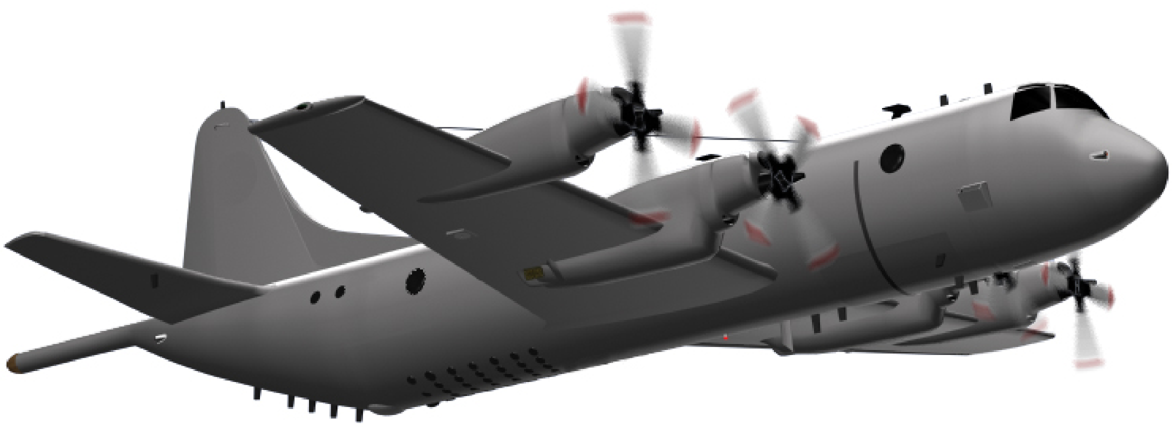
P-3 FLIGHT INSTRUCTOR'S GUIDE



THIS GUIDE SUPERSEDES ISD/WCP JAN 2007

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DEPARTMENT OF THE NAVY
PATROL SQUADRON 30
NAVAL AIR STATION
JACKSONVILLE, FLORIDA 32212-0024

IN REPLY REFER TO:
1542
Ser N00/ 0042
4 Feb 08

From: Commanding Officer, Patrol Squadron THIRTY
To: Commander, Patrol and Reconnaissance Group

Subj: LETTER OF PROMULGATION FOR P-3 FLEET

1. Purpose. The purpose of this letter is to promulgate the VP-30 Flight Instructor's Guide (FIG) to all Fleet P-3 squadrons.

2. Discussions. The VP-30 Flight Instructor's Guide has long been the standard for safe and effective instruction. Compliance with the FIG is a positive approach toward improving training effectiveness while reducing the risk inherent in operating a complex aircraft.

3. Action. All COMPATRECONGRU units shall comply with the FIG during P-3 training evolutions.

R. T. Fite

R. T. FITE

Distribution:
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PREFACE

Scope

This Flight Instructors Guide (FIG) has been prepared to assist the P-3 Instructor Pilot (IP) and Instructor Flight Engineer (IFE) in their daily conduct of training flights (e.g., syllabus flights, IP Dedicated Field Work flights (DFWs), instrument check flights, etc.). It contains training and instructional techniques that supplement material presented in the P-3 NATOPS Flight Manual, the NATOPS Instrument Flight Manual, OPNAVINST 3710.7 series, and the Flight Training Job Aid. It is to be used in conjunction with these sources and does not supersede or contravene any requirements or directives promulgated by NATOPS or other competent authority. The FIG presents the user with proper set-up procedures for some of the “common” malfunctions and predicaments. Nevertheless, instructors must ensure proper aircrew coordination, conduct thorough research, and have a complete understanding of possible consequences when designing a scenario.

A vast majority of the information in this guide was derived from instructor experience; however, some discussions concerning instructor techniques were taken from the FAA Flight Instructor’s Handbook (EA-AC61-16A). This publication may be used to learn more about the fundamentals of teaching and learning in order to improve the effectiveness of P-3 flight instruction.

Updating The Guide

If an instructor feels a particular item should be included in the guide, submit the item to Patrol Squadron Thirty for consideration using the enclosed form. The address is:

Commanding Officer PATRON 30
Attention: FLEET NATOPS Officer
Box 24
NAS Jacksonville, Florida 32212-0024

If you have any questions, please contact VP-30’s FLEET NATOPS Officer, DSN 942-3935/8102/8103/8104, COMM. (904) 542-3935/8102/8103/8104. FAX. (904) 542-1317.

Warnings, Cautions, And Notes

The following definitions apply to “WARNINGs,” “CAUTIONs,” and “NOTEs” found throughout the guide.

WARNING

An operating procedure, practice, or condition, etc., which may result in injury or death, if not carefully observed or followed.

Caution

An operating procedure, practice, or condition, etc., which may result in damage to the equipment.

Note

An operating procedure, practice, or condition, etc., which is essential to emphasize.

Wording

The concept of word usage and intended meaning which has been adhered to in preparing this manual is as follows:

- “Shall” has been used when application of a procedure is mandatory.
- “Should” has been used only when application of a procedure is recommended.
- “May” and “Need not” have been used only when application of a procedure is optional.
- “Will” has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

Change Symbol

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FLIGHT INSTRUCTOR'S GUIDE

P-3 Flight Instructor's Guide

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CHAPTER 1

General Information

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The Flight Instructor

Flight instructors must be fully qualified as pilots or flight engineers without deficiencies or faults in performance. Qualifications, however, must go beyond those required for Patrol Plane Commander (PPC) or crew holding flight engineer. Instructors should be recognized for their professionalism, flight safety, and most importantly their ability to teach. Hard work, preparation, and consistent performance are key instructor attributes.

Flying habits both during flight instruction and related operations have a vital effect on safety. Students will, either consciously or subconsciously, imitate the instructor's flying habits. An instructor who preaches strict compliance with OPNAVINST 3710.7, NATOPS Manuals, Maintenance Instruction Manuals (MIM), and squadron directives and yet is seen violating those directives will have little credibility with students. The adage "Do as I say, not as I do" has no place in flight instruction.

The effective instructor is considerate of the student's point of view and personal interests, carefully plans each period of instruction and is one who can organize the logic of teaching to fit the psychology of the student. The "best instructor" is one who encourages and increases self-confidence; is considerate and easy to talk to; has a good grasp of the subject matter and is able to explain it effectively; is willing to spend extra time when needed and is always ready to compliment good performance. Emphasis should be placed on the following:

1. Punctuality.

2. Confidence building. Recognize and reward superior performance with praise and/or grades as appropriate.

3. Encouragement of further study. Emphasize that continued study is always required.

4. Maintenance of specific notes on each flight while being as unobtrusive as possible.

5. Identification of substandard or unsatisfactory performance. This is the most positive method of drawing attention to weak areas. Failure to do so encourages acceptance of unsafe practices, is unfair to the student and reflects adversely on you as a professional. Be patient and willing to work on substandard areas until the student reaches the level of proficiency required. Repetition is a good and necessary learning process. The vast majority of material presented will be forgotten several times before the students get it firmly in their minds.

6. Allowing the student as much leeway as possible in getting the feel of the aircraft. Keep in mind, however, that it is the instructor's responsibility to ensure that an unsafe situation does not develop.

7. The student needs to assume command of the aircraft at all times unless otherwise directed. Knowledge of the aircraft is not enough when flying the P-3. Aircraft Commanders (AC) must be able to coordinate their crew and make "command" decisions.

8. Do not "gouge" the students. Teach them to fly the aircraft safely, not to pass exams.

The "worst instructor" is one who constantly screams, and belittles the student with extreme sarcasm and personal abuse; uses foul language; constantly rides the controls and emotionally upsets the students while flying and is inadequate in knowledge and presentation of syllabus material. The following apply:

1. Do not harass or threaten the student. Confronted with a threat the student will direct all attention to the elimination of that threat. Statements like "We'll stay here till you get this right," and "Miss it again and it's a down" will be interpreted as threats by the student. These situations usually result in degraded training and performance. A positive and mature approach yields outstanding results.

2. If the answer to a question is not known, then find the answer. When the answer is known, ensure the students are informed. Build your credibility.

3. If a mistake is made, admit it freely. Failure to do so can result in the loss of respect and credibility. Valuable training can be accomplished by a student observing the recovery process when correcting an error.

4. Avoid complacency. A second tour pilot or flight engineer can be just as dangerous in the aircraft as a first tour. Gravity respects neither rank, experience, service, nor friendship.

5. Instructors who conduct both NATOPS checks and pilot training flights must be able to differentiate between evaluating and instructing.

Instructor Training Course

FIUT and VP-30 IUT both include an Instructor Training Course (ITC) whose terminal objective is to "promote effective learning through teaching." For the purpose of the Instructor Training Course, learning is simply defined as a change in behavior as a result of experience. That change may be physical or overt, or it may involve complex intellectual or attitudinal changes, which affect behavior in more subtle ways. Instructors affect this "change in behavior" through their ability to teach. The better an instructor is, the more a given student will "learn" from a classroom lesson, simulator, or aircraft evolution. The definition of teaching is quite complex and involves all the techniques used by instructors to promote effective learning.

At the heart of the Instructor Training Course taught during Fleet IUT are the "Six Principles of Learning." They form the foundation from which the rest of the briefs are derived. The Six Principles are Readiness, Exercise, Effect, Primacy, Intensity, and Recency (REEPIR). Once defined, they weave themselves throughout the fabric of the course.

In addition to the lectures and discussions given during the course, ITC is heavily based on the idea that "Learning is Active" and "People learn by doing". In keeping with this idea, all new instructors are given opportunities to teach in front of their peers. From their experiences, IUTs gain confidence in themselves, polish areas of strength, and strengthen areas of weakness or deficiency. By the end of the course, the IUTs should have a clear understanding of what it takes to be an effective instructor.

The Six Principles of Learning

The Six principles of learning, although based on theory, may be applied to any teaching situation encountered by instructors. From the classroom to the aircraft, the ability to maximize these principles will greatly enhance instructional effectiveness.

Readiness: It is about motivating the student not the preparation of the instructor. It is the instructor's responsibility to ensure the student is presented a strong clear purpose, and a definite reason to learn. A properly motivated student will meet the instructor halfway and is eager to learn. Hazreps and sea stories are a couple of the many techniques used to ready the students. Motivate!

Exercise: The principle of exercise states that those skills most often repeated are best remembered. It is difficult for the mind to retain, evaluate, and apply new concepts or practices after a single exposure. Every time practice occurs, learning occurs. "What I hear, I forget." "What I see, I remember." "What I do, I understand." Realizing this, an instructor can see how important getting a student to perform "skill" based tasks as early as possible is to effective learning. A student may be able to repeat the checkpoints around the landing pattern with all the associated speeds and briefs, but until he or she actually gets into the aircraft or simulator and performs and practices these tasks, learning will not occur.

Effect: The principle of effect is based on the emotional reaction of the student. It states that learning is strengthened when accompanied by a pleasant or satisfying feeling. From the tone set during the brief, the malfunctions presented in-flight, and throughout the debrief session, instructors must be mindful that the words and actions perceived as non-constructive, negative, or harmful will hamper the learning process. Admittedly, there will be times when an instructor feels that negative effect is warranted, however this should be considered the exception rather than the rule. Positive constructive feedback strengthens the learning process.

Primacy: Primacy, the state of being first, often creates a strong, almost unshakable, impression. For the instructor this means what is taught must be correct the first time. Unteaching is more difficult than teaching. From appearance to how to demonstrate a three-engine landing, the instructor never gets a second chance to make a first impression. With that said, if a demonstration is done incorrectly or poorly, it is the instructor's job to "come clean," admit the mistake, and re-demonstrate the proper procedure or techniques correctly. A failure to do so reduces the instructors credibility as well as reinforces the bad habit or incorrect procedure. Teaching correctly the first time sets the foundation for future learning.

Intensity: Exciting or dramatic experiences teach more than routine or boring experiences. A student is likely to gain greater understanding of three engine landings and EFBRs by performing them rather than merely reading about them. For instructors, this means getting students into the airplane or simulator whenever possible.

Recency: Items most recently learned are the best remembered. Instructors must realize that key points must be reemphasized time and time again if they are to be remembered. In addition, instructors must be aware of when a student last flew an event. This will certainly dictate the amount of proficiency one could expect early on during a flight.

The Student

When developing the Instructor-Student relationship, instructors should never forget that they too were once a student. Self-respect, peer pressure, and the student's environment all affect performance. The instructor's objective must be to assist the student toward the goal of qualification. Several factors directly affect a student's ability to receive instruction. Recognize and then effectively deal with these factors in order to maintain a safe and constructive training environment. Utilize the different instructional techniques presented in the Fleet Instructor Training Course (FITC) to teach various levels of students. Students have different learning habits, so have a set of various instructional tools available to convey your teaching points.

Student Anxiety

Anxiety is probably the most significant psychological factor affecting flight instruction. Anxiety results from the fear of something, real or imagined. Some students affected by anxiety will react appropriately and more rapidly than they would in the absence of anxiety. Many on the other hand may be frozen in place and incapable of doing anything to correct the situation that has caused their anxiety. Others may act without rational thought. Both normal and abnormal reactions to anxiety are of concern and should be discussed. Causes for anxiety are not always aviation related; however, anxiety will always affect a student's performance.

Student Fatigue

An instructor must be alert to signs of student fatigue. This is evidenced by disinterest, slow reactions, and uncharacteristic or random errors. When such a state is observed, the flight should be terminated. Definite measures will minimize the incidence of fatigue during flight instruction. The most important of these is to maintain the student's interest. This may be accomplished by limiting repetitive maneuvers and evolutions previously learned to a reasonable level – taking the controls, shooting approaches, and full stop landings can be used to break the monotony and help maintain a student's focus.

Flight Instructor Fatigue

Instructor fatigue is potentially very dangerous. An instructor must be mentally and physically alert at all times and be aware of personal limitations. Extending the work day excessively prior to flight duties is considered poor headwork.

Effective Instruction

A flight instructor must be clear on the training evolution's objectives. Establish the primary objectives and organize the teaching methods and activities to achieve these goals.

Effective instruction involves four basic steps:

1. Preparation.
2. Explanation and demonstration/Presentation.
3. Application. (Trial and performance)
4. Review and evaluation.

To accomplish the necessary training, the instructor must draw a fine line between simulated and actual flight conditions. Simulating the loss of warning devices, navigational aids, and aircraft systems, while their full operation is obvious to the student, is quite different from an actual malfunction. The flight simulator is a valuable tool for presenting the majority of the malfunctions germane to the P-3. It also is a tremendous asset to bolster decision making and headwork during challenging scenarios. Yet, due to its low fidelity it does not provide a full substitute for flying the aircraft. In a simulator, particularly in the ditching and landing environments, the student's knowledge that an unprofessional action will not truly jeopardize his life, or the lives of the crew, is a fact that cannot be eliminated from the student's mind. To ignore this fact is to invite tragedy. These critical areas of flight should be the focus of training conducted in the airplane.

A professional instructor, through a combination of simulated and actual conditions, can achieve an effective training environment. Through initiative and theatrics, the instructor can further develop the situation to approach "real world." Caution must be taken when this simulated situation borders on becoming an actual problem. A distraction to either the student or the instructor can force it beyond this point. How far an instructor allows the situation to deteriorate is purely a judgment call based on instructional training, experience, and the student's ability.

Effective Questioning

The evaluation of the student's learning is continual throughout each period of instruction and involves more than simply presenting an instructional scenario. Direct questioning is necessary for determining the student's knowledge and understanding as well as judging the effectiveness of instruction given. Furthermore, it aids in planning the emphasis and pace of subsequent instruction.

Effective questioning requires preparation. Questions that are ambiguous or not clearly associated with the subject at hand are of little value and can be confusing or frustrating for the student.

Questions should be created to gauge a particular area, or aspect, of the student's knowledge. For example:

- Knowledge — "What brings on the FUEL PRESS LOW light?"
- Procedural — "What procedures do you execute with an illumination of the FUEL PRESS LOW light?"
- Understanding — "Why do we check for visible fuel during the FUEL PRESS LOW procedures?"
- Thought Process — "What future aircraft malfunctions might be expected following the illumination of the FUEL PRESS LOW light?"
- Headwork/decision making — "While on station at 500 feet AGL, you gain radar contact, as you turn the aircraft inbound, the #4 FUEL PRESS LOW light illuminates. What actions are you going to execute and how do they affect your ASW mission?"

A common instructor error is asking far too many knowledge, or "evaluation", questions – i.e. "what temperature does that light come on at?" and not asking more questions that gauge the student's understanding of the system, procedure, situation, or how it may affect the mission. Effective questioning requires the instructor to create objectives and devise a strategy that leads students to better understanding of the topic while developing their critical thinking and decision-making skills.

Good instruction involves asking questions that focus a student's thoughts on the objective and, which help teach rather than simply ask the student to recall bits of information. When properly planned and executed, effective questioning can help tie together ideas or guide the student to connect their learned knowledge to better understand a concept or situation. This understanding should lead to better decision making during a mission.

Another important facet of effective questioning is: understanding that different people learn in different ways. Some comprehend ideas in very structured ways while others need analogies or less structured ways to understand a concept. The goal is to get every student to the same point – to do that, it often takes varying questioning tactics to help students connect a sequence of information/variables to form a plan of action.

Asking: "Do you understand?" or "Do you have any questions?" has no place in effective quizzing. Few students will opt for further discussion when given this "out" by the instructor.

Other typical types of questions that should be avoided are:

- The puzzle — "What actions do you take, if during an in-flight restart of the number one engine, the paralleling light on the number four engine comes on?"
- The oversize — "What do you do before you ditch?"
- The toss-up — "Should the red TIT over temperature light come on at 1078 or 1080 degrees?"
- Bewilderment — "Since the fuel control gets 120 percent of engine fuel requirements and 20 percent is normally by-passed and since the TD system is capable of taking 50 percent of the fuel in the start limiting range, is the 50 percent that the TD system takes 50 percent of 100 percent which is 50 percent or 50 percent of 120 percent which is 60 percent or 50 percent plus the 20 percent which is 70 percent?"

"Gotcha" questions only put the student on the defensive and should be avoided at all times. The student might soon develop the feeling that (s)he is engaged in a battle of wits with the instructor, and any meaningful training could be lost.

CHAPTER 2

General Flight Training Procedures

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Planning a Training Flight and Scenario Writing

Preparation is the key as spontaneous scenarios are rarely successful. A good scenario can take several hours to prepare, especially the first few that an instructor compiles. More unauthorized malfunctions are conducted when scenarios are planned at the last minute. The IP and IFE must not make last minute changes unless they completely and thoroughly understand all of the implications. For example, failing Bus B with TR 1 already pulled is a completely different and a more compound emergency than failing Bus A with TR 2 already pulled (aircraft flight controls will become gust-locked).

Complete understanding of each event by all instructors is absolutely essential. An event labeled "Fails-to-Feather number 4" is insufficient. Both instructors should know how far into the fails-to-feather procedure they intend to proceed and what specifically caused the fails-to-feather. This type of planning should occur before the evolution begins.

To improve the quality of a training evolution the IP and IFE must consider the following:

1. Has the malfunction ever actually happened to a P-3 flight crew? Past hazard reports are an excellent source of material for training evolutions.
2. Is the evolution being presented as realistically as possible? Are the ICS calls realistic?
3. Does the scenario represent the proper degree of difficulty and challenge for the experience level of both the TP and TFE?
4. What are the teaching points? Does this portion of the scenario teach headwork and decision making, system operation and troubleshooting, CRM, system components, a local SOP or Stan Note, aircraft limits, or reemphasize a NATOPS procedure?

Once the desired simulations have been selected, ensure they are written down in a logical flow in the order of occurrence. This list of malfunctions and emergencies will provide continuity throughout the scenario as well as ensure that each instructor understands completely what is to be simulated and to what extent. A well written scenario is key to a successful training flight and is not just a list of malfunctions.

A well written scenario states the malfunction or emergency to be simulated, the set-up procedures required, clean-up procedures, and any particular notes to be covered during the simulation. Enough space should be left for the instructor to track trends and notes to readdress during the debrief session. Each malfunction or emergency simulated should have a valid teaching point associated with it. In addition, a section should be created to track trends at various points of the landing pattern. Well-written scenarios should be used during OFT training as well as training events in the aircraft. Scenarios for OFT events include more complex malfunctions because of the reduced safety concerns. A thoroughly planned scenario will aid in providing good instruction in a timely manner. The FITC scenario writing course provides numerous examples of both well and poorly written scenarios.

WARNING

Deviation from the established plan of action, may result in unintended situations that negatively affect safety of flight. If a simulation is not proceeding as previously planned, stop the scenario and discuss the discrepancy. If unforeseen modifications need to be made to the scenario, it is mandatory that these changes be thoroughly discussed and understood by each instructor before proceeding.

Prior to flying with a student for the first time, the instructor should review the training jacket. This jacket contains a wealth of useful information. Pay particular attention to personal history and trends on grades, noting areas of weakness including unsafe tendencies. If a jacket review is not possible, talk to other instructors who have flown with the student. Any information gained prior to briefing and flying with the student will be of benefit.

Flight Time Utilization

The IP and IFE must make every effort to use scheduled syllabus time in the most efficient manner. It is the instructor's responsibility to ensure that all required items on a gradesheet are completed and that each is allotted an appropriate portion of the scheduled time period. A method to maximize time management is to utilize combined malfunctions in a scenario. Combined malfunctions, for example, a fuel system malfunction tied to an inflight restart malfunction, are not compound malfunctions. Time should be allotted for a quick debrief and instructional points following each portion of the scenario. These inflight debrief points provide the student with immediate feedback and should be readdressed or amplified after the flight. Items not covered should be so indicated on the gradesheet to provide continuity during future training evolutions.

Time management is critical. Instructors must consider the amount of time each step in the scenario will require. To ensure both TPs receive all possible training, compatible scheduling of different syllabus events should be conducted. With proper use of the simulator for high work training, a 70-30 percent split between low and high work is typically appropriate on a training flight. Conversely, simulators should have a 30-70 split between low work and high work.

Allocate the flight training time equitably between the TP and TFE. Effective teamwork and CRM should be stressed and independent action discouraged. IPs who attempt to shortcut high work time in favor of more time in the landing pattern in the simulator will jeopardize the future level of expertise for both the TP and TFE. However, extended high work time in the airplane focusing on systems and procedures, unnecessarily curtails pilot training in basic airmanship. Expert system knowledge is of little interest to a TP attempting to land with a 15 knot crosswind in heavy snow at night. High work systems simulations should be conducted primarily in the simulator. Evolutions that can not be effectively reproduced in the simulator, due to the lack of fidelity, should be the foundation for the training conducted in the aircraft. A vast majority of pilot and FE systems and procedures training is accomplished during the high work scenario in both the aircraft and simulator.

The Brief

The instructor should conduct a brief prior to each evolution. Allow a minimum of 30 minutes for the brief and be prepared to discuss all aspects of the forthcoming evolution.

The purpose of a brief is to:

1. Determine if the student's knowledge is at the proper level for the ensuing event.
2. Check student's motivation as it pertains to study habits.
3. Develop a good line of communication with the student.
4. Impart knowledge by raising specific procedural and systems questions and providing answers and explanations to those questions asked by the student.
5. Expand system and procedural knowledge necessary for the evolution.
6. Review syllabus items to be covered.
7. Allow the student to "chair fly" the event prior to the event, correcting any mistakes to minimize the chance of reoccurrence during the flight.

The Debrief

Ensure each event presented has a detailed and comprehensive debrief. Feedback is essential to the training. Students must understand where their mistakes were committed and what action is needed to correct them. Just as important, ensure the debrief stresses the students strengths and what they did well. A debrief that is all good or all bad is destructive and will hinder the students progress. An effective debrief can only be achieved with thorough note taking by the instructor. Any trend detected must be discussed. Every effort must be made to debrief the event as soon as possible. Instructors should remain objective, flexible in presentation based on different student personalities, organized, specific and constructive.

The IP and the IFE are encouraged to conduct a short debrief together with the students discussing areas of common interest, (i.e. crew coordination, safety of flight issues, etc).

Grading

Fill out a gradesheet for each event. Be as specific as possible, since gradesheets are the best means of documenting performance and trends.

One of the most important but difficult functions an instructor will encounter is judging the performance of students. This evaluation must be based on the standards set for the minimum criteria for the average student at that stage in the syllabus. By observing other instructors and noting their evaluations, newly designated instructors can quickly establish a valid basis for their own critiques. NATOPS evaluation criteria is the baseline performance standard. There will be subjectivity inherent to each evaluation process, but the quantitative measures established by NATOPS are the standards instructors must train towards. The experience and judgment of the instructor are the final criteria. The following apply:

1. Do not grade items not observed. This introduces errors into the training system and may adversely affect the individual's development if these items are not covered during a later event.

2. Do not use grades to motivate. Remember, significant improvement in a previously weak area does not in itself constitute performance that exceeds the standard criteria..

3. Do not average out grades. Call them as you see them.

4. Compare co-pilot performance with co-pilot standards and pilot performance with pilot standards. Satisfactory performance for a co-pilot may not meet the standards for a pilot. (CH 26 NATOPS)

Marginal students should never be advanced to the next event with the hope that someone else will give them the "down". Any performance that does not meet the minimum requirements should be judged unqualified. Be alert to detect those individuals who do not measure up to the performance standards required for P-3 operations. Examination grades, flight grades, and personal observations are the only means of detecting substandard performance, which cannot be accepted. Consistently unsatisfactory performers should be evaluated as such and redirected to other areas more fitted to their particular abilities.

Crew Resource Management

Coordination between instructors is absolutely essential to eliminate confusion. When the IP and IFE are pursuing unrelated areas of instruction with their respective students, they must keep each other advised of simulated emergencies, induced equipment malfunctions, or actual emergencies. Make every effort to promote teamwork between the TP and TFE.

Occasionally, a disagreement may arise over the interpretation of a procedure. Argument between instructors will do no more than thoroughly confuse the TP and TFE and result in a loss of confidence in both instructors. If there is a difference of opinion, drop the subject and resolve it after the flight. When the correct information is known, ensure the TP and TFE also have the correct information.

During the course of instructional flights, the TFE will carry out the commands of the TP unless directed otherwise. Proper CRM is just as important as systems and procedural knowledge and should be taught, evaluated, and debriefed during the event.

Although conversation within the flight station is not normally carried out over the ICS, the TFE shall have a mike and headset available at all times.

Safety of Flight

The instructor pilot is responsible for the safe conduct of the training evolution and shall ensure that no practice, maneuver, or simulated emergency is carried to the extent that safety of flight is jeopardized. The instructor pilot shall control the training evolution in accordance with the scenario and in strict coordination with the instructor flight engineer.

Note

Use of HAZREPS is worthwhile, and should be the primary source for building realistic and challenging scenarios both in the aircraft and the simulator. This guide provides a foundation of malfunction set-up procedures for scenario based training in the aircraft. Any malfunction or emergency set-up not specifically outlined by this guide should be thoroughly briefed by the IP and IFE prior to the planeside brief and scenario execution.

Consideration should be given to not scheduling training flights in excess of 4 hours. Flights longer than 5 hours may result in degraded training due to aircrew fatigue.

In order to avoid the possibility of degraded performance and safety awareness, consideration should be given to canceling flights that are not airborne within 5 hours of the scheduled preflight time.

There is a temptation on instructional flights for crew members in the flight station to relax their outside scan. It is the responsibility of the instructor pilot to use extra trainees aboard as flight station lookouts and to ensure that other crew members are occupying aft lookout stations. In this regard, instructors should avoid long systems discussions that detract from the normal responsibilities of the students to see and avoid other traffic.

Airmanship

Basic Airmanship is a major teaching point that needs to be stressed. IPs should allocate portions of their training to bolster TP's basic airmanship. Focus should be on instrument procedures as well as tactically maneuvering the aircraft. This can be accomplished on training flights with more of the systems malfunctions being incorporated into the simulator without jeopardizing TFE training.

Use of Demonstrations

Instructors introducing new items into the syllabus are encouraged to demonstrate as well as talk about the new item in order for students to get the full benefit of their knowledge and experience. Students should follow along on the flight controls during these demonstrations in order to receive the physiological feedback of manipulating the flight controls. Properly demonstrated maneuvers serve as an excellent instructional technique and also keep the IP and IFE current and proficient. Background information such as supporting performance data should be discussed during the brief. Prior to conducting a demonstration, brief the required items from the inflight job aid card, or brief the low work item as discussed later in this document. Inform the upgrader of important teaching points you want them to take away from the demonstration. During the actual maneuver pick two to five teaching points to focus on, to include the physiological aspects of airmanship.

Simulating Emergencies and Malfunctions

The TP and TFE are probably anxious about any possible emergency or malfunction. The instructors should attempt to reassure and reinforce them by emphasizing that emergencies (i.e., those problems requiring immediate action) are much less common than malfunctions. The TP and TFE should learn to differentiate between the immediate responses required by emergencies and the timely analysis appropriate for malfunctions. Do not force the TP and TFE to treat everything that happens as an emergency.

It cannot be overemphasized that the most critical element involved when failing an aircraft system is the instructor's knowledge of what they lost, and what the ramifications are if the student reacts irrationally, or if an actual system malfunction occurs.

The IP and IFE must be fully alert and completely aware of what is occurring in the flight station at all times. During simulated malfunctions, the IFE should be defensively positioned in the flight station relative to switches, feather buttons, or emergency shutdown handles most likely to be used by the TFE in response to the malfunction. Students under stress will not always react in a predictable manner, so be alert! It can be uncomfortable to have the TFE call out "LOW POWER number 4" when the simulated malfunction is a low power on number 1. In this instance the IFE or IP must be alert enough to determine if the TFE's call was a real "LOW POWER" or just a good case of TFE nerves. Each simulated malfunction must be completed and cleaned up prior to moving on to the next area of discussion.

Simulated Malfunctions and Emergencies

It is imperative that all simulated malfunctions and emergencies are conducted within the limits of aircraft performance and the instructor's own abilities. Coordination with the ITC or INAV prior to and during crew drills is paramount to safe and realistic simulations.

It must be realized that this guide cannot cover every malfunction that can be simulated in flight. Consideration must be given to the instructor's abilities when selecting malfunctions to present to the TP and TFE.

Simulations that require engine shutdown or setting up major system malfunctions:

1. Shall have an IP and IFE on board.

WARNING

Safety of flight considerations dictate that major systems or component malfunctions shall not be set up by the IFE if he is occupying the FE seat.

Note
Flight Engineers in the IUT syllabus may set up malfunctions provided the following:

- A qualified IFE is in the FE seat.
- The qualified IFE has reviewed the scenario with the IP.
- The IFE in the seat shall ensure proper malfunction set-up prior to execution.

Note
Pilot training/proficiency flights on which only the rudder boost shutoff valve circuit breaker (K13) is pulled or any engine simulated out/no-flap landing practice require only an IP and a qualified FE.

2. Shall not be given during hours of darkness or under actual instrument conditions.

Note
Flight instrument malfunctions are not considered "major systems malfunctions" but are subject to the following restrictions, and apply to all IP's and designated Instrument Check Pilots:

- FDI circuit breakers shall not be pulled under IMC.
- Pulling the HSI and/or FDI circuit breakers during hours of darkness is approved.
- IFE's are not required for Instrument Check flights requiring the pulling of HSI and/or FDI circuit breakers.

3. Should not be conducted in high density traffic areas when doing so would jeopardize the safe conduct of the flight.

Note
Consideration should be given to delaying NTS checks, drills, simulated emergencies and malfunctions until clear of high density traffic areas. This does not preclude engine-out and no-flap work in the landing pattern.

4. Shall not be conducted in fuel pits.

Compound Malfunctions

Compound simulated malfunctions (two or more unrelated malfunctions concurrently for training purposes) shall not be incorporated into scenarios.

Compound emergencies may jeopardize safety and have the effect of unnerving the TP and TFE, decreasing their capacity to absorb further instruction. Common sense and good judgment must prevail at all times during training operations. However, combined malfunctions (for example, a fuel system malfunction tied to your in-flight restart malfunction) are not compound malfunctions.

Technique versus NATOPS

Instructors must ensure that in the course of instruction the students do not confuse technique or recommended procedures with established NATOPS procedures. The instructor must be explicit in the presentation, and clearly delineate required procedures. Technique is okay to teach, but allow for other styles as long as they comply with NATOPS.

Use of Emergency Shutdown Handles

No engine shall be secured in the landing or instrument approach pattern, below 1500', or on the active runway unless an actual malfunction occurs and then only upon the IP's command.

Use of the HRD Buttons

Occasionally the HRD button will stick behind the plastic shield adjacent to and surrounding the HRD button. The IFE shall physically check the HRD button prior to resetting the circuit breakers. If not checked the respective HRD may discharge when the circuit breakers are reset.

Opening of Exits In Flight

The main cabin door or the overwing exits shall not be opened in flight for simulated malfunctions or demonstrations.

Securing Of Electrical Busses

1. The monitorable essential busses shall not be secured in flight.
2. During in-flight fire of unknown origin drills, the Fuselage Fire or Electrical Fire of Unknown Origin checklist may be performed only through the securing of Bus A. All subsequent steps shall be simulated. During evolutions with a tactical crew

embarked, the IP shall coordinate with the ITC/INAV prior to planeside as to the timing and effect of planned bus losses.

3. Bus A and Bus B shall not be turned off at the same time.

Pilot Training with Tactical Crew Embarked

Touch and go landing practice is authorized with a tactical crew onboard at CO's discretion. If a full low work evolution is planned, the tactical crew should be disembarked.

Use of Command Bell

The command bell may be used for all drills provided it is prefaced by announcing "This is a drill" and no passengers are embarked.

IP Vacating Seat

The IP or another qualified PPC shall occupy the pilot or copilot seat anytime the aircraft is operating below 1000 feet AGL. All pilot in-flight seat swaps shall be accomplished at or above 1000 feet AGL. The IFE shall be in the flight station with his headset on any time the IP has left the flight station. FE's may swap seats above 500' AGL.

Power Control

The TP may request the TFE to make power settings at any time during the flight. During training however, the TP should be encouraged to handle power either after passing the final approach fix on a non-precision instrument approach or on the glide path for a precision approach. In the VFR landing pattern the TP shall, as a minimum, handle the power after the initial power reduction at the 180 position. The TFE may be requested to maintain any desired cruise power at altitude or to set power during actual or simulated foul weather approaches.

Actual Malfunctions During Training

Always be alert for actual malfunctions that may occur when simulations are in progress (e.g. if securing the Bus A monitoring switch results in the loss of MEAC, etc.). If an actual malfunction occurs, the IP/IFE should inform the crew that the malfunction is actual and direct the instructor flight engineer to clean up from any ongoing simulated malfunctions. The instructors should handle the malfunction and evaluate if they can resume training after the situation has been resolved. If training is resumed, it should commence at the next simulation. Resuming training in a simulation that ceased due to an actual malfunction is not recommended due to inadvertent consequences, i.e. a discharged HRD bottle after cleaning up from an engine fire simulation.

Note

Instructors may allow the TP and TFE to be involved in handling the malfunction but at all times the instructors should make it clear to all participants that the malfunction is actual.

Instructor Pilot Defensive Positioning During Takeoff and Landing

The following describes the recommended defensive position techniques:

1. Right hand around, but not riding, the yoke.

2. Feet on, but not riding, the rudders.

3. Left hand monitoring the power levers. On downwind and base, placing the left hand behind the power levers is sufficient. On final and in the flare, the IP's hand shall be on top of the power levers. This is the safest way to ensure that:

    a. All power levers stay together.

    b. The power levers are not brought over the ramp with the nose wheel still in the air.

    c. Simulated feathered engines' power levers are closed out in the flare.

    d. One power lever is not left in the flight range during simulated engine out landing reversal.

Note

Although always ready to take control of the aircraft, the IP should not be so defensively oriented that he interferes with the TP's efforts to control the aircraft.

CHAPTER 3

Ground Training Procedures

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Preflight Inspection

It is the responsibility of the IP and the IFE to ensure that a complete and proper preflight is performed. This is accomplished through coordination with other crewmembers, review of outstanding and previous discrepancies, and a check of the aircraft preflight inspection forms. In addition, the IP and IFE should ensure upgraders understand the different components of the Aircraft Discrepancy Book, how Maintenance Action Forms are processed, and how aircraft discrepancies may affect various missions.

During early stage flights, the IP and IFE should demonstrate proper preflight procedures. If more than one TP and one TFE are available, the TP and TFE flying first will normally preflight the inside of the aircraft and set up the cockpit while the second TP and TFE preflight the outside. Aircraft walkthrough and outside preflight teaching points should focus on developing the upgrader's knowledge and situational awareness as well as promote system discussions. Inside walkthroughs should concentrate on understanding of energized equipment during minimum crew evolutions in order to execute the firebill and to quality check ADB gripes. Outside preflights should help the TP/TFE begin to formulate their own database of expected conditions and potential hazard areas.

Plane Side Brief

The plane side brief is normally given by the TP first flying. A sample plane side brief is covered in the flight training job aid.

In addition to the items normally covered, the IP shall ensure that all flight station personnel understand that there will be no engines actually shutdown in the landing or instrument approach pattern, below 1500' AGL, or on the active runway unless an actual malfunction occurs and then only upon the command of the instructor pilot. The instructor pilot should also brief the crew of the plan of action if an actual malfunction occurs during simulated training. The students should be briefed on their expected use of CRM, aircraft equipment, and training aids.

Engine Start Procedures and Malfunctions

The sequence of events for engine starts will be conducted in accordance with NATOPS and the Pilot/FE Training Job Aid.

Note

If performing the torch or engine fire procedure on the aircraft, it is recommended to exclude the aft observer or the lineperson in order to minimize confusion with possible actual malfunctions.

Common errors:

1. TP fails to back-up the TFE during engine starts, or fails to monitor rotation and the lineperson.
2. TFE secures APU without engine driven generator on line.
3. TFE secures APU without checking the EGT.
4. TP fails to place hand on the nosewheel during engine starts.

Motor Over Procedure

In case the engine needs to be "motored over," do the Abbreviated Before Start checklist to the step "Fuel and Ignition Switches." Motor the engine, after rotation has stopped, turn on the fuel and ignition switch and complete the Abbreviated Before Start checklist. This procedure may be done only when the entire Before Start checklist has been completed.

Engine Fire On The Ground Procedures

The TP and TFE are required to know and perform the first two steps of the Engine Fire on the Ground checklist and then complete the entire checklist beginning with step 1.

Common errors:

1. TP calling for the Emergency Shutdown checklist.
2. TP continuing taxi.
3. TFE not pushing the HRD button.
4. TFE not waiting for the pilot's command to transfer and discharge the alternate bottle.
5. TFE opening the HRD transfer switch but not moving the switch to alternate.
6. TFE actuating the APU HRD vice alternate switch for engines 3 and 4.
7. TFE not fuel chopping the engine being started if the fire occurs on another engine during start.

Taxi Procedures

Taxiing should be done in accordance with the procedures in NATOPS and the Pilot/FE Training Job Aid.

Common errors:

1. Reversing as aircraft moves out of the chocks.
2. Leaving power levers in the reverse range after stopping the aircraft.
3. Failing to set the parking brake properly whenever the aircraft is stopped.
4. Leaving power levers too far forward, necessitating excessive use of brakes.
5. Not using the brakes but using excessive reverse to maintain a safe taxi speed.
6. Using the inboard brake during a fully deflected turn.

CAUTION

Do not use the inboard brake during a fully deflected turn. This is a pivot on the strut, meaning one wheel will turn backward and the other forward. Locking the brake at this time will create a severe twisting moment in the area where the gear bolts onto the wing causing possible fuel leaks.

7. Using excessive reverse with engines in low rpm causing excessive TIT and /or rpm decay.

Note

The IP should position his hand on the base of the power levers during taxi. Check TIT when power levers are retarded towards reverse. Block power levers as necessary.

8. Checking the HSI, turn and bank indicators in the line area.
9. Failing to straighten the nose wheel before stopping or parking the aircraft.
10. Losing centerline control during briefs or control checks.

Brake Tapping

Tapping the aircraft brakes at high speeds is a severe hazard and may result in a blown tire and tire separation. IPs must be alert for brake tapping. In the aircraft, the IP should follow the rudder pedals during the flight controls check as an aid to recognizing this problem. In the OFT, the brake indicator hold function may be used. Prior gradesheets should point out any trends.

If brake tapping is suspected, stop the aircraft, set the parking brake, and attempt to correct with seat and/or rudder pedal adjustment. If unable to correct, limit runway malfunctions to four engines until a simulator period can be scheduled.

Note

Habitual brake tapping should be corrected in the simulator. Additionally, the IP shall ensure that all gradesheets thoroughly reflect this problem along with any suggested cures.

Right Seat Taxi Procedures

The IP should be proficient in taxiing the aircraft from the right seat. The recommended right seat taxi technique follows:

1. Use differential power to control heading.

Note

Consideration should be given to shifting inboard engines or, if needed, all engines, to normal rpm.

2. If differential power is insufficient to maintain centerline, use occasional light braking, but do not ride the brakes.

3. Scan down the taxiway/runway. Concentrating on the centerline immediately in front of the nose causes over corrections.

Propeller System Demonstration (Ground)

This demonstration is designed to be performed on the ground and to show the functions of the autofeather system, feather button, static unfeathering procedures, airstart blade angle system, low pitch stops, and Beta scheduling. During briefs, ensure that the TP has a basic understanding of these systems. Prior to engine starts, perform the demo as follows:

CAUTION

When ambient temperature is near or below 0 degrees centigrade, unnecessary static cycling of propeller blades should be avoided. In these circumstances this demo should be performed at the end of the flight when oil temperature is sufficient to prevent blade seal damage.

1. Visually clear the propellers.

2. With the TP in the pilot's seat, arm the autofeather system and review its functions. Push the number 1 power lever to 90 degrees coordinator. Note the number 1 propeller feathering and the number 1 autofeather light on. Deactivate the autofeather system.

3. With blade angle at feather discuss what happens when the feather button is pulled to the unfeather position.

4. Unfeather the number 1 propeller. TP observes blade angle decreasing and then cycling around 45 degrees as the NTS INOP light flashes.

CAUTION

- Feather pump operation limits: Equal time on and off, not to exceed 60 seconds continuous operation. Maximum accumulated time during any 30 minute period is not to exceed 2 minutes.

- Explain to the TP that if the feather button is released during the static unfeather cycle above 10 degrees blade angle, the propeller should be refeathered to prevent damage to the pitchlock teeth.

5. Discuss overriding the 45 degrees protection and depress and hold the PCO. TP observes blade angle decreasing to 22.5 degrees.

6. Discuss the purpose of beta follow-up and the fact that it sets minimum blade angle as scheduled by power lever position. Move the power lever to flight idle. TP observes blade angle decreasing to 13 degrees. Discuss the low pitch stop relationship to minimum beta follow-up setting of 11 degrees.

7. Move power lever to maximum reverse. TP observes blade angle decreasing to -13 degrees. Discuss how blade angle is scheduled by power lever position in the beta range and reposition the power lever to the ground start position.

8. Discuss what would happen if the PCO were released any time blade angle is below 45 degrees. Discuss reasons for releasing feather button prior to releasing PCO.

9. Discuss the importance of checking the FE when he unfeathers a propeller in-flight and the result of pulling out on the feather button of an operating engine.

CHAPTER 4

Takeoff Training Procedures

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Takeoff Procedures

Normal takeoffs shall be in accordance with NATOPS. The training syllabus gradesheets outline the types of takeoffs required.

Common errors:

1. TP fails to adjust the rudder pedals properly. This is a critical item especially as the TP progresses to takeoff malfunctions. Ensure the TP extends the leg during rudder application and that the natural extension of the foot does not result in a brake application. Once the takeoff roll commences, only the "ball" of the foot should be on the rudder pedal.

2. TP does not place "heels on the deck" prior to commencing the takeoff roll resulting in an inadvertent brake application and possibly a blown tire.

3. TP continues to use the nose wheel steering after the rudder is effective resulting in undue stress on the nose gear.

4. TP grips the power levers and does not allow the TFE to set power.

5. TP removes right hand from the power levers prior to simulated refusal speed or fails to remove hand at simulated refusal speed.

6. TP does not apply sufficient yoke back pressure at "rotate."

7. TP over rotates.

8. TFE fails to set oil coolers for takeoff.

9. TFE advances power too rapidly or does not have power set by 80 knots.

10. TFE scans TIT when SHP limited or scans SHP when TIT limited.

11. TFE pulls RAWS circuit breakers without pilot concurrence or validation of an erroneous RAWS indication.

12. TFE fails to secure autofeather system once gear is safely up or prior to the initial level-off.

Takeoff Malfunctions Prior To Refusal

One of the most critical and potentially dangerous syllabus evolutions is the takeoff malfunction. That the malfunction is simulated does not reduce the danger of the situation. The necessity for an alert, proficient IP is even more evident when one realizes that a problem can be quickly complicated by an unexpected reaction on the part of the TP or an actual aircraft malfunction.

During the brief, discuss the definition of and basis for refusal speed and utilize NATOPS performance charts for the determination of refusal speed. Understanding this will help the TP realize the flight control, power lever and wheel brake inputs required during an abort.

The IP and IFE must mentally review the actions required throughout the evolution prior to commencing the abort run. The following requirements should be met:

1. Runway length — 6,000 feet minimum.
2. Runway width — 150 feet minimum.
3. Consider the crosswind component — More than 5–10 knots could cause serious control problems if the TP reacts adversely. The same holds true for the tailwind component on back taxi abort runs.
4. Runway condition — Sufficiently dry to prevent skidding or hydroplaning.

Abort Procedures on a Back Taxi

Takeoff malfunctions prior to refusal may be conducted on a high speed back taxi, after coordinating with the Tower. This practice allows for better time management during pilot training evolutions. Takeoffs with tailwinds are not commonplace but are conducted in real world operating environments (weapons departures, counter threat departures, and takeoffs from runways in high density traffic flow areas). Tailwind components decrease aircraft refusal speed by 1.5 knots for each knot of tailwind component. The distance to refusal increases 2% for each knot of tailwind. Example: Given the following parameters: 6,500 foot runway, 27 degrees C, PA = 0, 103,880 lbs GW, 10 knot tailwind, dry runway, 3500 SHP, refusal speed is 111 knots, the distance to refusal speed is 3200 feet. At all times the IP needs to have an airspeed and runway remaining point where an abort should be initiated in the event the simulated malfunction does not occur as planned. Consideration should be given to not conducting an EFBR during a back taxi with less than 7000 feet remaining with a tailwind component greater than 10 knots.

Abort-and-Go Takeoffs

A minimum of 6,000 feet of usable runway remaining is required after the aircraft has been brought to a full stop. Ensure the trim, flaps, and oil coolers are set correctly prior to initiating the takeoff.

Abort Procedures

For training purposes, an engine/propeller malfunction, generator mechanical failure lights, chips light, generator off light, etc. (see chapter 7 for additional warnings, cautions, and notes), may be given to the TP as abort criteria. As on all training flights, any command given by the IP supersedes one given by the TP.
It is recommended that the first aborts be done with all four engines so the TP gets the feel of reversing action.

Note

The TP will gain little in learning to control the aircraft if the engine is failed while he is still using the nose wheel steering.

The simulation of an engine/propeller malfunction may be accomplished by any one of the following:

1. Induce a power loss by use of the bleed system (see chapter 7 for set-up), and/or announce: “Power loss” sometime after 80 knots but prior to V_R.
2. Announce some type of engine/propeller or other system malfunction prior to V_R.

WARNING

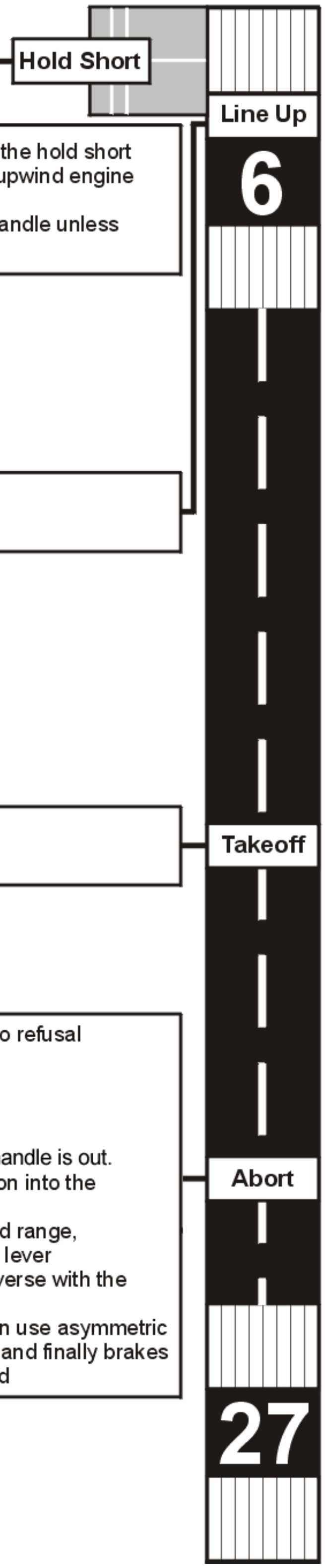
- IP’s should scan primarily down the runway but must be alert for the possibility of an actual emergency occurring during all simulated engine-out training.
- Simulating power losses prior to refusal shall be induced using the engine bleed system only. Retarding a power lever is prohibited in the aircraft.
- Simulated propeller malfunctions shall be announced by the IP.

Note

For three-engine aborts, the discussion on three-engine reversal is applicable.

Ensure the TP promptly calls for, and initiates, the abort by smoothly retarding the power levers to flight idle. Stress the use of rudder, forward yoke pressure, aileron into the failed engine and differential reverse power in maintaining directional control. If moderate wheel braking is used, allow the brakes to cool prior to setting the parking brakes. It must be emphasized that centerline control is paramount and that the TP must scan down the runway. The pace of the abort, the CRM involved, and the corresponding control inputs are the main teaching points to stress to the TP and TFE. The TP must first learn proper control inputs to maintain centerline without inducing oscillations prior to focusing on minimizing runway utilized. Make sure the TP understands the simulated scenario, i.e. are you runway limited simulated with a refusal speed, or is the scenario based on a non runway critical situation. During an EFBR demonstration, the IP should have the TP follow along on the controls to reinforce the physiological aspect of the abort. Stress CRM behavioral skills, especially communication, during the abort.

Engine Failure Before Refusal (EFBR) Demonstration



- Brief EFBR demonstration prior to or at the hold short
- Determine wind and plan on failing the upwind engine
- Request takeoff with abort option
- Ensure TFE understands simulated E handle unless "actual" is called

- Position aircraft on centerline
- Set parking brake

- Make right seat takeoff IAW FIG
- Make 80 knot call

- Call propeller related malfunction prior to refusal
- Make abort call
- Retard power lever toward flight idle
- Call E-handle #____"
  - RFE says, "Check me # ___."
  - Call "Simulated." to indicate that the E-handle is out.
  - Apply forward yoke pressure and aileron into the dead engine
- Bring all four power lever into the ground range, with Beta lights hold the engine's power lever at or near ground start and smoothly reverse with the remaining engines
- Maintain centerline with rudder first, then use asymmetric power as you lose rudder effectiveness and finally brakes
- Stress how centerline can be maintained

NOTES

1. The IP shall announce when he is taking the power lever ("I've got one")
2. Stress use of forward yoke and aileron into the failed engine
3. Emphasize detrimental effects of reverse greater than ground idle
4. Be smooth, precise and deliberate - NEVER RUSHED
5. Using the bleed system for low power on an EFBR gives a 1200-1400 SHP drop which equates to a 106-108 percent overspeed
6. Never pull power level to set up demo
7. The best defensive hand position is on top of the power levers to prevent rapid reversal or a power lever drop off
8. Be cautious of tailwinds during demo (backtaxi)

There is often discussion as to whether the proper sequence is to abort-and-feather or feather-and-abort in the event of a propeller malfunction. Delaying the power reduction until the emergency shutdown handle has been pulled can result in more runway being used during a critical evolution, aircraft control problems due to $V_{MC\ GRD}$, or continued acceleration through refusal speed. On the other hand, a delay in pulling the emergency shutdown handle until the power levers have been retarded to flight idle can result in severe control problems with flight idle power being developed by the normally operating engines and the pitchlocked powerplant/propeller combination producing, under some circumstances, in excess of 1500–2000 SHP. Obviously, further movement of the power lever into the ground and reverse range will further aggravate control problems with the pitchlocked propeller producing positive thrust and the other power plants producing reverse thrust.

The pace of control inputs and the standardized terminology used during an abort are significant teaching points to stress to upgraders. To standardize CRM during a three-engine abort for a simulated propeller malfunction, the RP and RFE shall perform the following after the malfunction is called out:

1. The TP calls out and initiates the abort, then calls for the appropriate E-handle.

2. The RFE shall say “Check me #______” but make no hand movements towards the E-handles.

3. The IP will announce “Simulated” and a three-engine reversal in accordance with Chapter 6 of this guide shall then be conducted.

WARNING

Prior to practicing simulated takeoff malfunctions below refusal, deenergize the autofeather system to prevent inadvertent autofeather of an engine.

Always consider the wind direction. A significant crosswind will cause the aircraft to weathercock into the wind and could compound the power loss problem for the TP.

Common errors:

1. TP slow in retarding the power levers with the aircraft below $V_{MC\ GRD}$ airspeed.

2. TP uses incorrect rudder inputs.

WARNING

- The IP should block the wrong rudder pedal with his foot and take the aircraft if the TP pushes the wrong rudder pedal.

- It is important to first stop the aircraft’s movement towards the side of the runway, then stop the movement toward the end of the runway. Trying to do both simultaneously may result in severe control difficulties.

3. TP retards power levers too quickly, leaving a power lever over the ramp during a propeller malfunction, or inducing control difficulties due to an inability to react to changing power output.

4. TP attempts to use nose wheel steering at high speed.

5. TP applies brakes during rudder application.

6. TP does not call for the emergency shutdown handle prior to entering the ground operating range on a propeller malfunction.

7. TP uses maximum reverse excessively, causing additional control problems as speed decreases.

Takeoff Malfunctions After Refusal

A discussion of refusal speed is appropriate for the brief. With long runways and at training weights, refusal speed is normally the rotate speed in most cases. Since this would not allow practice three-engine takeoffs, this figure is artificially reduced to 100 knots. For training purposes only, the takeoff should be continued if a simulated malfunction occurs above this speed. Explain to the TP that the IP still has the option to abort the takeoff in the 100-115 knots range in the event that an actual malfunction occurs.

The IP and IFE must mentally review the actions required for the evolution prior to commencing the takeoff. The following conditions should exist:

1. Runway length — 6,000 feet minimum.

2. Runway width — 150 feet minimum.

3. Consider the crosswind component. Caution should be exercised in simulating an upwind engine loss when crosswinds are present. Crosswinds may increase $V_{MC\ GRD}$ 2 knots for every 3 knots of crosswind component. More than 5–10 knots could cause control problems if the TP reacts adversely.

Actual engine failures during takeoffs do not take wind direction into account. The adverse effects on controllability should be stressed to more senior upgraders and discussed during all pilot meetings.

4. Runway condition — Sufficiently dry to prevent skidding or hydroplaning.

EFAR Procedures

Explain to the TP that a pilot's first indication of an engine failure is a swerve into the failed engine. The primary concern at this time must be controlling the aircraft while continuing down the runway. The TFE will determine the nature of the malfunction and call it out. The key to keeping the aircraft on runway centerline is coordinated aileron, rudder, and forward pressure on the yoke. This aids in tricycle gear directional stability. Emphasize in the brief that this is an easy time to tap a brake if feet are improperly positioned. The control inputs utilized to regain centerline control and maintain into the initial climb out attitude are also important teaching points.

The IP will call "rotate" and the TP should smoothly fly the aircraft off the runway raising the failed engine as necessary to fly straight (toward a maximum 5 degrees of bank in order to minimize $V_{MC\ AIR}$ and optimize climb out performance). The TP should continue to hold some degree of rudder and aileron correction as the landing gear break contact with the deck, or a skidding, unbalanced attitude will occur. As the aircraft climbs, the TP calls for the gear to be raised. Once the aircraft has exited the $V_{MC\ AIR}$ region, the TP can reduce the angle of bank used in order to fly out on runway centerline/heading or climb out instructions. Once safely airborne, the TP should ask the TFE what emergency has occurred, and then take the appropriate action. Stress to the TP the importance of proper CRM and adherence to the adage "Aviate, navigate, communicate". Proper coordination allows a complete analysis of cockpit indications once safely airborne (i.e., even though a power loss was called by the TFE, the engine may still be producing power), and ensures aircraft safety while performing corrective action. This coordination allows the TP to perform the primary duty of safely flying the aircraft and also allows for the pilot and copilot to backup or observe the TFE perform the corrective action.

For training purposes, an engine/propeller malfunction, chips light, generator off light, etc. (see chapter 7 for additional warnings, cautions, and notes), may be given above V_R to permit the TP to gain experience in controlling the aircraft and to ensure that he understands the meaning and importance of "Refusal" during the takeoff evolution.

The simulation of an engine/propeller malfunction after refusal may be accomplished by any one of the following:

1. Retard a power lever to simulate an engine failure.

2. Retard power lever to about 60 degrees coordinator to simulate fuel governing action and propeller drag associated with overspeed.

3. IP announces some type of engine/propeller or other system malfunction.

WARNING

- Prior to practicing simulated takeoff malfunctions above refusal, deenergize the autofeather system to prevent inadvertent autofeather of an engine.

- If a simulated engine failure occurs after Vr do not fail a second engine until traffic pattern altitude is reached. Action other than this will unnecessarily compound the malfunction, and more importantly, may cause VMC AIR to increase above the aircraft airspeed.

Note

It is recommended that prior warning be given to the TP on the first few engine failures (not which engine, but that one will be failed).

If the TP has control problems on the runway, the IP may delay calling rotate to ensure the aircraft is under control.

Note

Although additional power is available when using reduced power for takeoff, the TP should often be exposed to simulated malfunctions after refusal as if he had maximum power set, which would be the case if an actual refusal speed existed. This should prompt the TP to make a decision regarding flap selection during climb out. The IP may use additional power on any engine if he deems it necessary.

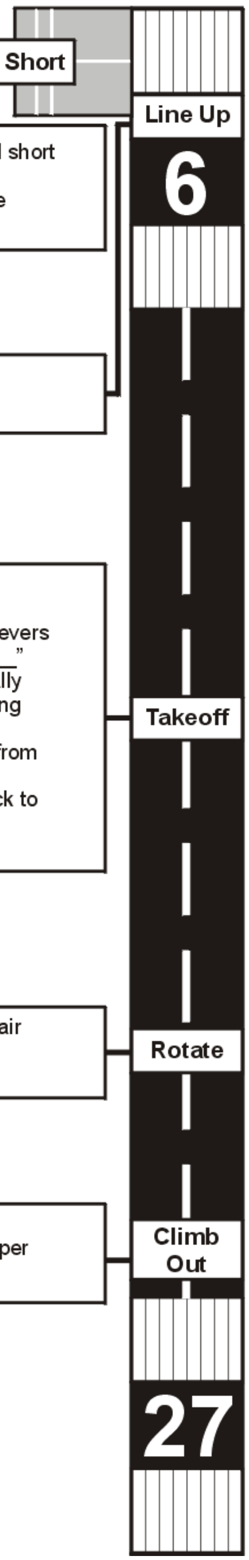
Common errors:

1. TP places his hand back on the power levers and attempts to abort.

Note

- Prevent this by positioning the hand at the base of the power lever, blocking any attempt to reverse.

Engine Failure After Refusal (EFAR) Demonstration



Hold Short
- Brief EFAR demonstration prior to or at the hold short
- Determine wind and decide which engine to fail (Favorable engine for takeoff will be unfavorable for landing)

Line Up
- Position aircraft on centerline
- Set parking brake

Takeoff
- Make right seat takeoff IAW FIG
  - Make 80 knot call
- Call refusal and move hands to base of power levers
- Retard power lever, RFE calls "Power loss #___" (Power may be pulled back in two stages. Initially reduce to show the swerve and pull the remaining power when convenient-climbout)
- Apply forward yoke pressure and aileron away from the dead engine
- Stop the swerve and set a shallow intercept back to centerline (It is not necessary to get back on centerline)

Rotate
- Call rotate and smoothly fly the aircraft into the air (Rotate may be called late-Do not rush)
- Raise the dead engine toward 5 degrees

Climb Out
- Call for gear up and raise the gear
- Ask for malfunction indications and execute proper procedures

NOTES

1. Forward yoke plants the nose and aileron away from the dead engine plants the main mounts to aid in weight distribution and directional control
2. If possible fail favorable engine for winds ("dead" engine downwind)
3. Stall buffet = 85 knots at 100,000 lbs. With gear down, approach flaps and 3000 SHP set
4. Keep the talking on the runway to a minimum "Note the swerve; stop the swerve; correct the swerve"

- If the TP is able to retard the power levers aft, the IP shall take the aircraft and either abort the takeoff or push the power back up and continue the takeoff. This decision depends on airspeed, runway remaining, how far back the power levers were retarded, etc.

2. TP fails to input correct aileron and rudder.

3. TP taps brake while applying rudder.

4. TP uses insufficient or opposite rudder.

WARNING

- If the TP uses the wrong rudder, the IP shall immediately take the aircraft and rotate while simultaneously reestablishing power on all four engines.
- VRO airspeed is not a consideration during this predicament. The IP should not wait for 115 knots because if he does, the aircraft will likely be off the runway. At training weights, the aircraft will have no problem flying with airspeed in the 100–115 knot range.

Note

To prevent this, the IP should block the wrong rudder with his foot.

5. TP attempts to rotate early (before rotate).

Note

- Try to prevent this by blocking the yoke, until rotation is desirable.
- If the TP attempts to rotate early, stop rotation, if possible, but once the nose wheel is airborne, take control and continue the takeoff, using all four power levers.

6. TP tries to determine problem instead of flying aircraft.

7. TP forgets to raise the gear.

8. TP fails to raise the flaps (if necessary).

Right Seat Takeoff Procedures

When demonstrating abort procedures and engine failures after refusal, the IP may make the takeoff from the right seat. Explain to the TP that this takeoff technique is being used to eliminate the problems possibly encountered with two people controlling the aircraft during this critical evolution, and that it is not the normal takeoff procedure.

The following is one recommended technique:

1. Taxi the aircraft onto the runway centerline with the nose wheel straight ahead and set the parking brake.

2. Advance the power levers to 2500 SHP (which should put the power levers above the 66 degrees coordinator crossover point).

Note

- With no crosswind, right rudder will normally be required for the takeoff and may be applied at this time.
- If there is a significant left crosswind, setting 2500 SHP on number 1 and 2000 SHP on the remaining engines will provide better centerline control.

3. Release the parking brake and smoothly release the brakes.

Note

Another technique is to do a rolling takeoff where the IP smoothly advances the power levers from flight idle as the brakes are released.

4. As the rudder becomes effective, smoothly advance the power levers.

Note

Asymmetric power lever advancement may be required to maintain centerline.

5. As the speed increases and rudder authority is established, call for briefed takeoff power.

6. Call "80 knots", "Refusal", and "Rotate" as required for the demonstration.

Note

- The IP's takeoff technique should allow directional control to be gained early enough to ensure that the briefed power is established by 80 knots.

- When performing a right seat takeoff, the left hand should remain on the power levers at all times. This is a precaution against any malfunction (occurring after simulated refusal speed) which may require an abort. The IP should move his hand to the base of the power levers to simulate refusal, and maintain that hand position through rotation.

Common errors:

1. Not ensuring the nose wheel is straight when the parking brake is set.

2. Applying brakes during takeoff roll, giving the TP the appearance that the IP is using brakes to steer the aircraft.

3. Retarding power levers versus advancing them in order to maintain centerline. Retarding a power lever multiplies the number of corrections required and induces control problems. This also increases the time required to establish SHP and the runway required for takeoff.

Smoke Removal Hatch Open Below and Above Refusal

This demonstration should be accomplished sometime during the syllabus. IPs have the option of having the IFE open the door upon a given signal (e.g., head nod) or at a certain speed. This malfunction may be given before or after refusal, but is more dramatic after refusal due to increased noise. If after V_R, the takeoff must be completed and the door closed after safely airborne. Be alert to the possibility of an unplanned abort after V_R.

130 Knot Climb Demonstration

This demonstration is used as a confidence building maneuver. Consult the appropriate charts for a discussion of stall speed, $V_{MC\ AIR}$, V_{50} 3 and 4-engine speeds. A general speed for climb out is 130 KIAS for aircraft weights of 90,000 to 108,000 lb.

WARNING

Rotate speeds from the charts are 115 knots and rotation should take place at that speed.

The crew must be briefed to be securely strapped in with emphasis given to preventing gear from going adrift in the aircraft. A normal takeoff sequence is made for training purposes. When clearance is a factor, maximum power should be applied with the brakes set.

Do not rotate early. Maintain strict adherence to the speed schedule. After rotation, adjust the nose attitude (about 15 degrees nose high) to maintain climb airspeed. When airborne, raise the gear. Use maximum power until level off.

WARNING

Do not raise the flaps above takeoff until level off (airspeed greater than 140).

Emphasize that normal takeoff speeds are used for this demonstration in order to provide a safe margin above stall and V_{MC} airspeeds. Use of the minimum distance speed schedule would result in less ground run distance but would significantly reduce the safety margins above both stall and V_{MC} airspeeds. Maximum performance takeoffs are usually made under conditions of some urgency when the results of engine failure cannot be considered.

Three-Engine Ferrying Takeoff Demonstration

Although not normally performed during the training syllabus in the aircraft, the following steps and notes supplement the current NATOPS procedures for training. Ensure the crew refers to the NATOPS for three-engine ferrying takeoff procedures prior to the takeoff.

This demonstration may only be performed with authorization from unit commanders.

The minimum recommended runway dimensions are 8,000 feet long and 200 feet wide. Discuss minimum control speed ground ($V_{MC\ GRD}$) and the three-engine performance charts available in NATOPS calculating the actual values.

Note

V_{RO} is 130 knots for all weights up to and including recommended maximum gross of 100,000 pounds. Takeoff performance and ground roll distance should be computed using appropriate NATOPS charts.

1. During the takeoff brief, brief the copilot to call out $V_{MC\ GRD}$ and 115 knots, in addition to 80 knots and rotate.

2. At the hold short complete the NATOPS three-engine ferrying procedures.

3. With brakes set, apply maximum power on the symmetrical engines. Initially apply full rudder toward the asymmetric engine.

4. Release the brakes and allow the aircraft to accelerate before attempting to increase power.

WARNING

No attempt should be made to apply maximum power on the asymmetric engine prior to reaching $V_{MC\ GRD}$.

If a three-engine ferry takeoff demonstration is conducted in the aircraft, be prepared to use all four power levers for the takeoff if directional control difficulties are encountered. Slow power application will significantly increase distance required to accelerate to 130 knots and the aircraft may reach a point where aborting the takeoff would not be advisable.

Only the two symmetrical engines will produce forecasted SHP when passing 80 knots.
The power lever should be advanced in such a way so that full rudder deflection is not required. There should be a reserve of rudder travel (in both directions) available at all times to make heading corrections.

Ensure maximum power is set by 115 knots.

CHAPTER 5

In-flight Training Procedures

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Climb Procedures

The autofeather system will be secured after informing the pilot and when the aircraft is safely airborne. One standardized technique taught to FRS TFEs is to secure the autofeather as soon as the landing gear is raised and should be done prior to the initial power reduction. The autofeather system can be secured prior to the climb checklist.

Note

With the autofeathering system armed, rapid power application initiated from a low power setting may be sufficient to feather an engine.

Common errors:

1. TP fails to account for P-factor after liftoff, dipping the right wing vice using right rudder.

2. TP fails to make a crosswind correction after liftoff.

3. TP accelerates through 190 knots prior to retracting the flaps from the takeoff position.

NTS Check Procedures

Emphasis should be placed on maintaining a visual lookout for traffic while conducting the NTS check. If possible, delay check until leaving high density area.

Common errors:

1. TP displays poor basic airwork.

2. TP fails to maintain an outside scan.

3. TP/TFE does not consider minimum airspeed for current gross weight (1.52Vs).

4. TFE does not use fuselage bleed air valves to get NTS action when required.

5. TFE opens engine bleed air valve with less than 800 SHP.

6. TFE does not observe SHP fluctuation or allow RPM to stabilize during NTS action.

7. TFE fixates on the feather valve light.

8. TFE forgets to reset the ice control panel/bleed air panel after the check has been completed.

Governor Indexing

The TP should know and understand the governor indexing procedures even though they are carried out by the TFE.

Common errors:

1. TP moves power levers while indexing.
2. TP fails to ensure Climb checklist complete.
3. TFE turns on a sync switch with a master selected.
4. TFE not alert for propeller malfunctions during indexing.

Steep Turns

Steep turns on upgrade syllabus training flights should normally be performed no lower than 4,000 feet AGL. To provide for familiarity with high angle of bank maneuvering (>45 degrees AOB) at lower altitude, upgrading pilots should be provided the opportunity to conduct tactical maneuvering on training flights within NATOPS altitude and angle of bank limits with a qualified instructor pilot. This guidance does not restrict realistic use of “high angles of bank” (i.e., over 45 degrees) for short periods of time when needed on tactical missions. Use of high angles of bank at low altitude must take into account pilot experience, fatigue, time of day, weather, altitude, fuel consumption and impact on aircrew performance. The objective of steep turn training is to prepare pilots to fly the aircraft effectively in tactical situations while minimizing unnecessary risks in the performance of such training.

Practice steep turns should be conducted only after extensive briefing between the IP and TP. The turns should be taught as confidence maneuvers and closely monitored throughout.

The IP should brief as a minimum:

1. Anticipated angles of bank and NATOPS limitations.
2. G-loading required to maintain level flight.
3. Aircraft weight and stall/stall buffet speeds for the configuration.
4. Stall recovery techniques, emphasizing the importance of leveling wings.
5. Duration of turns (i.e., 180 or 360 degrees).
6. Minimum maneuvering airspeed (gross weight +110 knots recommended) and the use of the AOA indicator.
7. Minimum acceptable weather conditions. Steep turns of 45 degrees angle of bank or greater shall be limited to daylight VMC with a clearly discernible horizon.
8. Use of power and utilization of the flight engineer.
9. Figure 5-1 should be used to brief the effects of angle of bank on the aircraft in balanced flight:

Practice turns with sustained angles of bank over 60 degrees are not recommended. A pull up from a 70 degrees angle of bank turn will exceed the airframe limits (3.0 g’s) of the aircraft.

Be alert for any abrupt control movements and teach the student to smoothly apply force on the controls. Control reversals should be avoided.

Alert the crew, set Condition V, clear the area and begin with turns of 45 degrees angle of bank. Turn for 180 degrees of heading change. Note that as the aircraft bank angle increases, the lift vector tilts from the vertical and the aircraft must increase AOA to maintain level flight. Note the increasing amount of control force required to maintain level flight. After the student has mastered 45 degrees advance to 60 degrees angle of bank.

Note

Aircraft loading of 2 g’s is required for a level 60 degree angle of bank turn. Aircraft loading of 3 g’s is required for a level 70 degree angle of bank turn (see figure 5-1).

Degrees AOB	Approximate G Loading	Percent Increase Stall Speed	0 Thrust Stall 100,000 lb. Aircraft
0	1.00	0	114
15	1.04	2	116
30	1.15	8	123
45	1.41	19	136
60	2.00	40	162
70	2.94	70	195

Figure 5-1. Effects Of Angle Of Bank On G's During Balanced Flight

Control Boost-Out Airwork

Booster shift control handles shall not be pulled to practice boost-off airwork:

1. If one or more engines are actually shutdown.
2. Below 4000 feet AGL.
3. During hours of darkness.
4. Under IMC.

Boost-out airwork is a condition that will occur with either the loss of all hydraulic pumps, certain flight control malfunctions, or the loss of all electrical power. Point out that "gust lock" will result from failure of either hydraulic or electrical systems, or improper procedures while combating an electrical fire of unknown origin.

WARNING

- In-flight, securing all hydraulic pumps prior to boost-out training is prohibited.
- The unable-to-shift boost controls scenario shall only be performed by simulating the hydraulic pumps are simulated secured.
- Inform the crew and secure loose equipment prior to shifting.
- It is possible to pull all axis boost handles past the mechanical stops.

Note

Instruct the TFE to pull the boost handles one at a time. Allow the TP to fly the aircraft in this condition. Demonstrate how easily altitude can be maintained using the trim tabs. A turn at altitude can be made with the use of asymmetric power rather than muscle on the yoke (i.e., left turn, increase power on number 3 and number 4 engines). When the desired angle of bank is reached, reset the horsepower.

WARNING

Beware of large power changes at low speeds. To demonstrate, slow to 140-150 knots, wings level, flaps up, boost-out, 500 SHP. At typical training weights of 80,000 to 110,000 lb., power off stall buffet speeds range from approximately 111 knots to 128 knots respectively. To simulate a waveoff, add power to break the rate of descent, roll in some nose down trim and add power slowly. Return the system to normal. Explain that the boost-out approach to a landing is no longer performed as a training maneuver in the aircraft. It is an emergency evolution and will be accomplished only at that time. If this emergency were to arise, consideration should be given to proceeding to a satisfactory alternate when adverse weather or high wind conditions exist at the destination.

160 Knot Maneuver

The primary purpose of this maneuver is to show the TP the reason behind the P-3 waveoff procedures. Additionally, the TP will gain an appreciation for power and trim requirements in various configurations which will help develop basic airwork skills. Ensure that the TP stabilizes at each increment to properly note power and trim changes before continuing. Begin by having the TP establish the aircraft on an assigned altitude and heading in the clean configuration at 160 knots (trimmed hands-off). Reference your 1.52 Vs. Note the power (approximately 1000 SHP) and trim required. Stress the importance of an instrument and visual scan and the importance of the VSI in altitude control.

1. Select maneuver flaps and have the TP maintain altitude and 160 knots, noting power and trim changes.

2. Select approach flaps and have the TP maintain altitude and 160 knots, noting power and trim changes.

3. Leave approach flaps set and drop the gear maintaining altitude and 160 knots, noting power and trim changes.

4. Raise the gear and set landing flaps. As airspeed bleeds off it will become apparent that the power setting will not be sufficient to maintain 160 knots (Note the elevator trim required, 19–23 units up). This serves as a good explanation for retracting the flaps to approach before raising the landing gear during a waveoff.

5. (Optional). With land flaps set, lower the landing gear again and slow to 140 knots; execute a waveoff climbing straight ahead. Although this is not an “in close” type waveoff when speeds may be less than 1.3 V_S, it will give the TP an appreciation for the trim required once the flaps are raised past the takeoff/approach position.

Common errors:

1. TP uses little or no rudder trim.

2. TP does not stabilize at each configuration to note power and trim changes.

3. TP flies primarily by use of the trim vice the primary flight controls.

4. TP does not maintain a positive rate of climb while executing waveoff procedures.

5. TP displays poor instrument scan.

Loiter Procedures

If a loiter shutdown is required by the syllabus, discuss the requirements that must be met before loitering an engine. Address the advantages of high altitude loiter and restart, and review the use of the loiter operating tables in the NATOPS Flight Manual. A sample loiter brief is listed in the Pilot/FE Training Job Aid.

Common errors:

1. TFE fails to get checked before pulling the emergency shutdown handle.

2. TFE fails to get checked prior to turning the fuel and ignition switch off.

3. TP does not suggest the reposition of the propeller for a bad “X” that is causing buffet.

Engine Restart During Flight

The TP and TFE should understand that proper crew coordination during an in-flight restart is paramount. Both should closely monitor cockpit indications, especially RPM and the annunciator lights. A sample restart brief is listed in the Pilot/FE Training Job Aid.

Common errors:

1. TP allows a start with no brief or an inadequate brief.

2. TP and TFE do not post an aft observer prior to the start.

3. TP does not watch the propeller during PCO.

4. TP does not check the TFE unfeathering the correct propeller.

5. TP does not observe blade angle and rotation.

6. TP does not check the TFE on the correct fuel and ignition switch.

7. TP or TFE does not call for continuation of the checklist.

Stall Buffet Demonstration

Power-off approach to stalls may be carried out in any configuration and must be conducted in accordance with procedures given in the NATOPS. The stall buffet demonstration shall be conducted in a power-off, zero degrees AOB condition and shall not be conducted:

1. If one or more engines are actually shutdown.

2. Below 10,000 feet AGL.

3. During hours of darkness.

4. Under IMC.

This demonstration is designed to introduce the TP to stall buffet and stall recovery techniques and is an excellent method of building confidence in P-3 performance characteristics. Instructors should brief the upgrader of the most likely scenarios of entering stall buffet and the performance charts that relate to those situations. Some teaching points to focus on include: the feeling of airframe buffet, AOA, recovery procedures, and altitude loss.

During the brief, determine actual stall speed and stall buffet speed for the desired aircraft configuration.

CAUTION

When conducting the stall buffet demo, the IP shall recover the aircraft if the calculated stall buffet speed is reached and the plane has not yet entered buffet. The speeds shall be recomputed and if during the second attempt the plane still does not buffet at the calculated speed, the airspeed may be allowed to decrease below the calculated value at the IP's discretion. Good judgment prevails as to how slow the aircraft should be allowed to fly.

Note

The IFE shall ensure that the TFE gives the correct stall and stall buffet speeds.

When conducting the approach to stall series, brief the TP to scan the AOA indicator. As the aircraft decelerates toward stall buffet the AOA indicator will enter the hashed band and stall buffet will occur at 20 units AOA.
In addition to the procedures in the NATOPS the following steps shall be performed:

1. Set Condition V, notify all crew members and execute clearing turns.

2. Initially set 300 SHP. This will allow SHP to remain positive as the aircraft decelerates.

3. Discontinue trimming 20 knots above the charted stall buffet speed and gradually decrease the airspeed at approximately 1 knot per second. This will require a loss of altitude, with typical rates of descent between 600 and 800 FPM.

4. Do not make large attitude corrections in an attempt to maintain altitude or an accelerated stall may occur.

5. Initiate recovery as the aircraft enters the stall buffet region. Relax back pressure on the yoke, advance the power levers and call for normal rated power. Use rudder and aileron to maintain balanced flight and wings level. Stress a smooth recovery.

6. Diving to accelerate is undesirable as this would not be possible at low altitude. Show the RP that a recovery can be made with a minimal loss of altitude.

7. The aircraft should be kept in balanced flight throughout the maneuver or a rolling tendency will occur on stall buffet entry and/or recovery.

Note

- Maintaining a visual scan, especially during recovery, is extremely helpful in developing a smooth coordinated technique.

- Wings level attitude is very important. If a wing is dropped there is a probability of stalling one wing.

Common errors:

1. Decelerating too slowly resulting in excessive altitude loss and mushy stall buffet entry.

2. Decelerating too rapidly causing abrupt or accelerated stall buffet.

3. Dropping a wing or not keeping the aircraft in balanced flight.

4. Lowering the nose excessively during recovery, resulting in unnecessary altitude loss.

5. Applying insufficient power during recovery, possibly resulting in accelerated stall.

Asymmetric Power Flying Qualities

The P-3 has good engine-out handling qualities in all configurations. The published one and two engine out $V_{MC\ AIR}$ for 5 degrees angle of bank toward the operating engines is rudder limited. At these airspeeds and power settings, aileron is effective in controlling angle of bank, and marginally effective to arrest roll rates following a sudden power loss or power addition. As the aircraft slows below these speeds, the aileron available to stop rolling conditions from power changes decreases, eventually resulting in insufficient aileron to hold the desired angle of bank.

Establishing a 3–5 degree angle of bank into the operating engines for straight flight results in the best climb performance (zero sideslip) and is a compromise between engine thrust and sideslip generated drag. This attitude results in the balance ball deflecting toward the operating engines. Under these conditions a centered balance ball is not optimum and should not be used. If maximum climb performance is required in a turn, this same ball deflection should be maintained.

$V_{MC\ Air}$ Demonstration (Sim only)

This demonstration is designed to show the aircraft yaw moments that can be expected during flight below minimum control airspeed regime. The IP should discuss what may cause the aircraft to enter $V_{MC\ AIR}$, and the techniques used to recover.

CAUTION

This demonstration shall only be performed in the simulator.

Procedures

* Perform maneuver at moderate to light gross weights (<100,000 lbs).

1. Ensure #1 and #2 are feathered and Rudder Boost Shutoff Valve CB (K13) is pulled.
2. Gear down, flaps at approach.
3. Establish aircraft 8-10 NM from field at 2500-3000' AGL in VMC. Use runway as visual reference point.
4. Maintain 145 KIAS, 600-800 FPM ROD on final.
5. Reduce power on #3 and #4 and decelerate towards 120 KIAS to simulate getting slow on approach.
6. Rapidly set max power on #3 and #4 and enter Vmc Air. **Demonstrate full control deflections** with nose tracking left for about 30-60 degrees of heading change.
7. Lower the nose and accelerate above VmcAir. *(1st way to get out of VmcAir- results in loss of approx 500')*
8. Once re-established on course and glideslope, smoothly re-apply max power again and raise the nose to re-enter VmcAir.
9. Once in VmcAir, rapidly reduce power on #4, raise the left wing and correct back to centerline. *(2nd way to get out of VmcAir)*
10. Continue approach at 1.35 Vs + 5 knots (145 minimum until landing is assured).
11. At 300 feet AGL execute NATOPS 2 Engine Waveoff Procedures.

Two-Engine Waveoff At Altitude

1. At an airspeed of 145 knots with gear down and flaps at approach, simulate feather on number 1 and 2. Reestablish power on number 3 and 4 required to fly a gradual descent of approximately 600 to 800 FPM.

2. Initiate the waveoff by gradually applying 925 degrees TIT or 3200 SHP while rolling in 5 degrees right wing down and sufficient rudder to prevent yaw. Emphasize visual references and a frequent but secondary instrument scan.

4. Repeat the waveoff until the TP can use power, aileron, and rudder simultaneously and instinctively, then add elevator for altitude adjustments.

Note

The same points apply to three-engine waveoffs. Directional control must be established before a climb is attempted. A slight loss in altitude with directional control is more desirable than a possible greater loss caused by improper action. This demonstration is conducted to either emphasize the actual two-engine waveoff procedures and the pace that it should be conducted or a step by step recovery to emphasize the importance of reducing drag to generate ROC.

Common errors:

1. TP attempts waveoff without using visual reference.
2. TP attempts a climb before adequate directional control is established.

Ram Effect Demonstration

The IP should demonstrate acceleration and deceleration characteristics and ram effect with the autopilot engaged and altitude hold selected. Ram effect is most vividly demonstrated by placing the power levers in the temp controlling range at an even horsepower setting (2,500 ± 500 SHP) and then observing both fuel flow and SHP increases as the aircraft accelerates. The demonstration may then be reversed by retarding the power levers and observing both fuel and SHP decrease as the aircraft slows.

It is of academic interest to realize that ram effect is a result of T-56 fuel scheduling processes. It is important, however, for the TP to realize and understand that ram effect displays itself in the form of a more sluggish initial response with rather long term effects whenever the power levers are repositioned for airspeed changes. The pilot should therefore be aware of airspeed after making any significant power change.

Emergency Gear Extension

Emphasize the fact that for all landing gear emergencies, reference to the NATOPS is desirable. This portion of the demonstration may be performed in the aircraft.

To demonstrate gear not extending because of electrical malfunction, pull the landing gear control circuit breaker (E17). When the TP calls for gear down, announce that the gear is not coming down, but that hydraulic pressure is normal. Ensure that the TP and TFE review the procedures in NATOPS. Have the TP or TFE operate the selector valve to the DOWN position. The selector valve may be used to raise the gear if desired. Be sure that the TP and TFE understand that the valve must be held in the UP position until the gear is up and locked or else it will freefall down. Do not forget to reset the landing gear control circuit breaker when finished with the demonstration.

The next demonstration may be initiated by simulating a failed number 1 hydraulic system. Turn off hydraulic pumps 1 and 1A and request gear down. The TP's and TFE's reaction should be to recognize a situation where the gear must be dropped manually. Ensure that TP and TFE review the procedures in NATOPS. Do not forget the warning about holding the nose gear until the main mounts are down and locked. The 1B hydraulic pump receives its control and power from the GOB whenever its switch is turned on and accumulator pressure is below 2200 PSI. Discuss methods available for energizing the GOB.

Demonstrate use of the 1B pump on the deck. Turn off the number 1 system and reduce system brake pressure below 2200 PSI level by pumping the brakes. Discuss the purpose of the 1B pump and its source of electrical power. Turn on the 1B pump and allow the brake accumulator to pressurize. Discuss time for normal number 1 system pressure to replenish, and return system to normal.

Note

Expand this discussion to include brake check during Landing checklist with only the 1B pump operative and unsafe landing gear procedures.

CAUTION

The landing gear must be cycled at least once normally prior to landing. This will ensure that the landing gear selector valve has been properly positioned down, enabling nose wheel steering.

Common errors:

1. TP and TFE do not turn on the number 1B pump during landing (simulator).

2. TP and TFE do not refer to NATOPS.

3. TP/TFE lack understanding of NATOPS procedures.

4. TP and TFE lack knowledge of the number 1B pump operation.

5. TP or TFE releases the selector valve while raising the gear before they are fully retracted.

In-Flight Prop System Demonstration

The purpose of this demonstration is to explain various components in the propeller system and to observe their in-flight operation.

CAUTION

This demonstration shall only be performed in the simulator.

1. Number 1 sync servo off, eliminating possible sync biasing of propellers during the demonstration.

2. Secure Bus B to secure power to propeller feather pump. Discuss alternate power source for engines number 1 and number 4.

3. Airspeed 190 knots.

4. NTS feather valve switch to feather valve check.

5. Set normal rated power on number 1.

Note

Failure to set normal rated power may result in engine–propeller decouple due to NTS values being exceeded.

6. Fuel chop number 1 engine with the fuel and ignition switch. Observe NTS operation, RPM 35–40 percent and note the flashing feather valve check light and fluctuating SHP.

7. Arm the autofeather system. Observe the feather button pull in, the autofeather light ON, and the feather pump not running. The feather solenoid has positioned the feather valve to the feather position.

At this time, the output of propeller pumps 1 and 2 should bring RPM below 10 percent.

8. Place the feather transfer switch (number 1 and 4) to alternate. Note the light in the feather button on; the propeller pump number 1 light out, and the propeller feathers.

9. Turn the autofeather switch off.

10. Place the feather transfer switch to NORMAL.

11. Restore Bus B.

12. Review the functions of the feather button (AC power to the feather motor, DC power to position the feather valve solenoid, DC power to the fuel shutoff valve in the fuel control).

45 Degree Airstart System Demonstration

CAUTION

This demonstration shall only be performed in the simulator.

The airstart blade angle system is discussed in the NATOPS manual. Review the components of the system (45 degrees blade angle switch on the beta shaft, feather button, pressure cutout override switch).

Note

Impress on the TP that this system is not actuated during a normal restart and that when it does actuate, a malfunction exists.

1. Complete the Restart checklist through the item PCO.

2. Brief the FE as follows: After the fuel and ignition switch is placed on, continue to hold the feather button. This will result in actuation of the airstart blade angle system, illuminating the NTS INOP light as the blade angle goes to 45 degrees after light-off. The FE will continue to hold out on the button while announcing “NTS INOP”. Observe RPM stabilizing at less than 100 percent, approximately 75–80 percent, and TIT steady at 830 degrees. The FE will then pull the emergency shutdown handle while continuing to hold out on the feather button.

3. After the propeller has been refeathered, conduct a normal restart, and complete the restart checklist.

Note

Discuss that normal NTS action has made this a controlled situation. In the event of an NTS failure, the decrease in blade angle from the feather position would be considerably more rapid, and the resultant cycling around the 45 degrees blade position would also be rougher. This can be demonstrated by inserting the NTS INOP malfunction for the subsequent restart. Stress the importance of the FE’s responsibility to hold out on the feather button until the emergency shutdown handle is fully pulled. Discuss what would happen if the FE accidentally pulled out on the wrong feather button while in a 2- or 3-engine loiter configuration and the importance of always checking the FE during feather or unfeather operation.

Air Conditioning And Pressurization System Demonstration

Demonstrate the air conditioning and pressurization systems as follows:

1. During the planeside brief inquire if any crew member has problems equalizing pressure in their ears.

2. Prior to takeoff, place the outflow valve switch to OFF to keep the outflow valve in the OPEN position. After takeoff, note that the cabin will climb at the same rate as the aircraft.

3. Between 3,000 and 4,000 feet, position the outflow valve switch to AUTO; the aircraft should start to pressurize. Note the cabin rate of descent, the ability to control this descent with the rate selector knob, and the corresponding increase in differential pressure.

4. Continue with automatic pressurization while climbing the aircraft. Dump one EDC and note that the aircraft will still pressurize on the remaining EDC. Place the dump switch back to NORMAL.

5. Level the aircraft at 17,000 feet or higher. Reduce the cabin altitude slowly by use of the closed position on the override switch noting the differential pressure to rise to 13.9–14.4" (11.7–12.2"). After the safety relief valve opens, place the override switch in the CLOSED position to completely close the outflow valve. The cabin altitude at this point will be approximately 2000 feet below sea level. Restore pressurization with outflow override switch. Climb the aircraft approximately 1000 feet, noting the

constant differential pressure at the safety relief valve setting and increasing cabin altitude.

WARNING

Performing this procedure below 17,000 feet could expose the crew to hyperbaric conditions.

Emergency Depressurization Demonstration

WARNING

Notify the crew before conducting any depressurization demo. For these demonstrations, aircraft altitude shall not exceed 10,000 feet.

With Electrical Power

The TP and TFE are required to have the checklist memorized. Explain that as long as FEAC is powered, the aircraft can be depressurized with the outflow valve and procedures for depressurization without electrical power do not apply. While discussing this procedure, conduct a review of the pressurization system and component parts.

Without Electrical Power

Ensure the TP realizes that the aircraft can be depressurized pneumatically or using the free fall chute.

Flight Idle Stop Demonstration

With all engines secured, pull the flight idle stop control circuit breakers and allow the TP to become familiar with the force required to overcome the flight idle stop on each power lever.

Engine Fire And Emergency Shutdown Procedures

Both the TP and the TFE are required to know the first two memory items of the emergency shutdown checklist. The TFE is expected to execute them upon command of the pilot when a malfunction requires an engine to be secured. Both students should have a thorough knowledge of all electrical and mechanical functions of the emergency shutdown handle.

WARNING

Instructors shall ensure that engines are not secured prior to obtaining a satisfactory NTS check.

After an engine has been secured for a simulated malfunction, the IP and FE shall "clean up" from the simulated malfunction, and initiate the first 9 steps of the restart checklist. Discussions concerning the simulated malfunction shall only be conducted after the malfunction has been cleaned up and the first 9 steps of the restart checklist have been completed.

CAUTION

If the oil tank shut off valve circuit breaker is inadvertently reset on a shutdown engine it shall be left in until the engine has been restarted. The circuit breaker shall then be pulled so the valve will remain open.

Emergency Engine Shutdown training shall only be accomplished if:

1. If no other engines are shutdown*
2. During daylight hours
3. Above 1500 FT AGL
4. VMC

*Does not apply to IUT Events (See considerations on page A-14)

Common errors:

1. TP does not confirm that an engine fire exists before calling for discharge of the second HRD.
2. TP/TFE do not utilize good CRM while conducting the Emergency Shutdown Checklist.
3. TFE does not get checked on the proper emergency shutdown handle.
4. TFE does not secure crossfeed and boost pumps to respective engine when shutdown for a fire or fuel leak.

Propeller Fails To Feather Procedures

The IP and IFE should designate the step at which the propeller feathers during this procedure. It is advisable to use engines number 3 or 4, so the TP and TFE can be informed that the propeller is still turning in the event the propeller has to be feathered prior to the step desired.

CAUTION

Do not let the propeller rotate for more than 45 seconds due to the possibility of damaging the propeller brake.

Note

- It is normal for oil to be vented overboard through the lab seal vent during this malfunction. Lab seal leaks are due to the reduction of fourteenth stage bleed air and insufficient oil scavenge during extremely low rpm operations, and because the number 3 engine lab seal vent is more noticeable from inside the aircraft, this is often reported by crewmen to the flight station. Unnecessary 3-engine landings have been made because this was treated as a malfunction.

- Although the “Two Bottle Fire Fails-To-Feather” scenario is unlikely in the P-3, it is a good teaching tool for both pilots and engineers. Due to the complexity and scenario variations, this malfunction should be taught in the simulator.

Inadvertent Engine Shutdown During Flight

An engine can be inadvertently secured by mistakes which include:

1. Autofeather system is left on after takeoff and engine feathers after level off and subsequent power application.

2. TFE unintentionally secures the wrong engine as a result of an induced malfunction (e.g. pushes in the wrong feather button while executing the propeller fails to feather procedure, turns off the wrong fuel and ignition switch during the execution of the Restart checklist, etc.).

If an inadvertent engine shutdown occurs and the result is two engines shutdown, or if an inadvertent engine shutdown occurs prior to obtaining an NTS check:

1. The IP shall take the airplane.

2. The IFE shall immediately ensure any simulated malfunctions are cleaned up.

3. The IFE shall ensure the APU is started, if applicable.

4. The IFE shall get in the seat.

5. Complete the Emergency Shutdown checklist through propeller.

6. Restart an engine using the Restart checklist. The restart checklist may be accomplished for two engines simultaneously; however, the engines shall be restarted individually.

Note

At the discretion of the IP and IFE, the TFE may be put back in the seat after the engine that was unintentionally shutdown has been restarted. The TFE should restart the original engine to complete this item in the training syllabus if the IP and IFE are confident in the safety of the evolution.

Ditching Drill

WARNING

The minimum ditching speed with a tactical crew embarked is 125 knots. Minimum recovery altitude is 4000 feet AGL.

Note

Only the night or instrument technique for water entry shall be used during simulated ditching. The immediate ditch can be simulated to instruct headwork and help develop a thought process of executing ditching procedures in a timely manner.

Ditching drills evaluate basic airwork and headwork. The success or failure of a ditch will depend largely on good headwork and the physical manner in which the aircraft enters the water. The TP should enter the simulated water with wings level, on ditch heading, at the minimum rate of descent (100 FPM rate of descent optimum), and at the minimum airspeed commensurate with the configuration and controllability. Ensure that the TP fully understands the consequences of wings not level, fast or slow touchdown or an excessive rate of descent. Ensure Coordination with INAV or ITC is conducted during the planeside brief and prior to execution of this drill when a tactical crew is embarked.

It is the TP’s responsibility to make the decision to ditch or bailout. Therefore, make the simulated emergency dictate the desired response.

Give an altitude for simulated water impact and the ditch heading, or have the TP give you a sea and wind evaluation for a ditch heading under existing conditions.

As a technique, the aircraft should be stabilized at the ditch speed and properly configured with the checklist complete, no later than 300 feet above the simulated water impact altitude.

The TP should call water impact using the barometric altimeter with both hands on the yoke.
IFE defensive positioning is most effective to the left of the RFE. If required for an emergency, the IFE can easily step in front of the FE seat as the RFE exits the seat.

WARNING

The IP shall always recover from ditching drills using all four engines. Failure to increase your airspeed or with insufficient power addition prior to retracting flaps to approach from land can lead to a settling effect with a nose high attitude. Stall buffet may result.

Note the TP's and TFE's execution of the following minimum procedures:

1. Completing the Ditching checklist.

Note

- The importance of keeping the crew informed of time until impact should be emphasized.
- The IFE shall ensure that the TFE gives the correct ditch speed. The IP may approximate the land flap ditch speed using ½ gross weight + 63.
- Occasionally some discrepancy may exist between the TP's and IP's airspeed indicator or altimeter. Get an airspeed and altitude check prior to simulated water impact.
- Pull the auxiliary ventilation control circuit breaker on MEDC (J21) or the auxiliary ventilation actuator circuit breaker on MEAC (J21), the EDC dump circuit breakers on MEDC (H23 and H24) and the outflow valve manual override circuit breaker on FEAC if depressurization is desired.
- If the jettison system is to be demonstrated, ensure the bomb bay is empty prior to switch actuation.
- Specific items on the Ditching checklist can be performed at any time during the maneuver and the TP should be encouraged to get ahead and then use the checklist as a review. For instance, the TP does not have to wait until JETTISON on the checklist to jettison stores or fuel.

2. Ditch preparation. Proper preparation for the TP and TFE includes:

   a. Helmet on, visor down, chin strap tight (time permitting).

   b. Gloves on.

   c. Zippers zipped.

   d. Flight station cleaned (e.g., charts, bottles, etc.).

   e. The landing gear warning circuit breaker may be pulled by the TFE under the direction of the pilot at the controls.

Engine Out Ditching

A simulated three-engine ditch may be practiced in later stage flights, but the IP should demonstrate the difference in SHP and flight control requirements.

In situations where one or more engines have failed, it is possible that someone may try to ditch the aircraft at an airspeed below $V_{MC\ AIR}$ for existing conditions. With one or more engines out (which has been the case during all ditches and training ditch crashes), most of the factors affecting $V_{MC\ AIR}$ are no longer variables. The relationship of ditching speeds to $V_{MC\ AIR}$ is critical. The accompanying figure (figure 5-2) compares $V_{MC\ AIR}$ (on three- and two-engines) to the NATOPS ditching speeds at various configurations. For the conditions stated, an interesting relationship exists. A comparison of the minimum ditch speed and $V_{MC\ AIR}$ at maximum power, 0 degrees bank angle, sea level, and the critical engine(s) inoperative reveals the following:

1. With both the number 1 and the number 2 engines failed, the ditching speed is below $V_{MC\ AIR}$ at all gross weights at both approach and land flaps.

2. With only the number 1 engine failed, the ditching speed is below $V_{MC\ AIR}$ for gross weights below 118,000 lb. at land flaps; below 108,000 lb. for approach flaps. Again, however, this would probably be only temporary to correct low airspeed/high sink rate at a critically low altitude.

Common errors:

1. TFE gives the wrong ditch speed.

2. TP selects incorrect flap position.

3. TP is unaware of correct ditching speed.

4. TP descends too slowly to ditching altitude (i.e., trying to descend at 100 feet per minute from 1000 feet altitude).

5. TP flares before water impact to reduce excessive rate of descent.

6. TP ditches with the wings not level; aircraft not in balanced flight.

7. For engine-out ditch, TP fails to consider aircraft controllability.

Bailout Drill

A bailout drill is a good opportunity to accomplish a pilot swap. Ensure Coordination with INAV or ITC is conducted during the planeside brief and prior to execution of this drill when a tactical crew is embarked.

WARNING

The main cabin door shall not be opened in-flight for demonstration purposes.

Common errors:

1. TP and TFE do not properly depressurize aircraft.

2. TP or TFE do not wear or have the appropriate survival gear.

3. TP does not notify the crew.

4. TP forgets to instruct copilot to attempt communication contact or to transmit emergency code on the IFF.

5. TP does not plan for the IP or TFE to get out of the aircraft when their assistance is no longer needed.

6. TP does not set up the aircraft properly; does not slow aircraft when possible.

7. TP gives no thought to aircraft heading when bailing out over land.

8. TP and TFE do not know the location of survival gear.

Fire Of Unknown Origin Drill

The Fire of Unknown Origin (FOUO) drill requires the utmost in prior planning because it is the most difficult emergency to realistically simulate. Many headwork decisions will face the crew. The speed at which you progress through the checklist will depend on many factors such as day or night flight, environmental conditions, nature of the fire, fumes or smoke, and the amount of information about the fire that the flight station is receiving. Ensure coordination with INAV or ITC is conducted during the planeside brief and prior to execution of this drill when a tactical crew is embarked.

The following items shall be considered prior to execution of the FOUO drill:

1. Determine ahead of time the exact point at which to stop the checklist.

2. Ensure that the drill moves at a realistic pace. An important aspect of a FOUO is the tempo at which

GROSS WEIGHT	80,000	90,000	100,000	110,000	120,000	130,000
Land flaps	103	108	114	119	124	131
App flaps	108	113	119	124	129	136
Flaps up	123	128	134	139	144	151
3 engine V_{MC}	123	123	123	123	123	123
2 engine V_{MC}	141	141	141	141	141	141

Figure 5-2. Minimum Ditch Speed Versus $V_{MC\ AIR}$

steps are accomplished as well as effective CRM within the flight station and with aft crewmembers. Control the pace at which the TP and TFE progress through the checklist by realistically simulating crew actions and/or providing information about the fire, to include the IP acting as a realistic copilot.

3. When the TP and TFE become reluctant to progress through the checklist, add a new dimension (such as an extreme smoke problem) to compel their continuation of the checklist.

4. When giving the fire in a supervisory panel, be aware of the possibility of the TP or TFE feathering without power to the feather pump. Do not let the simulations create an emergency greater than the one being simulated. In the airborne environment, keep it simple and safe, leaving the exotic for the simulator.

5. If a restart is to be made during the FOUO drill, plan no restart malfunctions unless they relate to the FOUO, this eliminates student confusion.

6. The cabin exhaust fan may be turned back on, leaving the red guard open, to provide INU cooling.

The intent of this simulation is to check the TP's and TFE's systematic use of the FOUO checklist as well as effective CRM with other crewmembers. It allows them to become aware of what they have available at any given time in a progressive electrical power reduction (i.e., radios, navaids, feather capability, etc.). The TP and TFE should be aware that the checklist is designed to secure electrical power in the most logical sequence. The use of the PA system is recommended as long as ICS is available.

Note

Emphasize that when the source of the fire is determined, the FOUO checklist is no longer required.

The TP must base his assessment of the emergency on information received from the IP and IFE. The student's mental picture of the simulated problem will therefore be only as vivid as the instructor's ability to convey the information necessary to describe a realistic situation. Immediately after smoke, fumes, or fire have been detected, the TP shall alert the crew and activate the firebill. The TFE shall turn the cabin exhaust fan off and the FOUO checklist shall be started with item number 1.

WARNING

During a simulated fire, the FOUO checklist may only be completed through BUS A – OFF.

Note

The IP may need to re-select UHF radios in order to maintain external communications after Bus A is deenergized.

The TP and TFE shall be familiar with the use of the smoke mask. Explain why the smoke masks should be donned whether or not smoke is readily apparent in the flight station. (i.e., burning electrical components produce toxic gases or by-products such as carbon monoxide, which can be colorless. These gases can quickly incapacitate crew members.)

If, after a FOUO, smoke or fumes are a significant problem, the TP and TFE must make a decision to either remove the smoke or restore electrical power. This will depend on how bad the smoke in the aircraft is. It is a headwork decision, so give them information needed to arrive at the desired conclusion and response.

WARNING

The over-wing exit shall not be removed during flight for simulated malfunctions.

Note

Practice in removing the exit can be done on the deck.

Electrical power shall be restored by use of the Restoring Electrical Power checklist upon completion of the drill. The sole purpose is the systematic restoration of power in the reverse order from which it was secured.

Common errors:

1. TP or TFE is unfamiliar with smoke mask operation.

2. TP and TFE use an inappropriate pace while executing checklists.

3. TP and TFE continue the Fire of Unknown Origin checklist after the source of the fire is determined.

4. TP and TFE are unaware of intentional equipment degradation as the Fire of Unknown Origin checklist progresses.

5. TP and TFE execute the Smoke or Fume Elimination checklist prior to determining the source of the fire.

6. TP and TFE continue Smoke or Fume Elimination checklist when not required.

7. TP and TFE fail to conduct a thorough flight station positional inspection.

Emergency Descent

The emergency descent should be conducted as outlined in NATOPS. Before commencing the descent, conduct a clearing turn and give the TP a minimum recovery altitude. The minimum recovery altitude shall not be less than 4,000’AGL.

CAUTION

Ensure that the landing lights are retracted.

The Descent checklist should be initiated as you are commencing the descent or as soon as practicable thereafter.

CAUTION

Ensure that IAS is below 190 knots before the landing gear is retracted.

The effects of flaps on the rate of descent can be graphically demonstrated by commencing the descent at a nominal altitude of 17,500 feet with the aircraft in the land flap configuration. Accelerate to 160 knots and note the rate of descent on the VSI. Raise the flaps to approach, accelerate to 180 knots and note the rate of descent. Now bring the flaps up, accelerate to 300 knots (250 if restricted by FAA below 10,000 feet) and again note the rate of descent. The best rate of descent is with the flaps up; the steepest angle of descent is in the land flap configuration.

CHAPTER 6

Landing Training Procedures

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Introduction

Instructing the landing pattern is one of the greatest challenges for the instructional team. It requires not only personal proficiency and knowledge, but also an understanding of the landing pattern and the ability to diagnose problems and offer corrective actions. Effective instruction helps improve the TP's understanding of how the aircraft reacts under various situations as well as the "cause and effect" of various inputs or corrections.

Another challenging aspect of instructing in the landing pattern is attempting to ascertain what information a TP is seeing and processing in order to make corrections. Often TPs will fly based on diagnosis by the IP rather than seeing the deviation themselves and processing the information in order to make the required change. One technique that can be effective is to ask the TP how the aircraft is positioned at various checkpoints rather than telling them.

The training syllabus gradesheets outline the types of landings required. The number of emergency landings should be at least one of each type. Ten to twelve landings per student per flight is normally sufficient considering the fatigue of the TP as well as that of the IP. Do not belabor a point. If the TP has demonstrated satisfactory performance in normal landings, move on to simulated emergency landings. This will afford the instructor more time to concentrate on weak areas. TPs experiencing difficulty may require more time to learn the techniques of a good landing but an excessive number of landings may endanger safety or reach a point of diminishing returns. One recommended technique when training two pilots on the same flight is to alternate TPs in the landing pattern every 5 to 6 landings to reduce fatigue and to allow the TP a chance to take a break and learn by observing the other TP. This would be especially beneficial if one particular TP is having problems in the pattern. IPs must be extremely vigilant to guard against complacency during extensive periods in the touch-and-go pattern. IPs are encouraged to break monotony by swapping TPs, departing the VFR pattern for an IFR approach, or performing a landing for IP proficiency.

VFR Landing Pattern

The purpose of practicing VFR landings (see figure 6-1) is to become proficient not only on the runway but on the transition from an actual IFR approach. Accordingly, the VFR "picture" should approximate that seen on breakout from an IFR approach.

There are several keys to flying a consistently good VFR approach and landing. The FRS teaches a descending–decelerating approach to a visual glide slope and touchdown in a nose-high attitude with the power levers at or near flight idle. Two of these keys are smooth basic airwork and power lever/SHP control. Although smooth basic airwork generally comes with experience, the TP should strive to make positive corrections and coordinated turns, using a combination instrument–visual scan to arrive on final looking at the same “picture” every time. Small power adjustments in the P-3 may not be detected audibly, giving rise to the common tendency to make rather large adjustments. The TP should be instructed to include the SHP gauges in his/her scan and to allow each small power adjustment to take effect prior to making an additional change.

The TP should be able to describe the VFR landing pattern with correct altitudes and airspeed s. See Figure 6-1, page 6-3.

While in the landing pattern, established airspeeds and altitudes should be adhered to, this consisting of ± 5 knots and ± 100 feet of prescribed limits. Airspeed for the approach is as published in the simplified schedule posted in the cockpit, and the TFE shall call out the correct airspeed associated with the type of landing being executed.

Descent Procedures

Discuss different types of descents. Check that the TP is using the checklists in a timely and correct manner. The Descent and Approach checklists should be completed prior to entering the landing pattern. If the VFR pattern is entered immediately after the first takeoff of the day, the climb checklist shall be completed to ensure the autofeather system is de-energized. The Approach checklist shall be completed to obtain the proper landing speeds.

Pattern Entry

Every effort should be made to enter the VFR pattern after an instrument approach has been completed. The use of VFR breaks or VFR downwind entries should be kept to a minimum. If an instrument approach was not previously executed, pattern entry is via the downwind leg; at which point approach flaps need to be extended. Premature flap extension will merely slow the aircraft unnecessarily wasting fuel and instructional time.

Note

When other aircraft are present in the VFR pattern, notify the tower upon entering the pattern or when turning crosswind of the landing intentions, if other than a touch-and-go. This allows the follow-on interval to extend upwind for spacing and help maintain pattern integrity off the 180.

Downwind Leg

Upon entering downwind, the TP should give the touch-and-go brief. On subsequent VFR approaches the TP can shorten the brief appropriately but should review the SHP to be used on the “go” portion.

Note

- In the VFR pattern, the TP may use the TFE to set power on takeoff, climb out, level off, and the initial power reduction off the 180 position. During the remainder of the approach and landing, the TP should make his own power adjustments. This requirement is a minimum and will enable the TP to learn the importance of power control in developing smooth basic airwork. Additionally, the above requirement will allow the TFE to receive more practice in setting SHP and scanning engine instruments.

- If extended on downwind, consideration should be given to maintaining airspeed and pattern altitude until intercepting a 3-degree glideslope.

Base Leg

Regardless of aircraft configuration, the landing gear shall be lowered no later than abeam the intended point of landing (first 1000 to 2000 feet of runway. The TP should commence his turn off the 180 in order to fly a consistent path over the ground, compensating for winds as necessary. The use of VFR checkpoints is an excellent way to promote a consistent path over the ground and decrease the reliance on instruments. It also promotes a better VFR scan for traffic and can help the TP ascertain wind direction and its effect on the aircraft. A power reduction should be made off the 180 position so the aircraft will decelerate in the descent. Various techniques are available as to the exact point at which a power reduction is made. Factors such as aircraft gross weight, winds, pattern altitude, and extensions due to traffic should be considered. Normally the power reduction is made either just before or as the turn is initiated. The TP should start a gradually descending, decelerating turn to reach the 90 degree position at roughly two-thirds pattern altitude. With a 1000 feet AGL pattern this will be the standard 600-700 feet AGL. However, with a higher pattern altitude (1200 or 1500 feet AGL) the downwind distance is slightly wider and the aircraft’s path over the ground is slightly longer. Thus, the 90-altitude checkpoint needs to be a little higher (800 or 1000 feet AGL, respectively). Emphasize use of the VSI in the base leg turn and the importance of checking altitude and airspeed

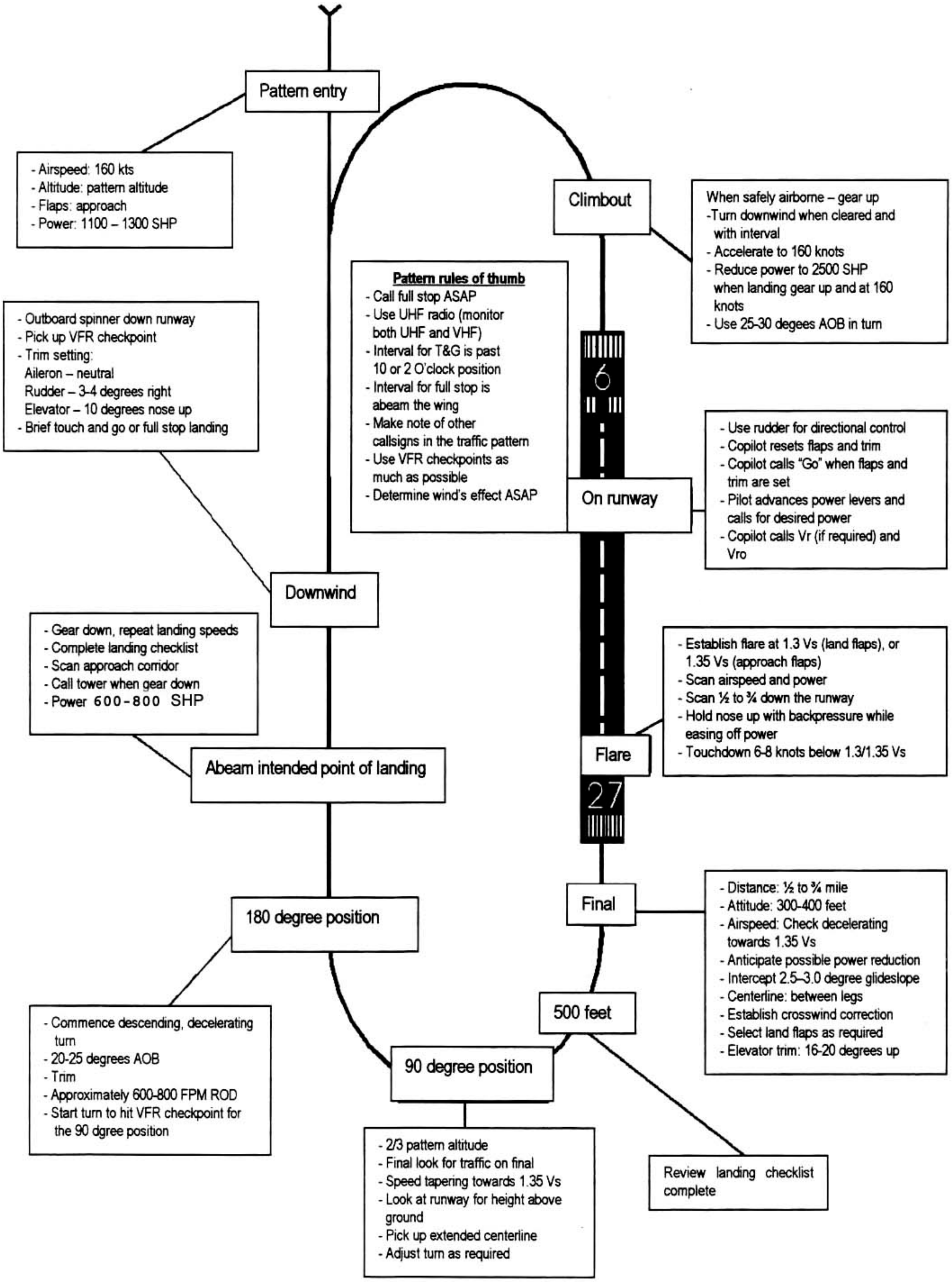


Figure 1. Normal landing Pattern

before making a power adjustment. Minimum power changes, coordinated turns, and proper use of trim are all essential for a smooth base leg turn.

Minimize system quizzing once the Landing checklist has been initiated.

Common errors by the TP:

1. Fails to compensate at the abeam position for strong cross or axial winds.

2. Climbs when the gear comes down.

3. Too much or too little power reduction at the 180.

4. Flat turn from 180 to 90 or too steep a turn from 180.

5. Inadequate crosswind correction.

6. Drops land flaps too early, requiring excessive power to reach the runway.

7. Fails to keep nose down after selecting land flaps causing airspeed to dissipate rapidly.

8. Power back to flight idle approaching the end of the runway.

9. Fails to use instrument scan to backup visual references (i.e., airspeed, altitude, and VSI).

10. Fails to scan SHP gauges when making power changes in the base leg turn, resulting in too many power adjustments.

Final

At approximately 1/2 to 3/4 mile, 300-400 feet AGL, the runway centerline and final glideslope should be intercepted. Alignment at this time is quite important since it will enable the TP to detect and correct for a crosswind. Lineup can most easily be achieved by having the TP “straddle” the centerline. The normal tendency is for the TP to line up left. The target airspeed range rolling final should not fall below 1.35 V_S with approach flaps (1.3 V_S with land flaps). Stress that it is not desirable to arrive at these speeds early on final approach and that airspeed should be slowly tapered to the final flap configuration speed as the flare is established. Touchdown normally occurs 6-8 knots below this speed.

Land Flap Landing

If land flaps are used, they should be selected at a comfortable distance from the landing threshold. Ideal land flap selection for a visual 3 degrees glide path will occur at 200-300 feet AGL with airspeed tapering to 1.35 V_S. Elevator trim will be required (normally 15-20 degrees up) so that the nose will not feel unnecessarily “heavy” when the flare is established. Without the proper trim, the common tendency is to land flat. Caution the TP that when land flaps are selected, the nose must remain pointed down toward the intended point of landing to prevent the rapid deceleration associated with level flight and land flaps. Once the flaps are full down, taper the airspeed so as to enter the flare at 1.3 $V_{S.}$ The approach indexer (12 units AOA or doughnut) may be used as a cross check when passing over the end of the runway. The power should be reduced gradually as the nose is rotated for the flare. The power–nose coordination in the flare is critical to achieve a desirable rate of descent at touchdown.

Note

- The touchdown point may be in the first third of the runway. The TP should, however, strive to land in the first 1000–2000 feet. This will become increasingly important during adverse weather conditions.

- The importance of smooth power reduction and nose attitude change while looking down the runway to detect and control sink rate to touchdown cannot be overstressed.

- Emphasize that the landing evolution is not a mechanical process resulting in touchdown with a predetermined power setting and nose attitude.

As the main gear touch down, retard the power levers to flight idle, if not already there, and lower the nose gear gently to the runway. Once the nose wheel is on the runway, check speed below 135 knots and bring the power levers over the ramp to the ground start position. After the Beta lights illuminate, reverse as necessary. Point out that reverse is most effective at high airspeeds and that brakes are most effective at low speeds. Directional control should be maintained by rudder, aileron, and asymmetric power, then shifting to nose wheel steering below 60 knots. Teach the TP the proper use of the brakes by giving them an opportunity to use the brakes to varying degrees.

Note

- Stress the importance of centerline control on landing rollout.
- In the FRS, the TP is taught to use normal reversing techniques (i.e., use reverse power as necessary to stop the aircraft in the available field length) for all normal and emergency landings. They are also introduced to the critical field length reversal technique for normal and emergency landings.

Common errors:

1. TP flares too high, floats, and/or lands long.

Note

- It is recommended that the aircraft not be allowed to touchdown past the first third of the runway.
- Although the IP may elect to allow TP to land the aircraft past the first third of the runway, he must be mindful of remaining runway length (especially less than 5000 feet remaining) if a touch and go is going to be attempted.

2. TP spots the deck and does not flare.

3. TP chops power in the flare.

WARNING

This is one of the more dangerous situations and could result in severe damage to the aircraft should it be allowed to impact the ground. The IP should take the aircraft, immediately apply power and execute a waveoff. Do not try to salvage a bad landing.

Note

The IP shall have his hands on top of the power levers to prevent excessive movement.

4. Flares too late.

5. Lands left of centerline.

6. Lands in a skid (usually left or into a crosswind).

7. Fails to close-out power levers when main mounts are on the runway.

8. Overly cautious coming into ground range.

9. Places hand on nose wheel too early on rollout, or fails to use nose wheel steering.

10. Releases crosswind control inputs at touchdown.

11. TP attempts to reverse above 135 KIAS.

Approach Flap Landing

This maneuver is a good warm-up for a no-flap landing as rate of descent and airspeed must be controlled more closely. The approach flap landing is a normal maneuver that should be considered when high crosswinds are present or during periods of low visibility when touchdown point and ground roll distance is not a problem. Touch-and-go landings can be made in an approach flap configuration, but because of higher rollout airspeeds, be careful not to allow the TP to rotate if the SHP is low (minimum 2500), regardless of speed attained. Consideration should be given to calculating your ground roll distance and brief the co-pilot on calling airspeed below 135 knots for reversal on full stop approach flap landings.

Crosswind Landings

The TP should already know the proper crosswind landing procedures. The wing-down/top-rudder method is best unless the component is severe, when a combination of crab/wing-down is better, as described in NATOPS.

Right Seat Landings

Landing from the right seat is introduced in the PPP syllabus and is a main focal point during PPC upgrading. All landing patterns and procedures remain the same with the exception of the pilot at controls (PAC) is manipulating the flaps, plus both the flaps and trim during the touch-and-go. The upgrading flight engineer should also gain valuable experience of operating the opposite set of power levers during touch-and-go landings. A common trend is to land right of centerline in a slight skid.

Power Setting Selection

Reduced power takeoffs should be performed whenever possible to preserve turbine life. Power settings should be based on gross weight, runway length and environmental conditions. TIT should be reduced as gross weight permits to produce a minimum of 3000 SHP while not exceeding 1010 TIT provided aircraft performance does not result in runway length or climb performance becoming critical. It is recommended that takeoff or touch-and-go power be reduced from 3500 to 3000 SHP when aircraft weight has decreased to 95,000 or 90,000 lbs. depending on runway length. Power shall not be reduced to less than 3000 SHP for takeoffs or touch-and-go's.

Stop-And-Go Landings

The stop-and-go landing is a time saving evolution and may be used whenever practicable. A minimum of 6,000 feet of usable runway remaining is required for the “go” portion. Simulated emergencies may be practiced on the “go” portion.

While executing stop-and-go landings, it is not desirable to conduct the entire abbreviated Takeoff checklist while on the runway. Before initiating the “go” portion, the IP and IFE shall ensure the following are completed:

1. Flaps — Takeoff.
2. Trim (rudder and elevator) — Reset.
3. Rudder boost shutoff valve circuit breaker (K13) — Reset.
4. Oil coolers — Set.

Touch-And-Go Landings

Four-engine land flap, approach flap, and no-flap are the only authorized configurations for performing touch-and-go landings. Under normal situations all other configurations will be made to a full stop. No-flap touch-and-go landings should only be conducted during remedial training, IP DFWs, or on annual NATOPS events for qualified pilots. Syllabus events that call for a no-flap landing shall be done to a full stop. Prior to rotating off any type of touch-and-go, flaps and trim shall be reset as necessary with a minimum of 2500 SHP set prior to initiating rotation.

Malfunctions During Touch-And-Go Landings

Should an actual malfunction occur prior to rotate, an abort may cause more of a hazard than reestablishing flight. The IP must immediately evaluate the nature of the malfunction, aircraft’s speed, current power setting, and runway remaining in order to make the decision to abort or continue the takeoff. Each IP should have a well thought out plan for the safest course of action. Hangar flying discussions are crucial to developing a pilot’s runway SA and decision making. If an upgrading pilot displays sub-standard performance in this area, an OFT session should be scheduled to reinforce the importance of runway SA.

WARNING

- Simulated emergencies or malfunctions prior to rotate shall not be given on touch-and-go landings except during the PPC Defensive Flying event, PPC check rides, or IUT events.

- EFARs during a touch-and-go landing are prohibited.

- Simulated malfunctions shall not be given during a no-flap touch-and-go or landing.

Note

Failing the flap indicator during co-pilot duties for an upgrading pilot while the IP is at the controls is valid training and is authorized.

Any emergency or malfunction given during a touch-and-go shall be simple and specific with an obvious course of action. (Example: IP call “EDC Press Low LT # 3” with power levers at flight idle.) These emergencies should evaluate the upgrader’s situational awareness during a critical stage of flight. It is strongly recommended that an IUT IP be scheduled for the PPC Defensive Flying event. The IP giving a malfunction during a touch-and-go should be prepared to take the controls should the upgrader delay his/her decision or proceed with a decision that could jeopardize flight safety.

Note

- Instructors are encouraged to use runway markers to determine actual V_R capabilities as governed by environmental conditions.

- Any time the IP determines the aircraft cannot be stopped with the available runway remaining a “refusal” call should be made to alleviate any confusion on the part of the other pilot.

Engine Out Landing Training

Simulated engine-out training and no-flap training is prohibited during hours of darkness. Simulated two-engine approaches and landings shall be conducted during day, VMC only.

Three-engine and no-flap approach training is permissible during daylight hours provided the ceiling is 1,000 feet and the visibility is 3 miles or better.

For both three-engine landings and two-engine landings the following requirements exist:

1. Runway length — 6,000 feet minimum.

2. Runway width — 150 feet minimum.

3. Consider crosswind — More than 5 to 10 knots crosswind component requires extra caution.

4. Runway condition — Sufficiently dry to prevent skidding or hydroplaning.

Simulated Three Engine Landing

The IP should initiate a simulated emergency situation which normally requires an engine to be shutdown. The student shall initiate the Emergency Shutdown checklist by performing the memory items and then call for the checklist. The IP will retard the power lever to 175 SHP to simulate a feathered engine and will report: "Emergency Shutdown checklist simulated complete down to APU". The students will then report whether or not the APU is required.

Explain to the TP that the pattern and airspeeds for the three engine landing do not differ from those for a normal approach and landing. The aircraft responds to total power and with one engine out, the horsepower lost must be added to the three operating engines. Stress the importance of being ahead of the aircraft on power calls and concentrating on flying the aircraft first, then handling the emergency and briefing the copilot.

Note

Stress that practice normal and emergency landings (three-engine, two-engine, and no-flap) are conducted in the VFR pattern from a 180 position in order to maximize available training time, and in most cases the preferred method would be to accomplish an emergency landing from an extended final position. Practice engine-out and no-flap GCAs are considered excellent training techniques.

A brief by the TP should be given on the downwind leg to include all of the NATOPS required brief items. The TP's brief should cover anticipated use of the flight controls, power levers, nose wheel steering, and brakes based on existing wind and runway conditions. The TP should brief bringing all four power levers into the Beta range and releasing a power lever at the IP's command. Ensure the TP knows the difference between a favorable and an unfavorable wind with respect to landing and rollout. If necessary a turn may be made at pattern altitude to give the TP time to set up for the approach.

Note

If the TP is trimming properly throughout a three engine approach, the rudder trim setting should be relatively neutral prior to touchdown.

Once the aircraft is on the runway, the TP should bring all power levers over the ramp. After scanning for all four beta lights, the IP may call for the power lever on the "failed engine." The TP should then release the power lever and continue to reverse with the "operating" engines, counteracting the tendency to swerve with rudder, aileron into the failed engine, and forward yoke pressure. When the speed has decreased to the point where directional control cannot be maintained with the flight controls, but the speed is still too high to use nose wheel steering, ease the asymmetric engine out of reverse to maintain centerline. Another technique at this speed is to bring the power levers out of maximum reverse towards ground idle. This creates renewed airflow over the rudder, extending its effectiveness. After the aircraft has slowed further, a combination of reverse, brakes, and nose wheel steering can be used to complete the landing rollout.

Centerline control is extremely important throughout final and during the landing ground roll. The IP should scan primarily down the runway, but be alert for an actual emergency. Being off centerline will only put the IP further behind the aircraft. Additionally, the TP learns little about directional control if "transiting" (as opposed to established on) centerline.

Common errors:

1. TP does not bring failed engine power lever into the BETA range, or is reluctant to use asymmetric reverse once in the ground range.

Note

- IP should use a hand position that maintains contact with all four power levers during the entire landing evolution.

- IP must ensure the "dropped" power lever is in the ground range.

2. TP uses nose wheel steering and/or brakes at high speed.

3. TP reverses with the wrong engine.

Simulated Two Engine Landing

The requirements, procedures and general briefs listed for three engine landings also apply for two-engine landings. The two-engine landing is normally started from a position downwind.

WARNING

The second engine should not be failed until established at pattern altitude. Downwind speed should be maintained above 160 knots with approach flaps or l.52 V_S in the clean configuration.

The discussion will arise regarding when to taper airspeed below 1.35V_S/145 knots or exactly when the "landing is assured". The 1.35 V_S/145 knot airspeed should be maintained to ensure an adequate margin above $V_{MC\ AIR}$ in the event of a waveoff. Tapering the airspeed below 1.35 V_S/145 knots essentially eliminates the waveoff option unless altitude can be traded for airspeed. The need for an actual two engine waveoff is perhaps overemphasized in the training environment and would probably be attempted only if the approach was too high and too fast. If the opposite situation occurred, the pilot should be committed to land and hopefully, close enough to add some power and make the runway. The point at which the landing is assured is the product of sound judgment. The pilot should consider the following:

1. Is the Landing checklist complete?
2. Is the existing SHP commensurate to a two engine landing?
3. Am I on or near normal visual glideslope?
4. Am I in a position to intercept the extended runway centerline without using excessive angle of bank?
5. Have I obtained landing clearance?

Note

TPs may assume that in an actual two-engine approach there would be no conflicting VFR traffic. Consequently, they should not delay their deceleration to landing speeds because of another VFR interval (e.g., "cleared to follow, cleared number 2, continue").

On final and assuming the landing can be made, select land flaps at the pilot's discretion and reset SHP as needed on the remaining engines. Touchdown as in a normal landing. After the nose wheel is on the runway, the TP should bring all power levers over the ramp. After scanning for all four beta lights, the IP may call for the power lever on the "failed engines." The TP should then release those power levers and continue to reverse with the "operating" engines, counteracting any tendency to swerve with rudder, aileron, and forward yoke pressure. Stress the importance of anticipating and coordinating aileron and rudder application to maintain centerline throughout final/landing ground roll evolution. The flight control/power lever technique during reverse is essentially the same as on a three engine landing (i.e., use the flight controls for directional control, then asymmetric power once the flight controls begin to lose their effectiveness).

Note

Emphasize to the TP that the outboard operating engine will be the primary cause of control problems.

The IP may introduce symmetrical two-engine out failures prior to asymmetrical engine out training, if dictated by the environment or if desiring power control training for the TP. When practicing these types of symmetric landings, the additional points of waveoff capabilities and non-applicability of the 145 knot minimum airspeed need to be addressed. If at any time a waveoff is required, the IP should take the aircraft and climb using all four power levers.

No-Flap Landing

A flap asymmetry, elevator boost out, flap control cable problem, or loss of both hydraulic systems may make the no-flap landing necessary. The TP should give the no-flap landing brief when on downwind. The IP shall ensure that the rudder boost shutoff valve circuit breaker is pulled and the TFE shall compute landing ground roll distance prior to commencing approach phase.

For no flap landings for training, the following requirements exist:

1. Runway length — 7,000 feet minimum.
2. Runway width — 150 feet minimum.
3. Consider crosswind — More than 5 to 10 knots crosswind component requires extra caution.
4. Runway condition — Sufficiently dry to prevent skidding or hydroplaning.

Note

Sound judgment should prevail when the TP briefs a go-around point for this landing. Even though the ground roll distance may be less than 4000 feet, few pilots would consider the "four board" an appropriate waveoff point for a 12,000 feet runway. Pilots should strive to land in the first 1000 to 2000 feet, and certainly within the first third of the runway.

No-flap landings will be conducted in the aircraft for training purposes in accordance with the following:

1. During scheduled upgrade syllabus flights which call for no-flap landing.

2. On NATOPS evaluation flights.

3. IPs should maintain proficiency in accordance with current guidance, to include no-flap landing demonstrations as required on the above flights.

4. No-flap landings will not be practiced above 103,880 lb. (or above 91,320 lb. on lightweight aircraft).

The approach may be slightly wider throughout. Altitude checkpoints in the pattern are the same as for normal patterns though the approach may be flatter due to a deeper track flown over the ground. Review the pattern airspeeds with the TP. Because of reduced drag less SHP will be required to fly this particular pattern and approach. Taper the speed in the base leg turn to arrive on final at 1.2 V_S (minimum 135 knots).

Use power as necessary and fly the aircraft to touchdown. Ensure the TP understands the relationship between nose attitude and airspeed, plus power settings and rate of decent. A normal flare is not used.

WARNING

- Beware of the TP who arrives at the 90 low and slow. An abrupt pull on the yoke may put the aircraft close to stall buffet speed. Power-off stall buffet speed for 100,000 lb., 30 degrees AOB, and flaps up is approximately 132 knots.

- Emphasize that a no-flap landing is a deferred emergency and there is no commitment to land on the first pass. Beware of larger power changes on final, especially from the TP correcting from a high and fast final.. Retarding the power levers rapidly on final causes high sink rates. Waveoff in this situation.

Watch for the TP who flies a beautiful approach and then drops the nose wheel to the deck. Fly the nose wheel gently to the deck and check the airspeed. The TP should brief the copilot to call the airspeed "below 135 knots." This restriction reduces the possibility of decouple or pitchlock.

WARNING

Guard against the TP who tries to reverse or even pick up the power levers above 135 knots. With hands on top of the power levers and a slight downward pressure, the IP can easily prevent upward movement.

Extreme caution should be used to ensure that pitchlock or decouple does not occur while going into the Beta range. The TFE should scan fuel flow, RPM and SHP for proper indications. Comment on the excessive amount of runway used while landing at high speeds. Stress smooth application and the effectiveness of reverse at high speeds as compared to brakes. Brakes may be applied as the aircraft slows. Syllabus events that call for a no-flap landing shall be done to a full stop. Figure 6-2 is provided to indicate the landing ground roll distance for a no-flap landing. Values are based on moderate wheel braking, zero wind and zero slope.

Airspeeds in excess of 135 knots on touchdown will significantly increase the runway required. For instance a touchdown speed of 145 knots may require an additional 1000-1500 feet of runway to allow airspeed to decrease below 135 knots and initiate reversal. Airspeed in excess of 1.2Vs at the landing ground roll distance remaining is to fast and a waveoff should be executed. If a no-flap approach is continued to a landing past the maximum intended touchdown point, a normal reversal may be insufficient to stop the aircraft on the runway unless hard wheel braking is used. The preferred alternative would be to execute a touch and go. In either of the above cases, if the aircraft touches down, the IP should take the controls.

WARNING

If a waveoff is warranted from a no-flap approach, be aware of a substantial nose-up pitch with the addition of waveoff power, in close proximity to the runway, a tailstrike could occurs.

OAT	80000 LB.	85000 LB.	90000 LB.	95000 LB.	103880 LB.
30^0 C	3760 feet	4010 feet	4260 feet	4600 feet	5420 feet
25^0 C	3708 feet	3960 feet	4210 feet	4550 feet	5320 feet
20^0 C	3630 feet	3880 feet	4130 feet	4470 feet	5230 feet
15^0 C	3560 feet	3810 feet	4060 feet	4400 feet	5170 feet

Figure 6-2. No-Flap Landing Ground Roll Distance

Common TP errors:

1. Not referencing or flying 1.52Vs or 1.2 Vs minimum speeds.
2. Slow (below 135) close to runway with insufficient correction.
3. Landing long or fast.
4. Not flying the nosewheel to the deck.

No-Flap Touch-and-Go

The purpose of No-Flap touch and go’s is to provide extra training to upgrading students that exhibit difficulty with the profile of a no-flap approach, while reducing full stops for aircraft fatigue life purposes. They may also be used to supplement training to ensure qualified pilots have proficiency in the maneuver. However, it is important to note that students must have adequate training for no-flap full stops. To this end, if a gradesheet calls for a no-flap landing the student should perform at least one no-flap to a full stop. Annual (not Initial) NATOPS checks may use a touch-and-go in lieu of a full stop. If an upgrading pilot has no deficiencies with the no-flap approach, they should only perform the specified number of no-flap landings in the syllabus, all to a full stop. The following paragraphs will discuss the procedures, cautions and notes associated with the maneuver. The teaching points discussed for a no flap landing are still pertinent as well as the added notes.

For no-flap touch-and-go training the following requirements exist:

1. Runway length — 7,000 feet minimum.
2. Runway width — 150 feet minimum.
3. Consider crosswind — More than 5 to 10 knots crosswind component requires extra caution.
4. Runway condition — Sufficiently dry to prevent skidding or hydroplaning.

Until the point of reverse or go, all no-flap landings shall be conducted in the same manner. NATOPS 16-1 shall be briefed, landing ground roll distance calculated, and K-13 pulled. [In the event of multiple touch-and-go’s, 16-1 need not be briefed each time as long as no major changes occur between approaches (i.e. Runway change)] and the approaches are done consecutively. The IP shall hold the student to the same standards for touch-and-go’s and full stops. (i.e. do not allow touch-and-go’s to be landed if a full stop would be waved-off.)

For the touch-and-go, the student shall land, close-out the power levers and fly the nosewheel to the deck. The IP should roll in “1 – 2 handfuls” of nose-down trim, wait until below 135 kts and then call “go”. The student will then call for 3000 SHP. Once the aircraft has reached 1.2Vs speed, the IP will call rotate. The student and IP should be aware of the tendency for the nose to pitch towards 8 to 10 degrees up, and fly the aircraft smoothly off the deck.

Reset K-13 once safely established on the climb out. Be alert for possible valid RAWS warnings after gear retraction.

In the case of a waveoff / go around, execute procedures as normal (just like an approach flap waveoff), without the addition of trim, being cognizant of the increased nose-up pitch. This should be accomplished as soon as it is realized the aircraft cannot remain within safe no-flap parameters prior to touchdown.

WARNING

If a waveoff is warranted from a no-flap approach, be aware of a substantial nose-up pitch with the addition of waveoff power, in close proximity to the runway, a tailstrike could occur.

Having to execute a "go" after placing the aircraft on deck due to insufficient runway remaining is a likely situation a pilot would encounter on a no-flap landing should be taught on PPC F5 defensive flying event

Cautions:

1. The nose will have a tendency to pitch up at rotate. The student and IP shall guard against over-rotation, IAW the no-flap brief in the JOB AID.

2. The IP shall be cognizant of landing ground-roll distance and airspeed at all times when on the approach and runway. In the event of an actual malfunction or student error, the IP shall be prepared to take the controls and abort or go depending on the situation.

Note

This is not a DFW practice maneuver, but may be used during non-initial NATOPS checks, IPDFWs, or dedicated syllabus events. Rotate at the 1.2 Vs speed.

WARNING

Simulated malfunctions shall not be given during a no-flap touch-and-go or landing.

Common student errors:

1. Landing long and/or fast
2. Not closing out the power levers.
3. Calling for flaps and trim.
4. Not flying the nosewheel to the deck.
5. Over-rotation.

VFR BREAK

It is strongly encouraged that an instrument approach be utilized for pattern entry in order to provide valuable instrument training for pilots. However, the VFR break usually provides the most expeditious means of entering the landing pattern, and is an excellent basic air work drill and confidence building maneuver. The VFR break is a standardized maneuver not to exceed 60 degrees AOB or 250 knots. If a break is to be conducted, the altitude should conform to local directives. Break altitude is usually higher than normal pattern altitude. While proceeding inbound to the field, locate other traffic in the pattern to ensure separation since visual contact may likely be lost during the break. The break may be performed power-on or power-off.

Power On Break

When in position and cleared for the break, the pilot should make a coordinated roll into a 60 degrees AOB (less AOB may be used) turn. The power which was set prior to the break should be maintained through 180 degrees of turn. The pilot should maintain altitude; however, his or her primary scan should be outside of the aircraft keeping the nose on the horizon. As the TP rolls wings level on downwind, the power levers should be reduced to flight idle and maneuver flaps selected. When established on downwind, start the descent while selecting gear down (at 1 G) and complete the landing checklist. With gear down and airspeed less than 190 KIAS the flaps should be selected to approach. The remainder of the approach is conducted just as a normal VFR landing.

Power Off Break

When in position and cleared for the break, the pilot should make a coordinated roll into a 60 degrees AOB turn and simultaneously retard the power levers to flight idle. The pilot should maintain altitude through 180 degrees of turn; however, his or her primary scan should be outside of the aircraft keeping the nose on the horizon. As the TP rolls wings level on downwind, select maneuver flaps and start the descent while selecting gear down (at 1 G). Complete the Landing checklist. With gear down and airspeed less than 190 KIAS the flaps should be selected to approach. The remainder of the approach is conducted just as a normal VFR landing.

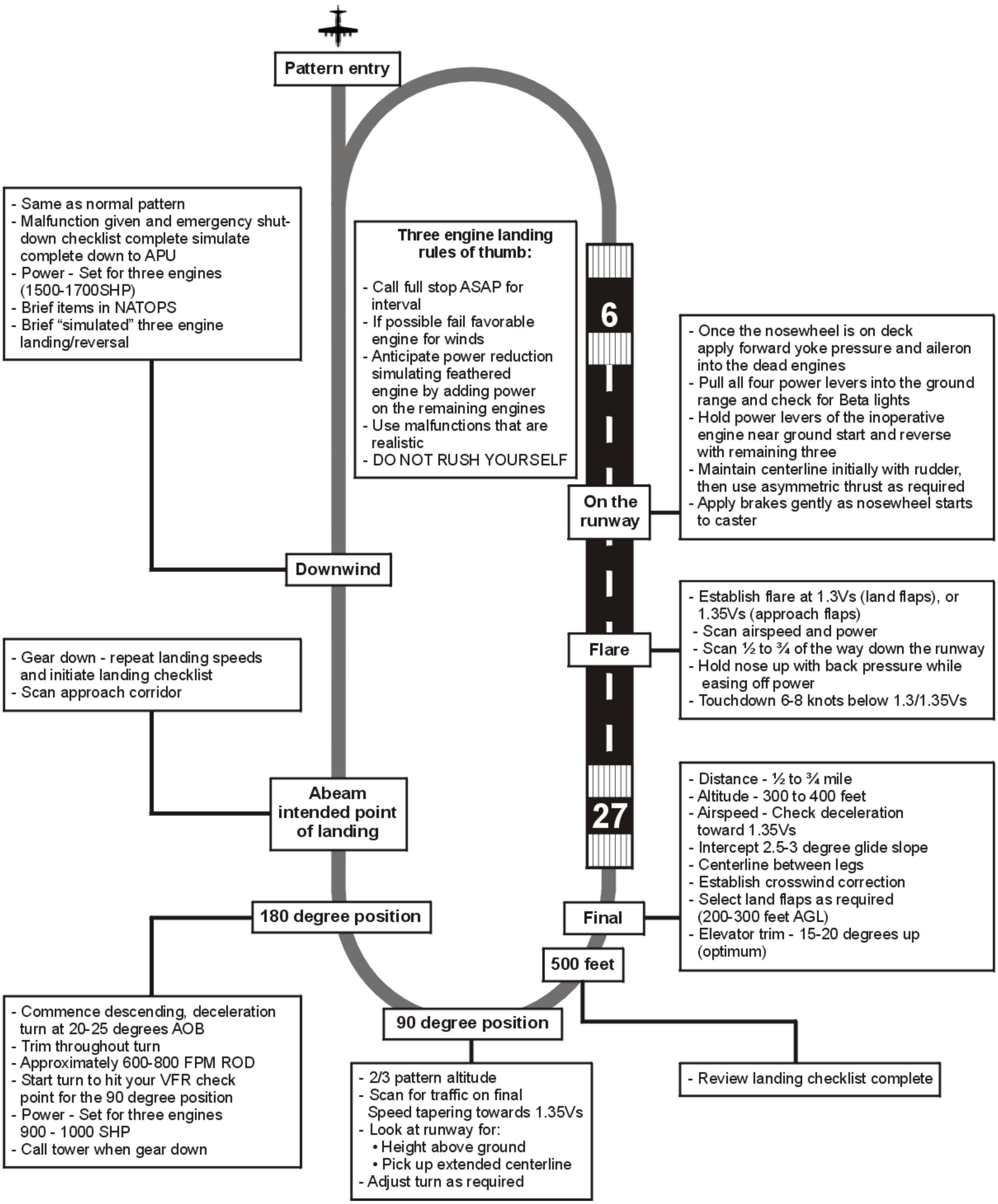
WARNING

Instructor pilots need to be aware of the increase in stall speed associated with high angle of bank and high G turns. Zero thrust stall speed for a 100,000 LB aircraft is 162 knots at 60 degrees AOB (2 G's) and 198 knots at 70 degrees AOB (3 G's). Refer to figure 5-1.

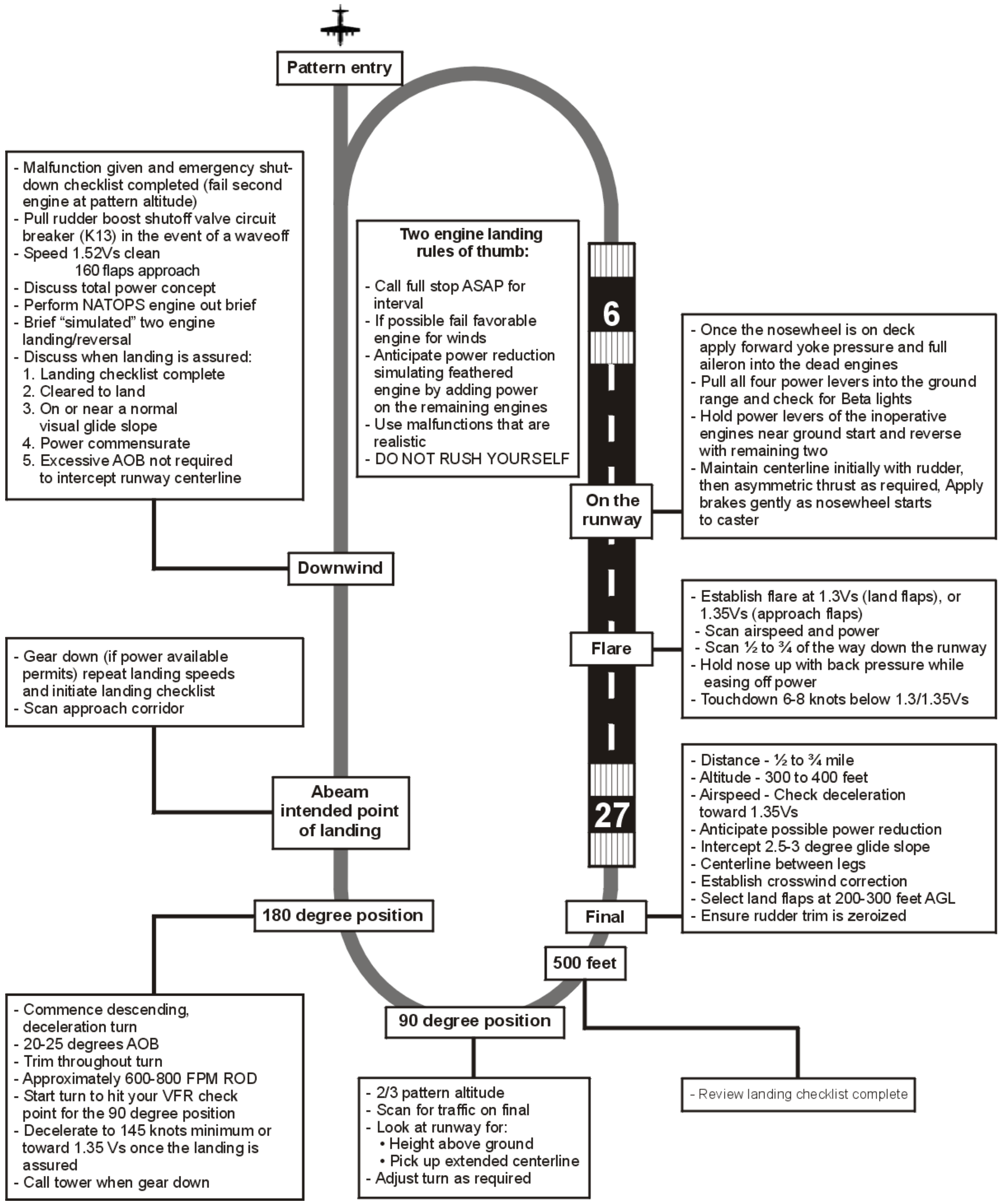
CAUTION

Remember the restriction of 190 KIAS to extend the gear at greater than 1 G.

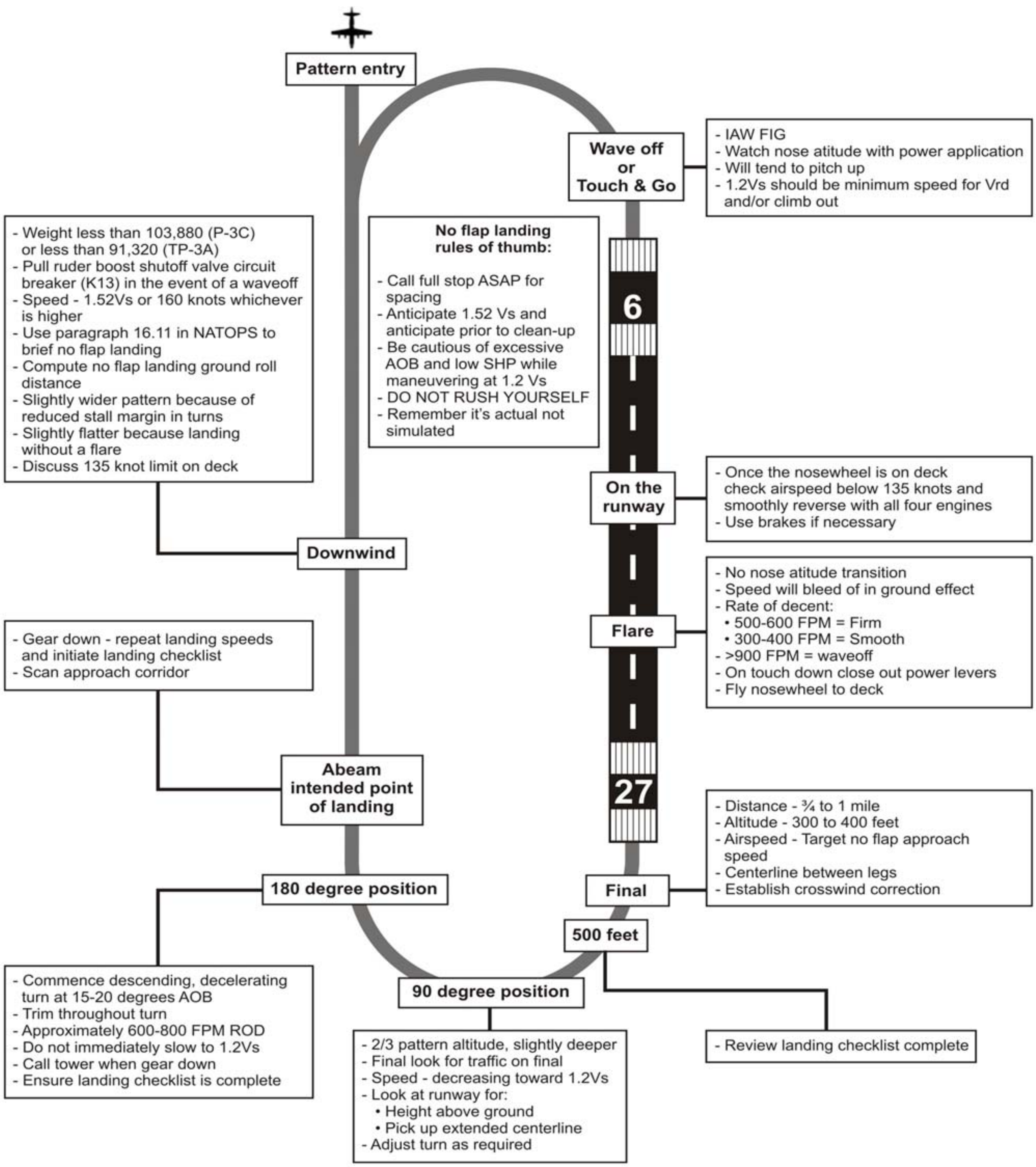
Three Engine Landing Demonstration



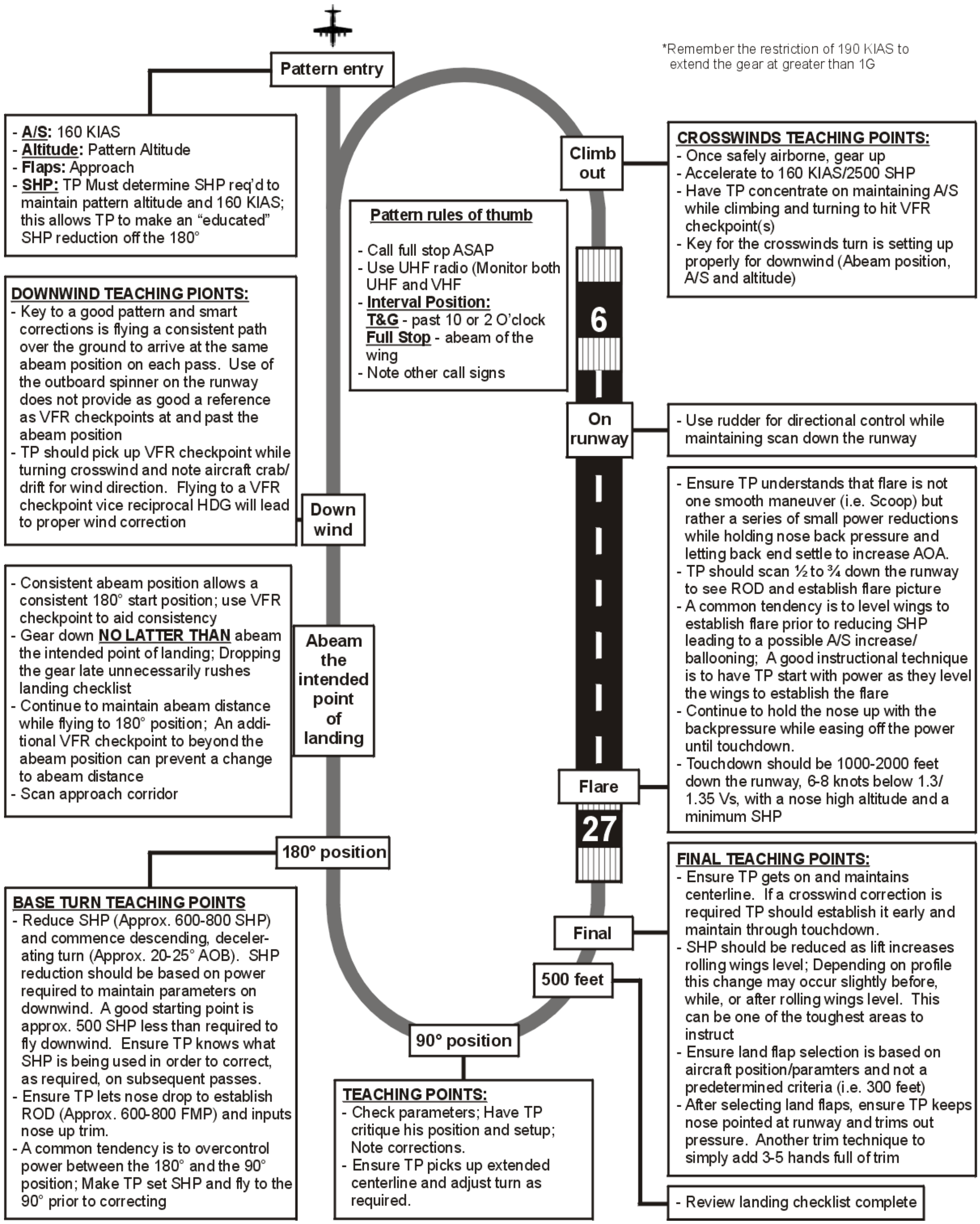
Two Engine Landing Demonstration



No Flap Landing Demonstration



Landing Pattern Instructional Technique



CHAPTER 7

Counter Threat Training Procedures

TABLE OF CONTENTS

Introduction:

The purpose of this chapter is to standardize instruction for conducting Counter Threat Training (CTT) during in-flight and OFT evolutions. It contains training and instructional techniques that support actual maneuvers delineated in the P-3 NTTP. The dynamic and challenging maneuvers require the instructor to ensure the aircraft remains within the flight envelope at all times. CTT is a training evolution not to exceed the limits of NATOPS/NAVAIR restrictions. The aim is to provide proper procedures to train pilots to safely and confidently operate the P-3 aircraft in a threat environment, while not exceeding the aircraft envelope. This training encompasses not only basic airwork, but also Operational Risk Management (ORM) and Crew Resource Management (CRM). It is imperative both during this training and in the operational environment that the operator be concerned with its impact on P-3 Fleet Life Expectancy (FLE). While Tactics, Techniques, and Procedures are presented for discussion and exposure, actual operational maneuvers are classified and can be referenced either in NTTP 3-22.5, Chapter 9, or by consulting the appropriate CTG SIPR website.

CTT Basics

1) Definitions and equipment limitations:

Control Inputs at High Airspeed- As per NATOPS Ch. 10.3.3.1, abrupt pitch inputs at high airspeeds (above 300 KIAS) should be avoided. This discussion was based upon a 3.0 G airframe limitation, not the current more restrictive limits. Due to the 2.5 G limitation, abrupt inputs even at speeds at or below 300 KIAS will cause an overstress. It is therefore imperative that the operator in normal circumstances make control inputs that are smooth and conservative (i.e. 2 seconds or greater to complete the input).

The **cockpit g meter** has limitations: it does not indicate the Gs occurring at critical aircraft structure points, and it does not indicate accurately during short duration or highly dynamic Gs. Based upon observed performance, it does not accurately mirror data reported by the **SDRS**. Because of these limitations, it is, at best, only a cross-reference tool. Illumination of the flight station SDRS "tattletale" light is the only accurate means of determining whether 2.5 G has been exceeded. Pending the installation of more advanced equipment (a flight station digital SDRS repeater) the operator must rely on proper control inputs to avoid exceeding aircraft flight envelope limitations. Reference CPRG INST 4790.9 for guidance on utilization of the SDRS.

Note

2.5Gs is max. If the SDRS "tattletale" illuminates in the flight station, CTT shall cease and the mission should be aborted. Sound ORM and aircrew judgement should apply to the same scenario during an operational mission.

2) Permissible flight envelope & applicable limits:

Practice of steep turns (i.e., greater than 45° AOB in accordance with CTM) should be conducted at a moderate aircraft weight and at a minimum altitude of 4**,000' AGL**. Practice steep turns shall never be attempted unless

Condition V has been set and the practice maneuvers have been thoroughly briefed.

Note

All CTT maneuvers in the aircraft shall be conducted only during daylight, VMC conditions. Simulated malfunctions shall not be given in the aircraft during CTT maneuvers.

BOTTOM LINE: Absent a serious emergency (i.e. aircraft under imminent or actual enemy fire) exceeding 2.5 Gs / 300 KIAS is not acceptable!

ORM Considerations

Example teaching/discussing points (not all-inclusive) :

1. Current airfield diagrams (USAF TACARDs) can be found on the CAOC website. These are very useful to familiarize crews with the actual procedures in use for their respective AOR.
2. Utilize squadron / wing intel resources- Have there been any recent SAFIRE reports? What is the nature and engagement envelope of the anti-aircraft threat in the area?
3. Maneuvering below threat envelope? In threat envelope/beneath MOSA? At what point does the risk of performing a given maneuver outweigh the anti-aircraft threat?
4. Equipment/tool familiarity and application: CMDS, MWS, TACAN/VOR, engine run-up/darken ship/strobes/windows, mark the numbers for NAV (GPS coordinates for referencing 1nm from the approach runway threshold)
5. Discuss potential emergencies (supplement with HAZREPs):
   a. Fire warning in the descent: 18k', 6000fpm ROD?
   b. Single or Dual EDC failure overland?
   c. Incoming missile and CRM.

Combat Departure

Combat departures are challenging and dynamic maneuvers that require thorough coordination and training. The two techniques that will be presented here are the low-level departure and the spiraling departure.
Tactical Priority:

1. Minimize time in threat envelope
2. Randomize departure sector

Low-Level Departure- This departure allows the aircraft to quickly transit through a possible threat area enroute to onstation.

1. Request a low-altitude departure with ATC.
2. Complete Takeoff checklist, Takeoff Brief, and Combat Departure brief. Reference 1.52Vs.

TIP: Mark the GPS when on the runway prior to takeoff for reference during arrival.

An example of a combat departure brief:

"Copilot, ensure Auto Feather is secured and landing lights are retracted when you select gear up. Arm CMDS once airborne. I'll call for flaps to maneuver, then up as we accelerate and level at 500' AGL, I'll maneuver to sector ___. When clean, call airspeed every 10 knots on acceleration and on the climb out. At 250 knots smoothly pitch 15º nose up, and relax to 10º when 10 knots above 1.52Vs. Once stabilized in the climb, I'll call for Climb Checklist. We'll set Condition IV once established in the climb."

Note

In an operational setting, all speeds may be used within NATOPS limitations. 250 KIAS is set as the limit for training to comply with FAR airspeed restrictions and to provide a margin of safety for overstress during the climb transition.

3. After rotate, disarm autofeather, retract the landing gear and flaps climb to 500' AGL and accelerate to 250 KIAS. While transiting to "safe area" turns no greater than 45˚ AOB may be executed to simulate low-level maneuvering.

WARNING

Failure to secure autofeather after takeoff may lead to inadvertant engine shutdown if power levers are retarded and then re-advanced.

4. When appropriate point is reached, announce "Standby tactical climb" to crew. Then smoothly (2˚-3˚ per second of pitch rate) transition the nose to 15˚ nose up. Set power as desired (950 TIT recommended at training weights). When 10 knots above desired speed (1.52 Vs or climb scheduled), lower the nose to 10˚ nose up, and then set pitch attitude as required to maintain desired speed while climbing to desired altitude. It is important to emphasize that it is **NOT** desirable to target 2.0 G in the climb transition. The above outlined gentle transition will not result in appreciably decreased climb performance from a 2 G pull-up. An overaggressive pull-up will result in increased G-induced drag, actually ***decreasing*** climb

performance, as well as bringing aircraft G-loading close to the 2.5 G overstress limit.

Note

Climb airspeed is at aircrew discretion. 1.52 Vs (12 units AOA) will result in a faster climb to any altitude, whereas climb scheduled airspeed allows greater margin above stall in case evasive maneuvering is required. In no cases should a climb at speeds less than 1.52 Vs be attempted, because of small margin above stall and the possibility of inducing an engine fire warning.

5. Inspect SDRS for overstress indications.

Teaching points: CRM, air work, smooth climb transition. Stress ICS discipline.

TIP: Climb to an altitude that will allow immediate commencement of a steep arrival.

Common errors:

1. Abrupt nose pull-up leading to overstress
2. Autofeather not secured
3. TP allows airspeed to decrease excessively during the climb
4. Poor airwork at low altitude
5. Failing to notify crew prior to climb

Spiraling Departure- This techinque is designed to allow the aircraft to safely climb within a notional sanitized area.

Coordinate with tower for a spiraling departure Set reduced power to simulate heavy weight takeoff conditions and provide a good VFR sight picture. Rotate on normal takeoff speed schedule, raise the landing gear, and allow the aircraft to accelerate. At 160 KIAS, roll into a 45˚ AOB turn and climb to briefed altitude. Secure autofeather, and simulate CMDS arming. When altitude is reached execute climb checklist and depart as necessary.

WARNING

Failure to secure autofeather after takeoff may lead to inadvertant engine shutdown if power levers are retarded and then re-advanced.

Common Errors

1. Not maintaining aircraft over safe area due to poor airwork or outside scan
2. Autofeather not secured
3. Exceeding takeoff / approach flaps speed at top of climb

Counter Threat Maneuvering

Practice Counter Threat Manevuers should be performed on upgrade syllabus flights to teach proper execution of basic P-3 defensive tactics. All maneuvers should be thoroughly briefed prior to the flight with reference to the NATOPS, Chapter 10, and the NTTP, Chapter 9. Stall speeds shall be computed IAW Chapter 27 and stall recovery procedures briefed.

The specifics of each manuever are classified SECRET and are discussed in detail in the NTTP. However, certain teaching points apply to all of these maneuvers:

1. Random altitude changes present the greatest risk for aircraft damage and injury to personnel. Limit pitch inputs to 2 seconds for full yoke deflection. During slow inputs, the yoke forces resisting elevator movement will remain sufficient and the G buildup will appear to follow the pilot's inputs.
2. The flight station G meter does not provide adequate warning of high G loading. It should be referenced as a cross-check. Proper teaching of control inputs and the SDRS tattletale light are the most accurate ways of protecting the aircraft from overstress.
3. At manuevering speed (GW +110), it is possible to reach 2.5 G before the onset of stall buffet.
4. All manuevers shall be conducted during daylight VMC, with minimum altitude of 4000' AGL.
5. During maneuvers that call for a descent in conjunction with steep AOB turns, the operator must be alert to both the possibilty of a rolling pull-out, as well exceeding 300 KIAS and 2.5 G as the aircraft transitions back to level flight.
6. During level altitude maneuvers, it is important to impress upon the TP that during an actual combat engagement, it may be desirable in some cases to sacrifice altitude for rate of turn. This unloading of the aircraft will further prevent both entering stall buffet and excursions above 2.5 G. However, an excessive altitude loss may put the aircraft in greater danger due to entering the envelope for different weapons, or by increasing the effectiveness of the weapon being countered. Operational Flight Crews will have to weigh these conflicting requirements. Climb back above appropriate minimum altitude after threat has been defeated.

Any crewmember may call "knock-it-off" for any of the following reasons:

1. Airsickness
2. SDRS "tattletale" light illuminates.
3. Gear becomes adrift
4. Condition V is broken

WARNING

Aircrew have been severely injured by not setting or maintaining Condition V during maneuvers.

Note

2.5Gs is max. If the SDRS "tattletale" illuminates in the flight station, CTT shall cease and the mission should be aborted. Sound ORM and aircrew judgement should apply to the same scenario during an operational mission.

Combat Arrival

Combat arrivals are dynamic, demanding maneuvers that require thorough training and coordination. Both steep arrivals and spiraling arrivals are presented here as valid techniques.

Tactical Priority:

1. Maneuver to a safe position to land the aircraft
2. Minimize time in threat envelope

Steep Arrival:

1. Request tactical arrival with appropriate ATC.

2. Complete the Descent, Approach, and Landing checklist before commencing descent. Brief configuration (gear down/ maneuver flaps recommended).

3. Coordinate MOSA with NAVCOM and SS3.

Profile:

1000' to 1 + 5 nm is recommended for initial training. **1 to 1** requires multiple S-turns, unless the headwind is significant.

Recommend slowing initially to 1.52 Vs to allow for greater rate of descent initially. If slowing is undesirable due to possible threat, recommend maintaining at least GW +110 KIAS.

Recommend using Gear down/maneuver flaps configuration.

Checkpoints are helpful and should be used to ensure that the aircraft is remaining on profile: Use the GPS mark from the departure and reference 1 nm from the approach end of the active runway for the arrival. Ultimately the aircraft should be at normal approach speeds and on a normal glideslope 2 miles from the end of the runway. Prior to deployment aircrews should practice the arrivals in the OFT to specific operational fields, utilizing various daylight and visibility conditions. This time is a great opportunity to introduce various emergencies during arrivals and departures (i.e. engine failure, FOUO, loss of pressurization, incoming enemy fire).

4. To begin the descent, configure and pitch about 25°-30° nose down. At about 255 KIAS transition to approximately 10˚ nose down. The VSI should be pegged. With maneuver flaps the recommended airspeed is 250 KIAS – this gives a margin below maximum flap speed.

5. Copilot duties are important- the arrival is **not** a single-piloted evolution, and should not be trained to as such. The copilot must back up the pilot on airspeed, altitude, altimeter settings, and whether or not the aircraft is ahead/behind of the desired descent profile.

6. Early analysis of the descent is important- If the aircraft is high, S-turns (limited to 45°AOB) or a slip (limited to 15°of sideslip) can be attempted to lose altitude. If this is unsuccessful, it is imperative for the flight crew to recognize it and proceed with an alternate plan. Examples include:

   a. Power-off break
   b. Enter a downwind for opposite runway (traffic permitting)
   c. A 360˚ turn

If the aircraft is ahead on profile 300-400 SHP on each engine may be added as necessary to arrest the rate of descent. It is generally undesirable to arrive at altitude far from the runway as this causes the aircraft to spend longer in a possible threat envelope.

TIP: It takes 3-4 miles to slow the airspeed 100 knots with power at flight idle. Keep this in mind when crosschecking DME/altitude/VSI/groundspeed. Use the GPS to give an accurate distance from the runway threshold (often more accurate than TACAN DME)

7. If a safe approach cannot be made- WAVEOFF.

8. Inspect SDRS for overstress indications.

WARNING

Rates of descent in excess of 3000 fpm are normal and allow the aircraft to exit the threat envelope as soon as possible. Failure to transition to a normal landing profile can result in excessively hard landings. Execute a waveoff in this situation.

Common errors:

1. Overspeeding the gear or flaps
2. Not aggressive enough with initial nose-down maneuver
3. Improper distance and altitude calculation
4. Incomplete checklists, briefs, etc.
5. Excessive speed on final leading to float down runway or excessive touchdown speed
6. Not recognizing an unsafe situation

Spiral arrival- this technique allows the aircraft to descend over a given sanitized area, minimizing exposure to enemy ground fire.

1. Coordinate a spiraling arrival with ATC. Complete all Descent, Approach and Landing checklists.

2. Select approach or land flaps and roll into a 45 ˚ AOB turn (recommend 145 KIAS and land flaps for training). Maneuver aircraft to arrive on short final in normal landing configuration (airspeed and rate of descent), and make normal landing or touch and go as applicable. Usually this will result in a rate of descent of approximately 4000 fpm (useful in determining altitude from which to begin descent).

WARNING

Rates of descent in excess of 3000 fpm are normal and allow the aircraft to exit the threat envelope as soon as possible. Failure to transition to a normal landing profile can result in excessively hard landings. Execute a waveoff in this situation.

Common Errors

1. Not maintaining aircraft over "safe area"
2. No wind corrections
3. Poor outside scan, referencing of VFR checkpoints
4. Excessive speed on final
5. Incomplete checklists, briefs, etc.

CHAPTER 8

Level D-equivalent Simulator Protocol

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The Level D-e Simulator

The Level D-equivalent high fidelity flight trainer is comprised of various upgraded and legacy components from the previous 2F87 simulator model. Upgraded components include a high resolution visual package, control loading, motion, the aerodynamic model and the systems model. Legacy components consist of most hardware, the Instructor Operating System (IOS) software and the communications suite, which is over 30 years old in most flight trainers.

The visual package contains 156 properly modeled airfields, 16 of which have one-foot high resolution imagery. The worldwide database is comprised of 10-meter imagery.

The Level D-e physics based systems model allows the operator to stimulate aircraft systems as a means of presenting emergencies and malfunctions. For example, the malfunction labeled "Cross Ship Manifold Leak" does not automatically bring on the FUS DUCT HOT Light, but rather triggers a leak that gradually increases the temperature in the cross ship manifold. The light then illuminates once the temperature in the manifold reaches a sufficient value. Instructor pilots and flight engineers must therefore possess precise systems knowledge and have a solid grasp on Level D-e operating principles in order to provide effective instruction in the device.

Instructors shall use the communications suite to the maximum extent practicable, but must remember it is an aging component. ICS and radio sustainability relies heavily on the instructors' willingness to exercise and gripe the system, and the technicians' ability to tune it.

Effective Use of the Level D-e OFT

Instructors must use all resources at their disposal to make the quality of the training commensurate with the high fidelity technology. IPs and IFEs shall use the following items to the maximum extent practical:

- Donning of flight gloves, mock survival vests and harnesses by students in the seat
- Use of smoke masks during FOUO drills
- Computer Aided Debrief System (CADS)
- Record/Replay function
- Aural cue volume level 3-5
- Communications suite
- The VFR landing pattern and engine-out runway maneuvers
- Enhanced environmental features

Logging of Level D-e Time

The flight trainer must be on motion in order to log Level D-e time. Flight time in the Level D-e shall be logged at the back of the aviator's logbook under its own classification of flight time.

Effective Instruction

Instructors must have a firm grasp of how to employ the training device. All Level D-e OFT operators must have completed the Level D-e Operator Course and should reference the Instructor Utilization Handbook (IUH) before and during simulator events. Operators should note the following items during training events:

- Several malfunction codes trigger fluid or bleed air leaks that eventually cause an annunciator light to illuminate. The following table is provided for scenario planning purposes:

Malfunction Label	**Time for Light to Illuminate (Approximate)**
Left/Right EDC Duct Leak	1:15
Cross Ship Manifold Leak	1:05
Left/Right Wing Manifold Leak	0:25
Massive Engine Bleed Air Leak	1:00
Nacelle Over-heat	0:55
Anti-ice Failed On	1:10
Prop Fluid Leak 20 gal./min.	PP1—3:00
	PP2—6:00

- The malfunction labeled "Eng. X Off Speed Prop Gov" presents a gradual propeller off speed condition. The most effective off speed malfunction to present during an EFBR maneuver is the one labeled "Eng. X Sync Induced Off Speed."

- There are two different coupler failures in the model. The one labeled "Engine X Coupler Fail" is an isolated coupler failure that causes RPM to decrease and then stabilize at 100%. The one labeled "Eng. X Decouple Overspeed" triggers an over speed condition followed by a decouple.

- More realistic power lever alignment may be accomplished through use of the four malfunctions labeled "Eng. X Efficiency."

- In order to freeze an engine bleed air valve a given number of degrees open, one must use malfunctions 236-241. Proper placement of the valve is difficult to accomplish when pulling the respective circuit breaker.

- The high fidelity visual package allows the operator to insert very realistic weather conditions, but each weather variable is independent of the others.

Protocol for NATOPS Checks in the Level D-e OFT

The Level D-e OFT is an ideal platform from which to administer annual NATOPS evaluation flights. However, although some capabilities provide more realistic training during certain flight maneuvers and aircraft emergencies, others have the propensity to create a nearly impossible scenario for even the most seasoned aviator. In an effort to create a reasonable setting for NATOPS flight evaluations in the OFT and avoid giving an unfair advantage to pilots who receive their evaluation flight in the aircraft, the following protocol shall be followed during NATOPS check flights in the Level D-e:

- A qualified NATOPS instructor shall occupy the right seat.

- Visual parameters must be set to daylight hours under visual meteorological conditions in the VFR landing pattern and high work area.

- Crosswind components and other environmental settings shall be set to reasonable values throughout the evolution.

- Ditching drills may be conducted to water impact.

- Evaluations in the simulator shall adhere to the criteria outlined in Chapter 26 of NATOPS.

- The instructor shall avoid scenarios that are unrealistically difficult. The focus should be on the student's basic ability to safely operate the aircraft.

Simulator Sickness

Simulator sickness is a medical phenomenon that is addressed in the OPNAV 3710 series. It is not unusual to experience nausea or disorientation during or after a simulator event. Data suggests that more experienced aviators and individuals who are new to the simulator are most susceptible to these symptoms. In accordance with OPNAV 3710.7, "flight personnel exhibiting symptoms of simulator exposure should abstain from same day flying duties. Individuals who have experienced simulator sickness in the past have a greater probability of recurrence and should not be scheduled to fly for 24 hours following simulator exposure."

CHAPTER 9

Malfunction Set Up For Aircraft

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Note

Any simulated malfunctions (i.e., propeller pump lights, press low lights, etc.) that must be announced by the IP or IFE are not included in this malfunction index. This does not prevent instructors from presenting these malfunctions in the aircraft.

Indicator circuit breakers may be pulled for scan checks at the discretion of the IP/IFE.

The following set-up matrix cannot cover all simulated malfunctions possible. Consideration should be given to the predicted outcome of the malfunction and the instructor's abilities.

To the maximum extent practical, training in the aircraft should encompass only items that are not adequately reproduced in the simulator. Leverage the simulator to conduct as much high work and system training as possible in order to provide more realistic training and maximize aircraft utilization efficiencies.

Auxiliary Power Unit Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
A1	APU flameout.	1. Pull APU start control circuit breaker (F32).	

Electrical Power Supply System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
B1	Generator failure.	1. Turn off respective generator switch.	**Note** Reset procedures can be simulated in flight by using the APU generator switch.
B2	APU generator fails.	1. Pull generator control circuit breaker (G29).	**Note** Pull prior to shifting down the last engine driven generator.
B3	Loss of a main AC bus.	1. Turn off respective bus monitor switch. *or* 1. Pull Bus A or B control circuit breaker (J1, J2). 2. Turn off associated generator or downshift the engine. *or* 1. Pull generator 4 transfer circuit breaker prior to downshifting an inboard engine or securing the APU.	
B4	Loss of Main DC.	1. Pull TR number 1 and TR number 2 circuit breakers. *or* 1. TR 2 circuit breaker out on a fire of unknown origin.	**CAUTION** Loss of MDC will fail ground/air sensing, shifting engines up and failing power to ground air conditioning. EDCs will have to be dumped manually to prevent overheated air cycle cooling units. Do not try this with TR 1 out and failing Bus B in-flight or gustlock will occur.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
B5	Loss of FEAC.	1. Pull phase A and/or phase B circuit breaker(s).	**Note** Total loss of Flight AC shall not be performed in aircraft. Transponder will be lost if phase C is pulled.
B6	Loss of MEAC/MEDC.		**WARNING** Shall not be performed in aircraft; loss of MEDC would cause failure of warning lights, ICS, communications, and may result in sheared EDC drive shafts.
B7	Loss of SEDC during restart.	Pull essential DC Feeder number 3.	**Note** Pull the circuit breaker prior to fuel and ignition switch being turned on. **CAUTION** Cycle temperature datum switches prior to restart.
B8	Inverter failure.	1. Pull inverter power circuit breaker (C36). 2. Pull power sensing circuit breaker (J3).	**Note** Pull prior to TFE selecting an engine or turning on inverter–battery test switch. **CAUTION** Null TDs if this malfunction is conducted with malfunction J5 on an in-flight restart.
B9	Loss of SEAC.	Pull start essential AC circuit breaker (C4).	**Note** Digital TIT indicators will blank.

Flight Instrument Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
C1	Pilot's HSI failure (TP-3A). Pilot's HSI failure (P-3C).	1. Pull pilot's HSI circuit breaker (26V AC and 115V AC on FWD navigation interconnection box). 1. Turn on NAV Simulator. *or* 1. Pull pilot's HSI control circuit breaker.	**Note** Pull circuit breaker at discretion of the IP. On EFDS aircraft, the EHSI will go blank and the EFDI will go to split screen mode, if the EHSI CB is pulled.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
C2	Pilot's turn needle failure.	1. Pull pilot's turn rate gyro circuit breaker (H13).	**Note** Pull circuit breaker at discretion of the IP. Not available on EFDS aircraft.

Propeller System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
D1	Fluctuating rpm.	1. Call out malfunction. *Or* 1. Cycle respective engine anti-ice circuit breaker (H9-12).	**Note** Cycling anti-ice circuit breaker will also cause slight SHP/TIT fluctuation.
D2	Decouple.	1. Retard power lever. 2. Call out indication, i.e., TIT, rpm, fuel flow, for desired type decouple.	
D3	Tach generator failure.	1. Call out indication. 2. IP move power lever.	**Note** If sync is not turned off, power lever movement simulates fluctuation in TIT, SHP, and fuel flow.
D4	Emergency shutdown with a propeller fails to feather.	1. Pull propeller feather control circuit breaker (E22, E23, J26, J27). 2. Reset propeller control circuit breaker. *Or* 1. Pull left and right wiper switch circuit breakers. (H5-8,J5-8).	**Note** Pull propeller feather control circuit breaker prior to inducing a malfunction requiring shutdown. Reset at IP/IFE discretion depending on intent of demonstration, i.e. alternate bus, PCO, etc. Be aware of normal lab seal vent leakage. **CAUTION** Do not allow the propeller to rotate for an extended period of time (45 second maximum) due to the possibility of damaging the propeller brake. If this malfunction is conducted in conjunction with an engine fire see malfunction E5 for set-up instructions.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
D5	Sync system INOP.	1. Pull sync control circuit breaker (G22). *Or* 1. Pull sync power on Bus A circuit breaker.	**Note** Pull circuit breaker prior to FE synchronizing the propellers. **CAUTION** Ensure sync switches are off prior to resetting circuit breaker.
D6	No NTS light on shutdown.	1. Pull NTS check circuit breaker immediately after light illuminates, then reset it.	

Propulsion System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
E1	Engine fire on the ground.	1. Pull *all* engine fire extinguisher C/B's (E5-E8 and K9-Kl2). 2. Pull APU manual fire extinguisher C/B's (F25, F26) if simulated fire is on engine number 3 or 4. 3. Pull propeller feather control C/B (E22, 23, J26, J27). 4. Pull oil tank shutoff valve C/B (H17-20). 5. Actuate fire detector test switch. **CLEAN-UP** 1. Reset HRD circuit breakers. 2. Reset propeller control C/B. 3. Push in E handle. 4. Reset oil tank shutoff valve circuit breaker.	**Note** Before resetting the HRD circuit breakers check that the HRD button is out. Before pushing in the emergency shutdown handle, allow propeller to feather. Do not reset the oil tank shutoff valve circuit breaker after the After Start checklist complete.
E2	Oil cooler inducer malfunction.	1. Pull respective flight idle stop circuit breaker (H25-H28). *Or* 1. Pull oil cooler act. circuit breaker (A-13, 14, B-13, 14).	**CAUTION** IFE monitor engine oil temp closely.
E3	Autofeather system malfunction.	1. Pull respective autofeather circuit breaker (F21-F24).	**Note** Pull circuit breaker prior to TFE arming system.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
E4	Low oil pressure in normal rpm.	1. Pull oil pressure indicator circuit breaker (26V INST. BUS number 1 or 2) (J31, 32, 37, 38).	**Note** Pull circuit breaker prior to engine being shifted to normal RPM.
E5	Engine Fire.	1. Pull *all* engine fire extinguisher circuit breaker's (E5-E8 and K9-K12) 2. Pull APU manual fire extinguisher circuit breakers (F25, F26) if simulated fire is on engines 3 or 4. 3. Actuate fire detector test switch.	**CAUTION** Do not allow the oil tank shutoff valve circuit breaker to be set. If this malfunction is done with a propeller fails to feather, see malfunction D4.
E6	Engine anti-ice light on, switch off.	1. Pull respective torquemeter circuit breaker (D7-10). 2. Pull respective engine ice control circuit breaker (H9-12). 3. Reset engine ice circuit breaker. 4. Reset torquemeter circuit breaker.	**Note** Engine anti-ice light will illuminate in approximately 90 seconds. Reset engine ice control circuit breaker prior to TFE troubleshooting. Reset torquemeter circuit breaker immediately after resetting ice control circuit breaker.
E7	Fluctuating SHP.	1. Cycle respective engine anti-ice circuit breaker (H9-12). *or* 1. Cycle TD control circuit breaker (A36-39).	**CAUTION** Cycle TD control circuit breaker only if power lever is below 66 degrees coordinator.
E8	Engine fails to shutdown.	1. Pull propeller feather control circuit breaker (E22, E23, J26, 27). 2. Pull oil tank shutoff valve circuit breaker (H17-20). 3. Pull respective fuel and ignition circuit breaker (A32-A35). **CLEAN-UP** 1. Reset propeller control circuit breaker. 2. Push in emergency shutdown handle. 3. Reset oil tank shutoff valve circuit breaker.	**Note** Pull circuit breakers prior to TFE shutting down the engine. **CAUTION** Allow engine to terminate feather before pushing in emergency shutdown handle.

Engine and Aircraft Fuel System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
F1	Boost pump failure.	1. Pull fuel boost pump control circuit breaker (E9-E12).	**CAUTION** During the climb, be aware for possible engine power loss due to aeration.
F2	Crossfeed valve failure.	1. Pull crossfeed valve circuit breaker (B7-10).	

Engine and Aircraft Foul Weather System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
G1	Wing deice check malfunction.	1. Pull wing deice modulation valve circuit breaker (F13-F15). *or* 1. Cycle respective engine anti-ice circuit breaker (H9-12).	**Note** Pull wing deice modulation valve circuit breaker prior to TFE turning on wing deice switches Pull and reset respective engine anti-ice circuit breaker as wing deice turned on/off.
G2	Engine anti-ice light on with control switch off.	1. Pull engine anti-ice circuit breaker (H9-12).	

Air Conditioning And Pressurization System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
H1	No, or loss of ground air conditioning.	1. Pull start control circuit breaker (B31). *or* 1. Pull air multiplier valve circuit breaker (J24). *or* 1. Pull APU load and shutoff valve circuit breaker (G31). *or* 1. Pull Aux-vent control circuit breaker (J21).	**CAUTION** Pulling the Aux-vent control circuit breaker (J21) with either inboard engine operating undumps the EDCs without operating heat exchanger fans. EDC's will have to be manually dumped to prevent overheating of the air-cycle cooling units.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
H2	Scissors switch failure on the ground.	1. Pull ground–air sensing circuit breaker on MDC (No. 1 upper, on main load center).	**CAUTION** Loss of ground–air sensing shifts up the engines and fails power to ground air conditioning. EDCs have to be manually dumped to prevent overheating of the air cycle cooling units.
H3	EDC PRESS LOW, TEMP HIGH, etc.	1. Simulated in the aircraft by calling out malfunction.	**Note** Pull EDC disconnect circuit breakers (H21-22).
H4	Quill shaft failure.	1. Pull disconnect circuit breakers (H21, 22). 2. Dump EDC, pull EDC air press indicator circuit breaker (K29, K35). 3. Undump EDC. *or* 1. Fail the indicator circuit breaker on a touch-and-go before the spread comes back. *or* 1. Fail the indicator circuit breaker before in-flight restart.	**Note** Recommend set up on number 3 EDC so TP and TFE do not detect EDC not dumping. EDC will indicate loss of spread, no press low light. **CAUTION** With EDC dumped, do not pull EDC dump circuit breakers (H23, H24). This can cause an inadvertent sheared EDC driveshaft.
H5	Scissor switch failure during flight.	1. Utilize a small enough differential to minimize discomfort, then open the auxiliary ventilation.	**WARNING** Aircraft will depressurize rapidly. Ensure crew is notified prior and aircraft is below 10,000 feet.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
H6	No or partial pressurization.	1. Pull outflow valve circuit breaker (FEAC). *or* 1. Place outflow switch to off. *or* 1. Place aux. vent switch to open. *or* 1. Open free fall chute. *or* 1. Pull aux. vent actuator circuit breaker (B21) on MEAC.	Pull outflow valve circuit breaker, position switch, or open chute prior to takeoff. Pull aux. vent circuit breaker during starts when ground air conditioning is off. **CAUTION** Pulling the Aux-vent control circuit breaker (J21) with either inboard engine operating undumps the EDCs without operating heat exchanger fans.
H7	Cabin exhaust FAN OUT light.	1. Pull cabin exhaust fan control circuit breaker (E1).	**Note** If airflow across the outflow valve is still sufficient, the FAN OUT light may not illuminate. INS warning horn may startle aft observer. (LTN-72 Only) **CAUTION** Do not allow avionics equipment to overheat.

Hydraulic And Flight Control System Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
I1	Control surface binding during taxi.	1. Block rudder. *or* 1. Engage Autopilot.	**Note** Have AFCS on or foot positioned prior to controls check on Takeoff checklist.
I2	Landing gear fails to retract.	1. Pull landing gear control circuit breaker (E17)	**Note** Pull circuit breaker prior to or just after selecting gear up.
I3	Hydraulic pump failure.	1. Pull respective hydraulic system pump control circuit breaker (E13, K14, E15)	**Note** Expect approximately 5-10 second delay before annunciator light illuminates. Reset circuit breaker after FE turns the respective pump switch off to ensure pump is available if needed.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
I4	Single hydraulic system failure.	1. Pull #2 hydraulic pump control circuit breaker (E15). 2. Pull hydraulic system quantity circuit breaker (E16).	**CAUTION** Ensure the TFE has uncovered the boost handles. **Note** Reset circuit breaker after FE turns the respective pump switch off to ensure the pump is available if needed.
I5	Rudder power light.	1. Pull rudder boost circuit breaker (K13).	**Note** Pull circuit breaker with flaps above 60 percent.
I6	Unsafe gear up or down.	1. Pull landing position indicator circuit breaker (E18).	
I7	Flap asymmetry.	1. Set flaps at desired position, i.e., up, maneuver or approach. 2. Call out malfunction.	**Note** Do not set flaps at an intermediate position. Call out as flaps are extended or retracted.
I8	Binding flight control/unable to shift.	1. IP hold affected control.	**WARNING** Inducing a gustlock during flight in any channel is prohibited, except rudder above 4000 feet on IUT events. After clean-up, the IFE shall ensure boost handles are in and locked.

Engine Start Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
J1	Bleed air valve partially open or unable to open.	1. Pull bleed air valve circuit breaker (B36-B39).	**Note** Pull circuit breaker immediately after the bleed air valve light comes on, or pull circuit breaker prior to opening valve.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
J2	No bleed air pressure or loss of bleed air.	1. Pull bleed air start valve circuit breaker (G32). *or* 1. Pull APU load and shutoff valve circuit breaker (G31). *or* 1. Pull start control circuit breaker (B31). *or* 1. Place in-flight arm switch to arm. *or* 1. Pull bleed air manifold pressure indicator circuit breaker (H29). *or* 1. Pull instrument bus 1 transformer circuit breaker on MEAC (B4).	**Note** Pull circuit breakers prior to selecting an engine. When using APU bleed air, pull circuit breaker after turning off ground air conditioning. Position the in-flight arm switch to arm prior to selecting an engine. Pulling the bleed air manifold pressure indicator circuit breaker or the instrument bus 1 circuit breaker also works with an external air source. Pull circuit breaker prior to connecting huffer. To indicate a loss of bleed air, pull Bleed air shutoff valve circuit breaker or APU load and shutoff circuit breaker after engine selected.
J3	Starter button will not stay in.	1. Pull Start control circuit breaker (B31). *Or* 1. Pull essential DC feeder #3 circuit breaker behind co-pilot seat.	**Note** Pull circuit breaker prior to actuation of the starter button. **CAUTION** Cycle TD switches for a minimum of 5 seconds prior to engine start.
J4	Torch.	1. Call out malfunction.	**Note** Pull fire extinguisher circuit breakers.
J5	Loss of SEDC.	1. Pull essential DC feeder number 3 circuit breaker behind copilot seat.	**CAUTION** Do not pull the essential DC feeder number 3 circuit breaker any time after the 16% RPM or fuel flow has been initiated. Cycle TD switches for a minimum of 5 seconds prior to engine start.
J6	No fuel flow, no light off.	1. Pull fuel shutoff valve circuit breaker (B32-B35).	**Note** Pull circuit breaker prior to 16 percent. **CAUTION** Do not reset circuit breaker during start to simulate late fuel flow and lightoff.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
J7	Fuel flow, no lightoff.	1. Pull fuel shutoff valve circuit breaker (B32-35). 2. Reset circuit breaker after FE discontinues start with the fuel and ignition switch.	**Note** Pull circuit breaker immediately after fuel flow has initiated. **CAUTION** Motor engine prior to next start.
J8	Premature starter disengagement.	1. Pull start control circuit breaker (B31).	**CAUTION** Pull start control circuit breaker at or above 50 percent and positive SHP to prevent engine stagnation or stall. Do not use the essential DC feeder number 3 for this malfunction.
J9	Low oil pressure.	1. Pull oil pressure indicator circuit breaker (26V INST. BUS No. 1 or No. 2) (J31, 32, 37, 38).	**Note** Pull circuit breaker after FE checks rising pressure at 35 percent RPM.
J10	No oil pressure at 35 %.	1. Pull oil pressure indicator circuit breaker (26V instrument bus number 1 or 2) (J31, 32, 37, 38).	**Note** Pull circuit breaker prior to rotation. **CAUTION** IP and IFE shall ensure start is secured prior to 35 percent.
J11	No air rise due to a failure of instrument bus No. 1 while starting engine No. 1 or 4.	1. Pull propeller feather control circuit breaker (J26 or 27). 2. Pull oil tank shutoff valve circuit breaker (H17 or 20). 3. Pull instrument bus 1 circuit breaker (B4 on MEAC). **CLEAN-UP** 1. Reset propeller control circuit breaker. 2. Push in emergency shutdown handle. 3. Reset oil tank shutoff valve circuit breaker.	

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
J12	SHP gauge failure.	1. Pull torquemeter circuit breaker (D7-D10).	**Note** Pull circuit breaker when SHP cycles through zero. Digital SHP gauge blanks with CB pulled.
J13	No air rise when starter button pops.	1. Pull propeller feather control circuit breaker (E22, E23, J26 or J27). 2. Pull oil tank shutoff valve circuit breaker (H17 - H20). 3. Pull bleed air manifold indicator circuit breaker (H29). 4. Push in bleed air manifold indicator circuit breaker (H29). **CLEAN-UP** 1. Reset propeller control circuit breaker. 2. Push in emergency shutdown handle. 3. Reset oil tank shutoff valve circuit breaker.	**Note** Pull bleed air manifold indicator circuit breaker after checking air pressure at 16 percent. Push in bleed air manifold circuit breaker after bleed air valve closes if bad start control valve, leave it out if failed gage. **WARNING** Monitor start valve light and TIT for closure of start valve. **Note** Before pushing in the emergency shutdown handle, allow propeller to feather. Do not reset the oil tank shutoff valve circuit breaker after the after start checklist complete.

Takeoff Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
K1	Aborted takeoff due to a malfunction before refusal.	1. Pull circuit breaker or turn off equipment which will immediately activate a caution light; such as pitot heater, generator off, etc. *or* 1. IP call out any simulated malfunction.	**Note** IP consider pattern traffic. Pull circuit breaker or turn off equipment after calling 80 knots and prior to V_R. Do not use time delay malfunction such as hydraulic pump or cabin exhaust fan.

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
K2	Aborted takeoff due to low power or power loss.	1. Open bleed air valve. 2. Turn on any or all wing deice modulation valves and anti-ice valve. **CLEAN-UP** 1. Close bleed air valve and turn off wing deice modulation and anti-ice valves.	**Note** IP consider pattern traffic. To simulate a low power, open modulation valves as takeoff power is being set. For a power loss, open modulation valves after power has been set. Close valves when abort initiated. IP be prepared to call the malfunction prior to V_R if TFE fails to recognize it. **WARNING** IFE monitor power on other engines in event the TFE calls another one.
K3	Aborted takeoff due to a propeller malfunction.	1. IP call out the indication (i.e., overspeed number 1 engine, propeller pump light number 3, etc.).	**Note** IP consider pattern traffic. May be done in conjunction with a power loss. **WARNING** Do not simulate partial power loss by retarding power lever due to $V_{MC\ GRD}$
K4	Malfunctions after refusal.	1. IP discretion.	**Note** IP call out or induce malfunction after refusal.
K5	Sheared speed sense control.	1. IP reduce power to approximately 830 TIT on one engine.	

NTS Check Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
L1	Stuck NTS plunger during NTS check.	1. Push in respective feather button.	**CAUTION** Ensure NTS system is operating prior to pushing in feather button. Ensure clean up from NTS check after malfunction. If set up to a propeller fails to feather, the feather pump AC circuit breaker shall be pulled and not the DC circuit breaker. Pulling the DC circuit breaker may result in a propeller decouple.
L2	Misrigged alpha shaft and/or stuck power lever during NTS check.	1. IP hold power lever at flight idle. 2. IP call overspeed for misrigged alpha shaft.	**Note** Release power lever when SHP goes positive. If SHP gauge CB pulled to simulate negative SHP, the gauge will go blank with digital SHP gauges installed. **WARNING** If scenario includes shutting down the motor to a fails to feather via the feather button, the feather pump AC circuit breaker shall be pulled and not the DC circuit breaker. Pulling the DC circuit breaker may result in a propeller decouple. **CAUTION** Ensure NTS system is operating before allowing TFE to shutdown engine.
L3	Not enough air bled off during NTS check.	1. Pull bleed air valve circuit breaker as soon as BAV light comes on (B36-39). *or* 1. Fail wing mod valve (F13-15).	
L4	No SHP fluctuation, or SHP in excess of 500 during NTS check.	1. Pull torquemeter circuit breaker (D7-10).	**Note** Pull circuit breaker as SHP cycles in negative range after NTS action is observed, or pull circuit breaker as SHP needle is moving in negative direction after NTS is observed. With digital SHP gauges they will go blank with the torquemeter CB pulled.

In-Flight Restart Malfunctions

	MALFUNCTIONS	SET-UP	NOTES-CAUTIONS-WARNINGS
M1	Steady feather light.	1. Place the NTS feather valve switch to the NTS position.	**Note** Position switch while TFE is watching for indicated rotation.
M2	Loss of power to the propeller feather pump during PCO.	1. Pull propeller control circuit breaker (E22, E23, J26, J27).	**Note** Pull circuit breaker prior to or during TFE pushing PCO. **CAUTION** Do not pull circuit breaker while unfeathering propeller as the airstart switch protection is lost.
M3	Light remains on in feather button after PCO is released.	1. Depress PCO after FE releases the feather button. 2. Release PCO when emergency shutdown handle is pulled out.	
M4	No fuel flow, no light off.	1. Pull fuel shutoff circuit breaker (B32-35). *or* 2. Pull essential DC feeder number 3 behind copilot.	**Note** Pull circuit breaker prior to unfeathering propeller. **CAUTION** Cycle TD switches for a minimum of 5 seconds prior to engine start if the essential DC feeder #3 is pulled.
M5	No fuel flow but light off.	1. Pull fuel flow power supply circuit breaker on Main AC Bus A.	**Note** Pull circuit breaker prior to unfeathering propeller.
M6	Fuel flow, no light off.	1. Pull fuel shutoff valve circuit breaker (B32-35). 2. Reset after feather button pushed in.	**Note** Pull circuit breaker immediately after fuel flow.
M7	Oil pressure failure.	1. Pull oil pressure indicator circuit breaker (26V instrument bus number 1 or 2) (J31, 32, 37, 38).	**Note** Pull circuit breaker prior to rotation. **CAUTION** IP and IFE shall ensure start is secured prior to 35 percent.
M8	Instrument bus 1 failure while starting engine number 1 or 4).	1. Pull instrument bus 1 circuit breaker (B4 on MEAC).	**Note** Pull Instrument Bus 1 circuit breaker before unfeathering the propeller.
M9	Premature lightoff.	1. Pull fuel and ignition circuit breaker (A32-35).	**Note** • Pull fuel and ignition circuit breaker prior to unfeathering. • Guard circuit breaker in case TFE refeathers propeller. Do not reset until fuel and ignition switch has been turned back on.

APPENDIX A

INSTRUCTOR UNDER TRAINING (IUT) SYLLABUS

TABLE OF CONTENTS

SCOPE

This appendix has been prepared to assist squadrons and their designated IUT instructors in the conduct of ACTC Level 4 IUT syllabus events. It presents the user with information designed to standardize the IUT instructional process, reduce risks associated with IUT training and maximize the effectiveness of instructor training. Additionally, it contains training and instructional technique guidance that supplements material presented in the P-3 NATOPS Flight Manual, the NATOPS Instrument Flight Manual, OPNAV 3710.7 Series, Pilot/FE Training Job Aid and elsewhere in this Guide. Its purpose is to govern the conduct of IUT flights in conjunction with the sources listed above and is not intended to supersede any requirements or directives promulgated by NATOPS, OPNAV or other competent authority. This appendix should be used as a guide while drafting a squadron Instructor Pilot Training Program (1525.1).

IUT syllabus guidance is not to be utilized for other than formally scheduled ACTC Level 4 IUT training events. Where this appendix contradicts guidance contained in the rest of the FIG, this guidance applies to IUT events only. It is critical that IUT instructors ensure proper crew coordination and effective event preparation. IUT instructors must have a complete understanding of all possible outcomes when designing and delivering IUT training and take all necessary steps to ensure the safe completion of IUT events. All ACTC 4 IUT events should be conducted by a designated IUT Instructor.

The IUT syllabus, at the Commanding Officer's discretion, may be modified for pilots and flight engineers with prior instructor designation. Recommended factors to consider: amount of previous P-3 instructional experience, time out of the P-3 and the nature of recent duty (flying/non-flying).

TERMINOLOGY

To clarify discussion terminology for the purposes of this appendix, the following terminology definitions apply:

- IUT = Prospective Instructor Pilot
- IUT FE = Prospective Instructor Flight Engineer
- IP = IUT Instructor Pilot (generally in role as a student pilot)
- IFE = IUT Instructor Flight Engineer (generally in role as a student Flight Engineer)
- IUT Team = IUT and IUT FE
- IUT Instructors = IP and IFE

THE FLEET SQUADRON IUT INSTRUCTOR

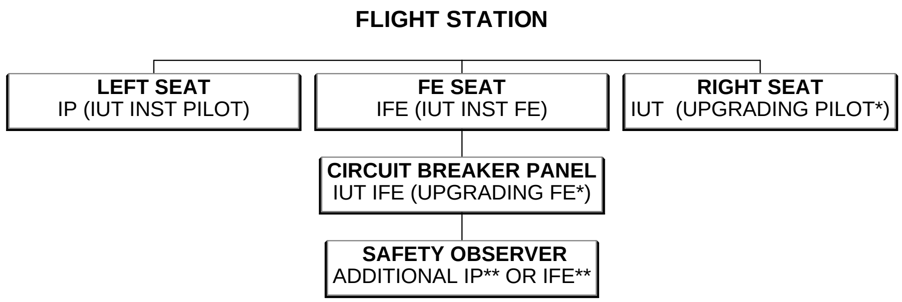
Due to the demanding nature of the instructor training process, IUT Instructors must be eminently qualified to conduct IUT training. Qualification requirements must be more stringent than those used for IP or IFE designation. IUT instructors are the cornerstone of an effective squadron upgrade syllabus and standardization among individual squadron instructors. The IP or IFE should be recognized for their instructional experience, teaching ability, professionalism and attention to flight safety. In addition to the key instructor attributes identified elsewhere in the FIG, the IP or IFE should possess significant P-3 instructional experience, a significant number of total flight hours and exceptional proficiency in the aircraft. Experience as an FRS IP/IFE or NATOPS Instructor can be beneficial, however, neither is crucial to the effectiveness as an IUT Instructor. Most critical to the safety and success of the IUT instructor are overall proficiency, currency, situational awareness and teaching ability. IUT instructors should have completed their squadron IUT instructor syllabus. This syllabus could consist of observations of IUT events and an interview with senior IUT IPs. Commanding Officers should carefully consider the presence of the above listed attributes prior to designating an IUT Instructor.

FIG APPLICABILITY

Guidance promulgated by the P-3 NATOPS Flight Manual, the NATOPS Instrument Flight Manual and the OPNAV 3710.7 Series cannot be waived under the auspices of this appendix. IUT Instructors are responsible for ensuring that safety of flight is not compromised and NATOPS/OPNAV guidance is not violated. FIG guidance for normal training flights contained in the previous chapters of this document may not apply to IUT training events.

CREW MAKEUP

In general, crew make up for an IUT event is as depicted below:



* On occasion, it may become necessary to fly an IUT or IUT FE without a flight partner. In that case, the missing IUT or IUT FE may only be replaced with a positionally qualified instructor.

** When feasible, the use of a Safety Observer (an additional IP or IFE or an upgrading IUT instructor) should be used on IUT-2, 4, 5 and 6X to increase safety and training efficiency. If the Safety Observer is a Pilot, he may only pull circuit breakers for scan items. Only qualified IUT Instructor Pilots or IFE's may fail systems using circuit breakers for the purpose of presenting simulated actual malfunctions**.**

OPNAV 3710.7T authorizes the aircraft commander to be out of the seat during IUT landing pattern work, if a qualified IUT instructor pilot is occupying one of the flight control stations. Each squadron's Commanding Officer retains the option to require that the individual who signed the "A Sheet" shall occupy one of the pilot seats during all landing pattern evolutions.

ROLE PLAYING

The use of appropriate role-playing during the IUT is critical to the development of an effective IP or IFE. The goal of role-playing should not be to confuse, overwhelm, or intimidate the IUT Team; instead, the "role" should seek to expose the IUT Team to various levels of student performance in a controlled environment. Role-playing normally involves the portrayal of a typical "student" with a specific, generally recognized set of training deficiencies. An IUT or IUT FE should be exposed to numerous roles as part of the IUT process in order for him/her to develop the skills necessary to effectively train fleet students. Each characteristic the IUT instructor emulates should have a distinct teaching point associated with it. The IUT instructor should portray the minimal amount of "role-playing" to convey the teaching point. Once the IUT has produced an adequate solution to the characteristic portrayed, the IUT instructor should discontinue that portion of the "Role." Some of the most common roles include:

1. Below Average First Tour
   a. Primary subtypes could include early or late stage of training (i.e. PPP Fly 1 or PPC stage), secondary subtypes could include Meek (shy, retiring personality) or Aggressive (i.e. significant non-P-3 aviation experience)

b. First tour FEs should have basic operating skills and systems knowledge.

2. Average First Tour (same subtypes apply)
3. Above Average First Tour (same subtypes as Below Average First Tour apply)
4. Recent upgraders with distinct deficiencies
5. Second Tour
   a. As with first tour, experience portrayed could include highly experienced (i.e. former FRS instructor or TPS grad) or relatively inexperienced (i.e. low hours, eight years out of the cockpit). Personality subtypes could include meek or aggressive.

It is imperative that the IP and IFE maintain clear control of instructor "roles" in order to avoid confusion during scenario execution. More specifically, the IP and IFE must clearly delineate when "in role" and when "out of role." While "in role", the IP or IFE is expected to play his/her part fully, avoiding instructing the IUT Team so that they have the opportunity to fully develop their instructional skills. Only while "out of role" should the IP or IFE provide instruction. The IUT instructors will be "out of role" only if a safety of flight issue arises, or if there is a significant instructional point that needs to be debriefed. The IP shall announce "I have the controls" if he/she feels that he/she must take control of the aircraft in the event that a safety of flight concern arises. While "out of role", the IP and IFE should remain out of role until all safety of flight concerns have been resolved and all necessary instruction has been given. Only after confirming all outstanding issues are resolved should the IP and IFE clearly announce that they are "back in role" and training resumed.

EVENT SCENARIOS

The P-3 Instructor P3QS is designed for the squadrons' use in training IUTs and IUT FEs. The program consists of P3QS and Aircrew Evolutions. The overall theme throughout all the Aircrew Evolutions fall under the following three categories in order of importance:

1. **Safety of Flight**
2. **Effective Instruction with Accurate Evaluation**
3. **Crew Resource Management**

The specific focus of the Aircrew Evolutions are as follows:

PPIP/IFE OFT-1:

IUT Emphasis - The development of right seat proficiency while conducting high and low work demonstrations. Focus on FIG/NATOPS knowledge, standardization, basic instructional skills and defensive positioning IAW the FIG. The IUT will be in a single pilot environment to practice radio / checklist management and overall IP situational awareness (scan).

IUT FE Emphasis - The IUT FE should practice basic malfunction setup, OFT operation, developing an IFE scan / defensive position and be challenged with NATOPS discussions.

Scenario - None. However, IUT and IUT FE will control the flow and pace of the event to begin practicing time management.

IP Role - None.

IFE Role - None.

Note - This event is best taught by a senior squadron IUT IP and IUT IFE to ensure the correct habit patterns and safety envelopes are formed early in the IUT.

PPIP/IFE OFT-2:

IUT Emphasis - The further development of right seat proficiency, the introduction of scenario presentation and an introduction to trend recognition and correction. IUT Team crew coordination skills should be emphasized.

IUT FE Emphasis - The introduction of scenario presentation and an introduction to trend recognition and correction. IUT Team crew coordination skills should be emphasized.

Scenario - A basic scenario should be written by the IUT based on the PPIP/IFE OFT-2 gradesheet (no OFT codes maybe used by the IUTs to setup their malfunctions).

IP Role - No personality. IP will demonstrate common student mistakes, trends and predicaments.

IFE Role - No personality. IFE will demonstrate common student mistakes, trends and predicaments.

Note - Critical predicament demos include (but are not limited to) incorrect rudder on EFAR, early rotate, unplanned engine shutdown, "actual" malfunction during scenario, etc. Time shall be allotted for the IUT to practice right seat demonstrations.

PPIP OFT-3:

IUT Emphasis - The development of right seat proficiency while conducting Combat Threat Training (CTT). Focus on instructing Combat Threat Maneuvering (CTM) safely within the operating envelope of the aircraft.

IUT FE Emphasis – IUT FE does not participate in PPIP OFT-3.

Scenario - None. However, IUT will control the flow and pace of the event to practice time management.

IP Role - None.

IFE Role - None.

Note - None

PPIP OFT-4 (FIUT**):**

IUT Emphasis - The further development of right seat proficiency while conducting high and low work demonstrations. Focus on FIG/NATOPS knowledge, standardization, basic instructional skills and defensive positioning IAW the FIG. The IUT will be in a single pilot environment to practice radio / checklist management and overall IP situational awareness (scan).

IUT FE Emphasis – IUT FE does not participate in PPIP OFT-4.

Scenario - None. However, IUT will control the flow and pace of the event to practice time management.

IP Role - None.

IFE Role - None.

Note - FIUT will discuss current fleet trends, ensure fleet standardization and polish the IUT's presentation of right seat demonstrations.

PPIP OFT-5 and PPIFE OFT-3 (FIUT**):**

IUT Emphasis – This event will stress instruction, scenario presentation, trend recognition/correction and develop the IUT's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

IUT FE Emphasis - This event will stress instruction, scenario presentation, trend recognition/correction and develop the IUT FE's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

Scenario - A scenario should be written by the IUT based on the PPIP/IFE OFT-5 gradesheet (no OFT codes maybe used by the IUTs to setup their malfunctions).

IP Role - Early PPP syllabus pilot. IP will demonstrate common student mistakes, trends and predicaments as well as force the IUT to deal with a malfunctioning aircraft.

IFE Role - Multiple tour FE that is new to the squadron after finishing a non flying shore tour. IFE will demonstrate common student mistakes, trends and predicaments as well as force the IUT FE to deal with a malfunctioning aircraft.

Note - None.

PPIP/PPIFE Fly-1:

IUT Emphasis - The first IUT flight should be used to refine the basic skills developed in the OFT. The event should focus on developing complete comfort for the IUT in all types of right seat landings, right seat demos, other runway work, defensive positioning, radio / checklist management in the pattern and overall IP situational awareness (scan).

IUT FE Emphasis - The IUT FE should practice basic malfunction setup, OFT operation, developing an IFE scan / defensive position and be challenged with NATOPS discussions.

Scenario - None. However, IUT and IUT FE will control the flow and pace of the event to practice time management.

IP Role - None.

IFE Role - None.

Note - This event is best taught by a senior squadron IUT IP and IUT IFE to ensure the correct habit patterns and safety envelopes are formed early in the IUT.

PPIP/PPIFE Fly-2:

IUT Emphasis - The further development of right seat proficiency, the introduction of scenario presentation and an introduction to trend recognition and correction. IUT Team crew coordination skills should be emphasized.

IUT FE Emphasis - The introduction of scenario presentation and an introduction to trend recognition and correction. IUT Team crew coordination skills should be emphasized.

Scenario - A basic scenario should be written by the IUT based on the PPIP/IFE FLY-2 gradesheet.

IP Role - No personality. IP will demonstrate common student mistakes, trends and predicaments.

IFE Role - No personality. IFE will demonstrate common student mistakes, trends and predicaments.

Note - Critical predicament demos include (but are not limited to) incorrect rudder on EFAR, early rotate, unplanned engine shutdown, "actual" malfunction during scenario, etc. Time shall be allotted for the IUT to practice right seat demonstrations.

PPIP/PPIFE Fly-3 (FIUT**):**

IUT Emphasis - The event will focus on standardizing and refining the IUT's right seat demonstrations. The IUT shall maintain safety of flight at all times while demonstrating proficient right seat BAW.

IUT FE Emphasis - The IUT FE should practice basic malfunction setup, developing an IFE scan / defensive position and be challenged with NATOPS discussions.

Scenario - None. However, IUT and IUT FE will control the flow and pace of the event to practice time management.

IP Role - None.

IFE Role - None.

Note - None.

PPIP/PPIFE Fly-4 (FIUT**):**

IUT Emphasis – This event will stress instruction, scenario presentation, trend recognition/correction and further develop the IUT's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

IUT FE Emphasis - This event will stress instruction, scenario presentation, trend recognition/correction and further develop the IUT FE's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

Scenario - A scenario should be written by the IUT based on the PPIP/IFE Fly-4 gradesheet.

IP Role - Late PPP syllabus pilot. IP will demonstrate common student mistakes, trends and predicaments as well as force the IUT to deal with a malfunctioning aircraft.

IFE Role – Early PPFE syllabus FE. IFE will demonstrate common student mistakes, trends and predicaments as well as force the IUT FE to deal with a malfunctioning aircraft.

Note - This event will involve in-depth role playing, presentation of "simulated actual malfunction" scenarios by the IP and IFE (scenarios that require safety of flight decisions to be made by the IUT Team) and refinement of IUT Team defensive positioning skills through predicaments.

PPIP/PPIFE Fly-5:

IUT Emphasis – This event will stress instruction, scenario presentation, trend recognition/correction and further develop the IUT's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

IUT FE Emphasis - This event will stress instruction, scenario presentation, trend recognition/correction and further develop the IUT FE's ability to maintain SOF when both the aircraft and RP/RFE team are not operating to their maximum potential. IUT Team crew coordination skills will be emphasized.

Scenario - A scenario should be written by the IUT based on the PPIP/IFE Fly-5 gradesheet.

IP Role - IP discretion.

IFE Role - IFE discretion.

Note - This event will involve in-depth role playing, presentation of "simulated actual malfunction" scenarios by the IP and IFE (scenarios that require safety of flight decisions to be made by the IUT Team) and refinement of IUT Team defensive positioning skills through predicaments. Due to the challenging nature of this event, the Commanding Officer should use the utmost care in selection of the IP and IFE team. Only the most seasoned and experienced instructors should be chosen. Assignment of a senior second tour IP and IFE would be the normal expectation.

PPIP/PPIFE Fly-6X:

IUT Emphasis - An overall evaluation of the IUT's instructor abilities. The IUT shall demonstrate an ability to mentor and train student while maintaining a safe training environment.

IUT FE Emphasis - An overall evaluation of the IUT's instructor abilities. The IUT shall demonstrate an ability to mentor and train student while maintaining a safe training environment.

Scenario - A scenario should be written by the IUT based on the PPIP/IFE Fly-6X gradesheet.

IP Role - Senior squadron IP's discretion.

IFE Role – Senior squadron IFE's discretion.

Note - This event is normally flown with the senior squadron IP and IFE and will also serve as a standardization check for basic squadron instructional technique. The IUT/IUTFE shall be designated only after successfully completing this flight.

IUT Syllabus Notes

1. IUT events are demanding on all participants. In light of this fact, excluding IUT-1 and 3, flight events should be scheduled as "stand alone" events (i.e. should not be scheduled in conjunction with other pilot training syllabus events). The fatigue level of both the IP/IFE and IUT Team should be constantly evaluated and the event terminated if fatigue levels begin to affect performance and safety.
2. To avoid the possibility that a non-IUT upgrader could misunderstand specific IUT training points or role-playing, observation of IUT events by non-instructors is discouraged.
3. The use of IDFW events to develop right seat skills prior to IUT Fly-1 is encouraged. It is critical that right seat proficiency be confirmed prior to the IUT beginning VP-30 FIUT training.
4. Role-playing and safety of flight should be thoroughly briefed and adhered to by the IP and IFE. Ideally, an IUT scenario should be available to the IP and IFE the day prior to the IUT event and used to develop role-play scenarios. Changes to the briefed plan should be avoided to limit confusion during the IUT event.
5. The post-flight debrief is a critical component of IUT training. Intentional errors made by the IP / IFE while in-role are often missed and often appeared unrealistic to the IUTs. These errors must be fully debriefed and the teaching points clarified prior to concluding the training evolution. It is recommended that as many as possible of these intentional errors be debriefed with all cockpit crewmembers present.

STUDENT PILOT/FE MISTAKES

A critical part of the IUT/IUT FE training process is the development of the ability to react appropriately to student mistakes. The IP and IFE must allow the IUT Team to make mistakes in scenario and demo presentations, thereby developing their instructional skills while maintaining an acceptable safety of flight envelope. As long as safety of flight is not compromised, the IP and IFE should not be too quick to rescue the IUT Team from a poorly set up malfunction or below average demo. The IP and IFE should use their experience and scan to remain within an acceptable safety of flight envelope while allowing the IUT Team to learn from their own mistakes.

The IP and IFE must also impart to the IUT Team the ability to recognize and react to mistakes in their own students. Student mistakes can be separated into categories of instructive (i.e. failing to open bleed air valves for engine start) and compromising (i.e. power chop in the flare). It is incumbent upon the IP and IFE to instill a sense of what defines an instructive mistake (and is therefore allowable as part of the learning process) and what student mistakes may compromise safety of flight. The IUT Team ultimately must learn to react quickly to contain compromising mistakes, and more slowly to correct instructive mistakes. This sense can only be imparted through adequate role playing performance and a credible IUT training process.

EVENT PREPARATION

Preparation for an IUT event should begin well prior to the walk to Maintenance Control to read the ADB. It is critical that time is allowed for an adequate preflight brief. The preflight briefing not only covers information critical to the conduct of the upcoming flight, it also sets the tone for the new instructor as he or she develops his or her own briefing routines. During the brief, PQS completion for the respective IUT event should be verified, the planned role should be discussed, flight planning conducted and areas of focus should be identified for the flight. The day prior to the brief, a written scenario should be presented to the IP and IFE by the IUT Team.

The IP and IFE shall thoroughly brief the scenario, planned predicaments and any simulated actual malfunctions planned.

PREFLIGHT

During preflight, the entire crew's focus should be on safely preparing the aircraft for flight. Although role-playing is acceptable, it should not interfere with attention to flight safety. The IP and IFE should ensure preflight duties are clearly established by the IUT Team. During early stage flights when role playing is not an issue, the preflight can be used to review preflight items with the goal of standardizing presentation and imparting "evaluator level" NATOPS knowledge. The IP and IFE should always conduct a thorough pre-flight walk around regardless of assigned duties.

PLANESIDE BRIEF

The completion of a proper Planeside Brief is critical to the safety of an IUT event. Planeside brief is normally completed in role for later stage IUT flights to give the IUT the opportunity to practice critique of the "students" brief as well as the opportunity to practice a normal IP brief. The IP should follow the IUT brief critique with a clear "out of role" and "I have the controls" brief that covers crew coordination, handling of actual emergencies and in/out of role distinctions.

IN-FLIGHT

The in-flight portion of an IUT event can be broken down into the distinct phases of taxi, takeoff, climb/NTS check, high work and low work. The three general objectives common to all phases of in-flight IUT instruction are:

1. Validation by the IP and IFE of IUT Team's ability to safely conduct flight operations in the instructional environment.

2. Instruction of the IUT Team in techniques and procedures for the safe presentation of aircraft malfunctions in the instructional environment, to include time management.

3. Presentation, instruction and practice with specific student "Predicaments" for the IUT Team.

INSTRUCTOR PREDICAMENT LIST

The following is a detailed description of the predicaments that, over the years, have been found to correspond to some of the more common errors made by upgrading pilots on familiarization flights. Each predicament is described, explaining how the IP shall perform it, ways the IUT can prevent the predicament from happening, and finally, what the IUT Team shall do to get out of the predicament should it happen. Some predicaments have additional maneuvers that will be shown to the IUT Team in the OFT. While this list is thorough, it is not meant to be all-inclusive. The IP may present additional predicaments, malfunctions, and emergencies as long as they do not contradict any requirements or directives contained in this supplement or promulgated by competent authority. The importance of hangar flying discussions between IUT instructors cannot be stressed enough. Emphasis on such discussions promotes instructors covering as many predicaments as possible and devising a plan of action for when these predicaments arise.

WARNING

The following predicaments shall not be performed in the aircraft:

1. **Actual engine shutdown by any means while on the runway or below 1500' AGL.**
2. **Early rotate below 100 KIAS.**
3. **Autofeather or intentional shutdown of an engine prior to an in-flight NTS check.**
4. **Incomplete extension of the Emergency Shutdown Handle (soft E-handle).**
5. **Intentional gust lock of flight control, except rudder above 4000' AGL on IUT events.**

Note

HRD buttons shall not be pushed unless proper set-up has been verified by the IFE in the seat or a qualified flight station observer.

TAKEOFF PREDICAMENTS

WRONG RUDDER ON ENGINE FAILURE BEFORE REFUSAL (SIMULATOR ONLY)

WARNING

This predicament shall not be performed in the aircraft because of the limited recovery margin.

Execution - In this predicament the IP will use the wrong rudder during the three engine abort.
Prevention - IUT should block the wrong rudder pedal with his/her foot.
Response - IUT should take the aircraft and correct back to centerline using the following technique:

A. Power to flight idle to alleviate the effects of VMC ground.
B. Establish directional control of the aircraft.
C. Stop the aircraft.

Wrong Rudder On Engine Failure After Refusal (CO APPROVAL)

WARNING

The Wrong Rudder on Engine Failure After Refusal requires Commanding Officer approval prior to conducting in the aircraft.

The IP shall use minimal wrong rudder and shall not 'push through' the IUT's block.

Execution - IP initiates wrong rudder application during EFAR. Minimal wrong rudder will result in noticeable centerline deviation.
Prevention - IUT should block the wrong rudder pedal with his/her foot.
Response - This must be purely reactionary. The IUT does not have the time to assess the situation prior to the aircraft departing the side of the runway. The IUT must immediately take the aircraft and rotate while simultaneously reestablishing power on all four engines.

WARNING

V_{ro} airspeed is not a consideration during this predicament. The IUT should not wait for 115 knots because the aircraft will more than likely depart the runway. At training weights, the aircraft will have no problem flying with airspeed in the 100–115 knot range.

Note

During an IUT SIM, the IUT should be shown the ramifications of a slow response to this predicament.

No Rudder On Engine Failure Before Refusal

Execution – IP will not use rudder during the three-engine abort.
Prevention - IUT should block the wrong rudder pedal with his/her foot.
Response - - IUT should assess the speed at which the aircraft is moving toward the side of the runway. If the IP makes no correction toward centerline, IUT should take the aircraft and correct back to centerline using rudder and asymmetric power and, as a last resort, brakes.

No Rudder On Engine Failure After Refusal

Execution - IP will not use rudder during the EFAR.
Prevention – IUT should be aware of insufficient use of rudder by RP.
Response - IUT should assess the speed at which the aircraft is moving toward the side of the runway. If the IP makes no correction toward centerline, the IUT must immediately take the aircraft and rotate while simultaneously reestablishing power on all four engines.

Abort After Refusal

Execution - IP attempts to abort after the simulated refusal speed of 100 knots when given a malfunction.
Prevention - IUT's hands at the base of the power levers should prevent IP from retarding power levers too much.
Response - If IP is able to retard power levers aft then IUT shall take the aircraft and either abort the takeoff him/herself or push the power back up and continue the takeoff.

Note

The decision whether to continue the abort or push the power back up and continue the takeoff is a judgment call the IUT will have to make at the time depending on the airspeed, runway remaining, how far back the power levers were retarded, etc.

EARLY ROTATE

Execution - V_{ro} is confused with V_r. Rotate occurs at 100 knots. This can occur on a takeoff or touch and go.
Prevention - Arm and hand position should be such that the yoke is blocked until the IUT wants rotate to occur.
Response - The IUT should first consider not calling refusal if IP brings hand to yoke early. However, if nosewheel does leave runway, the IUT should take controls, hold nosewheel off the deck and continue with the takeoff.

Note

Rotate at less than 100 knots shall only be demonstrated during the IUT simulator phase.

IN-FLIGHT PREDICAMENTS

Two Engines Inadvertently Shutdown On The Same Side (CO APPROVAL)

WARNING

The Two-Engine Inadvertently Shutdown on the Same Side scenario may only be performed in the aircraft with Commanding Officer approval.

IAW NATOPS, conducting emergency maneuvers with two engines shutdown is prohibited. Maintain straight and level flight, and limit the duration in this configuration.

If two engine-driven generators are to be shutdown, the APU shall be started prior to executing this predicament.

This scenario may be performed in the aircraft with the following precautions:

- Single-engine performance shall be evaluated by the IP and IFE prior to execution. A 100,000 lb. aircraft will have a 420 FPM rate-of-descent (standard day, normal-rated power, three propellers feathered).
- Minimum airspeed shall be loiter speed.
- Minimum altitude for execution shall be 4000 feet AGL. Given the above single-engine conditions, this altitude will provide over eight minutes to restart engines.
- No additional malfunctions or predicaments shall be presented while in a two-engine configuration.

The following items pertain to presenting the predicament in either the simulator or the aircraft:

Note

During the IUT SIM, single engine flight characteristics should be discussed and practiced.

Execution – Two engines inadvertently shutdown usually occurs when the IFE pushes in the wrong feather button during a prop-fails-to-feather scenario.
Prevention – This is very difficult to prevent. The IUT and or IUT FE may try to stop the IFE by raising their voices or through physical contact.
Response – If two engines are inadvertently shutdown, the IUT shall take the aircraft, get the IUT FE in the FE seat and complete the Emergency Shutdown and Restart checklists IAW Chapter 5. The inboard engine should be restarted first. The IUT Team should then determine if training is to be continued.

Engine Is Autofeathered (SIMULATOR ONLY)

Execution - The autofeather is inadvertently left on and an engine is autofeathered. This can occur with rapid power lever movement during level-off and subsequent climb.
Prevention – The IUT should get in the habit of utilizing the Climb checklist as soon as practical after takeoff to ensure the autofeather is OFF. Many flight engineers routinely turn autofeather off when safely airborne but the IUT should not count on this technique. The IUTFE should ensure the autofeather is secured when safely airborne.
Response - The IUT and IUT FE should halt all training until the situation is resolved. If an engine autofeathers, the IUT should take the aircraft, have the IUTFE get in the seat and restart the engine using the Restart checklist.

Note

During an IUT SIM, discuss the ramifications of restarting an engine that has not had an NTS check performed.

SIMULATED Actual Malfunction During High Work

The IUT and IUT FE must develop the ability to interrupt training to deal with unexpected events. Presentation of malfunctions to the IUT and IUT FE during IUT events (we will call these "simulated actual malfunctions") by the IP and IFE team allows the IUT and IUT FE to develop necessary skills to react to situations that might occur during a typical student training event. Simulated actual malfunctions should be realistic (i.e. resolvable using existing NATOPS procedures) to provide effective training (an example could be prop fails to feather during a normal shutdown). The IP and IFE should remain in role during presentation of a simulated actual malfunction unless safety of flight becomes an issue.

Execution - Any number of malfunctions or emergencies can occur during training.
Prevention - Maintaining situational awareness and an active scan will alert the instructor to potentially dangerous situations.
Response – The IUT and IUT FE should halt all training until the situation is resolved. Once cleaned up from all simulated malfunctions, the IUT should handle the emergency or malfunction and evaluate if he/she can resume training after the situation has been resolved. IUT may request IP and IFE involvement in role in handling the malfunction but at all times should make it clear to all participants that this is an actual malfunction. If necessary, the IP and IFE should come out of role and work together with the IUT Team to resolve the situation.

The use of a second IUT Instructor Pilot as a "Safety Pilot" can increase the safety and efficiency of the IUT event. The Safety Pilot, if used, should not be directly involved in instruction or role-playing. The Safety Pilot should participate in the event as an observer; taking notes as required and providing a back up to the IP and IFE on safety of flight issues. The Safety Pilot may pull circuit breakers for scan items. The Safety pilot shall not set up major system malfunctions (e.g. engine fire).

LANDING PATTERN PREDICAMENTS

Simulated Actual Malfunction During Touch-And-Go

WARNING

An EFAR shall not be conducted during a touch-and-go.

Execution – Simulated malfunction given during touch-and-go.
Prevention - None
Response - IUT should make decision whether or not to abort the touch-and-go, taking into account the runway remaining and aircraft speed.

WARNING

During a no-flap touch and go, simulated malfunctions shall not be conducted.

Abort During Touch and Go

Execution – IP aborts during Touch and Go.
Prevention - IUT should guard against the student bringing the power levers into the ground range.
Response - IUT should make decision whether or not to abort the Touch and Go, taking into account the runway remaining and aircraft speed.

Low Or High On Final

WARNING

If the IUT does not recognize an unsafe situation, the IP shall immediately execute a waveoff.

Execution - Aircraft deviates from a three degree glideslope.
Prevention - IUT should stress a three degree glideslope and the visual cues that can be used to learn how a three degree approach looks (i.e. "the ball", ILS, VASI, etc.).
Response - IUT should alert the IP to this deviation if corrective action is not being taken and take control of the aircraft as required to maintain safety of flight limits.

Power Chop In Flare

WARNING

IP should be aware of IUT not recognizing power chop. If the IUT does not recognize an unsafe situation, the IP shall immediately execute a waveoff.

Execution - Power levers are rapidly retarded to flight idle. Additional airspeed should be utilized when performing this predicament. Airspeed shall not be less than 1.3 or 1.35 $V_{S.}$ Typically a pilot will take this action when he / she is high and fast or when he / she has yet to establish a "feel" for power lever movement.
Prevention - The IUT shall have his/her hands on top of the power levers and prevent excessive movement.
Response - This is one of the most dangerous situations and could result in severe damage to the aircraft should it be allowed to impact the ground. The IUT should take the aircraft, immediately apply power and execute a waveoff.

Aircraft Floats In Flare

WARNING

If the IUT does not recognize an unsafe situation, the IP shall immediately execute a waveoff.

Execution - IP is fast on final and aircraft touchdown is past the first third of the runway.
Prevention - It is not recommended that the aircraft be allowed to touchdown past the first third of the runway.
Response - Although the IUT may elect to allow an IP to land the aircraft past the first third of the runway, he/she must be mindful of remaining runway length (especially less than 5000 feet remaining) if a touch-and-go is going to be attempted.

Note

In an IUT SIM, the IUT shall be shown various touch-and-go scenarios with touchdowns at various runway remaining distances (i.e. touchdown at "4" board). This demonstration should reemphasize the concept of an actual refusal point on touch-and-go's.

Land Aircraft Off Centerline

WARNING

IUT should not allow IP to land with mainmounts outside of centerline. If the IUT does not recognize an unsafe situation, the IP shall immediately execute a waveoff.

Execution - Aircraft touches down with centerline outside of mainmounts.
Prevention - IUT should constantly stress centerline control. In addition the IUT should be aware of runway width (exercise caution with 150 feet or less) and obstructions that are close to the runway might be impacted by a prop or wing.
Response - IUT must determine if it is advantageous to allow aircraft to continue or to waveoff.

Reversing With The Wrong Engine During A Simulated Engine Out Landing

Execution - The IP will forget which engine has been simulated shutdown especially when all four power levers are very close to being married up.
Prevention - IUT should maintain scenario awareness.
Response - If briefed incorrectly, the IUT should correct the IP. Consideration should be given if the crosswind component is more than 5 to 10 knots. Extra caution is required. If this occurs during touchdown and reversal allow the IP to continue with the wrong engine and discuss the "mix-up" afterwards. The resulting runway airwork will still call for proper use of rudder, aileron and asymmetric power.

On ENGINE OUT REVERSAL All Four Power Levers Not Brought into the Ground Range

Execution - IP leaves a power lever in the flight range, or leaves the power lever just over the ramp.
Prevention - IUT should utilize a hand position that maintains contact with all four power levers during the entire landing evolution.
Response - IUT should bring the "dropped" power lever into the ground range.

ATTEMPTED REVERSAL above 135 knots

WARNING

The IP shall not bring the power levers into the ground range, as pitchlock may occur.

Execution - IP lifts the power levers at the flight idle position as if bringing them into the ground range.
Prevention - IUT should position hand on the power levers to prevent inadvertent movement into the ground range.
Response - IUT should block the power levers until the airspeed has decreased to below 135 knots.

LONG OR FAST ON No Flap (LEADS TO Touch-And-Go)

Execution - IP may land with less than the no-flap ground roll distance remaining.
Prevention - IUT should recognize that insufficient runway remains and not allow the aircraft to touch-down.
Response - If the aircraft does touchdown the IUT should add power, accelerate to and rotate at 1.2 V_S or 135 knots, whichever is greater. IUT should be mindful of the aircraft tendency to pitch up with power application.

Aircraft Takeoff With Flaps At Land

Execution - Either on a touch-and-go, stop-and-go, or a normal takeoff the flaps are positioned at land with the flap position indicator failed at approach.
Prevention - None. This predicament is conducted strictly for IUT exposure.
Response - IUT should notice the difference in aircraft angle of attack, the greater power required, the LGWS alert, etc.

No Flap Landing With The Flaps At Approach

Execution - Off the "180" and after the Landing checklist has been completed, the flaps should be lowered to "approach" with the flap position indicator failed in the "up" position.
Prevention - None. This predicament is conducted strictly for IUT exposure.
Response - IUT should notice the lower angle of attack and the higher power setting required to fly the same pattern/approach.

Approach Flap Landing With Flaps Up

WARNING

If the IUT is flying the aircraft, this predicament shall only be flown to a low approach. The IP/IFE shall ensure that the aircraft is not flown below the appropriate 1.52/1.2 speeds.

Execution - The flap position indicator should be failed and the flaps should slowly be brought to the "up" position.
Prevention - None. This predicament is strictly for IUT exposure.
Response - IUT should notice the higher angle of attack and the lower power setting required to fly the same pattern/approach.

GENERAL PREDICAMENTS

Scan Items

The IUT flights are also the time to emphasize the importance of a good scan, both outside and inside. It is very important for the IUT to be observant and maintain the highest degree of situational awareness, especially considering that he/she may be the only qualified crewmember occupying a flight station seat. In order to improve IUT cockpit awareness and inside scan various items will be randomly failed throughout the IUT syllabus.

Note

When feasible, the use of a Safety Observer (an IUT Instructor Pilot or qualified IFE) should be used on IUT-2, 5, and 6X to increase safety and training efficiency. The Safety Pilot can participate in the event as an observer, taking notes as required and providing a back up to the IP and IFE on safety of flight issues. If the Safety Observer is a pilot, he may only pull circuit breakers for scan items. Only qualified IFE's may fail systems using circuit breakers for the purpose of presenting simulated actual malfunctions**.**

Incorrect checklists

WARNING

The IP shall not commence the takeoff roll or descend below 500 feet AGL on an approach until all checklists are completed correctly and in their entirety.

Execution - IP does not call for the checklists or gives the wrong checklist response. IUT should also be wary of those times when the IP might read the checklists (i.e. copilot duties) and the possibility of skipping an item.
Prevention - IUT should have a technique for ensuring all checklists are completed (i.e. physically holding the checklist or positioning the checklist in the glareshield). The IUT should be knowledgeable enough about the checklists such that he/she recognizes when an item has been skipped.
Response – IUT should complete the correct checklist in a timely and thorough manner.