NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-867 (Rev 04-02)**

FLIGHT PREPARATION
(T-39)

INTERMEDIATE/ADVANCED
SNFO/SNAV

APRIL 2002

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
CNATRA
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI TX 78419-5041

1542
N3111

12 APR 2002

CNATRA P-867 (Rev 04-02)

Subject: INTERMEDIATE/ADVANCED FLIGHT PREPARATION (T-39) STUDENT GUIDE

1. CNATRA P-867 (Rev 04-02) PAT, "Intermediate/Advanced Flight Preparation (T-39) Student Guide" is issued for information, standardization of instruction, and guidance of instructors and students in the Naval Air Training Command.

2. This publication will be used to support the curriculum at Training Squadron FOUR and TEN.

3. Recommedation for changes shall be submitted via TIP form (CNATRA 1550/13) in accordance with CNATRAINST 1550.6

4. CNATRA P-867 (Rev.01-00) PAT is hereby cancelled and superseded.

C. W. MCKOWN
Assistant Chief of Staff for
Training and Operations

Distribution:
CNARTAINST 5215.1Q
List I (E, M, R, Z, BB, DD, KK)
List III (R (6))

STUDENT WORKBOOK

Q – 2D-0027

INTERMEDIATE/ADVANCED FLIGHT PREPARATION (T-39)

Prepared by
COMTRAWING SIX
390 SAN CARLOS ROAD, SUITE C
PENSACOLA, FL 32508

Prepared for
CHIEF OF NAVAL AIR TRAINING
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI, TX 78419-5041

April 2002

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:
Original...0...01 Apr 02 (this will be the date issued)
TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 83 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.
COVER	0	C-1 – C-3	0
LETTER	0	C-4 (blank)	0
iii – xiv	0	D-1 – D-2	0
1-1 – 1-10	0	E-1 – E-2	0
2-1 – 2-19	0	F-1	0
2-20 (blank)	0	F -2 (blank)	0
3-1	0	G-1 – G-9	0
3-2 (blank)	0	G-10 (blank)	0
4-1 – 4-2	0	H-1	0
A-1 – A-10	0	H-2 (blank)	0
B-1 - B-2	0		0
	0		0
	0		0
	0		0

INTERIM CHANGE SUMMARY

The following Changes have been previously incorporated in this manual:

CHANGE NUMBER	REMARKS/PURPOSE

The following interim Changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

SECURITY AWARENESS NOTICE

This course does not contain any classified material

SAFETY/HAZARD AWARENESS NOTICE

There are no special safety precautions to be observed during this course.

TABLE OF CONTENTS

HOW TO USE YOUR STUDENT GUIDE

This Student Guide provides text material, figures, tables, and assignment sheets to guide you through your study assignments and augment the instructor presentations. It covers the lesson objectives, gives examples, and includes all information the student needs to perform to set standards. After reading this guide, reinforce all the materials by performing practice problems, cockpit familiarizations, preflights, checklists, and flight scenarios. Group study has been proven to be most effective.

1. TEXT MATERIAL

Provide a listing of major teaching points, covering the enabling objectives and steps. Amplify supplemental information from the reference materials for the course. You will be tested on this material during the course.

2. FIGURES AND TABLES

Provide supplemental information, visually depict learning points, and amplify difficult to understand points.

3. ASSIGNMENT SHEETS

Assist you in being prepared for the lesson topics before they are presented by the instructor or occur in the course.

The student workbook is designed to reinforce instructors' lectures and demonstrations. Students must study the workbook assignment and complete the end-of-chapter questions prior to going to class. Ask questions if any of your instructional material is not clearly understood.

COURSE OVERVIEW

1. INTRODUCTION

This unit describes the T-39 operating procedures, including checklists, emergency procedures, aircraft operating limits, and the operation of various aircraft systems and equipment. Standard procedures are a necessity for all aircrews. A missed item on a checklist can have disastrous results, but can be avoided if everyone uses the same procedures.

2. MODE OF INSTRUCTION

This course consists of group-paced lectures employing various instructional media and a preflight video. Material is reinforced by scheduled FAM 0's, student-initiated observer hops, and self-paced study. Practice preflights and cockpit familiarization sessions are highly recommended. Aircraft are assigned by maintenance on the field side of the hangar, first deck.

3. SPECIFIC INSTRUCTIONAL OBJECTIVE

Upon completion of this course, the students will demonstrate their knowledge of T-39 operating procedures and limitations by completing the end-of-course examination with a minimum score of 80%.

4. INSTRUCTIONAL PROCEDURES

a. Terminal and Enabling Objectives

Each lesson will cover Terminal and Enabling Objectives (taken from CNATRAINST 1542.131B (Intermediate) and CNATRAINST 1542.132A (Advanced)) describing specific procedures, with pertinent amplifying illustrations.

b. T-39 Flight Preparation book

The T-39 Flight Preparation course book is designed to reinforce the lectures and examples covered in class. It is to be used in conjunction with the T-39 NATOPS Flight Manual, and is not to be considered an all-inclusive study guide.

c. The NATOPS

A new T-39 N/G NATOPS is currently being written and going through the approval process. Whenever this publication refers to the NATOPS Flight Manual or Pocket Checklist, the student will utilize the appropriate materials provided.

Study the NATOPS, work through practice problems, be thoroughly familiar with the checklists, and do the required reading prior to class. Ask questions anytime the material is not clearly understood.

5. FINAL PERFORMANCE CHECK

The Enabling Objectives and Enabling Steps identify what you are expected to accomplish in this course and the standard you must meet before progressing to further stages of training. You will have a course review and an examination. However, the ultimate performance check will take place in the aircraft. A student who can perform the Enabling Objectives will be able to pass the final examination and flights. During this course, you will be briefed on the specific tasks you must perform throughout your T-39 flights.

INTERMEDIATE TERMINAL OBJECTIVES

(As numbered in CNATRAINST 1542.131B)

1. Operate and assess an aircraft and its systems in accordance with the NATOPS procedures and limitations, and Flight Training Instructions, reporting any anomaly to the instructor or pilot.

2. Navigate an aircraft via visual references and navigation instruments with instructor assistance, and through coordination with a pilot.

3. Compute and evaluate fuel requirements and enroute times, factoring in the effects of aircraft performance, and meteorological conditions, fuel requirements and enroute times.

4. Communicate with appropriate Air Traffic Control facilities and other aircraft.

5. Use Flight Information Publications (FLIPs), Notices to Airmen (NOTAMs), and other applicable flight information needed to plan flights and operate the T-39 in the Federal Aviation Administration's Air Traffic Control (ATC) system.

6. Determine the condition and readiness of an aircraft for flight during preflight and postflight.

7. Apply aircrew coordination concepts and procedures during aircraft operations.

10. Demonstrate adequate preparation for flight and mission accomplishment.

ADVANCED TERMINAL OBJECTIVES

(As numbered in CNATRAINST 1542.132A)

A. Ground Mapping Radar Navigation. Effectively navigate using preflight planning data and a ground mapping radar system.

B. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

C. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground.

D. Communicate. Communicate in an aircraft using the radio, hand signals, and the Inter-cockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

E. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operation Procedures Standardization (NATOPS).

UNIT ONE: T-39 OPERATING PROCEDURES

1. INTRODUCTION

Prior to the first flight you shall be familiar with the location and operation of all items in the cockpit and cabin. You should be intimately familiar with emergency egress procedures.

2. INTERMEDIATE ENABLING OBJECTIVES (AS NUMBERED IN CNATRAINST 1542.131B)

1-1 Locate and operate T-39 aircraft systems in accordance with NATOPS.

1-5 Extract T-39 aircraft performance data from charts, given an oral or written examination.

1-6 Perform T-39 checklists in accordance with NATOPS.

1-9 Execute T-39 specified "immediate action" emergencies as required by flight instructor or during actual emergency, in accordance with NATOPS.

3. ADVANCED ENABLING OBJECTIVES (AS NUMBERED IN CNATRAINST 1542.132A)

E-1. Locate and operate T-39N aircraft systems, given a flight training event, and in accordance with NATOPS.

E-2. Perform appropriate T-39N checklists as required, given a mission in the T-39 and in accordance with NATOPS.

E-3. Operate the T-39N/G within limitations, given a mission in the T-39, and in accordance with NATOPS.

E-4. Execute T-39N/G "immediate action" emergencies as required by flight instructor or actual emergency, and in accordance with NATOPS.

4. ENABLING STEPS

1 Perform preflight checklist

2 Perform pre-power checks

3 Perform starting engines checklist

4 Perform avionics power-up checklist

5 Perform before taxiing checklist

6 Perform taxiing checklist

7 Perform line-up checklist

8 Perform after takeoff checklist

9 Perform climb checklist

10 Perform descent checklist

11 Perform approach checklist

12 Perform landing checklist

13 Perform clearing runway checklist

14 Perform engine shutdown checklist

5. INSTRUCTIONAL AIDS

T-39 Pilot's Pocket Checklist

T-39 NATOPS, Shore Based Procedures (Expanded Checklist)

6. REFERENCES

T-39 Pilot's Pocket Checklist

T-39 NATOPS

Airmen's Information Manual

FAR Part 91

7. GENERAL

Complex aircraft require attention to detail to be flown safely and effectively. Checklists allow for the safe and orderly operation of the aircraft and ensure everything is prepared for the next evolution of the flight.

Most multi-place aircraft checklists are "challenge and response" (C&R), which, when properly coordinated, provide for a high degree of safety. Using this method, one person calls an item, while the other performs the action and gives the proper response, i.e., CHALLENGE, RESPONSE, VERIFY.

The challenger verifies the completion of an item by visually noting the action has been performed properly (not by responding verbally to the pilot's response). Once the pilot completes and responds to the item, the copilot moves to the next item. However, configuration changes (gear, flaps, and trim) require visual and verbal backup by the student, i.e., "Gear, Gear Down; I show Gear Down". In this case, the sequence becomes "Challenge, Response, Verify (visually and verbally)".

If at any time you do not get a response corresponding with what the pocket checklist (PCL) says and you do not know why, ask! Better to be sure and safe, than unsure and sorry. Other checklists, which are not challenge and response, are to be completed at the appropriate time and then verbally acknowledged as having been completed.

The T-39 is checklist-intensive, so it is very important the student becomes extremely familiar with the cockpit layout to ensure quick and timely checklist completion. Cockpit familiarity comes only by looking at a cockpit layout and performing the checklists until you are comfortable with the location of switches and the proper checklists responses.

This Section covers only checklist items that are not self-evident. Thorough discussions of cockpit procedures and event flow are presented in paragraph 2.16, Assignment Sheet and Appendix A. Expanded information on Normal and Emergency T-39 procedures are found in the NATOPS.

Study all Notes, Warnings, and Cautions associated with checklists

8. PREFLIGHT

Preflighting any aircraft begins with reading the Aircraft Discrepancy Book (ADB) (the pilot will do this at the squadron) and continues as you approach the plane. Before walking to the aircraft, preflight yourself by closing all zippers on your flight suit and inventory your carry-on items. Scan the area in and around the aircraft as you may notice things from afar that you would not notice up close. Once you reach the aircraft, you should not have to use your PCL for this procedure. You will learn to preflight the T-39 by way of a FAM O brief with an instructor, by watching a video in class, and by practicing on your own. Some general things to look for while preflighting any aircraft are fluid leaks, safety wires, cotter keys, missing nuts or rivets, electrical wire connections or frayed wires, fluid levels, pitot system condition, and switchology to name only a few. As you get to know your aircraft better, preflights will become easier.

9. PRE-POWER CHECKS

This checklist is not challenge and response. It is completed on your own. Take your time and be thorough. It is designed as a cockpit "wipe-out" and your checks should get quicker with practice. Try not to be intimidated by the pilot finishing his first. Remember, the pilot has done this many more times than you. Tell the pilot when you are complete, and ask if he is ready to start engines. More than likely, the pilot will be ready.

When checking the circuit breakers, you check the panel above the pilot, and the pilot will check the one above you. It is easier to see the white ring of a popped CB when viewed from an angle rather than straight on. It is easier to check your oxygen mask before actually taking your seat.

10. STARTING ENGINES (C&R)

If the pilot is ready to start engines, ensure you have a fire bottle and a plane captain, then begin this checklist. The "essential bus circuit breaker out" caution light and Master Caution lights are tested by pressing the ESS BUS CB out test button on the same panel. To test the battery temperature circuitry press the Battery Temp test button on the electrical control panel. This activates the BATT HOT caution light as well as the Master Caution Lights. The fire-warning test activates the firelights, a loud bell, the Master Caution lights, and the AFT Fuselage Hot light. During the start, the student scans from outside-in checking engine instruments and

calling "thumbs up" when he sees the plane captain's signal. The pilot will normally verbalize the start sequence.

After the thumbs up, the student will continue to check for normal indications on the engine instruments as well as the annunciator panel. During a battery start, ensure you monitor the battery temperature. If the temperature rises above 120°F, isolate the battery (N model), or turn off the battery (G model) and watch the rate at which the needle rises for possible thermal runaway. To check direct current available at the essential bus, (DC) Voltage/Load, look at the voltmeter. Check the voltage of each generator by pressing the LH and RH GEN VOLT buttons. Set airplane altitude (bottom window of Cabin Controller) to 1000 feet above final cruising altitude (G model).

NOTE: *If this results in the Cabin Pressure needle being below 250 feet, then 250 feet shall be set on the needle.*

Check bleed air flow using the cabin air selector by cycling it OFF-RH-OFF, OFF-LH-OFF, then OFF-BOTH, checking each setting for proper flow by observing the Cabin Pressure rate-of-change indicator for downward needle deflection toward "CABIN". (Note: If the pilot's sliding window is open, pressurization can be confirmed by positive airflow from side vents of either the pilot's or co-pilot's cockpit cooling air outlets.)

11. AVIONICS POWER-UP (C&R)

This checklist is initiated right after the engine start. This is the place for the student to demonstrate his "prowess" in equipment operation by setting up all the avionics in a smooth and timely manner. After completion of this checklist, get ATIS and put your clearance on request.

12. BEFORE TAXIING (C&R)

This checklist is initiated immediately after the Avionics Power-Up checks, getting ATIS, and putting clearance on request. Call for taxi only after this checklist is complete.

For speedbrake/aux hydraulic check, the student will notice a deflection of both the normal and aux hydraulic needles when the speedbrake is cycled with the AUX SYS switch - ON. Then there should be an obvious deflection on just the normal needle with the AUX SYS switch – OFF when the speedbrake is cycled again.

This is a good time to get your ICS/Audio panel set up for proper volume settings. You should know how to align comp #2 using the incr/decr buttons. With "DG" pushed in/activated, these buttons will act to move the compass rose one direction or the other. Pushing DG twice in rapid succession will cause the compass to fast erect.

For the Mach/Airspeed warning test, the student will hear a warning clacker and an audible tone in the headset. During stall warning test, the student will hear and feel the control columns shake, and the red ignition lights in the starter buttons will illuminate. The pilot will test both the inboard and the outboard stall warning vanes (transducers under the right wing).

During the fuel quantity test, the pilot will select RH IND, RH WING, LH IND, AUX, and then TEST. This gets the two needles out of sync and moving away from their true indications. As each needle passes through 300 lbs, they will activate the Low Fuel Level light separately.

The Hydraulic Warning test checks the warning horn. (This is the same as the Mach/Airspeed horn). This warning horn indicates hydraulic pump failure only with weight on wheels.

13. TAXIING (C&R)

Prior to entering the taxi-way (the plane may pull out of the chocks and move through the line area to free the plane captain) the following shall be performed: keep the a/c clear of obstructions and call Ground. Student should have the airport diagram out and visible for quick reference during taxi. Scan should be from 9 o'clock to aft of the right wing. When taxiing, first priority is to keep the a/c clear of any dangers in the line area, taxi-ways, and intersections. In the immediate line area the student will **NOT** perform checklists. SOP is to call Ground when pulling out of chocks and once clear of the line, initiate the Taxi Checklist.

Beginning with item 3 (altimeters), the dialogue should resemble the following: "Altimeter set xx.xx indicating xx feet/Gyro uncaged, erect, stable, no off flags/VSI indicates zero/EHSI heading xxx (verify with taxiway and wet compass)/Airspeed indicating zero/ball tracking in turns/RADALT on, set 400 feet." Although the pilot may not respond, allow for a response after each item.

On item 9 (review T/O data), confirm T/O and Climb EPR's, V1, Vr, and V2. For the departure brief, the student will set the initial hold down altitude into the altitude alerter and the initial heading/course into the EHSI heading bug/CDI respectively, then request the abort brief from the pilot.

14. LINE-UP (C&R)

As the aircraft approaches the hold short area, switch to tower frequency. Once all previous checklists are complete, run the first four items of the line-up checklist, ask the pilot and instructor if they are ready to go and call for takeoff. When cleared for position and hold, or takeoff, clear the "groove" (final) and down the runway. Clear the run-up area for FOD, and runway for other aircraft. Upon receiving takeoff clearance, complete the last two items of the Line-up Checklist.

When transponder is called, turn it from STBY to ON, ensure it is in MON, and selected for altitude reporting. Verbalize this while doing it and ensure the correct squawk is set. The compass heading should be checked to see that it corresponds to the runway heading.

15. AFTER TAKEOFF (C&R)

At rotation, note attitude (8-12 degrees nose-up), monitor altitude, airspeed, VSI, and altimeter for safety of flight. When you see there are two positive rates of climb, verbalize "two positive rates of climb, Gear." This is done with visual and instrument indications of climbing away from the ground, i.e. outside observation and VSI or altimeter positive readings. If you do not see a positive rate of climb, say (with a definite voice inflection): "POWER", "ATTITUDE", or "ALTITUDE." This should get the pilot's attention to do something to correct

the situation. Once the aircraft is clean, the pilot shall respond with "gear up, lights out." The student shall then call for landing/taxi lights.

Once the first two items of the after takeoff checks are complete, check your nav, clear ALL turns and call departure (not necessarily in that order). With all this going on, do **NOT** let the pilot exceed the speed limit (250 kts) on the landing/taxi lights. Above 1500 feet AGL, call for ignition and thrust reversers.

16. CLIMB (C&R)

During climb out from a field or low-level, monitor engine instruments (EPR, Oil, EGT, RPM, etc.) to ensure the engine is within operating limits throughout the climb. Give the pilot a cruise EPR/IMN 1000 feet prior to level off at assigned altitude or any intermediate altitude. Perform the Climb checks at 10,000 feet MSL. Check cabin altitude and pressure differential are following the schedule. Passing 18,000 feet, ensure aux air is off and altimeter set to 29.92. Remember: Aviate, Navigate, Communicate, and Checklists.

17. CRUISE

Student should periodically check the items on the Cruise Checklist and report the checklist complete. This is NOT to be done in a challenge and response format.

18. DESCENT (C&R)

Approximately 100-150 NM prior to the destination IAF, you should get ATIS, brief crew of wx and initiate the Descent checks. Use of anti-ice will be predicated on whether the flight is going through, or expects to go through, visible moisture with the temperature below approximately 5°C.

The Crew Brief will include destination weather, field and approach brief, wave-off EPR, reverse thrust EPR, and Vref. Final approach speed is figured as follows: V_{ref} = 11,700 lbs + 200 lbs/person + EPR at the FAF (which is EPR at the IAF minus 400 lbs). When looking up V_{ref} for the resultant weight, be sure you do not accidentally look at the stall speed columns to the left of the V_{ref} column! Also, if the aircraft is single engine, no flap, or stuck slat, be sure to add the appropriate amount to you r V_{ref}. In a T-39G, set cabin controller pressure to 250 feet above field elevation.

19. APPROACH (C&R)

This checklist should be initiated passing FL180, or when cleared for the approach. Use ATIS altimeter setting if the current setting is not yet received from Approach. Do NOT forget altitude calls: 15K MSL, 10K MSL, 5K AGL, 4K MSL, 3K MSL, 2K MSL, 1K MSL, 1000 feet prior to any assigned altitude above 1000 feet, “Rad Alt Alive” (radio altimeter is active at 2,000 or 2500 feet AGL depending on model), 200 feet prior to any altitude below 1000 feet AGL, and MDA or DH. STUDENT SHOULD PREDICT THE MSL ALTITUDE AT WHICH THE RADALT WILL COME ALIVE BASED ON TERRAIN ELEVATION. Radar altimeter should be set to HAT/HAA (HAA if expecting circling approach).

20. LANDING (C&R)

When inside 12nm, slow to 180 KIAS. Initiate landing checks no later than 10nm on final, or below 180 KIAS on downward if in the break/overhead. For a precision approach (ILS/PAR), configure aircraft **no later than** 7nm or NLT 1 dot below glideslope (ILS). Fly 150 KIAS until FAF, then Vref + 10 until short final. Expect pilot to fly approach flaps for non-precision approaches until landing is ensured, and full flaps for precision approaches. Asking for gear above 180 KIAS or asking to slow to gear speed when below 180 KIAS is a below in scan at a minimum (can be an UNSAT at instructor discretion based on safety of flight judgement). Missed approach/climb out instructions should be given after the landing checks and before the FAF. Once the pilot takes over visually, the student should be scanning the "meatball" (outside landing signal, i.e. ball), lineup, airspeed, and AOA. Generally, **NO** comments to the pilot are desired unless the aircraft is outside safe parameters or there is conflicting traffic. Prior to touchdown, the student should re-verify gear/flaps down and landing clearance.

21. ROLLOUT

This is not a Challenge and Response Checklist. The pilot completes it while the student verifies thrust reversers on, flaps up, and thrust reversers deploying. If all six thrust reverser lights are not illuminated, notify the pilot. Call distance to go vs. airspeed, i.e. "6 board, 110 kts". Remember, thrust reversers should normally be stowed by 60 KIAS.

The student will verbalize "Rollout Checklist complete" when the pilot completes the rollout checks. If not on tower at touch down, ensure a switch to tower freq is made quickly. Monitor tower until clear of the active runway(s) and clear the aircraft from 9 to 4 O'clock. Call ground when clear of all active runways and then initiate the Clearing Runway Checklist.

22. CLEARING RUNWAY AND ENGINE SHUTDOWN CHECKLISTS (C&R)

Between these two checklists, the student "owns" the transponder, NAVAIDS, radios, INU, cabin air selector, electrical panel, and copilot lighting.

23. WAVEOFF

This is not a Challenge and Response Checklist. The pilot completes this checklist while the student ensures the power is up, and flaps are coming up. Monitor attitude and acknowledge "positive rate of climb." The bottom line is to ensure the pilot performs the Waveoff checklist and verbalizes "Waveoff checklist complete."

Ensure flaps are up and call for After Takeoff checks if departing the pattern. If, after the gear is up, you still hear wind noise, make sure the pilot has the speedbrake in. If not departing the pattern, continue to monitor positive rate of climb and comply with departure/climb out instructions. Keep your "head on a swivel" looking for traffic.

24. TOUCH AND GO LANDING

The pilot completes the Touch and Go Checklist (not C&R). The student calls out airspeeds while ensuring flaps are moving up, power is up, and speedbrake is in. At rotation, note attitude (8-12 degrees nose up), and continues to monitor airspeed, VSI, and altimeter. Call "two positive rates of climb." If staying in the landing pattern, complete landing checks on downwind leg. If departing the pattern, complete the After Takeoff Checklist.

UNIT 1 REVIEW QUESTIONS

1. What should you observe when the Fire Warning Test is activated?

2. When moving the Cabin Air Selector from OFF to RH, the Cabin Pressure rate-of-change indicator will show a climb. (T / F)

3. What five items are you required to compute for take-off data?

4. What do pilot and the SNFO/SNAV set in their airspeed bugs during the Taxiing Checklist?

5. List the altitude calls on a descent in the proper order.

6. By 10,000 feet the cabin altitude should be following the _____.

7. Thrust reversers should normally be off by _____knots during landing.

8. What three items are you required to compute in the Descent Checklist?

9. What is V_{REF} for a no-flap landing with 4 persons and 3400 lbs of fuel?

10. When can you call for Landing Checklist during a TACAN approach?

UNIT 1 REVIEW ANSWERS

1. Both firelights, both master caution lights, and AFT FUS HOT light illuminated along with the fire bell.

2. False

3. V1, V_R, V2, T/O EPR, climb EPR

4. Pilot sets V2, SNFO sets V1, both memorize V_R

5. 15K MSL, 10K MSL, 5K AGL, 4K MSL, 3K MSL, 2K MSL, 1K MSL, 1000 feet prior to any assigned altitude above 1000 feet, “Rad Alt Alive” (radio altimeter is active at 2,000 feet AGL), 200 feet prior to any altitude below 1000 feet AGL, and MDA or DH.

6. Cabin controller schedule

7. 60

8. V_{REF}, Waveoff EPR, and T/R stops

9. 128 KIAS

10. Below 180 KIAS, and within 12 nm on final.

UNIT 2: T-39 FLIGHT PROFILES

1. INTRODUCTION

All Enabling Objectives are tested on a written examination to the accuracy of 80% unless otherwise specified. This learning unit of instruction interfaces with flights ANAV-18 through ANAV-21 (Intermediate), AN-1 through LL-4X (advanced Core), STK-1 through Comp-6X (Advanced Strike), and FSTK-1 through FA-4X (Advanced Strike Fighter). The final performance checks are the end-of-course examinations and the AVX-2X (Intermediate), and all check rides in advanced.

2. INTERMEDIATE ENABLING OBJECTIVES (AS NUMBERED IN CNATRAINST 1542.131B)

2-1. Maintain or make recommendations to maintain a specified course, given a published standard instrument departure or approach, to a tolerance of: arcs $\pm$ 1 nm; course $\pm$ 3 ^{o} or 2 nm. (whichever is less).

2-2. Maintain or make recommendations to maintain a specified enroute course, including TACAN point-to-points, given radio aids to navigation, FLIPs and appropriate charts, to a tolerance of: $\pm$ 5° or 3 nm (whichever is less).

2-7. Determine wind direction and speed, given a T-39 mission: $\pm$ 30 ^{o}, $\pm$ 10 kts.

2-9. Maintain or make recommendations to maintain assigned and published altitudes, given a specified route or assigned a specific altitude, in accordance with Federal Aviation Regulations.

2-10. Execute or make recommendations to execute holding procedures, given a specified holding course, in accordance with Federal Aviation Regulations.

2-12. Execute or make recommendations to execute VFR entry and traffic pattern procedures, given a specified airfield, in accordance with FLIP and local directives.

2-15. Execute "DRAFT" in flight as required, given instructor assistance, without error.

3-1. Update destination Initial Approach Fix (IAF) estimated fuel remaining and mission completion feasibility at each navigational checkpoint factoring in the effects of forecast and observed meteorological conditions, given a specified course, Flight Log, and forecast and observed weather, to a tolerance of: $\pm$ 100 lbs.

3-2. Make recommendations for an alternate destination based on estimated fuel requirements, and observed and forecast meteorological conditions, given a specified course, Flight Log and forecast and observed weather without error.

3-3. Update estimated time of arrival at destination, prior to flight, given a specified course, Flight Log, and forecast weather to a tolerance of: $\pm$ 5 minutes of the Instructor's calculations.

3-4. Update estimated time of arrival at each navigational checkpoint and after each ground speed check, given a specified course and Flight Log to a tolerance of: $\pm$1 minute of actual mark-on-top or mark abeam.

4-1. Communicate via two-way radio using standard military and FAA terminology with appropriate agencies and aircrew during: (a) ground operations, (b) departure, (c) enroute, (d) formation flight and (e) arrival; in VMC or IMC, wingman, day or night, given assigned mission and route, in normal or emergency conditions, and with no errors that will preclude mission success.

5-2. Complete a Flight Log given a mission, FLIPs, NATOPS, OPNAVINST 3710.7R, and forecast weather in accordance with appropriate PAT Pub without error.

5-5. Complete a DD-175 using FLIP and Flight Log information, given a mission, in accordance with appropriate PAT Pub without error.

6-4. Complete applicable parts of a naval aircraft flight record (yellow sheet) during pre/post flight without error.

3. ADVANCEC ENABLING OBJECTIVES (AS NUMBERED IN CNATRAINST 1542.132A)

B-1 Plan a mission to be flown under Instrument Flight Rules to include the following:

a. Extract data from FLIP.
b. Extract data from NATOPS.
c. Prepare a jet log.
d. Prepare a DD-175.
e. Obtain, interpret, and apply DD-175-1 information.

All of the above should be IAW Federal Aviation Regulations (FAR), OPNAVINST 3710.7R, and TRAWING SIX Standard Operating Procedures (SOP), to the accuracy of: fuel $\pm$ 100 lbs, time $\pm$ min, course 2° , and DD-175 no errors.

B-2 Make recommendations to intercept and fly a specified course IAW FAR, OPNAVINST 3710.7R, and TRAWING SIX SOP, to include:

a. Jet routes, $\pm$ 2nm or $\pm$ 3 degrees whichever is less.
b. VHF Omni directional Range (VOR) routes, $\pm$ 2nm or $\pm$ 3° whichever is less.
c. Departure Procedures, $\pm$ 2nm or $\pm$ 3º whichever is less.
d. Tactical Air Navigation (TACAN) point-to-point, within 3 nm.
e. TACAN arcs, $\pm$ 1 nm.
f. Published TACAN, ILS, VOR, and non-directional radio beacon approaches, $\pm$ 2 nm or $\pm$ 3° whichever is less.

B-3 Select and identify NAVAID without error.

B-4 Determine position from NAVAID within 1 nm.

B-5 Determine navigation course winds within 20°, speed $\pm$ 10 knots.

B-6 Adjust headings and speed or estimated times enroute (ETEs) to compensate for computed wind effects within 1 degree of course, $\pm$ 1 min. ETE.

B-7 Ensure compliance with SIDs, approaches, and Air Traffic Control (ATC) clearances IAW FARs.

B-8 Monitor aircraft's airspeed, altitude, rate of climb or descent, attitude, fuel consumption and systems operation throughout duration of flight or simulator training event IAW FARs, NATOPS, and FTIs.

B-9 Make recommended corrections to return aircraft to intended course within 1 nm.

B-10 Determine aircraft position in relation to intended course within 1 nm.

B-11 Determine amount and duration of heading correction to return aircraft to intended course within 1 nm.

B-12 Coordinate correcting aircraft to intended flight path with pilot within 1nm.

B-13 Direct appropriate aircraft flight profiles, with emphasis on airspeed, or maintaining and changing altitude IAW NATOPS, without error.

B-14 Communicate clearly and concisely using radios with appropriate agencies using standard military and FAA terminology so that 95% of transmissions need not be repeated.

B-15 Communicate clearly and concisely with embarked crew members using ICS without interfering with incoming radio transmissions without error.

B-16 Direct avoidance of meteorological hazards to flight by evaluating differences between forecast weather, forecast updates, and observed weather without error.

B-17 Interpret meteorological conditions for aviation hazards enroute without error.

B-18 Use aviation weather services to update forecast of enroute and destination weather without error.

B-19 Direct flight course and destination deviation as appropriate to avoid or minimize hazardous meteorological conditions IAW OPNAVINST 3710.7R and TRAWING SIX SOP without error.

B-20 Ensure all landings are made with adequate fuel reserves IAW OPNAVINST 3710.7R and TRAWING SIX SOP without error.

B-21 Direct appropriate destination deviation if sufficient fuel based on ETE and fuel consumption computations, is unavailable IAW OPNAVINST 3710.7R and TRAWING SIX SOP without error.

B-22 Update fuel requirements at each navigational checkpoint within $\pm$ 200 lbs.

B-23 Recommend mission deviation or abort as appropriate for any unplanned or discrepancies in aircraft, personnel, flight planning, weather, or other hazards to aviation IAW NATOPS and TRAWING SIX SOP without error.

4. INSTRUCTION AID

Overhead slides

5. REFERENCES

T-39 NATOPS

FLIP General Planning

FLIP Area Planning 1, 1A, 1B

OPNAVINST 3710.7

6. GENERAL

Every successful flight depends on thorough planning prior to flight. Preflight planning includes: Flight Logs for fuel planning, DD-175's for ATC coordination, knowledge of FLIP, NOTAMS, and forecasted weather as well as a thorough knowledge of flight procedures. This section will cover the basic preflight planning and flight procedures for Instrument Navigation flights as flown during ANAV-18 through 21 and the AVX-2X (Intermediate), and AN-1 through AN-2 (Advanced).

7. FLIGHT SCHEDULE

INTERMEDIATE: The daily flight schedule assigns crews and missions for the next day. Stereo routes will have different call signs than the DD-175 flights. Currently, stereo route flights will use the "BUC" call sign in VT-4 and the "KATT" call sign in VT-10. Flights requiring a DD-175 will use the "DREAD" call sign in VT-4 and the "BREVET" call sign in VT-10. When assigned a DD-175 flight, there will be a note on the flight schedule to contact the mission commander for the route. It is the student's responsibility to determine the forecast weather and contact the mission commander with suggestions for a route of flight. If you cannot contact the mission commander, tell the CDO, who will either give you directions or refer you to an instructor who will. In the event of a DD-175 flight, the crew will meet at base operations at the brief time; otherwise, the crew will meet in the ready room. Students should be available 30 minutes prior to scheduled brief time unless crew rest would be violated or the instructor dictates otherwise.

ADVANCED: The daily Flight Schedule will assign the crews and missions for the next day. All T-39 flights will have the ROKT 500-590, regardless of stereo flight or DD-175.

When assigned a DD-175 flight, you shall to contact the Mission Commander for the route and/or destination.

(In the event of a DD-175 flight, the crew will meet at Base Operations at the brief time; otherwise, the crew will meet in the squadron briefing rooms).

8. FLIP

The DOD Flight Information Publications (FLIP) contains information for preflight planning and enroute use. Prior to the flight, aircrew members should consult the General Planning (GP), Area Planning (AP), and Planning Change Notices for information on items needed during flight, such as IR and VR routes, Supplemental Airport Remarks, and MOA boundaries.

Appropriate inflight publications must be carried on every flight. Students are required to have any publications that may be used during a flight except for General Planning and the Area Planning publications. If you are going on an out-and-in or cross-country you will need Area Charts, High Altitude Charts, Low Altitude Charts covering the entire route of flight, High and Low Altitude Approach Plates, and STARs for your destination. Ensure you have publications for divert fields along your route.

9. FLIGHT LOGS

Flight Logs (Jet Cards)

Flight logs are used to plan fuel consumption, ETA's, and collect Aerodrome information for the destination, alternate, and emergency divert fields. Flight logs are not used for enroute navigation. Each student will bring a flight log for the planned route of flight. Flight log construction is the same as previously learned with a few exceptions:

ETEs may be figured to either the nearest minute or half minute.

Fuel figures for the T-39 aircraft can be divided into three parts: normal thrust climb, enroute fuel flow, and divert requirements.

Start fuel is the max usable fuel, 7200 lbs (JP-5). Fuel reserve requirements, as indicated by OPNAVINST 3710.7 are 20 min at 10,000 feet MSL or 10% of required fuel, whichever is higher. This equates to 600 lbs based on a fuel flow of 1800 PPH at 10,000 feet MSL, 175 KIAS, or 10% of required fuel. Plan 400 lbs for start, taxi, takeoff, and each planned approach.

The 400 lbs for start, taxi, and takeoff is added to L/O fuel on the front of flight logs and omitted on the back.

10. PLANNING

Plan your alternate airfield profiles for an ANAV/AN flight as follows:

From the destination IAF to alternate IAF at last cruising altitude, airspeed, and fuel flow.

From the destination IAF to alternate IAF using the destination IAF altitude and maximum range airspeed. At NPA, this is 16,000 feet, 300 TAS and 2200 PPH.

Bingo profile, destination airfield to alternate airfield.

All flights will be planned to arrive at the destination IAF with the minimum fuel required to execute the divert profile IAW OPNAV 3710. That fuel is dependent on what your alternate is for that day and will affect your MCF fuels. For example: if Eglin is the alternate that day then you must have enough fuel to arrive at the destination IAF, proceed to Eglin's IAF, shoot the approach and land with 600 lbs IAW TW-6 SOP and OPNAV 3710. If the alternate is something different (i.e. Eglin doesn't qualify and you have to use Mobile or Maxwell AFB), then you have to arrive at NPA's IAAF with more fuel to be able to make it to the alternate with the required fuel.

On a VFR day where a weather alternate is not required but we must have a divert anyway (Training Command rules), consider using Pensacola Regional (PNS) as the divert and adjust your fuel numbers accordingly.

NOTE: PNS is NOT a suitable WX alternate for NPA (for planning purposes) due to it's proximity to home base. However, nothing prevents use of good judgement to go to PNS if the wx there is sufficient to shoot an approach and NPA is down for any reason.

INTERMEDIATE NOTE: *You are required to bring a non-winded but completed flight log and DD-175 to every flight corresponding to each of the T-39 stereo routes (NPA 150, NPA 151, NPA 152, and NPA 153). For low-level stereo routes bring a generic 50X-A (Alpha) flight log as well as the NPA-150 series flight logs. See your in-flight guide for routings.*

11. DD-175

You are required to complete a DD-175 for each flight in accordance with FLIP General Planning without error. DD-175's are only filed at Base Operations when indicated on the flight schedule by "DD-175 required." A practice DD-175 is required for all other flights (INTERMEDIATE ONLY). The Instructor NFO/ Navigator (INFO/NAV) will review it. If it is necessary to file a flight plan, turn in two copies to wx shop at base ops, after the instructor reviews the flight plan.

T-39 Flight Plans are slightly different from T-34 Flight Plans:

- The controlling agency for the T-39 aircraft is CTW-6 vice VT-4 / 10
- The TD designation is SBR-1 / A.
- On composite (low-level) flight plans the last entry in the IFR route of flight is the fix/radial/distance of the low-level entry point. The next line is the VR. When transitioning to IFR after the low-level, the fix/radial/distance of the VR exit point is filed in the point of departure block of the next line.
- Low-levels will be annotated in the remarks section as follows:

"VR1020 E2315 X2345"

- A VOID time is required for any stopover flight plan and any flight plan that has an enroute terminal delay. The IFR pop-up point after a delay is listed under point of departure.

- Fuel on board is 3 + 10 for VNAV/AVX/STK/COMP flights and 4 + 00 for ANAV/AN flights.
- Another notable difference is the number of people on board. The pilot in command will be a pilot from CTW-6/NPA. Leave the name blank, unless you can figure this out by referencing a Raytheon Flight Schedule. The rest of the crew will be listed in the available rows with the mission commander designated as MC to the left of the name. IAW standard operating procedures (SOP), the senior NFO/NAV instructor on board is designated as the mission commander. If there is an observer on the flight, the designation is OBS.

12. BRIEFS

a. Preflight Brief

Intermediate Students will brief ANAV-19-21, VNAV-6&7, and AVX-2X flights. Required briefing items are listed in the appendices. Review your squadron T-1A/T-39 Briefing Guide for specific brief items.

Advanced students should become familiar with the VT-86 Briefing Guide and reference it for briefing standards.

b. Departure Brief (TCAS)

The Departure Brief will be given as part of the crew brief in the Before Takeoff Checklist:

(1)	First turn/DME	**"Turn"**
(2)	First course after takeoff	**"Course"**
(3)	Initial altitude restriction	**"Altitude"**
(4)	EHSI setup	**"Setup"**

c. Field Brief (ERLONA)

The Field Brief should be given as part of the Descent checklist. Always ask if the pilot requires the Field Brief; he may not need it. However, it should always be done when flying into an unfamiliar airport, which will occur during out-and-in, or cross-country flights.

(1)	Field elevation	"**Elevation"**
(2)	Description of runways and arresting gear	"**Runway description"**
(3)	Description of runway lighting	"**Lighting"**
(4)	Location of highest obstructions	"**Obstructions"**
(5)	Location of NAVAID	"**NAVAID"**
(6)	Minimum Safe Altitude and NOTAMS	"**Altitude (MSA)"**

d. Holding Brief (FETL)

The Holding Brief is given during the Descent checklist if holding is expected:

(1) Define the holding fix **"Fix"**

(2) Type of entry **"Entry"**

(3) Direction of turns **"Turn direction"**

(4) Length of Legs **"Leg lengths"**

e. Approach Brief (ICARM)

The Approach Brief (required) is given during the Descent Checklist or in holding:

(1) IAF - Radial and DME, altitude **"IAF location"**

(2) First course after the IAF and DME of arc if req **"Course"**

(3) First altitude to descend to and first restriction **"Altitude/Restrictions"**

(4) MDA/DH and HAT/HAA (set in radar altimeters) **"MDA"**

f. Missed Approach Brief (MIF)

The Missed Approach Brief is given on the final approach course, after the landing checks, but prior to the FAF. On a GCA, the missed approach instructions given by the controller need not be repeated. The Missed Approach Brief includes either published instructions or verbal climb out instructions for an enroute approach. The brief contains:

(1) Missed Approach Point (MAP) "**MAP"**

(2) Initial heading "**Initial heading"**

(3) First altitude "**First Altitude"**

13. GROUND PROCEDURES

After briefing a stereo route, it is the student's responsibility to get a weather brief. When filing a DD-175, the pilot will pick up the DD-175-1 (weather brief). Once at the aircraft, a thorough preflight of the aircraft shall be performed by all crewmembers.

The sequence of copying ATIS and Clearance may vary. It is possible the pilot will want to pull out of the chocks before completing the Before Taxi checks in order to clear the plane captain early. The importance of clearing the right side of the aircraft while the aircraft is moving cannot be overemphasized. Once clear of all aircraft in the ramp area, the call to Base and Ground for taxi clearance shall be made. In VT-86, the instructor will call Base.

a. Taxiing

(1) Clear the right side of the aircraft.

(2) When clear of the aircraft line, initiate the Taxiing Checklist.

(3) In the hold short area, switch the radio to Tower.

(4) When the crew is ready, contact Tower for takeoff.

During the checklists there should be a smooth flow of information between the pilot and SNFO. While verbalizing the flight instrument check, ensure: the altimeter is set within limits; gyros are erect, stable, no off flags; VSI shows XXX; EHSI heading XXX; airspeed shows Zero,

RADALT set to 400 feet. All items must be properly set prior to takeoff. This is to include altitude alerter set to the first level off altitude, CDI set to the first radial, and heading bug set to the first heading after runway heading.

b. Takeoff

The Standard Departure Procedures used by jet aircraft at NAS Pensacola are radar vectors. Complete the first four items of the Lineup Checklist prior to calling for takeoff. When cleared for position and hold, or takeoff, clear the "groove" (final) and clear the runup area for FOD, and the runway for other aircraft. Upon receiving takeoff clearance, complete the last two items of the Lineup Checklist.

(1) Note the takeoff time.

(2) Call "Off the peg"

(3) Call "60 kts"

(4) Call V1 in knots, i.e. "123".

14. DEPARTURE

a. After noting a positive rate of climb

(1) Initiate the After Takeoff checklist.

(2) When switched by tower - call Departure.

(3) Above 1500 feet AGL, complete the After Takeoff checklist.

b. Navigate the departure

(1) Call Departure (if not already accomplished).

(2) Monitor engine instruments (EPR, Oil, EGT, RPM, etc) to ensure the engine is within operating limits.

(3) Initiate the climb checklist (passing 10,000 feet or final level off, whichever occurs first).

(4) Continue climb checklist passing transition altitude (18,000 feet).

(5) One thousand feet prior to final level off, check outside air temperature (OAT), give a cruise EPR, and an Indicated Mach Number (Cruise Mach).

The standards for departure include arcing to a tolerance of $\pm$1 NM and course control to a tolerance of $\pm$2 NM and 3 radials. On departure, 90° turns are led by 1% of Ground Speed, True Airspeed, or Indicated Airspeed, using that order of precedence. Indicated Mach Number (IMN) is an indication of TAS; e.g. 0.5 IMN = 300 KTAS, 0.6 IMN = 360 KTAS, etc. If IAS is 250 KTS and IMN is 0.5, lead the turn by 3 DME. TAS may also be determined by adding 5 KTS for each 1000' of altitude to the aircraft's IAS.

EXAMPLE: *What is my lead turn to arc on the departure if….*

Altitude = 10,000 feet MSL
IAS = 250 KTS

TAS = *250 KIAS + 50 KTS (5 x 10)*
= *300 KTAS*

ANSWER: *Lead turn by 1% of TAS or 3NM*

15. IFR PROCEDURAL CALLS

Three calls are performed at each turn point: Two-Minute Prior, Mark-On-Top, and Wings- Level.

a. The Two-Minute Prior call is given 2 minutes from the calculated ETA for the upcoming turn point. If the turn point is estimated at 15 + 30, a two-minute prior call should be given at 13 + 30. The Two-Minute Prior call includes:

(1) Outbound heading for course.

(2) Estimated time of arrival (ETA) at, and description of navigation to the next checkpoint.

EXAMPLE: *"Two Minutes prior to Montgomery; Outbound heading 310° for a course of 315°, ETA to DELBE is 23 + 45. We're doing a point to point to the Meridian 043° at 87nm."*

b. The Mark-On-Top call consists of:

(1) Left/Right XXX (clear turn)

(2) Time (at minimum DME or needle passing the 90° benchmark

(3) Place

(4) Fuel on board

(5) NAVAID (remains the same or switches to next station if on a direct leg)

EXAMPLE: *"Left 310°" (at lead point), "Time 15 + 30, Place Montgomery, Fuel 3800#'s, NAVAID switching to Meridian."*

c. The Wings-Level call is initiated when the aircraft is established on an outbound course from the turn point (navigate prior to TP procedures). The Wings-Level call consists of:

(1) Fuel +/- preflight

(2) Fuel at the IAF

EXAMPLE: *"We are 500 lbs above preflight, I estimate 2250 at the initial."*

16. GENERAL PROCEDURES

a. Ground speed checks

A manual ground speed check is required on the first leg after level off. Once accomplished, compare with the aircraft GSP readout. If it is determined to be reliable (+/- 10 kts), the student may use the ground speed readout of the EHSI. Keep in mind, GSP uses rate of change in DME. Consequently, the following criteria apply for GSP or manual groundspeed checks to be valid:

(1) Level flight

(2) Stabilized mach number

(3) Radial tracking

(4) DME greater than the thousands of feet of aircraft altitude

Once these conditions are met, there are two methods of computing ground speed. One is to check the DME at 1, 2, or 3-minute intervals. Since the DME readout is digital, the one-minute check is accurate and ground speed can be determined by multiplying the DME flown by 60. Another method is to take a 36-second check and add a zero to the end of the DME difference. If this check is continued to the 1-minute mark, ground speed in both knots and nautical miles per minute can be obtained without calculation (and can be used for cross-checking).

At the completion of the first ground speed check, and every leg thereafter (once the GSP readout is valid), the student must give an updated estimated time of arrival (ETA) at the next point and estimated fuel remaining at the IAF.

b. Wind analysis

The headwind/tailwind component is determined by taking the difference between TAS and ground speed. The crosswind component is determined by the crab angle: the amount of wind that equates to one degree of crab can be determined by dividing the TAS by 60. If the TAS is 420 kts then one degree of crab equates to 7 kts of crosswind. This is called the Guide number. A quick method of determining wind is to take all of the larger component and half of the smaller to determine velocity and use vector analysis to determine direction (See the Trainee Guide for Visual Navigation CNATRA P-811 or P-812). At 420 kts TAS, for example, if it takes 7 ^{o} of left crab to maintain a course of 360 with a ground speed of 390 kts, the wind can be determined this way:

7 kts/degree of crab x 7 degree of crab = 49 kts crosswind

390 kts GS - 420 kts TAS = 30 kts headwind

The resulting wind is 300 at 65 knots (rounded to the nearest 5 kts).

c. Lead points

During flights, <u>all</u> turns greater than 30 ^{o} (including point-to-points) will be led. To calculate the lead point for a 90 ^{o} turn, use Minimum DME +1 percent of ground speed over NAVAIDS, and 1 percent of ground speed at fixes. Consequently, 45° and 30° turns are led by one half of 1% and one third of 1% of ground speed, respectively.

EXAMPLE: *Calculate the lead point for an aircraft at FL 350, 450 kts ground speed, making a 90 ^{o} turn over a NAVAID.*

Minimum DME	=	*35,000/6,000*	=	*5.8 DME*
1% of ground speed	=	*0.01 x 450*	=	*<u>4.5 DME</u>*
Lead Point				*10.3 DME*

The pilot would be directed to turn to the outbound heading upon reaching 10.3 DME from the NAVAID or at an appropriate number of radials approaching a point to point.

d. Course control

Theoretically, you should always roll out on the radial after leading turns; however, this is not always the case. As soon as the aircraft position can be determined after a turn, a correction should be made to the proper radial.

Prior to any course change a wind-adjusted heading should be determined in order to maintain course on the next leg. Knowledge of the winds (either preflight or computed) allows a quick determination of crab; only minor heading adjustments should be needed for the leg. If the winds are unknown, observe the drift after having been on course, then return to course and adjust the heading to compensate for the drift. The CDI can be a very effective tool in managing drift.

Any CDI needle deflection indicates you are off course. Remember the needle is a "fly to" indication and deflects in the direction you must turn. A good rule of thumb is to turn 10º from wind corrected heading for every mile you are off course.

***NOTE**: The TACAN is the primary NAVAID enroute.*

e. Estimated Time of Arrival

The ETA to the next point is given during the two-minute prior call. To determine ETA to the next point, divide the leg distance by ground speed in miles per minute and add to the ETA of the upcoming point.

***NOTE:** on a 90^{o} turn the crosswind component becomes headwind component.*

EXAMPLE:

1. 420 kts ground speed, leg distance 84 NM.

2. 84 NM / 7 NM per minute = 12 minutes.

After the initial estimate you may set up "gates" to further refine the time. A gate is a distance equal to a whole number of minutes based on the current ground speed. A six-minute gate would be 39.0 NM, given a 390 kts (6.5 NM/min) ground speed. Note that a six-minute gate is the ground speed in knots divided by 10 (since six minutes is a tenth of an hour), and a five-minute gate is the ground speed in miles per minute multiplied by 10 then divided by 2.

***NOTE**: Use Aircraft clock (time mode) for ETAs vice the flight time or elapsed time modes.*

f. Estimated IAF fuels

Estimated fuel at the Initial Approach Fix (IAF) is given during the wings-level call and after each ground speed check. Several techniques for fuel computation may be used. Four will be explained in the following discussion and are summarized in Figure 2-1. The following examples use the information below:

DISTANCE AND ETE[1]

[1] Adjusted for preflight winds

	DISTANCE TO NEXT PT	DISTANCE TO IAF	TIME TO NEXT PT	TIME TO IAF
PT #1	140	770	0+20	1+50
PT #2	N/A	630	N/A	1+30

You mark on top of PT #1 at 40+00 with 6100# of fuel. Enroute to PT #2 you complete a ground speed check: you are traveling 420 kts (7 NM/min). When you "freeze" the fuel quantity and fuel flow, you have: time (44+00); fuel now (6040 #); fuel flow (1800 #/hr); distance to PT #2 (112 NM). Compute IAF fuel for wings-level after PT #1 and IAF fuel after ground speed check.

Ground speed check:

112 NM ÷ 7 NM/min = 16 min to PT #2

16 min (to PT #2) + 90 min (PT #2 to IAF) = 106 min (to IAF)

(1) Pounds per minute method:

Divide fuel flow by 60 to determine pounds per minute. Multiply pounds per minute by minutes remaining to IAF.

1800#/hour ÷ 60 min/hour = 30.0 #/min

Wings Level: 106 min x 30.0#/min = 3180# fuel burned to IAF

6040# - 3180# = 2860# at IAF

(2) Matrix method:

Set up a matrix of fuel used at convenient time intervals, then add available time intervals to equal the time remaining. For example, at 1800 # per hour, the matrix would be:

Time (min)	60	30	15	10	6	1
	1800#	900#	450 #	300 #	180#	30#

To speed the matrix calculations, note that 30 minutes is half of 60 minutes, 15 minutes is half of 30 minutes, and 6 minutes is a tenth of an hour.

Wings Level: 106 min = 60 + 30 + 15 +1 = 1800 + 900 + 450 + 30 = 3180

or = (60 x 2) - 15 + 1 = 3600 - 450 + 30 = 3180

then

6040# - 3180# = 2860# at IAF

(3) Gauge method:

The gauge method is a variation on the matrix method. Instead of setting up a matrix, we will use the fuel flow gauges. At fuel flow 1800#/hr, each gauge reads 900#/hr.

Time (min) minutes Fuel (number of gauges)

60	2 gauges	= 1800
30	1 gauge	= 900
45	1 gauge + 1/2 other gauge	= 1350
20	2/3 of 1 gauge	= 600
15	1/2 of 1 gauge	= 450
10	1/3 of 1 gauge	= 300
5	1/2 of 1 gauge divided by 3	= 150
1	1800/60	= 30.0

Wings Level: 106 min = 60 + 45 + 1 = both gauges + 1 gauge + 1/2 of 1 gauge + 1
= 1800 + 900 + 450 + 30

6040 # - 3180 # = 2860# at the IAF

(4) Pounds per nautical mile method

Determine fuel flow in terms of pounds per NM by dividing fuel flow (#/hr) by estimated ground speed to IAF (NM/hr). Multiply the result by the distance remaining to IAF.

1800 #/hr ÷ 420 NM/hr (estimated) = 4.3 #/NM

Wings level: 742 nm x
6040 – 3180 = 2860 # at IAF

COMPARISONS:

Method	Advantage	Disadvantage
Pounds Per Minute	(1). Once fuel flow/min is determined, multiply by time remaining. (2). In-flight re-planning	(1). Requires accurate ETEs; preflight winds must be reasonably accurate (± 10-20 kts and 10-20 °) (2). Must recompute when fuel flow changes (3). Math intensive
Matrix	(1). Uses addition instead of multiplication (2). Accurate	(1). Requires new matrix if fuel flow changes. (2). Also dependent on accurate ETEs

Gauge	(1). Same as matrix, but automatically updates if fuel flow changes (2). Fast, Tactical	Sometimes difficult to measure fractions of a gauge. Also dependent on accurate ETEs
Pounds Per Nautical Mile (ppnm)	(1). Independent of preflight ETEs. (2). Useful on long, straight-line flights (*i.e*. cross-country flights). (3). Inflight re-planning	(1). Cumbersome numbers to multiply and divide-small errors in ppnm figure can cause large errors. (2). Difficult to estimate average ground speed to IAF

Figure 1-2

g. Enroute delays

INTERMEDIATE: Expect to do a minimum of 3 different approaches at 3 different airfields on ANAV-20. These approaches will normally be filed approaches but can be unplanned inflight route changes (such as simulated divert). The enroute approach on ANAV-21 is considered optional with regard to completing the flight. If planned, the delay should be included on the DD-175, per FLIP, with 0+20 allotted for the approach. This will require a little more in-depth fuel planning on the Flight Log, and FLIP study to determine the peculiarities of the field.

When executing enroute delays, the clearance limit will be to the delay airfield. Approach Control will give further clearance sometime during or after the approach. It is important to note that civilian and Air Force fields will often keep you up Tower frequency until clear of the Class D airspace. Tower will direct the switch to departure in these cases.

17. PENETRATION VS ENROUTE DESCENT

Jet aircraft approaching the terminal phase from the high altitude structure have a choice of a high altitude penetration or an enroute descent. ATC will often ask what type of approach is desired approximately 200 miles from your destination. If you wish to execute the entire published high altitude approach, you need to request the penetration. If ATC does not make this request, they will assume you desire an enroute descent. Be wary of altitude assignments below the IAF altitude. If you want a low altitude approach, or desire vectors to an ILS, a GCA or TACAN final, you should request the enroute descent. The aircrew may refuse an enroute descent in favor of a penetration approach.

a. Approach. The approach phase requires constant vigilance. It is very easy to misdirect your focus during this phase of flight. There are many checklists and briefs to perform, and the airspace is significantly more crowded.

b. Descent Checklist. The descent checklist includes numerous items that must be accomplished early so the crew is ready for the approach. Weather information for the destination airfield should be obtained **at least** 100-150 NM prior to the destination by

listening to ATIS or calling METRO. In either case, monitor center while up the different frequency. If the weather on ATIS is questionable, METRO should be contacted for further information.

c. Holding. The normal method of setting up for a TACAN approach is to proceed directly to the IAF and commence the approach. However, it may be necessary to enter holding. Recommended holding speed for the T-39 aircraft is 200 KIAS. The aircraft should be slowed three minutes prior to entering holding. The three methods of entering are:

(1) Teardrop entry

(2) Outbound parallel

(3) Direct entry

The type of entry is dependent upon the aircraft's heading when crossing the holding fix and can be determined by using the entry diagram at the top of the high altitude approach plate or standard entry procedures.

d. Initial Approach Fix. TACAN approaches at NPA are relatively easy since the aircraft will normally be close to the initial heading when reaching the IAF. The procedures for commencing the approach are:

(1) Slow to penetration speed (250 kts).

(2) Line up the aircraft on the appropriate heading.

(3) Direct the pilot to descend at the IAF.

(4) Call Approach with altitude leaving.

(5) Make appropriate altitude calls.

To commence a TACAN approach, you must be within 1 NM of the IAF and on initial approach heading. If the initial course is greater than 90º from the heading to the IAF, request one turn in holding, or request maneuvering airspace to offset from the IAF. If the inbound heading to the IAF is within 90º of the inbound course – then lead the turn and proceed inbound.

After commencing, your responsibilities during the approach consist mostly of maintaining altitude, position awareness, course control, and a good lookout. If there is an arc on the approach, it should be led by 1% of the Ground speed, True Airspeed, or Indicated Airspeed, just as in the departure (remember that TAS = IAS + 5kts for each 1k of alt). Segment the arc by giving headings to maintain the arc within 1 NM.

Ensure all altitude restrictions are met. This is especially important at the NPA Final Approach Fix due to the close proximity of VFR break traffic. At the Final Approach Fix, instruct the pilot to descend to the MDA, turn if necessary, and report the gear and landing intentions to the controller i.e. “three down and locked, full stop.” If the runway environment is not in sight at the Missed Approach Point, direct a missed approach and initiate go around procedures. The student may call the field in sight anywhere along the final approach course, by indicating its position relative to the nose, but will continue to

navigate to the missed approach point.

While navigating inbound to the airfield, any crosswind will have significant effect on the course. Using the same wind analysis as during the enroute phase, at 120 knots one degree of crab is required for every two knots of crosswind. The crosswind can be easily compensated for since the winds have been obtained from ATIS or METRO during the Descent checklist. When correcting back on course, use the wind-adjusted heading and make appropriate corrections. Aggressive corrections to course are recommended, but, when intercepting final course, be aware of the small distance between radials near the TACAN.

Throughout the approach it is very likely other aircraft will be near you, which increases the potential for a midair. A good scan must be developed. Listening to the radio gives information on how many aircraft are in the area, their location in the pattern and type of approach. When up Tower frequency, it is a good idea to listen to the call signs and positions of the various aircraft and develop a mental picture of their approximate locations. "Clearing on the radios" will help develop the situational awareness required of every aviator throughout their career. This is especially true given the hazards of flying around the ship.

e. VFR arrival procedures (Course Rules)

Entering for the "break" (or the "overhead") at Sherman Field is the same for all jet aircraft. Aircraft are to be at 2000 feet MSL, wings-level, 3 NM prior to the entry point. The entry points are "Point X-RAY" (NPA 231/6) for runway 07, "Bronson" (NPA 288/5) for runway 19, "Point Long" (NPA 180/6) for runway 01, and "Pickens Gate" (NPA 104/7) for runway 25. Maintain 2000 feet MSL until 3 DME (or crossing Blue Angel Parkway for runway 19), then descend to 1300 feet. The "break" altitude is 1300 feet and is always toward base operations for jets. Pattern altitude is 800 feet. VFR entry Procedures and course rules must be committed to memory. (See Appendices pages D-1 and D-2)

f. ILS approach procedures

During ANAV/AN flights, an Instrument Landing System (ILS) approach may be conducted as a demonstration item. It is important to understand the basics of how an ILS works.

After contacting approach control and requesting an ILS, the aircraft will be vectored to intercept the final approach course at a specific altitude (approximately 1,000 feet to 2,500 feet AGL). Prior to the final approach course the appropriate ILS frequency will be set in VHF NAV (ILS/LOC). DME, if available, will be displayed on the digital DME display. Ensure the information is displayed on the EHSI. The approach plate has all required altitudes, courses, and frequencies. The pilot and instructor will demonstrate how the aircraft's autopilot and instrumentation will be set to maintain the proper final approach course and glideslope to the runway. The Landing Checklist shall be initiated **no later than** one "dot" below glideslope (*i.e.*, the carrot will be one "dot" above the reference datum) or 7 nm on final.

g. On deck procedures

It is important to emphasize the flight does not end at touchdown. Your attention must be focused until back in the ready room. During the landing roll, call out runway

remaining and airspeed (“5 Board, 100 Knots”) until 60 Knots. When clear of all active runways, call Ground Control for taxi and initiate the After Clearing Runway checklist. While taxiing it is still the copilot's responsibility to clear the right side of the aircraft. On the ramp, call Base and report the aircraft status. In VT-86, the instructor will call base. When the aircraft is in the chocks, initiate the Engine Shutdown checklist.

h. Flight record

The WINFLIR is filled out at the completion of every flight and is completed in the same manner with a few exceptions. An "E" is placed in location 10, since the crew and aircraft do not have the same organization code. Since it is possible to have more than one mission per WINFLIR, these should be designated in the Total Mission Requirement Data section (ANAV flights are 1G2, VNAV flights are 1G1). Raytheon Pilots are listed by name on the WINFLIR. The next line should be the Mission Commander/Instructor having a Special Qualification of “Z.” Student Data should follow, using Special Code of “T”, or “B” if only flying as an Observer. There will be an instruction sheet located in the area and the standard for completing the flight record is zero errors. Have the Mission Commander sign the WINFLIR and deposit it in the appropriate location determined by your squadron.

i. Flight debrief

The flight debrief is conducted at the conclusion of the flight. The debrief will begin at the instructor's discretion. Bring all the equipment utilized during the flight to the briefing room, including your “junk jacket." If the flight was a check flight, special check flight, re-fly, or other flight which required a jacket review, the instructor and student should ensure the appropriate entries are made in the aviation training jacket (ATJ). At the conclusion of the debrief, the student will route the grade sheet, aviation training jacket, and down chit (if applicable) to student control.

UNIT 2 REVIEW QUESTIONS

1. Outbound from Pt. A to Pt. B you complete a ground speed check of 6.8 NM/min. You have 74 NM remaining to Pt. B and fuel on board is 4,220#. Fuel flow is 1600#/hour. Time from Pt. B to the IAF is 1+26 (from your flight log). What is your EFR at the IAF?

2. Same as #1: GS = 7.2NM/min. Fuel on board is 4010#. Distance to Pt. B is 35 NM. Fuel flow is 1800#/hour. Time from Pt. B to IAF is 1+11.

3. Same as #1: GS = 7.0 NM/min. Fuel on board is 3650#. Distance to Pt. B is 42 NM. Fuel flow is 1550#/hour. Time from pt. B to IAF is 0+51.

4. Same as #1: GS = 7.6 NM/min. Fuel on board is 3320#. Distance to Pt. B is 61 NM. Fuel flow is 1450#/hour. Time from Pt. B to IAF is 0+33.

5. Same as #1: GS = 7.4 NM/min. Fuel on board is 5350#. Distance to Pt. B is 89 NM. Fuel flow is 1900#/hour. Time from Pt. B to IAF is 1+12.

6. How much fuel is required for an approach during flight planning (for the flight card)?

7. What is the total wind if you are heading 176^{o} to maintain a course of 180 with a ground speed of 7.5 NM/min? Assume 420 KTAS.

8. What is the jet course rules initial point (Name, Radial/DME, and Altitude) for Runway 25 at NAS Pensacola?

9. What is entered in the “Fuel on Board” block of a DD-175 for an ANAV flight?

10. List the items for an ANAV Mark-on-Top call in proper order.

UNIT 2 REVIEW ANSWERS

1. 1640#
2. 1730#
3. 2180#
4. 2330#
5. 2690#
6. 400#
7. 045 ^{o} at 44 knots
8. Pickens Gate (NPA 104/7) at 1800’
9. 4+00
10. Turn (Clear), Time, Place, Fuel, and NAVAID

UNIT 3: T-39 COURSE REVIEW

1. PURPOSE

The purpose of the T-39 Flight Preparation course review is to provide experience through actual involvement with course materials, lessen the abstract aspects of learning, and provide an atmosphere of informal open discussion for the students.

2. DESCRIPTION

The instructor will conduct an overview of chapters 1 and 2. All course learning objectives will be reviewed for understanding and clarity. An atmosphere of open discussion will serve as the review session format throughout the "Question and Answer" period.

3. REQUIREMENTS

One hour has been allotted for the review. During the review, students are encouraged to use reference materials and training devices.

THIS PAGE INTENTIONALLY LEFT BLANK

UNIT 4: T-39 EXAMINATION AND REVIEW

1. DESCRIPTION OF EXAMINATION

The Flight Preparation end-of-course examination contains fifty multiple-choice, True/False, and fill-in-the-blank questions. Expect twenty-five general knowledge questions concerning flight preparation concepts. The other twenty-five questions are reserved for the T-39 NATOPS portion of the examination.

One and a half hours (1+30) are allotted for the end-of-course examination.

2. STANDARDS AND GRADING CRITERIA

To successfully complete the examination, you are required to correctly answer a minimum of 80% of the questions.

3. MATERIALS REQUIRED

The instructor will provide all materials required for the examination. Textbooks, CR-2s, class notes, or other study aids are prohibited.

4. TESTING PROCEDURES

The examination will begin on time. Students late by less than ten minutes will be permitted to take the examinations with their class; however, the scheduled completion time remains in effect. Time extensions for late arrivals are prohibited.

The instructor will provide an examination, answer sheet, and pencil to each student.

Should questions arise during the examination period, students should raise their hand for instructor assistance.

Writing in examination booklets is prohibited.

Upon completion of the examination, you will be provided with a critique sheet. Remember that while constructive comments are encouraged, a professional response is expected.

5. PROCEDURES

During the examination review, your instructor will read and provide the correct answer for each question. Upon your request, he will discuss any question or answer.

Note taking of any type during the review is prohibited.

6. GRADING QUERIES

If in the opinion of the instructor a controversy exists over a test item, he will request grading be suspended and a review initiated.

If you believe your examination has been graded incorrectly, you must advise the instructor, course officer, or class advisor.

Do not ask the personnel in the testing office about your examination. They are not permitted to provide information other than your grade. If you have a problem with a grade, ask an instructor for assistance.

7. GRADE POSTING

When completed, grades will be posted on the first deck bulletin board in Griffith Hall. Examination results will be posted within twenty-four hours.

If there are any failures, a note requesting those individuals to obtain an Unsatisfactory Event Report from the testing office will be posted.

8. RE-EXAMINATIONS

If you have failed this examination, you must schedule a debrief with any T-39 Flight Prep instructor. Additionally, you are required to confer with one of your class advisors concerning your academic situation. Your final step is to confer with the Academic Training Officer. You are allotted three days from the date of the examination to complete the Unsatisfactory Event Report routing and return it to the testing office.

The scheduling of the Flight Preparation re-examination is your responsibility. You must complete the re-examination within five working days of the date of the failure.

APPENDIX A

INTERMEDIATE - WHAT'S EXPECTED (NOT ALL INCLUSIVE)

1. ANAV-18/19

a. Brief

- Instructor will demo the briefing for the ANAV-18 hop. Student will brief the ANAV-19 hop in its entirety, including all standards, with instructor's assistance as required.
- Be available at Base Operations one half hour prior to brief time.
- Have a completed (wind adjusted) flight log, DD-175, current charts and publications. Although not required, route of flight may be lightly traced in pencil or outlined with chart tape (understand that as you gain experience, it is expected you discontinue highlighting routes).
- Know all boldface EPs, limitations, and EOD/QOD/SOP
- Know required comm for ground ops, departure, enroute, and arrival
- Know all turn point procedures (2 min/MOT/WL calls) and required altitude calls. On descent call: 15K MSL, 10K MSL, 5K AGL, 4K MSL, 3K MSL, 2K MSL, 1K MSL, 1000 feet prior to any assigned altitude above 1000 feet, "Rad Alt Alive" (radio altimeter is active at 2000 feet AGL), 200 feet prior to any altitude below 1000 feet AGL, and MDA or DH. The student shall also report 1,000 feet prior to level off **(passing xxxx for xxxx)** above 1000 feet MSL, and 200 feet prior below 1,000 feet AGL (i.e., on final approach course).
- Be familiar with Abnormal Engine Start indications (Hot/Hung/Wet Start), hand signals

(Fire/Egress/ Engine Shutdown), and corrective actions

b. Walk Time (45 min prior to T/O)

- The pilot will meet the student and INFO/INAV one hour prior to takeoff to discuss safety procedures, and conduct an overview for the flight. At 45 min prior to T/O, all will walk to the aircraft.

c. Arrival at Aircraft

- Upon arrival to the aircraft, the student will perform the Exterior Inspection.
- The instructor pilot will perform the Before Exterior and the Interior Inspection checklists.
- The student will check the interior and strap into the seat.
- Set all non-digital radio frequencies and NAVAIDs

- Basic radio setup: UHF is primary. Students may use VHF if required.
- The student shall notify the crew of ALL radio switches (i.e., "Crew uniform is primary").

d. Avionics Power-Up Checklist

- Set all remaining radios, NAVAIDs, and ICS

e. Prior to leaving the chocks Get ATIS and clearance

f. Prior to Taxiing

- Call Base
- Call Ground
- Keep the A/C clear of obstructions (minimum scan responsibilities are from 9 to 4 o'clock)

g. Taxiing Checklist

- At a minimum, clear all taxi-ways, throats, and off-duty runways
- Flight Instrument check: the dialogue should resemble the following: "Altimeter set xx.xx indicating xx feet / gyro uncaged, erect, stable, no off flags / VSI indicates zero / EHSI heading xxx (verify with taxiway and wet compass) / airspeed indicating zero / I've bugged xxx (V1) you should bug xxx (V2) / RADALT on, set 400 feet."
- When taxiing, priority one is to clear A/C (in the ramp area the student should be nearly 100% dedicated to clearing the A/C)
- Ensure all NAVAIDS and flight instruments are set for the departure. The TACAN will be used as the primary means of navigation. The heading bug will be set to the initial heading for the SID, with the CDI set to the initial SID course. The first altitude restriction will be set in the altitude preselect. Students will set 400 feet in the radio altimeter for minimum emergency altitude.
- Time To Go (TTG) will be displayed in the bottom left corner of the EHSI until a ground speed check is accomplished on ANAVs; only then will ground speed be displayed using the HSI button.

h. Departure Brief

- Brief what is set into each NAVAID
- Include first heading, course, and altitude
- Receive the Abort Brief from the pilot

i. Lineup Checklist

- Verbalize clearing the “Groove”
- Clear the other side for A/C
- Clear the run-up area for FOD and the runway for other aircraft
- Commence the Lineup checklist
- Note the T/O time

j. T/O Roll

- The student’s primary scan is runway alignment and airspeed. The secondary scan is engine instruments and caution-warning light panel. Students should not fixate on the airspeed indicator.
- Call “Off the peg, 60 kts, V1 in knots

k. At Rotation

- Monitor attitude, airspeed, VSI, Altimeter, and scan outside
- Once 2 positive rates are confirmed, verbalize “two positive rates of climb, GEAR.”
- The pilot will raise the gear.
- Once A/C is “clean”, pilot shall respond with "Gear up, lights out." Student shall then call for landing/taxi lights – confirm “retracted and off.”
- Complete the After Takeoff checklist after passing 1500 feet
- Aviate, Navigate, Communicate, Checklists, then EPRs

l. Clear All Turns

- All turns regardless of direction should be cleared on the student's side.
- Clear as often as rate of bank/turn dictates (Turns greater than 30º angle of bank require an almost continual clearing turn outward at co-altitude, and above (if climbing))
- Generally the copilot should “stay out of phase” with the pilot (i.e., if the pilot is primarily scanning outside/left then the copilot should scan inside/right)

m. Climb Out

- Update Engine Pressure Ratio (EPR) every 5000 feet starting at 5000 feet MSL
- Perform the Climb checklist passing 10,000 feet
- 1000 feet prior to final level off, give a Cruise EPR and an IMN for cruise

- Turn point procedures are expected to be performed at all fixes and NAVAIDS, including departures and approaches (may be modified in climb/descents by omitting ETA's and EFRs, for example - "Two minutes prior to CANUE, outbound heading 186 for a course of 180")
- For climbs, descents, or initial level off, the student may use KTAS or KIAS in figuring ETA's (IMN X 10 will give a rough TAS in NM per MIN, e.g., .5 IMN = 5 NM/min = 300 KTAS).
- At least 3 "complete" turn points at altitude are required to complete any ANAV.
- Students should plan 2 PT-to-PTs on each ANAV sortie. These may include intersections on SIDs or Approaches and will satisfy the "complete" turn point requirement if done at altitude.

n. Turn Point Procedures

- (2 Min prior) Outbound heading XXX for course XXX (Direct/Jet Route), ETA to _____ is xx+xx, description of jet route or next turn point.
- (MOT) Left/Right XXX (clear turn), time, place, fuel, NAVAID
- (Wings-Level) Fuel $\pm$ preflight, Fuel at the IAF is _____

NOTE: *Lead **all** turns on airways and direct (i.e. TACAN to TACAN) routes, including PT-PT's.*

o. Ground Speed Checks

- One ground speed check shall be accomplished on the first leg to validate the ground speed readout. If the check is within $\pm$ 10 kts of the readout, the ground speed readout may be used for the remainder of the flight. Use the HSI button to toggle to ground speed.
- After ground speed check, update the ETA to the next point and EFR at the IAF
- Update ETAs and IAF fuels on each leg thereafter
- The student shall also verbalize the wind calculated.

p. Basic NAVAID Setup

- TACAN is the primary NAVAID. VOR is a backup. Be flexible – if the situation dictates that the VOR makes more sense to use first then do it. Example – you are cleared direct to the Brookley (BFM) VORTAC and then to NPA. Instead of putting your TACAN on BFM with nothing to put the VOR on to leapfrog the NAVAIDs (Saufley, 108.8 is a T-34-ism – don't do it!), and then switching the TACAN again to NPA, just navigate to BFM with the VOR and have the TACAN already on NPA for a seamless switch.
- At the change over point on an airway, switch the TACAN and give the pilot a new heading for the new course.

- On a direct leg -- switch the TACAN, center the CDI, and give the pilot a new heading for the new course.
- Always inform crew of NAVAID switches. Use common name vice channel or frequency, e.g., "TACAN switching to Crestview".

q. Changes/Flexibility

At all times, the student should be able to adjust some flight parameter to meet fuel/time/weather requirements:

- Shorten the time remaining (alter distance to go)
- Select optimum altitude (climb)
- Select optimum airspeed (max range/endurance)
- Minimum fuel required is 1100# on deck plus #400 for each approach plus enroute divert fuel if destination is IMC.

r. Descent

- Obtain ATIS
- Initiate Descent checklist 100-150 NM (approximately 15-20 min) prior to the destination IAF
- Crew brief includes destination weather, field and approach briefs, holding brief (if required), V_{ref}, W/O EPR, and T/R stops, and estimate of MSL altitude where radalt should come alive.

s. Approach

- RadAlt/Radio Altimeter is set to HAT/HAA for an instrument approach and 400 feet for a visual approach (single engine go-around climb to 400 feet AGL min).
- Mandatory altitude calls -- 15K MSL, 10K MSL, 5K AGL, 4K MSL, 3K MSL, 2K MSL, 1K MSL, 1000 feet prior to any assigned altitude above 1000 feet, "Rad Alt Alive" (radio altimeter is active at 2000 feet AGL), 200 feet prior to any altitude below 1000 feet AGL, and MDA or DH. Clear all turns.

t. Landing Checklist

- Slowing through 180 KIAS in the break (visual) and wings level on downwind
- NLT 7 nm prior to TDZ on TACAN approach
- $\pm 30^{o}$ and within 12 nm on GCA
- Same as GCA but NLT "1 Dot below glideslope" on ILS (- 7nm)

- Once gear speed is reached (180 knots) the student should commence the Landing checklist. While conducting the checklist, aviation and navigation must continue.

NOTE: *Calling for the Landing checklist above 180 KIAS or asking to slow to gear speed when below 180 KIAS is a below average in scan.*

- Priorities at IAF, FAF, MAP or DH are to Aviate, Navigate, Communicate, and then complete Checklists.
- Missed approach /climbout instructions should be given after the FAF and before the MAP.
- Once the pilot takes over visually, the student should be scanning "meatball, line-up, and AOA/Airspeed". Generally, NO comments are made to the pilot unless outside safe parameters or conflicting traffic exists.
- Prior to touchdown the student should verbally re-verify gear/flaps down and landing clearance.

u. Waveoff and Touch and Go

- The pilot will advance the throttles to recommended EPR.
- Verbalize "two positive rates of climb-GEAR"
- The pilot will retract the gear and flaps, if required.
- Monitor attitude, airspeed, VSI, and Altitude
- Initiate the After Takeoff checklist as appropriate.

v. Full Stop

- Student will call out distance remaining and airspeed until 60 knots.
- Monitor tower frequency until clear of the active and non-duty runways
- Clear the A/C from the 9-4 o'clock
- Call ground
- Prompt the pilot for the After Clearing Runway checklist
- Call Base
- Complete the Engine Shutdown checklist

w. Postflight

- Conduct a post flight inspection
- The Instructor NAV/NFO will assist the student with the WINFLIR on ANAV-16 ONLY.

*** Flight standards, DOR/Training Time Out policy, and Safety considerations should be covered prior to each hop.

2. ANAV-20

Student will brief hop in its entirety, including all standards, with instructor's assistance as required. Procedurally the same as ANAV-16 & 17.

a. Enroute

Turnpoint procedures are expected to be performed at all fixes and NAVAIDS with the following modifications:

- Delete the ETA portion of the 2 min prior call.
- Delete the IAF EFR from the wings level.
- Wings level fuel will consist of a comparison of actual fuel remaining to the estimated fuel remaining on the winded flight log (± preflight).

Route changes should be kept to a minimum where practicable.

b. Practice Enroute Approach

- The student should plan at a minimum 3 different approaches at 3 different airfields (may include a demo ILS; all other approaches are review items). The final approach will be at the destination airfield.
- The student is responsible for all procedures, communications, and copilot duties into, at, and out of the enroute fields.
- The student should know the difference between a High Penetration and Enroute Descent, and be prepared to give the appropriate request to ATC (probably ARTCC).
- ATC DOES NOT care specifically what approach request you have but rather how you want to enter the terminal area (penetration or enroute descent). Also, ATC will be concerned with whether you plan to leave and/or return to their control (full stop, touch and go, or low approach).

c. ATC Check-in

- The approach request should include the intention off "place the remainder of my flight plan as filed to Navy Pensacola (or whatever your destination is) at flight level xxx on request".
- Expect a clearance similar to this: "Callsign, climbout instructions are _____, expect FL xxx in 10 minutes, contact Departure control on frequency xxx.x, squawk xxxx".
- These instructions may be given at one time or piece-meal during the approach or climbout.

- Normally the climbout instructions will serve as the missed approach brief.
- Dial in your departure altitude in the altitude selector.
- The student should know the 'on-course" heading from the practice field to the next point in the route of flight.

3. ANAV-21

Student will brief hop in its entirety. Same procedures and formats as ANAV-16 & 17.

a. Enroute

The instructor will require the student to perform a route change in-flight. The student will contact ATC to request the route change, recompute an ETA to the new turnpoint, and recompute an updated initial approach fix fuel.

b. Approach

The practice approach (optional) should be out of the local area (not talking to Pensacola ATC).

NOTE: *ANAV-20 & 21 may be completed in any order.*

4. VNAV-5

Enroute standards are the same as ANAV-18.

a. Brief

- The student should bring to the brief:
  - A flight log winded for all enroute legs
  - All appropriate charts, pubs, and a completed DD-175
  - A completed low-level chart
- The instructor will demonstrate how to brief a low-level route.
- The student should be able to draw or recite from memory:
  - Turn point features and all features that are going to aid the student in locating the turn point
  - Times and headings to all turn points and intermediate check points
  - General location of all obstructions higher than A/C altitude within 3 NM of course centerline and ALL altitude changes. Inflight hazard calls are made for any obstruction 300 feet or higher.
  - Wind analysis formulas without error
  - Turn point procedures, intermediate checkpoint and hazard calls without error
  - Fix, Analyze, Compensate, Correct, then Update times
  - How to perform a BDHI correction and its parameters

- Proper scan -- Clock, Chart, Ground
- Proper format for cancellation of IFR and checking in/out with FSS
- Proper format for low level exit communications including IFR clearance pickup

b. Flight

- The RadAlt/Radio Altimeter shall be set to 80% of the lowest route altitude segment.
- EHSI will be set to TTG in the lower left display via the HSI button.
- On the initial leg of the first low-level, the instructor may demo:
  - All turn point procedures (all altitude information shall be given in feet AGL)
  - Intermediate checkpoint and hazard calls
  - Proper wind analysis
  - "Fix, Analyze, Compensate, Correct, Update"
  - A course and time correction, including a BDHI correction
- The demo normally extends from the 2 minute prior call at Pt. A to the MOT call at Pt. B.
- The instructor will correct errors in the students' distance estimates and formats/procedures.
- At 500 feet AGL and 1 minute to go (5 NM out), the turn point or checkpoint is approximately ½ way to the horizon. The full horizon is approximately 3 minutes out (15 NM away).

5. VNAV-6

The student will brief hop in its entirety, including all standards, with instructor's assistance as required. Same brief procedures as VNAV-5. Format/procedure deviation (on deck or airborne) is not average. The average student may be slow with procedures and will be inaccurate at judging distances. The flight will stress the BASICS -- format and procedures, Clock, Chart, Ground, etc.

6. VNAV-7

Student will brief hop in its entirety. The next low-level hop is the students' checkride. A "longer noose" is given to the student. NO basic format or procedures errors are permitted. Deviations permitted here will only hurt the student on the checkride, where little direct assistance is given. Student's distance estimate errors shall always be corrected.

7. AVX-2X

The student briefs the hop in its entirety including all standards. The student should meet the standards with little or no direct assistance. This is still a training hop so the Instructor NAV/NFO may still instruct.

8. GENERAL

ANAV-18 will be the student's first flight, but the flights following it may either be ANAV or VNAV profiles. If you are scheduled for a VNAV profile and the local weather prevents accomplishing a low level, expect to fly an ANAV profile (NPA 150/151/152/153 stereo route listed in your in-flight guide).

VNAV-5 will utilize either VR1020 (Primary) or VR1006 (Secondary).

APPENDIX B

INTERMEDIATE AND ADVANCED GRADING STANDARDS

Refer to the Master Curriculum Guide

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

T-39 BRIEFING GUIDE

The following is a suggested minimum briefing guide; see your squadron for specific brief formats.

- Ready to fly? (Med up/Crew rest/Gloves)
- DOR/TTO Policies
- Event/Callsign/Aircraft#/Crew
- Flightplan/Flight Log/Current FLIP Pubs
- Walk/Taxi/T.O./LL Entry & Exit/Land Times
- Weather/NOTAMs
- Takeoff/Climb data
- Communications Plan
- Questions of the Day
- Man Up/Preflight
- Engine Start
  - Type
  - Crew Coordination
  - Hot/Hung/Wet Starts
- Before Taxi Checks
  - Instrument/NAVAID/ Set-up
  - Non-standard ops (if applicable)
- Comm Plan (Ground Ops)
  - Preset Usage
  - CDU Inputs
- Taxi
  - Lookout Doctrine/Responsibilities
  - Taxi Route
- Line-up
  - Responsibilities
  - Checklist

- Takeoff
  - Takeoff Roll (prior to rotation) - Procedures and Responsibilities
  - Rotation and Climbout - Procedures and Crew Coordination
- Departure
  - Brief
  - Procedures/Plans/Crew Coordination
  - Emergency Plan (Pilot Brief)
- Enroute Cruise Plan-to-include
  - Route of flight
  - Climb/Level Off/and Descent points
  - Checklists
  - Turn Point Procedures
  - Navigation / NAVAIDs
  - Lead Points
  - Communications
  - Enroute Approaches (to include climbout plan)
  - Crew Coordination
  - Emergency Divert Plan
- Low Level Plan - to include
  - LL Entry Checklist
  - Descent
  - Equipment Operation (EHSI / NAVAIDs)
  - Cancellation of IFR
  - Communications
  - Crew Coordination (Turn Point Procedures)
  - Checkpoints
  - Turn points
  - Course/Time Control
  - Emergency/Abort Plan
  - LL Exit Checklist
- Approach
  - Checklists

  - Approach Plate/Course Rules Brief
  - Crew Coordination
  - Communications
  - Climbout/Missed Approach
  - Backup Approach
- Landing Rollout and Ground Operations
  - Checklists
  - Crew Coordination/Lookout Doctrine
  - Communications
  - Parking Area/Field Overview
- Emergency Operations (Pilot Briefing)
- Debrief Place and Time
- Questions/Grading Standards!!!!!

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

VFR JET ARRIVAL PROCEDURES

NOTE: *Class C participation is mandatory for all aircraft proceeding VFR. All arrivals contact Pensacola Approach Control prior to 20 NM for radar service and sequencing over the appropriate VFR entry points (IAF).*

1. Arrivals

NOTE: *Maintain 1300 feet until established on the downwind leg; pattern altitude is 800 feet*

Rwy 7: IAF - Point X-RAY (NPA 231/6) - Right traffic, depart IAF hdg 050°, maintain 2000 feet until 3 DME, descend to 1300 feet, level break.

Rwy 19: IAF - Bronson (NPA 288/5) - Left traffic, depart IAF direct to Ferguson, remain south of HWY 98, maintain 2000 feet until crossing Blue Angel Parkway, descend to 1300 feet, level break.

Rwy 25: IAF - Pickens Gate (NPA 104/7) - Left traffic, depart IAF hdg 330°, maintain 2000 feet until 3 DME, descend to 1300', level break.

Rwy 1: IAF - Point Long (NPA 180/6) - Right traffic, depart IAF hdg 360°, maintain 2000 feet until 3 DME, descend to 1300 feet, level break.

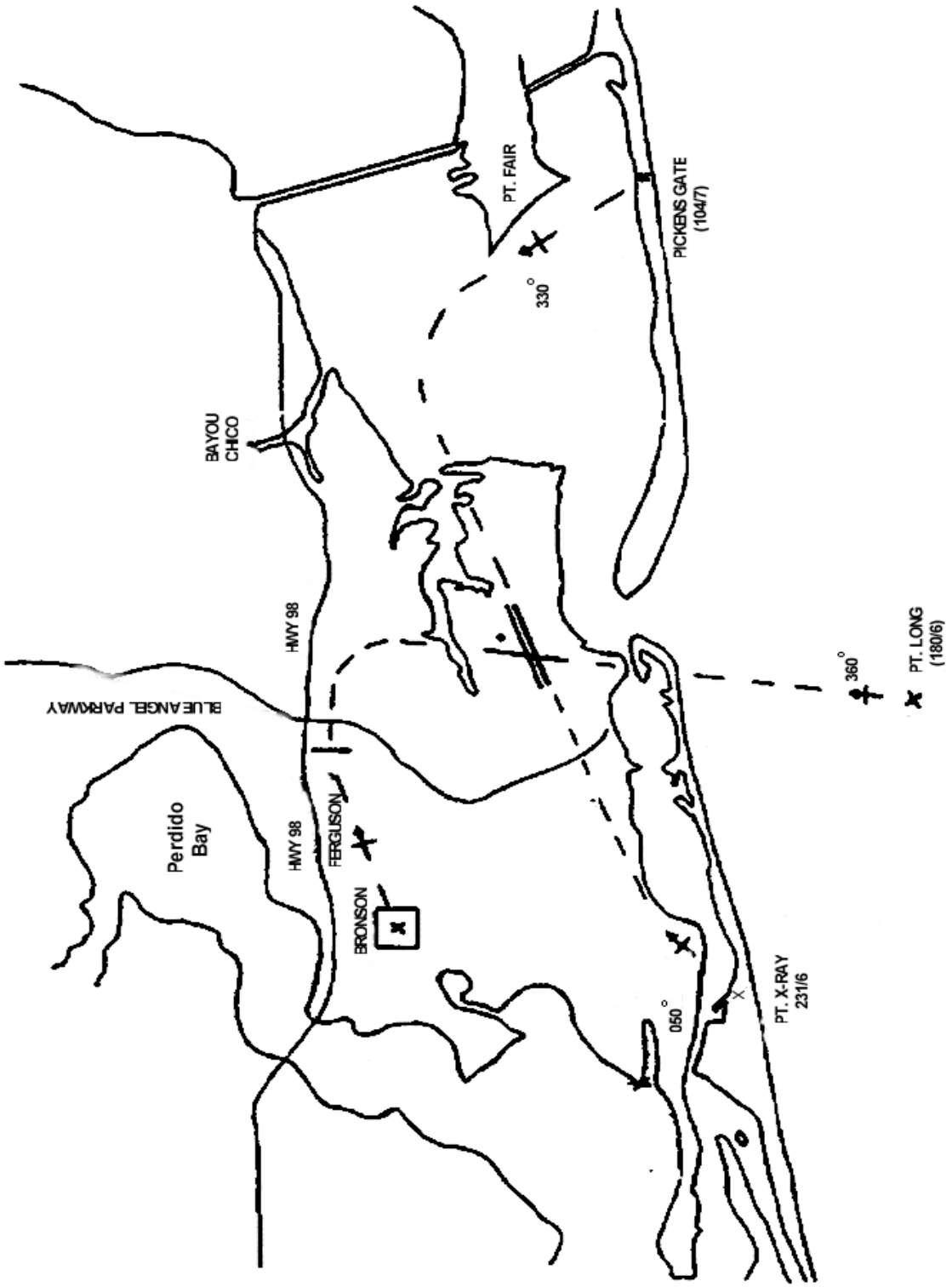
NOTE: *When NPA weather is below 2500 feet ceiling or 3 miles visibility, recovery will be via straight-in, i.e., TACAN, GCA, or visual straight-in.*

2. Break Points

Rwy 07/25 - over south parallel taxiway

Rwy 01/19 - over east parallel taxiway

IMPORTANT NOTE: When continued VMC flight is assured to the VFR entry point and within Pensacola' airspace, tell Pensacola Approach you want to cancel IFR ("Rocket 505 – cancel IFR"). Even though you have technically cancelled IFR, you must still comply with assigned altitudes and vector headings given by approach. Also, stay on your previously assigned squawk code. DO NOT switch to 1200 unless told to. Usually they will tell you to proceed direct to the entry point (X-ray, Bronson, etc.), but listen up to what they clear you for.



VFR JET ARRIVAL DIAGRAM

APPENDIX E

INSTRUMENT LANDING SYSTEM (ILS) BASICS

You will be introduced to the ILS approach in the T-39 syllabus. The following is information taken from the Aeronautical Information Manual (AIM) and the T-39 NATOPS to assist you in preparation for ILS approaches. The T-39 and most other aircraft have ILS. You will be expected to know the basics of the ILS/Localizer system.

1. ILS/Localizer/Glideslope

The ILS is a precision approach similar to the PAR, with the exception of a final controller using radar to verbalize azimuth and glideslope information, this information is displayed on the aircraft flight instruments for you to interpret. An ILS consists of two components, the localizer and the glideslope. The localizer provides the azimuth (centerline) portion of the ILS. Glideslope must be available, otherwise an approach must revert to the localizer minimums (higher than an ILS). The glideslope is normally 3º but can be higher depending on local terrain (Refer to minimums section in the front portion of the approach plates). Corresponding VSI/VVI information for a given glideslope at a given airspeed can be found on the inside back cover of any approach plate.

2. ILS Minimums

There are three categories of ILS minimums, but the T-39G is only qualified for Category-I minimums. For general knowledge, the three categories are:

- Category I - 200 - 1/2 (2400RVR)
- Category II - 100 - 1/4 (1200RVR)
- Category III - 0 - 0

3. ILS/Localizer Transmitter

Your Approach plate will specify the ILS frequency (see any ILS approach plate). It will be contained in a box that has an 'I' preceding the airfield's 3 letter identifier (such as: I-PNS or I-MOB). If the box has a TACAN channel, the ILS provides DME (see Mobile Regional). If the ILS does not have DME and a TACAN is co-located on the field (see Gulfport), then you will have to select the TACAN channel and the ILS frequency. TACAN DME is displayed on the EHSI and DME associated with the VHF NAV (VOR/LOC) frequency (if available) is displayed on the digital DME gauge.

4. Marker Beacons (Fan Markers)

Marker Beacons are available with some ILS/Localizer systems. Ordinarily there are two Marker Beacons associated with an ILS: the Outer Marker (OM) and the Middle Marker (MM). The Outer Marker always transmits at 400 Hz, and is indicated by an aural signal and

the blue "OM" light flashing. The Outer Marker is co-located with the FAF and the approximate position for glideslope interception. The Middle Marker always transmits at 1300 Hz, is co-located with the MAP or DH, and is indicated by an aural tone and the amber “MM” light flashing

5. Compass Locators

A Compass Locator is an NDB used in conjunction with, or in place of a Middle and/or Outer Marker. They are tuned up on the ADF (see Mobile Regional ILS 14). You will need to select the ADF on the Bearing needle on the EHSI. Upon station passage it will swing from 12 to 6 o'clock.

6. Timed ILS

As a back-up, a timing box near the bottom of an approach plate will give the time required to travel from the Outer Marker (FAF) to the Middle marker (DH/MAP).

For more on the ILS/Localizer system, refer to the AIM (a copy is located in the ready room). Your instructor will brief and assist you with your first ILS approach, but you still must function as a crewmember, so try to do as much as you can on your own. If you have any questions, contact your personal advisor, any T-39G instructor, or pilot.

APPENDIX F

BIRDSTRIKE/EMERGENCIES

a. Birdstrikes

Birdstrikes can occur in virtually any stage of the flight. The most common times are during takeoffs, landings, approaches, and low-levels. When birds hear the high pitch sounds of approaching jet engines, they instinctively tuck their wings and dive. The "birdstrike zone," where birds pose the most danger, is the area between 11 o'clock and 1 o'clock, from slightly above the horizon to 30º above the horizon. If a bird is seen in this zone, call it immediately followed by position using clock code (e.g., "Bird, 1 o'clock!"). The pilot will then initiate action to avoid the bird. Clock codes are essential so the pilot will be able to immediately acquire the bird visually. If you see a bird not in the birdstrike zone, don't say anything.

If a birdstrike does occur, it usually will not cause any major problems. In the event a bird is ingested into one of the engines, noises from the engine or a visual check may indicate the need to shut down the engine. If the radome is struck, it could shatter requiring a reduced airspeed. The windshield though, is the primary danger area.

If the windshield does break, the cockpit will become extremely noisy from windblast making cockpit communication difficult, and there is the possibility the pilot or PNF/CP will be incapacitated. If this should occur, the remaining crewmember must positively direct the aircraft away from the ground. Select MRT and climb away from the ground using no greater than 30º nose-up attitude to avoid stalling the A/C. Monitor altitude and airspeed continuously. Climb to at *least* 5000 feet AGL and assess the situation. Consider engaging the auto-pilot once leveled off to minimize task saturation of the crew. The mission will terminate and the flight will immediately return to base when a birdstrike of any kind occurs.

b. Lost Aircraft

The standard for maintaining course on a low-level is $\pm$ 2 nm. If the aircraft becomes lost, follow these procedures:

(1) Climb to an appropriate VFR altitude.

(2) Fix the position of the aircraft either visually or with a NAVAID fix.

(3) Expect to reenter the route at an alternate entry point (fuel permitting) or discontinue training.

(4) If aircraft position cannot be determined, execute lost plane procedures.

c. Lost Plane Procedures

(1) Climb

(2) Confess

(3) Communicate

(4) Conserve

(5) Conform

APPENDIX G

T-39 NATOPS INFORMATION

1. ABBREVIATIONS

AGL	Above Ground Level
ALT	Altitude
AOA	Angle of Attack - units or degrees
AOB	Angle of Bank
ASR	Airport Surveillance Radar
ATA	Actual Time of Arrival
°C	Degrees Centigrade
CAS	Calibrated Airspeed
CFL	Critical Field Length in feet
CG, cg	Center of Gravity in percent of mean aerodynamic chord, MAC.
EPR	Engine Pressure Ratio
ETE	Estimated Time Enroute
°F	Degrees Fahrenheit
FF	Fuel Flow
FOB	Fuel on Board
FPM, fpm	Feet per Minute
G,g	Acceleration due to Gravity
GS	Ground Speed
gpm	Gallons per Minute
HRS	Hours
IAF	Initial Approach Fix
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMN	Indicated Mach Number
IR	Ice on Runway
KCAS	Knots Calibrated Airspeed

KEAS	Knots Equivalent Airspeed
KIAS	Knots Indicated Airspeed
KN or KT	Knots True Airspeed
KTAS	Knots True Airspeed
LB/GAL	Pounds Per Gallon
LB/HR, pph	Pounds Per Hour
LB/HR/ENG	Pounds Per Hour Per Engine
LB/MIN	Pounds Per Minute
LSR	Loose Snow on Runway
M	Mach Number
MIN	Minute
M_{MO}	Maximum Mach Speed
MSI	Mach Speed Indicator
NM	Nautical Mile
OAT, SAT	Outside Air Temperature, Static Air Temperature - Actual air temperature that would be measured with the aircraft at zero velocity. OAT is obtained from meteorological sources. SAT is obtained from in-flight temperature measurement
pph	Pounds per Hour
PSR	Packed Snow on Runway
RCR	Runway Condition Reading
RL	Runway Length in Feet
RSC	Runway Surface Condition
SEC	Seconds
SL	Sea Level
SLR	Slush on Runway
TAS	True Airspeed
TOF	Takeoff Factor
TOGW	Takeoff Gross Weight
V1	Decision Speed (critical engine failure speed)
V2	Safe Single Engine Speed
V_{MCA}	Minimum Controllable Airspeed, airborne (assumes single engine)
V_{MCG}	Minimum Controllable Airspeed, ground (assumes single engine)

V_{MO}	Maximum Operating Speed
V_R	Rotation Speed
V_{REF}	Final Approach Speed at threshold (1.3 x Vso)
V_{SO}	Stall Speed dirty
V_X	Best Angle of Climb
V_{XSE}	Best Angle of Climb, single engine
V_Y	Best Rate of Climb
V_{YSE}	Best Rate of Climb, single engine
WR	Wet Runway, standing water
WT	Weight
ZFW	Zero Fuel Weight
%RPM	Revolutions Per Minute - measured in percent

2. TAKE-OFF

a. Definitions

(1) V1: The speed above which the takeoff is continued and below which the takeoff is abandoned in the event of an engine failure.

(2) Refusal Speed: Used in conjunction with critical field length chart to determine speed at which an aircraft can either accelerate to refusal speed and then stop, or accelerate to refusal speed and continue takeoff while one engine is failed at refusal speed. All available remaining runway will be required to get the aircraft airborne.

(3) V2: Must be not less than 1.1 x V_{MC} or 1.2 Vs and must be attained before reaching a height of 35 feet.

(4) V_R: The speed at which the aircraft is rotated to the takeoff attitude. V_R must not be less than V1 or less than 1.05 x V_{MC}. It must also be high enough to allow V2 to be attained before the aircraft reaches a height of 35 feet.

(5) V_S: The stalling speed or the minimum steady flight speed at which the aircraft is controllable.

(6) V_{MCA}: The speed required to provide sufficient control to fly a straight path over the ground with a failed engine. This speed is based on the engine windmilling, takeoff thrust on the good engine, and no more than 5º bank away from the failed engine. At minimum control speed, it may be necessary to sacrifice altitude for airspeed while putting the aircraft in clean configuration and obtaining sufficient airspeed to climb.

(7) V_{MCG}: The speed at which the aircraft can be controlled on the ground with a failed engine and by use of aerodynamic controls alone. The speed is based on the failed engine windmilling, takeoff thrust on the good engine, the nosewheel off the runway, and use of ailerons and rudder to maintain directional control within 25 feet of the desired path.

(8) V_B: The design speed for maximum gust intensity.

(9) V_F: The design flap speed.

(10) V_{MO}: The maximum operating limit speed.

(11) V_{SO}: Stall speed or the minimum steady flight speed in the landing configuration.

(12) V_{REF}: Final approach speed at the 50 feet threshold height in a normal landing configuration.

(13) Balance Field Length: The distance within which the aircraft can either accelerate to V1 and then stop, or accelerate to V1 and continue to a height of 35 feet with one engine cut at V1.

(14) Critical Field Length: The distance within which the aircraft can either accelerate to refusal speed and then stop, or accelerate to refusal speed and continue takeoff while one engine is failed at refusal speed. All available runway will be required to get the aircraft airborne.

(15) Second segment climb: The aircraft must be capable of maintaining a climb gradient of at least 2.4 % (24 feet per 1,000 feet) with one engine inoperative and the other engine at takeoff thrust.

(16) Third segment climb: May be used for level-flight acceleration at 800 feet above the airport pressure altitude to final takeoff climb speed.

(17) Engine Pressure Ratio: This is the ratio of the turbine discharge total pressure to compressor inlet total pressure. Turbine discharge total pressure is an average pressure taken by four probes manifolded together immediately downstream of the turbine. Compressor inlet total pressure is measured by two electrically heated pitot pressure heads, one for each instrument, mounted on the leading edge of the vertical stabilizer.

(18) RCR: A measure of tire to runway friction coefficient. RCR is given as a whole number. This value is used to define the braking characteristics for various runway surface conditions. The reported RCR is therefore a factor in determining any performance involving braking, such as critical engine failure speed and refusal speed. Some airfields report runway braking characteristics in accordance with ICAO documents, that is, “good”, “medium”, and “poor”. In order to relate these ICAO

categories to an RCR or when RCR values are not available, the following relationship will be used:

RWY CONDITION	ICAO REPORT	RCR
Dry	Good	23
Wet	Medium	12
Icy	Poor	05

(19) Runway Surface Condition (RSC): RSC is the average depth covering the runway surface measured to 1/10 inch (1 inch is equivalent to a RSC of 10). The runway surface condition affects both the acceleration and stopping performance of the aircraft and must be accounted for when determining takeoff and landing data. RSC types are listed below:

- WR Wet runway, standing water
- SLR Slush on runway
- LSR Loose snow on runway
- PSR Packed snow on runway
- IR Ice on runway

(20) Runway Length: Runway length is the paved surface length excluding any overrun.

b. Conditions Affecting Take-Off and ClimbOut Performance

(1) Aircraft Weight

(2) Engine Thrust

(3) Air Density

(4) Wind Direction and Velocity

(5) Runway Gradient

(6) Runway Surface Conditions

3. CLIMB

a. Definitions

(1) Climb Speed: Normal climbs (2 engines) can be made using maximum continuous thrust. When Climbing at maximum continuous thrust, do not exceed 260 KIAS or .69 Mach. EPR must be recalculated every 5000 feet to prevent the possibility of

overboosting the engines at higher altitudes. Safe single engine speed is 133 KIAS. (Based on takeoff thrust on good engine, maximum weight, gear and flaps up, and speedbrake retracted).

(2) Climb Thrust: Climb performance is based on Maximum Continuous Thrust EPR Setting for both 1 and 2 engine operation. This is to be used for climb and acceleration and should not be used for normal operations.

(3) Cruise (Service) Ceiling: Corresponds to a rate of climb of 100 FPM

b. Factors affecting climb performance

(1) Temperature: Variations in outside air temperature from the ICAO standard day (ISA) have significant affects on time, fuel and distance in climb and performance ceilings.

(2) Operation of Anti-Ice Systems: The operation of anti-ice systems during climb will result in decreased climb performance and lower performance ceilings

(3) Engine Loss: The loss of an engine will significantly degrade climb performance and lower the performance ceilings of the aircraft. Time to climb, fuel to climb, and distance in climb will all increase, and performance ceiling will be lowered.

4. CRUISE

a. Factors Affecting Range Performance

(1) Outside Air Temperature: Outside air temperature variations from the ICAO Standard Day have no effect on range when less than rated power is required. However, cruise time and fuel flow will be modified slightly because true airspeed and engine fuel consumption vary with temperature at a given Mach number. These relationships are true whether cruising at maximum range (climbing flight path) or constant altitude. For maximum range cruise where rated power is required (such as 1 engine operation), an increase in temperature means a reduction in range, altitude, Mach number, time, and an increase in fuel flow. For constant altitude cruise at rated power, an increase in temperature reduces the maximum allowable weight and Mach number that can be flown at that altitude.

(2) Wind: When winds are calm, ground speed equals true airspeed. When flying into a headwind, ground speed equals true airspeed less the headwind component. When flying with a tailwind the reverse is true. Additionally, wind affects maximum range values as a result of changes in maximum-range true airspeeds. When striving for maximum range, it is advantageous to reduce the time of exposure to a headwind component and increase the time of exposure to a tailwind component.

(3) Anti-Ice: The operation of anti-ice systems will result in reduced range. The specific effects on cruise performance will depend on the selected range cruise thrust setting.

5. DESCENT

a. Normal Descent

.65 Mach or 300 knots IAS, speed brake closed. Above 22,000 feet establish aircraft rate of descent at 1100 ft/min. Below 22,000 feet establish aircraft rate of descent at 5500 ft/min with idle thrust.

b. Emergency Descent

Used idle thrust, speed brake open. Descend at .77 indicated Mach number or 325 knots IAS, whichever is less.

c. Zero Thrust Descent

Speed brake closed, 170 Knots IAS. At 170 Knots, the glide ratio is about 12.5 to 1 which equates to a glide of about 21 nm for every 10,000 feet of altitude. (Gear down cuts the range in half)

6. APPROACH AND LANDING

- Maximum Landing Weight – 17,500 Lbs
- Single Engine Landing – Add 10 Kts to V_{REF}
- No Flap Landing – Add 10 Kts to V_{REF}
- Slats Inop – Add 15 Kts to V_{REF}
- Landing Distance Considerations (flaps down / optimum braking / speed brake closed/anti-skid on)
  - For each 5 Knots above recommended touchdown speed, increase ground roll by 10%.
  - Speed brake open will decrease distance by 6%
  - For anti-skid inoperative increase distance by 26%
  - There is no allowance for thrust reverser operation

a. Runway Condition Reading (RCR)

RCR is a measure of tire to runway friction coefficient. RCR is given as a whole number. Values vary from 26 (maximum friction coefficient) to 2 (minimum friction coefficient). This value is used to define the braking characteristics for various runway

surface conditions. Some airfields report runway braking characteristics in accordance with ICAO documents, that is "good", "medium", and "poor". In order to relate these ICAO categories to an RCR or when RCR values are not available, the following relationship will be used.

RUNWAY CONDITION	ICAO REPORT	RCR
Dry	Good	23
Wet	Medium	12
Icy	Poor	05

b. Landing With Wind Gradient Or Wind Shear.

Wind velocity is generally higher a short distance above the runway than it is on the runway itself. Entering this wind gradient during the landing approach could result in a change in airspeed which requires correction.

When landing with a headwind, more thrust is required to maintain a desired glide path than is necessary with no wind. Also, the decreasing magnitude of the headwind in the gradient can cause a decrease in airspeed which has to be counteracted with the use of additional thrust to prevent a possible short landing. With a tailwind during the landing approach, the proper glide slope is maintained with a lower thrust setting, and since the magnitude of the tailwind is decreasing during penetration of the wind gradient, airspeed may have a tendency to increase, requiring a reduction in thrust. If these corrective measures are not taken, there is a possibility of over-shooting the runway, necessitating a go-around.

The effect of crosswind will also be considered during the landing approach. As the aircraft approaches the runway, less correction for crosswind may be required to maintain the proper flight path.

The degree of corrective action necessary during an approach is dependent upon the severity of the wind gradient. With a sharp gradient, the change in airspeed could be very rapid, requiring an immediate correction. The combination of wind gradient, plus wind that is intermittent or variable in direction and/or speed, requires caution always be exercised during the landing approach. The corrections below summarize landing data corrections required due to wind effects.

c. Wind Corrections

Accounting for wind in planning the landing requires the wind direction and speed be known. The headwind (or tailwind) and crosswind components can then be determined using the TAKE-OFF AND LANDING CROSSWIND chart in the PCL.

d. Runway Surface Condition (RSC)

RSC is the average depth covering the runway surface measured to 1/10th of an inch. The RSC reduces the stopping distance of the aircraft. No credit should be taken for RSC.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H

FLIGHT PLANNING DATA

T-39 NORMAL THRUST CLIMB

TWO ENGINES

T-39 FUEL FLOW
TWO ENGINES

ALT	TAS	PPH
SL	300	3000
10,000'	300	2400
15,000'	300	2200
	360	2300
20,000'	360	2000
23,000'	360	1900
	390	2100
	420	2200
25,000'	360	1800
	390	1950
	420	2100
27,000'	360	1750
	390	1850
	420	2000
29,000'	360	1650
	420	1900
31,000'	360	1500
	390	1650
	420	1800
33,000	420	1750
35,000'	390	1550
	420	1650
37,000'	390	1500
	420	1600
39,000'	390	1450
	420	1550
41,000'	390	1350
	420	1450
43,000'	420	1300
45,000'	420	1200

ALT (1000's)	TIME (mins)	FUEL (lbs.)	DIST (nm)
10	3	200	12
15	5	350	22
20	7	430	32
21	8	480	38
23	9	500	40
25	10	600	48
27	12	650	57
30	13	780	72
33	16	800	80
35	18	920	102
37	20	1000	118
39	26	1150	147
41	31	1500	233
43	37	1680	265
45	44	1800	305

1. START/TAXI/TAKEOFF CONSUMES 400# (JP-5) AND IS NOT INCLUDED IN ABOVE FIGURES.
2. FUEL REQUIRED FOR APPROACH: 400#.
3. RESERVE FUEL COMPUTED AT 175 KIAS, 10K MSL, 1800 PPH FOR A 14,000# AIRCRAFT IS 600#.
4. TOTAL FUEL: 7200# (JP-5), 6900# (JP-4)
   3+10 FOR VNAV AND 4+00 FOR INAV.
5. DESCENT: ALLOW 30#, 2 MINUTES, AND 10 NM PER 5000 FEET OF ALTITUDE.
6. ENROUTE BETWEEN LOW-LEVELS:
   10.5K, 300 KTAS, 2400 PPH
   16.5K, 300 KTAS, 2000 PPH

THIS PAGE INTENTIONALLY LEFT BLANK