'. We will execute a standard rate turn in the shortest direction to the safe heading. PNAC will squawk 7700, Pensacola Approach on 118.6, and IFR clearance for an approach back to KNDZ. If we regain VMC, we will remain VMC. Our safe heading today is 360, except from checkpoint 9 through checkpoint 10 where the safe heading will be 090."*

The lost communication plan should cover the course of action to be taken in the event of a radio failure. If the flight is returning to South Whiting, the brief should include a review of the local lost communication radio procedures.

> *"Lost Communications – If we experience a total radio failure, we will climb to troubleshoot as necessary. We will maintain a vigilant scan for other aircraft at all times during the emergency. If unable to regain radio communications, we will maintain VMC, squawk 7600, and make all calls in the blind. We will intercept course rules to NAS South Whiting Field. Once at NAS South Whiting Field, we will overfly the field, determine the course for the runway in use, and look for an Aldis lamp signal from the tower."*

Lastly, brief the disorientation procedures that the crew will use in the event they become lost. This plan may include orbiting until reoriented, climbing for better visibility, or returning to the last known checkpoint.

> *"Disorientation Procedures – If we become disoriented on the route of flight, we will enter holding and attempt to identify a known reference point. If able, we can return to the last known checkpoint to reorient or continue to the next checkpoint once reoriented."*

705. ADMINISTRATION AND LOGISTICS

This paragraph passes the administration and logistics information necessary to complete the mission. At Training Wing Five, the admin and logistics are simple. In the fleet, however, this paragraph covers important information such as what cargo and passengers go on each aircraft.

The flight duration shall be calculated using JMPS and briefed accordingly.

> *"Administration and Logistics: Flight duration will be 1 hour and 33 minutes."*

Two fuel states are briefed during admin and logistics: the mission fuel and the Bingo Fuel. Mission fuel is all the fuel required to complete the mission and land at the destination airfield at NATOPS minimum fuel. This includes course rules to and from the route, route execution, and 20 minutes of pattern work at an OLF or airfield. Mission fuel planning should reflect the airspeed at which the segments of the route will be flown. Brief the Bingo Fuel as well as the checkpoint from which it is calculated and the Bingo route to be flown. Additionally, state the maximum range airspeed from which the Bingo Fuel was calculated.

> *"Fuel - Mission Fuel is 600 pounds. Bingo fuel is 150 pounds from checkpoint 5 direct to Point Snake for a course rules arrival to South Whiting using the maximum range airspeed of 135 knots."*

706. COMMAND AND SIGNAL

The command and signal paragraph provides a final review of the communication sequence and transponder codes for the entire flight. Brief all frequencies in the order in which they will be used during the flight.

> *"Communications – Preset and manual frequencies will be used as required. Comm flow is 5 for Base, 1 for ATIS, 3 for Ground, 4 for Tower, 9 for Pace, 13 for Site-X, 19 for Western Common, 14 for Green Route Common, 122.8 for Bay Minette, 118.5 for Mobile Approach, 118.8 for Downtown Tower, and 121.7 for Downtown Ground."*

Brief all the NAVAIDS to be used during the flight as well as GPS waypoints that will be loaded into the FMS.

> *"Navigation along the route will be primarily visual. We will tune Gateswood TACAN 60X for reference in the Western Operating Area. The Green Route and Mobile Downtown will be loaded in the GPS for backup as required."*

For ID and recognition, discuss all the transponder codes to be used during the flight and when any automatic code changes will occur.

> *"ID and Recognition – Squawk – We will squawk 0100 outbound to Pt Pond. At Pt Pond, we will squawk the Western Operating Area code of 4777. Upon departing the Western Operating Area, we will squawk 1200 until otherwise assigned by Mobile Approach."*

707. NATOPS BY EXCEPTION

The mission brief focuses on the execution of the mission by addressing actions that are directed outside the aircraft and apply to all members of the flight. In a multi-aircraft mission, the audience will break up into individual crews to complete the NATOPS brief. For a single ship mission, pause at the end of the Mission Brief and ask if there are any questions. If there are no questions, continue with the NATOPS by exception brief. The NATOPS by exception brief covers only those items in the NATOPS brief that were not already covered in the Mission Brief.

The NATOPS, by exception, includes more detailed crew coordination instructions, such as PAC and PNAC responsibilities, and how aircraft emergencies or system failures will be handled. Review the NATOPS brief and only brief the items not already covered. It is not necessary to state "previously briefed" for items discussed in the Mission Brief, just skip them and move on to the next item.

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CHAPTER EIGHT
LOW-LEVEL NAVIGATION EXECUTION

800. INTRODUCTION

The low-level navigation flights are designed to introduce the aviator to the problems associated with navigation at 500 feet AGL and below on large-scale maps. The SNA shall maintain orientation along the route and identify each checkpoint. Airspeed should be adjusted accordingly to maintain orientation and timing as required.

SNAs shall arrive within ± 2 minutes of timing starting from the first checkpoint and ending with the last checkpoint. Adjusting airspeed, delaying time to a checkpoint, and holding are permitted to meet timing. With sufficient time and checkpoints remaining, adjusting airspeed is the preferred method to get back within the two-minute time constraint. If the SNA recognizes that adjusting airspeed alone will not allow sufficient time to get within parameters, the SNA may request a ROLEX and the instructor can elect to extend the overall route time.

Detailed planning and chair flying will improve SNA SA and effectiveness during low-level navigation. In addition to navigation, the SNA must also master cockpit task management, low-level lookout, and effective communication between the PNAC and the PAC.

801. CONDUCT OF LOW-LEVEL NAVIGATION FLIGHTS

During low-level navigation events, the instructor will fly the aircraft while the SNA navigates using the map. As the PNAC, the SNA must orient the PAC to the route of flight. This requires a balance between giving the PAC enough detail so he or she can recognize correct features, but not so much information that the PAC becomes saturated in detail. To ensure that they are passing the appropriate amount of information, the PNAC should focus on being directive then descriptive, chunking information, and talking from big to small.

Being **directive then descriptive** means that the PNAC prioritizes specific instructions over descriptions of a feature. For example, if the PNAC wanted the PAC to fly towards a specific field, the PNAC would direct the PAC to fly toward the field and then describe the field to ensure PAC can identify the field. *"Turn right to two o'clock… Roll out… Do you see the bright green field directly off the nose? Checkpoint 9 is the intersection on the left side of the field."* When possible, the PNAC should describe features as they will be seen from the helicopter. For example, to draw the PAC's attention to a feature, the PNAC might say, "Look for a pond to the right of this East/West running road." This gives the PAC a specific visual image to look for and helps the PAC remain oriented. It also reminds the PNAC to confirm that the road in question is, in fact, running East/West. Many pilots have become turned around following an incorrect road because they failed to look at the RMI to verify that the road is heading in the right direction.

The example above also demonstrates **chunking information**. The PNAC should not assault the PAC with a continuous stream of words. Instead, the PNAC should give the PAC short bursts of information to ensure the PAC has time to process the information. When the PAC has acknowledged the information, the PNAC should continue with the next information block.

Chunking information also facilitates a dialogue between the PNAC and PAC. It allows the PAC to ask for clarification, if necessary, and assures the PNAC that the PAC understands the instructions. This dialogue ensures that the task of navigating remains divided amongst the crew instead of resting solely on the PNAC.

When talking the PAC onto checkpoints or other features, the PNAC should **work from big to small**. The PNAC should begin by describing large, easy to identify features in the vicinity of the checkpoint and then point out successively smaller features to direct the PAC's attention to the checkpoint.

PNAC: "*Call contact on the hill at 12 o'clock.*"

PAC: "*Contact.*"

PNAC: "*Do you see the clearing in the trees on the top of the hill?"*

PAC: "*Yes.*"

PNAC: "*Checkpoint 9 is the red sandpit in that clearing.*"

PAC: "*Contact.*"

In the event the aircrew becomes disoriented, ensure the aircraft is at a safe altitude, and climb if necessary until reoriented. Once the aircrew realizes they are disoriented, they should enter holding so they can focus on reorienting. While holding the crew should look outside for prominent features, then search for those features on the map in order to determine their current position. Once their current position is determined, the crew can make the appropriate course corrections to get back on route.

NOTE

During operational missions, disorientation procedures will change based on a variety of factors including threats in the area of operation.

802. THE 6TS DURING LOW LEVEL NAVIGATION

Since the PAC's attention is focused on flying, the PNAC is responsible for most of the routine cockpit tasks during low-level navigation. SNAs should endeavor to develop a systematic approach to navigation. The 6Ts are a recommended technique for managing tasks throughout the flight. Performing the 6Ts at each checkpoint ensures that all necessary items are accomplished. At each checkpoint, the PNAC verbalizes each step to maintain the PAC's SA.

1. Time

The first time in the 6Ts is for overall route timing. Determine if the aircraft is ahead or behind the planned timing for the checkpoint. There is no need to wait until the aircraft is directly over the checkpoint to make an estimation. When the checkpoint is in sight, check the route time. If the planned time has already elapsed, the aircraft is behind and the PNAC will need to call for an increase in groundspeed. If the clock time has not yet reached the planned checkpoint time, estimate how long it will take to reach the checkpoint and confirm the time while passing over the checkpoint.

> *"Call contact on the Y intersection off the nose. That is checkpoint two. Planned time is 4+00, time now 4+05. Increase airspeed to 100 knots."*

2. Turn

Advise the PAC which direction to turn. The crew shall confirm the aircraft is cleared in the direction of the turn prior to executing the turn.

> *"Come right to One O'clock. Back up heading 304. Clear right."*

Backup headings and clock codes are useful for the initial turn but need to be corrected for any crosswind after rollout. The PNAC should provide the PAC with crab angle corrections if required. Give the PAC aim points to help them maintain an outside scan and avoid drifting off course. The aim point can be a preplanned feature from the brief or a visually significant object along the route.

> *"Rollout. Aim down the right side of the catfish ponds."*

3. Time

Once rolled out on the new heading, start the timer for individual leg time.

4. Transition

Confirm the airspeed, altitude, NAVAIDs, and transponder codes. The PNAC should direct the PAC to adjust the altitude and airspeed, as well as advising the PAC of any changes to the NAVAIDs and transponder code. If the PNAC noted a disparity between planned time and actual time on the first T, he or she should call for a change to the groundspeed if not already complete.

5. Twist

Twist the heading bug to the backup heading.

6. Talk

The PNAC should complete a gas and gauges check. The PAC will make the proper external traffic call.

> *"Gauges checked normal. We have 530 pounds."*
> *"Eightball 610, checkpoint 1 to 2"*

When conducting the gas and gauges check, the PNAC must consider the fuel status and determine if the aircraft has sufficient fuel to complete the mission. If the aircraft is approaching Bingo Fuel, the crew should determine whether or not the route can be completed.

The PNAC does not need to wait until the aircraft is directly over the checkpoint to complete the 6Ts. If the checkpoint is in sight, the PNAC can finish several of the Ts before reaching the checkpoint. Before beginning the 6Ts, the PNAC should ensure that the PAC sees the checkpoint. Inform the PAC of the next turn and proceed with the 6Ts. Once over the checkpoint, review the 6Ts to ensure that each step is complete. Starting the 6Ts early allows the PNAC to stay ahead of the aircraft, remain oriented as the PAC turns to the new heading, and guide the PAC to the follow-on checkpoint.

803. USE OF GPS ON LOW-LEVEL NAVIGATION FLIGHTS

The GPS is an excellent tool for navigation. In some areas of the world where terrain features are limited or over water, it may be the only source of information. However, GPS has limitations. If satellite reception is inadequate, waypoints are programmed incorrectly, or the GPS receiver fails, the aircrew must rely on VNAV skills.

Naval Aviators must constantly hone their navigation skills using pilotage and D/R, as well as navigation aids such as the GPS. Regardless of the means of navigation, pilots should always confirm the course using all available tools.

During low-level navigation routes, use of the GPS for navigation is at the instructor’s discretion. The focus of low-level navigation training is VNAV, so SNAs should not expect to use GPS for the majority of the flight. However, in order to build solid habit patterns, SNAs should still load their intended route of flight into the FMS prior to takeoff.

804. ROUTE TIMING

TOT timing starts at the first checkpoint on the route and ends at the last checkpoint. SNAs must monitor route time and leg time at each checkpoint to ensure proper groundspeed is being flown. Head winds and tail winds can have a big effect on groundspeed and must be identified by the crew early in the route. Expected wind effects should be included in the weather portion of the mission brief.

If the flight gets ahead of the planned timing, the SNA should request that the instructor slow down to get back on timing. If the flight is so far ahead on timing, that reducing groundspeed is impractical, the SNA may elect to hold at a checkpoint prior to final checkpoint.

If the flight is behind timing, the SNA should request that the instructor increase groundspeed to catch up. If the flight is so far behind timeline that it cannot arrive at the final checkpoint at the planned TOT, the SNA should request a ROLEX from the instructor. When requesting a ROLEX, the SNA must determine how far behind the flight is and request a ROLEX for a specific amount of time. For example, if the SNA determines that the flight is 2:53 behind and cannot catch up before the end of the route, he or she should request a ROLEX of three minutes. A ROLEX is a contingency that can usually be avoided through proper planning. A request for a ROLEX will be granted at the discretion of the instructor.

When requesting an airspeed adjustment, SNAs should give the instructor a specific groundspeed they would like the instructor to fly. A general rule for calculating groundspeed corrections is the 10 percent per minute rule, meaning a 10 percent change in speed held for one minute will correct for six seconds. To determine the length of time to hold a correction, divide the timing deviation by six seconds and convert the answer to minutes and seconds. This is the amount of time that a 10 percent change in planned groundspeed must be held to return to the timeline.

*Groundspeed Adjustment = Planned Groundspeed*10%*

*Length of time to hold a correction = [Time deviation/6 seconds]*1 minute*

Example**:** The helicopter arrives at a checkpoint 20 seconds later than planned. This indicates the need to increase speed to get back on timeline. Using the general rule:

1. Divide 20 seconds by 6 seconds. This equals 3.33 or, after converting to minutes, 3 minutes 20 seconds. Therefore, a 10 percent groundspeed increase must be held for 3 minutes 20 seconds in order to return to the planned timeline.

2. If planned groundspeed is 90 knots, a 10 percent increase is 99 knots (90 knots + 9 knots = 99).

3. After requesting that the instructor maintain a 99 knot groundspeed, the student should note the time and request the instructor to slow back to 90 knots groundspeed after 3:20.

If a 10 percent increase/decrease is not possible due to aircraft limitations or safety considerations, the equation can be adjusted by using 5 percent or half of the calculated value for the adjustment. When using 5 percent, divide the time deviation by 3 seconds, which will increase the length of time to hold the correction.

When using 5 percent in the example above, divide (20 sec / 3 sec) and multiply 1 Minute to equal 6 minutes and 40 seconds. 5 percent of 90 knots is 4.5 knots. An increase to 94.5 or 95 knots groundspeed should be held for 6 minutes 40 seconds to get back on timing.

805. FUEL CHECKS AND CALCULATIONS

In-flight, fuel can be stated in either pounds of fuel onboard or time remaining. Both have practical applications, and both are important to overall fuel management. When conducting fuel checks in flight, compare actual fuel quantity in pounds to the fuel required to continue the mission from the route card. If there is less fuel onboard than the detailed mission planning requires, adjust the route or the time in the objective area. Bingo Fuel is also given in pounds. Fuel expressed in pounds is primarily used for internal planning.

SNAs should be able to convert the remaining fuel in the tank to time remaining by the same method used in radio instruments. This information can be used to calculate time remaining until the aircraft must be on deck or time remaining until Bingo Fuel. Fuel expressed in time remaining is primarily used for coordination with outside agencies.

> *"Ma'am, we only have 495 pounds. I calculated the required mission fuel as 550 pounds. We need to cut out DLAs at the OLF in order to have enough fuel remaining to complete the route."*

> *"Sir, fuel quantity is 496 pounds, Bingo Fuel is 400 pounds. We have 0+14 remaining until Bingo."*

SNAs shall notify the instructor if the actual fuel remaining is below the mission fuel. If the helicopter reaches Bingo Fuel, the SNA shall navigate the flight directly to a fuel source.

> *"Bingo Fuel is 330 pounds. Current fuel is 350 pounds, I recommend we turn left to 075 and proceed to LZ Site X."*

If the fuel remaining decreases below the Bingo Fuel and the helicopter is not already en route to a fuel source, the crew should find a place to land closer than the fuel source. The crew may also consider the possibility of a fuel leak.

806. DEBRIEF

A thorough debrief shall be conducted at the completion of every flight. All participating aircrew should meet at a designated location and time to discuss the successes and failures of the flight. In the fleet, the discussion is led by the mission commander and should be debriefed by phase (plan, brief, execution). The debrief should be held as close as possible to the completion of the mission so that the events of flight are fresh in everyone's mind. Critiques of the mission should start with the positives and then move into the mission failures. All aspects of the flight should be covered.

In the training environment, the instructor will debrief the student's planning and brief prior to the flight. This debrief will cover map preparation as well as the delivery and content of the brief. The execution of the flight shall be debriefed at the completion of the flight IAW Wing and Squadron Standard Operating Procedures (SOP). This facilitates the SNA receiving an honest critique of the entire flight and guides the instructor in conducting a standardized debrief.

CHAPTER NINE
TERF MANEUVERS

900. INTRODUCTION

During TERF flight, the pilot may need to maneuver the helicopter around obstacles along the route of flight. TERF maneuvers are designed to allow the pilot to guide the helicopters around an obstacle without impacting the terrain or exposing the helicopter to the enemy for an excessive amount of time. In flight school, TERF maneuvers will be performed only in the simulator.

901. TERF QUICK STOP

Maneuver Description: The TERF quick stop, as shown in Figure 9-1, is a coordinated maneuver designed to slow or stop the helicopter in the TERF environment.

Application: The TERF quick stop is used when the helicopter is at very low altitudes. The helicopter rotates around the tail rotor during the maneuver to avoid striking the tail skid on the ground.

1. Procedure

    a. Establish the helicopter in straight and level flight at 20 feet AGL and 40 Knots Indicated Airspeed (KIAS).

    b. Coordinated aft cyclic and collective adjustments to rotate the helicopter around the tail rotor while maintaining the tail rotor at a constant altitude.

    c. Adjust the pedals as required to maintain heading.

    d. As groundspeed, approaches zero, raise the collective, and apply forward, cyclic to intercept a landing profile or execute a waveoff.

2. Amplification and Technique

The helicopter must be rotated around the tail rotor to avoid a loss of altitude of the tail section. If the helicopter is allowed to descend, the tail rotor may contact terrain. However, ballooning may expose the aircraft to enemy observation. Depending on environmentals and actual airspeed at initiation, collective adjustments will vary. Be prepared to correct any climb or descent. Initially a slight collective increase may be necessary to avoid the tail rotor descending as the helicopter rotates about lateral axis. Once the initial pitch up is established, the collective will need to be lowered to avoid ballooning.

Tail rotor altitude must be determined visually by scanning outside the aircraft. As the helicopter rotates, the radar altimeter will be at an angle to the terrain that will not provide accurate information.

3. Energy Management

The TERF quick stop bleeds off excess kinetic energy without gaining potential energy. At the end of the quick stop, the helicopter will be in a low-energy state. This means it will take a large collective input to either establish the helicopter in a hover or execute a waveoff. However, the low energy state at the end of a TERF quick stop is ideal for allowing the helicopter to settle into a no hover landing.

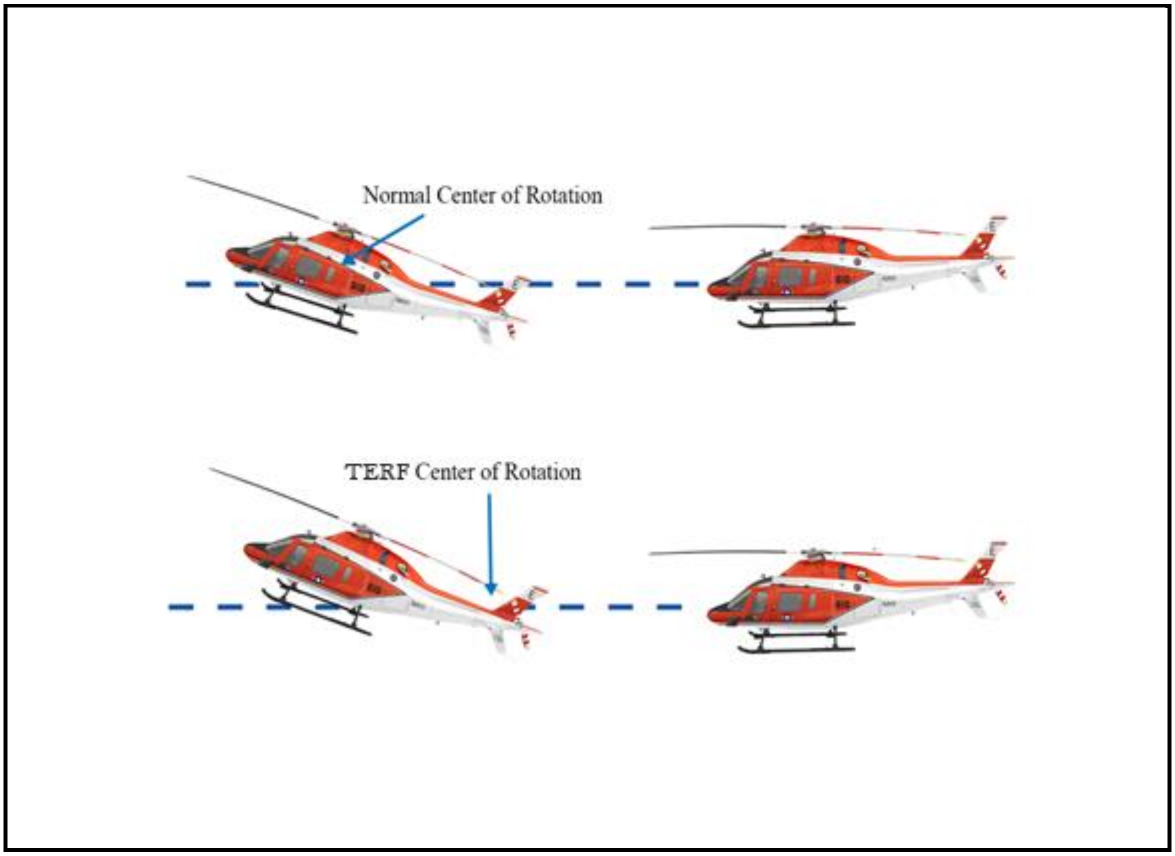

Figure 9-1 TERF Quick Stops

902. TERF TURNS

Maneuver Description: TERF turns, as shown in Figure 9-2, are coordinated maneuvers that allow the pilot to execute steep turns in the TERF environment.

Application: TERF turns are used when the helicopter is at very low altitudes. During the maneuver, the helicopter rotates around the lowest edge of the tip path plane to avoid terrain contact during the turn.

1. Procedure

   a. Establish the helicopter in straight and level flight at 20 feet AGL and 40 KIAS.

b. Begin the maneuver by raising the collective to establish a slight climb.

c. Use the cyclic to roll the helicopter into 30–45 degree Angle of Bank (AOB) turn.

d. Maintain the tip path plane on the inside of the turn at a constant altitude.

e. Adjust the pedals as necessary to maintain balanced flight.

f. Approaching the desired heading, return to wings level and lower the collective to avoid ballooning.

2. Amplification and Technique

In turns greater than 30-degree AOB, the tip path plane is the lowest point of the helicopter. By rotating around the tip path plane, the TERF turn allows the pilot to perform a high AOB turn without contacting the terrain.

To rotate around the tip path plane, the fuselage of the helicopter must climb. By leading the turn with a small collective increase, the pilot ensures that tip path altitude will remain constant throughout the turn.

When rolling out, the pilot must decrease the collective to avoid ballooning. Climbing at the completion of a TERF turn could expose the helicopter to enemy observation.

Tip path plane altitude must be determined visually by scanning outside the aircraft. As the aircraft rotates, the radar altimeter will be at an angle to the terrain that will not provide accurate information.

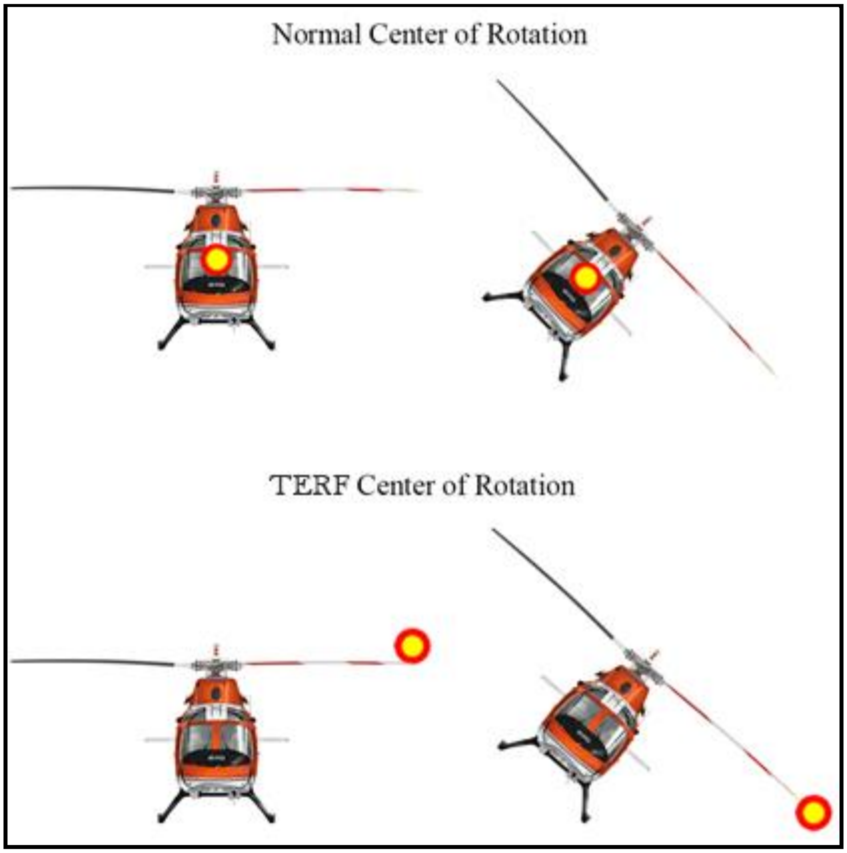

Figure 9-2 TERF Turns

3. Energy Management

To maintain altitude and airspeed in a turn, the helicopter requires more power. If the pilot cannot add power in the turn, he or she may pitch the nose up and bleed off airspeed to maintain altitude. In effect, this uses the kinetic energy of airspeed to maintain the helicopter's potential energy throughout the turn. However, when the helicopter rolls out of the turn, it will be in a lower energy state than when it started. Kinetic energy has decreased because airspeed is slower, and potential energy remains the same because the helicopter did not climb through the turn. To regain the original energy state, the pilot must pitch the helicopter nose down to accelerate. At a constant altitude, the helicopter will eventually return to its original airspeed. If the pilot wishes to accelerate faster, he or she can either add power or descend to trade potential energy for kinetic energy (airspeed).

In TERF turns, pilots may elect to bleed off airspeed to maintain altitude. However, they must remember that this decreases the helicopter's overall energy. In a very steep turn, the decrease in energy may place the helicopter in a situation where it does not have enough energy to maintain altitude, and the helicopter will descend. At the very low altitudes associated with TERF turns, even a small descent may result in the blade tips impacting terrain. Therefore, pilots must be cognizant of the helicopter's energy state at all times during a TERF turn and use an increase in power to maintain altitude whenever possible.

9-4 TERF MANEUVERS

If the helicopter begins descending when power is already at the maximum available, the pilot must reduce the AOB and slow toward bucket airspeed. Before commencing a TERF turn, pilots must ensure that the Pr will not exceed the Pa and that there are options to safely exit the maneuver in the event of an emergency. When conducting any TERF maneuver, ensure that a safe power margin exists and there is enough space to conduct the maneuver. Never place the helicopter in a position where there is no escape route.

903. BUNTS

Maneuver Description: Bunts, as shown in Figure 9-3, are used to cross obstacles running perpendicular to the route of flight in the TERF environment.

Application: Bunts allow the helicopter to cross obstacles while maintaining terrain clearance and returning to a masked position as soon as possible.

1. Procedure

   a. Bunts may be commenced at any airspeed and any altitude.

   b. Approaching the obstacle, increase collective and apply aft cyclic to initiate a climb.

   c. As the helicopter crests the obstacle, lower the collective and apply forward cyclic to initiate a descent back to the desired altitude and airspeed.

2. Amplification and Technique

During the climb, gain only enough altitude to clear the obstacle. Excessive altitude gain may expose the helicopter to enemy observation.

Before descending, ensure that the tail is clear of the obstacle. Descending too soon may cause the tail rotor to contact terrain.

Use caution when decreasing the collective and simultaneously applying forward cyclic to avoid placing the helicopter in a low G situation. If the helicopter is allowed to enter a low G situation, the pilot may experience reduced controllability. Pilots may consider establishing a turn during the descent to maintain a positive G load on the helicopter.

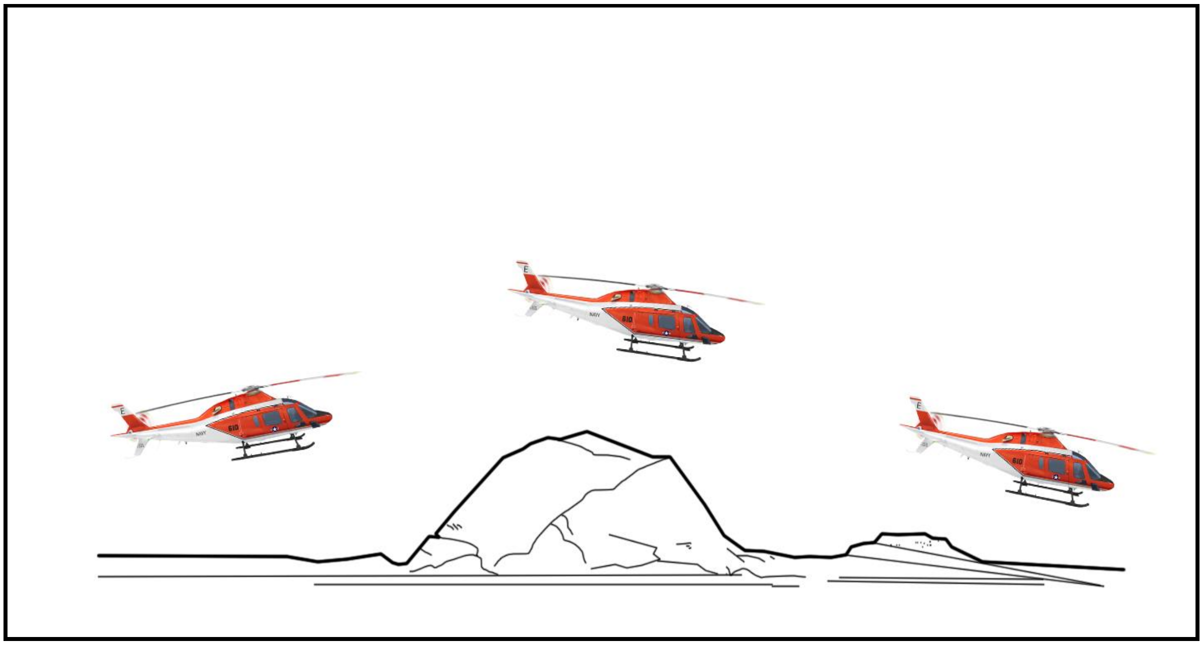

Figure 9-3 Bunts

3. Energy Management

During a bunt, the pilot trades kinetic energy (airspeed) for potential energy (altitude) to cross the obstacle. As the helicopter descends on the opposite side of the obstacle, it trades the potential energy gained in the climb back into kinetic energy. Although it is theoretically possible to perform a bunt without changing the power setting, pilots should increase the collective when initiating the climb. This prevents the helicopter from using all its kinetic energy to clear the obstacle reaching the top of the obstacle with little or no airspeed. Low airspeed during a bunt exposes the helicopter for a longer period of time and may result in the helicopter settling and descending into the terrain.

904. ROLLS

Maneuver Description: Rolls, as shown in Figure 9-4, are used to cross obstacles running generally parallel to the route of flight in the TERF environment.

Application: Rolls allow the helicopter to cross obstacles while maintaining terrain clearance and returning to a masked position as soon as possible.

1. Procedure

   a. Rolls can be commenced at any airspeed and any altitude.

   b. Make a 45-degree turn toward the obstacle while raising the collective to climb above the terrain.

   c. As the helicopter crests the obstacle, lower the collective and apply forward cyclic to initiate a descent while simultaneously turning parallel to the obstacle.

d. Adjust the cyclic and collective to return to the desired altitude and airspeed.

2. Amplification and Technique

During the climb, gain only enough altitude to clear the obstacle. Excessive altitude gain may expose the helicopter to enemy observation.

The obstacle may be crossed wings level or in a turn. If crossing the obstacle in a turn, ensure the tip path plane is clear of terrain on the inside of the turn. If the AOB is greater than 30-degree, the tip path plane will be the lowest point of the helicopter.

Maintain a positive G load on the helicopter throughout the maneuver.

3. Energy Management

Energy management in a roll is very similar to the energy management in a bunt. The pilot trades off kinetic energy to climb over an obstacle and then regains kinetic energy as it descends. In a roll, however, the pilot will always roll into an AOB during the climb and descent. For this reason, the pilot must always increase power when executing a roll. It is unlikely that the helicopter will have sufficient kinetic energy to climb over an obstacle while maintaining a turn.

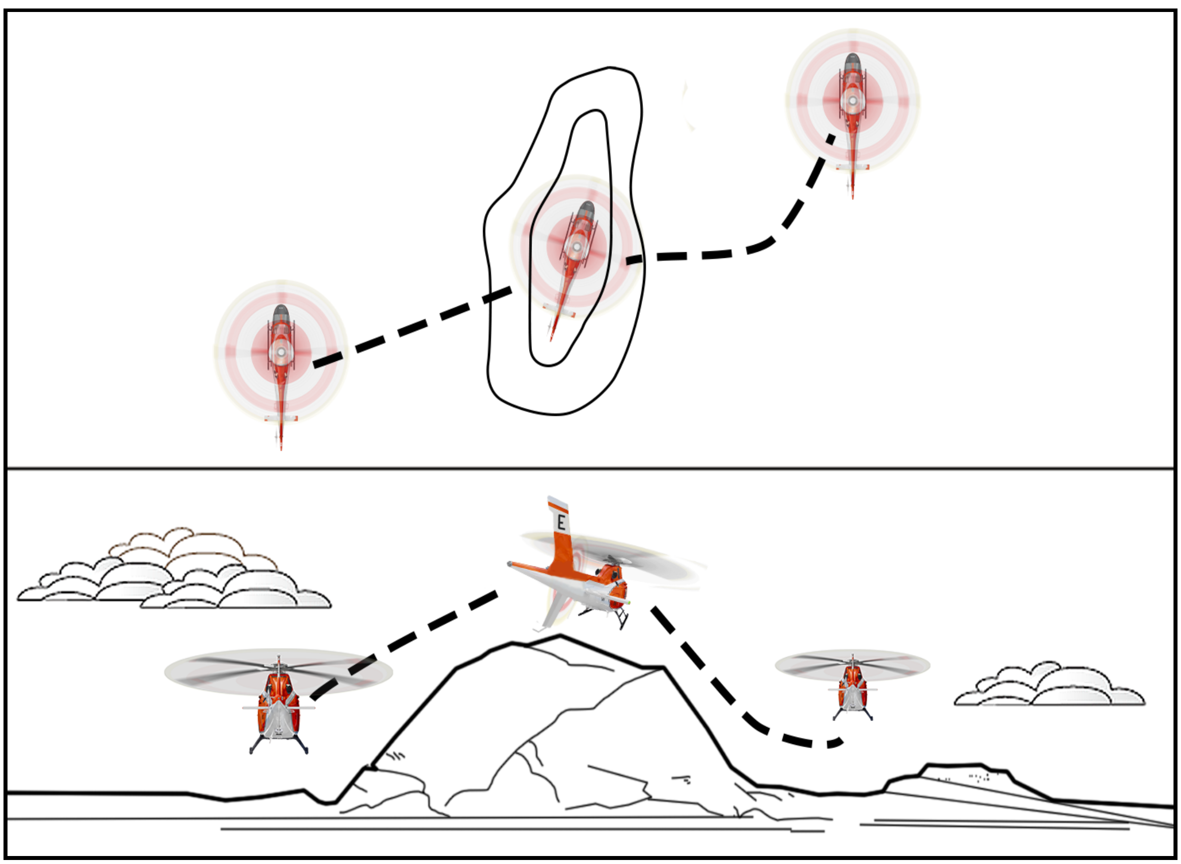

Figure 9-4 Rolls

905. NAP OF THE EARTH UNMASK/MASK

Maneuver Description: A NOE unmask/mask, as shown in Figure 9-5, allows the pilot to climb above an obstacle for a few moments and then descend behind the obstacle again.

Application: The unmask/mask is used to reconnoiter the area ahead, deliver ordinance, or adjust fires on a target.

1. Procedure

    a. Establish the helicopter in a stabilized hover behind a piece of terrain that masks the helicopter from view.

    b. Raise the collective to climb straight up to an altitude that allows the pilot to view the terrain on the other side of the obstacle. Stabilize at the minimum altitude that grants the pilot the necessary Field of View (FOV).

    c. Adjust cyclic and pedals as required to maintain heading and avoid drifting over the top of the obstacle.

    d. Lower the collective to return to the original altitude.

2. Amplification and Technique

During prefight planning, the pilot must ensure that the helicopter will have sufficient power to HOGE. Attempting to unmask and mask without the ability to HOGE may result in a Pr exceeds Pa situation.

Pilots must be careful not to drift forward while in the unmasked position. If the helicopter drifts over the masking terrain, the pilot will need to taxi backward while in a HOGE before descending to the masked position. Taxiing backwards takes time and leaves the helicopter in an exposed position for an excessive amount of time.

When unmasking and masking, the pilots must be aware of the rotor wash signature. Downwash may kick up sand or cause vegetation to sway, alerting the enemy to the helicopter's presence. Following an unmask/mask procedure; pilots should consider moving away from area where the helicopter appeared over the obstacle.

During an unmask/mask procedure, the pilot should leave a clear area to the side so that the helicopter has a way to fly out of the unmask/mask in the event of an emergency. If possible, the way out should be to the right, because a maneuver to the right requires less power than the same maneuver to the left.

Figure 9-5 Unmask/Mask

3. Energy Management

While in the unmasked position, the helicopter has a great deal of potential energy but little or no kinetic energy. If the helicopter needs to fly away from the unmasked position, the pilot can trade that potential energy into kinetic energy. This is why it is vital that pilots leave an area to either side of the unmask/mask to allow the helicopter room to maneuver. For example, if the helicopter experienced an emergency, the pilot can turn away from the obstacle, lower the nose, and gain airspeed to transition to forward flight.

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APPENDIX A
GLOSSARY

Above Ground Level (AGL) – Describes the literal height above the ground over which you are flying.

Aim Point – Any obvious feature that provides navigation guidance toward the next checkpoint.

Backwards Planning – A planning technique in which the pilots begin planning in the objective area, then move backward to the route of flight, and end with planning the departure and staging area.

Bingo – Fuel state needed to recover at the nearest source of fuel with the NATOPS minimum fuel requirement on board.

Blind – No visual contact with friendly aircraft or ground positions. The opposite of VISUAL.

Brief – The second phase of all missions. During the brief, the mission commander communicates his or her plan to all participants in the mission.

Bunts – A maneuver for crossing over an obstacle perpendicular to the route of flight while minimizing exposure to the enemy.

Chart Updating Manual (CHUM) – A quarterly supplementary publication that delineates the most up to date low-level flight hazards, such as power lines and towers.

Checkpoint – A prominent terrain feature that enables a pilot to remain oriented along a route.

Contact – Acknowledges sighting of a specified reference point, either visually or via sensor.

Continuation Fuel – The fuel required at each checkpoint to complete the mission and arrive on deck at the destination with the NATOPS minimum fuel on board. Also called a running bingo.

Contour Flight – Flights conducted at low altitude conforming to the contour of the Earth's surface. Airspeed and altitude vary depending on terrain and obstacles, usually between 50 and 100 feet AGL.

Coversheet – The first page of the smart pack. It includes the names of all aircrew in the flight, aircraft assignments, radio frequencies, event timeline, and power calculations.

Cross Country – A flight out of the local area.

Cultural Lighting – Ambient lighting caused by manmade features.

Dead Reckoning (D/R) – A method of calculating one's position by using a previously determined position, or fix, and advancing that position based upon known or estimated speeds over elapsed time.

Debrief – The fourth and final phase of any mission. All participants meet to analyze the successes and failures of the mission-planning, brief, and execution.

Doghouses – Annotations on the map that include navigation information for each leg of the route

Egress – The route out of an objective area.

Electronic Chart Updating Manual (ECHUM) – A tool within Joint Mission Planning Software (JMPS) that gives a visual depiction of the most up to date low-level flight hazards.

Electronic Flight Bag (EFB) – An electronic information management device that helps flight crews perform flight management tasks more easily and efficiently with less paper, providing the reference material often found in the pilot's carry-on flight bag, including the flight-crew operating manual, navigational charts, etc.

Electronic Kneeboard (EKB) – An electronic device that enables access to digital publications, tactical imagery, and other dynamic data in all USN and USMC aircraft.

Event Driven Mission – A mission in which a series of event must be completed in a specific order to achieve mission success.

Execution – The third phase of any mission. This is the phase in which the mission commander’s plan is put into action.

Fixed-Base Operator (FBO) – An organization granted the right by an airport to operate at the airport and provide aeronautical services such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance, flight instruction, and similar services.

Flat Hatting – Flying at a low altitude and/or high rate of speed for thrill purposes.

Funneling Feature – Any manmade or naturally occurring linear feature that leads to the next checkpoint.

Go Criteria – The friendly disposition prerequisites that must be met prior to commencing a mission. May include equipment, personnel, weather, or other conditions.

Hover In Ground Effect (HIGE) – The Power Required (Pr) or ability to maintain a hover at an altitude in ground effect.

Hover Out of Ground Effect (HOGE) – The Pr or ability to maintain a hover at an altitude above ground effect.

Ingress – The route into an objective area.

Intermediate Checkpoint – Any feature along a planned route between checkpoints that provides a navigational reference.

International Civil Aviation Organization (ICAO) Identifier – A four-letter alphanumeric code designating each airport around the world.

Joint Mission Planning Software (JMPS) – The computer system used for flight planning, including route planning, checkpoint selection, and fuel burn.

Joint Operations Graphic (JOG) - The Joint Operations Graphic-Air (JOG-A) is an aeronautical chart for international and joint service air/ground tactical operations that focuses on identifying horizontal checkpoints and low altitude air navigation hazards.

Joker – Joker Fuel is a pre-briefed fuel state (above Bingo) selected by the mission planner at which separation, bugout, or event termination should begin. The mission commander defines the Joker Fuel for the mission either in time remaining or in a specific amount of fuel.

Landing Zone (LZ) – Any specified area of terrain used for landing aircraft.

Landing Zone Diagram (LZ Diagram) – A visual depiction of the landing zone, landing plan, and surrounding terrain that supports the mission commander's scheme of maneuver.

L-Hour – The time a helicopter or flight of helicopter is assigned to touchdown in a specified landing zone.

Limiting Feature - Any manmade or terrain feature that defines a limit to the leg of flight. Linear limiting features are best (river or road), but point features (tower) can also be used.

Low-Level Flight – Flights conducted at an altitude at which detection along the route can be minimized or avoided, usually between 100 and 200 feet AGL.

Lunar Daily Illumination (LDI) – A graph obtained through the Joint Mission Planning Software (JMPS) that shows the level of illumination from the moon throughout a specified period.

Lunar Elevation / Azimuth Angles (LEAA) – A graph obtained through the Joint Mission Planning Software (JMPS) that shows moon's elevation and azimuth throughout a specified period of time.

Map Changeover Point – Geographical references at which the pilot will switch from one map to the next.

Masking – An aircraft or checkpoint being blocked or hidden by surrounding terrain or vegetation.

Max Endurance – A power setting and associated airspeed that will allow an aircraft to remain in the air for as long as possible with a given amount of fuel on board.

Max Range – A power setting and associated airspeed that will allow an aircraft to travel as far as possible with a given amount of fuel.

Mission Analysis – The mission commander's study of the assigned mission. It occurs at the beginning of the mission-planning phase.

Mission Fuel – The minimum fuel required to complete the mission. At Training Wing Five, this includes course rules, navigation route, landings, and course rules back to Whiting.

Mission Phases – All missions are broken into four phases: planning, brief, execution, and debrief.

Monochromatic Image – A picture displayed in varying tones of the same color. NVGs display a green monochromatic image.

Nap of the Earth (NOE) – Flights flown as close to the Earth's surface as terrain and obstacles permit.

Nap of the Earth (NOE) Mask / Unmask – A maneuver that allows the pilot to climb above an obstacle to survey the surrounding area and quickly descend back into a hidden position.

Navigation Log (NAV Log) – A tool used to guide preflight planning and a plan to execute in flight.

No-Go Criteria – Enemy disposition-based prerequisites that must be met prior to commencing a mission. No-go criteria are not used at Training Wing Five.

NOTAMs – A notice containing information essential to personnel concerned with flight operations but not known far enough in advance to be publicized by other means.

Objective Area – The location in which a mission is carried out, not including the transit to and from the point of departure.

Pilotage - A method of determining a position over the ground using map-to-ground orientation.

Planning – The first phase of any mission. It begins with the receipt of the mission order and ends at the beginning of the brief. It is characterized by building the plan for mission execution.

ROLEX - Timeline adjustment in minutes. Always referenced from original preplanned mission execution time. "Plus" means later. "Minus" means earlier.

Roll - A maneuver for crossing over an obstacle parallel to the route of flight while minimizing exposure to the enemy.

Smart Pack – A series of documents created during flight planning to aid the crews in successfully completing the mission.

SMEAC – Situation, Mission, Execution, Administration and Logistics, and Command and Signal. The briefing format prescribed by Joint Planning Doctrine.

SWEEP – Size/Slope/Suitability/Surface, Winds, Elevation, Egress/Obstacles, Power Available (Pa)/Pr. An acronym used to brief a landing zone and to conduct a real time evaluation of a landing zone prior to landing.

Temporary Flight Restrictions (TFR) – A type of Notices to Airmen (NOTAM). A TFR defines an area restricted to air travel due to a hazardous condition, a special event, or a general warning for the entire FAA airspace.

TERF Quick Stop – A maneuver for slowing or stopping the helicopter at low altitude such that the fuselage rotates around the tail rotor to avoid striking the tail on the ground.

TERF Turns – A method of banking the helicopter at low altitude such that the fuselage rotates around the tip path plane on the inside of the turn, thus preventing the main rotor blades from striking the ground.

Terrain Contrast – The difference in appearance between different aspects of the terrain within the same Field of View (FOV).

Terrain Flight (TERF) – Tactical flights conducted at or below 200 feet AGL.

Tic Marks – Small pen marks made perpendicular to the route line that can denote either the time or mileage from the last checkpoint.

Time on Target (TOT) – The time at which ordinance should be impacting the target. After the mission it is defined as the actual time of the attack.

Timing Driven Mission – A mission in which each asset relies on every other asset to complete an assigned task on a detailed timeline.

Timing Tic Marks – An indicator used for setting the timing of the ignition system of an engine, typically found on the crankshaft pulley or the flywheel. The largest radius rotating at crankshaft speed and therefore the place where marks at one degree intervals will be farthest apart.

Topographic Line MAP (TLM) 1:50,000 - The 1:50,000 TLM is a lithographic map that portrays detailed topographic and cultural information.

Visual – Sighting of a friendly aircraft or ground position. Opposite of BLIND.

Visual Scanning – The ability to recognize ground reference points within the field of vision.

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APPENDIX B
BLANK COVER SHEET

HT-X (CALLSIGN)

JULIAN DATE: XXX	MISSION: XXXXXXXX	EXTERNAL C/S: XXXXX

A/C	SPOT	C/S	AIRCREW	MPTS

TIMELINE	EVENT	VHF	UHF	NOTES

BN	AGENCY	FREQ	BN	AGENCY	FREQ

METRO				BINGO
SR:	MR:	EENT:	HLL:	(LOCATION)
SS:	MS:	ILLUM:	LLL:	LBS

ATIS:

ATIS:

LOC	HIGE	HOGE	END Q / AS	RNG Q / AS	MSA / HDG
TAKEOFF			/	/	
HAROLD			/	/	

NOTES

Figure B-1 Blank Cover Sheet

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APPENDIX C
TW-5 BRIEFING GUIDE

SITUATION

- Introduction
- Time Hack
- Aircraft Assignment(s)
  - Lead/Single Ship: A/C _____on Spot_____
  - Wing: A/C _____on Spot_____
- Section Leader (Formation only) _________________
- Call Sign
  - External Callsign: ________________
  - Internal Callsign (Formation only): _________________
- Smart Pack Inventory
- Maps/Charts
- Weather
  - Current___________________________
  - Destination_______________________
  - Required__________________________
- SLAP
  - Sunset_________ EENT________
  - Moonrise_______
  - Moonset________
  - %Illum__________
  - Sun / Moon Azm/Ele________________
  - Shadowing_______________________

MISSION

- At ______ L, HT-8/18/28 will launch a single/two TH-73A(s) in order to safely complete a ______.

EXECUTION

- Concept of Operations
- Control measures
  - Boundaries
  - Airspace
  - Restricted Areas
  - Noise Sensitive Areas
  - LZs
- Obstacles to flight
  - Avoidance
  - Powerlines
  - Towers
  - Aircraft
  - Birds
- Scheme of Maneuver
  - Preflight at ______ (time)
  - Start Checklist ________
  - Check-in (Formation only) _______________
  - Taxi _______
  - Takeoff ________
  - Course Rules NASWF → Route/Working Area
  - Route
    - F = Formation
    - A = Airspeed/Altitude
    - L = Lighting
    - C = Comms/Squawks
    - O = Obstacles
    - N = Navigation/NVG Considerations
  - Working Area
    - Sequence of Events
  - Route/Working Area → LZ

Figure C-1 TW-5 Briefing Guide Page 1

- LZ
  - S
  - W
  - E
  - E
  - P
- Actions in the LZ
- RTB

- Coordinating Instructions
  - Emergencies & Systems Failures
  - IIMC
    - Safe Heading_____
    - Safe Altitude_____
  - Loss of Visual Contact (Formation only)
  - Lost Comm
  - Disorientation Procedures
  - Downed Aircraft (Formation only)
  - Aborts (Formation only)
  - Waveoffs (Formation only)

ADMINISTRATION & LOGISTICS

- Flight duration_______
- Fuel
  - Mission_____
  - Bingo_______

COMMAND & SIGNAL

- Chain of Responsibility (Formation only)
  - Section Leader
- Callsign(s)
- Communications
  - Preset/Manual Frequencies
  - Frequency Changes (Formation only)
  - NAVAIDS/GPS
- Terminology (Formation only)
  - Terminate
  - Knock-It-Off
  - Hard deck
- ID and Recognition
  - Transponder
- Visual Signals (Formation only)
- Debrief

NATOPS BY EXCEPTION

Figure C-2 TW-5 Briefing Guide Page 2