



U.S. Department
of Transportation

**Federal Aviation
Administration**

FAA-S-8081-21
with Changes 1, 2, 3, and 4

FLIGHT ENGINEER

Practical Test Standard

for

• **RECIPROCATING ENGINE**

• **TURBOPROPELLER**

and

• **TURBOJET**

POWERED AIRCRAFT

JANUARY 1999

FLIGHT STANDARDS SERVICE
Washington, DC 20591

FLIGHT ENGINEER

Practical Test Standard

for

Reciprocating Engine

Turbopropeller

and

Turbojet

POWERED AIRCRAFT

1999

**FLIGHT STANDARDS SERVICE
WASHINGTON, DC 20591**

NOTE

This book establishes the flight engineer—reciprocating engine, turbopropeller (turboprop), and turbojet powered aircraft practical test standard. This standard is to be used for flight engineer certification. Material in FAA-S-8081-21 will be effective January 1, 1999.

RECORD OF CHANGES

Change 1—2/8/2011

Added English Language proficiency requirements.

Change 2—5/4/2011

Appendix 1:

Table 2 – Task Authorization for Applicants Eligible for Exemption 4901, as amended

Change 3—5/3/2012

Appendix 1:

Table 1 and 2 – Removed FSTD levels 1, 2, and 3.

Change 4—1/8/2018

Introduction:

Practical Test Standard Concept – Removed reference to SFAR 58.

Practical Test Book Description – Updated list of references.

Use of FAA-Approved Flight Simulators and Flight Training Devices for Testing – Removed paragraph referencing Exemption No. 4901.

Testing in TASKS and in Normal, Abnormal, and Emergency Procedures – Changed “Aircraft Flight Manual” to “Airplane Flight Manual.”

Inspector and Examiner Responsibility: Practical Test Administered To Applicants Eligible Under 14 CFR part 63, section 63.37(b)(1), (2), (3), or (4) or Otherwise Not Eligible For Use of Exemption 4901, As Amended – Removed reference to Exemption No. 4901.

Inspector and Examiner Responsibility: Practical Test Administered to Applicants Eligible Under 14 CFR part 63, section 63.37(b)(7) or Otherwise Eligible For Use of Exemption 4901, As Amended – Removed entire subsection.

Section 2: Preflight, Ground, Flight, and Postflight Procedures:

Area of Operation II: Preflight Procedures: Task B: Preflight Inspection – Exterior – Revised Note to remove reference to unrestricted flight engineer certificate.

Appendix 1 – Task vs. Simulation Device Credit

Table 1 – Task Authorization for Applicants Not Eligible for Exemption 4901, as Amended – Revised title to “Task Authorization”.

Table 2 – Task Authorization for Applicants Eligible for Exemption 4901, as Amended – Removed table.

FOREWORD

The Flight Engineer Practical Test Standard for Reciprocating Engine, Turbopropeller, and Turbojet Powered Aircraft is published by the Federal Aviation Administration (FAA) to establish the standard for flight engineer practical tests. FAA inspectors and designated examiners (referred to as examiners throughout this book) shall conduct practical tests in compliance with this standard. Flight engineers exercising instructor privileges and applicants should find this standard helpful during training and when preparing for practical tests.

Richard O. Gordon
Acting Director, Flight Standards Service

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INTRODUCTION

General Information

The Flight Standards Service of the Federal Aviation Administration (FAA) has developed this practical test standard (PTS) for use by FAA inspectors and examiners when conducting flight engineer practical tests. Instructors and applicants are expected to be guided by this standard when preparing for practical tests.

NOTE: Throughout this practical test standard, when the term “examiners” is used, “inspectors and examiners” should be understood.

Information considered directive in nature is described in this practical test book in terms, such as “shall” and “must” indicating the actions are mandatory. Guidance information is described in terms, such as “should” and “may” indicating the actions are desirable or permissive, but not mandatory.

The FAA gratefully acknowledges the valuable assistance provided by the many individuals who contributed their time and talent in assisting with the development of this practical test standard.

This practical test standard is accessible through the Internet at www.fedworld.gov/pub/faa-att/faa-att.htm, or by modem at 703-321-3339. You may purchase this standard from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Changes to this standard, in accordance with AC 60-27, Announcement of Availability: Changes to Practical Test Standards, will be available through the Internet and then later incorporated into a printed revision. For a listing of changes, AFS-600's Internet web site may be accessed at www.mmac.jccbi.gov/afs/afs600.htm.

Comments regarding this publication should be sent to:

U.S. Department of Transportation
Federal Aviation Administration
Flight Standards Service
Airman Testing Standards Branch, AFS-630
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Change 4 (1/8/18)

Practical Test Standard Concept

Title 49, United States Code, empowers the Administrator of the FAA to promote safety. Specifically, section 44701(a)(5) states: “The Administrator of the Federal Aviation Administration shall promote safe flight of civil aircraft in air commerce by prescribing – regulations and minimum standards....” Title 14 of the Code of Federal Regulations (14 CFR) specifies areas of knowledge and skill that shall be demonstrated by an applicant before issuance of a flight engineer certificate. The standards for airman certificates are published in this practical test standard and contain specific TASKS in which competency shall be demonstrated. The FAA will revise this PTS whenever it is determined that changes are needed in the interest of safety. Adherence to provisions of the regulations and the practical test standard is mandatory for evaluation of flight engineer applicants.

For some aircraft types, provisions of FAA Flight Standardization Board Reports (FSB) may specify details as to how 14 CFR and this practical test standard apply to certain TASKS, procedures, or knowledge areas.

Practical Test Book Description

This book contains the practical test standard for the initial issuance of a flight engineer certificate and for the addition of class ratings to that certificate. The flight engineer practical test standard includes the AREAS OF OPERATION and TASKS.

AREAS OF OPERATION are phases of the practical test arranged in a logical sequence in two sections within this standard. Section One is conducted on the ground and contains TASKS to determine the applicant’s knowledge of the aircraft, applicable equipment, documents, operating manuals, performance, and limitations. Section Two contains TASKS to determine the applicant’s knowledge and skill during preflight, ground, flight, and postflight procedures. The examiner may conduct the practical test in any sequence that results in an efficient and valid test.

TASKS list the required knowledge and skills appropriate to an AREA OF OPERATION.

NOTE is used to emphasize special considerations required in the AREA OF OPERATION or TASK.

The TASK's Objective lists the important elements that must be satisfactorily performed to demonstrate competency in a TASK. The Objective includes:

1. specifically what the applicant should be able to do;
2. the conditions under which the TASK is to be performed; and
3. the minimum acceptable standards of performance.

The REFERENCE identifies the publication(s) that describe(s) the TASK. Descriptions of TASKS are not included in this standard because this information can be found in the current issue of the listed references. Materials other than those listed may be used for reference if their content conveys substantially the same meaning as the referenced materials.

This practical test standard is based on the following references.

14 CFR part 1	Definitions and Abbreviations
14 CFR part 60	Flight Simulation Training Device Initial and Continuing Qualification and Use
14 CFR part 63	Certification: Flight Crewmembers Other Than Pilots
14 CFR part 91	General Operating and Flight Rules
14 CFR part 121	Operating Requirements: Domestic, Flag, and Supplemental Operations
AC 00-6	Aviation Weather
AC 00-45	Aviation Weather Services
AC 120-27	Aircraft Weight and Balance Control
AC 120-35	Flightcrew Member Line Operational Simulations: Line Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation
AC 120-40	Airplane Simulator Qualification
AC 120-45	Airplane Flight Training Device Qualification
AC 120-51	Crew Resource Management Training

Change 4 (1/8/18)

AC 120-53	Guidance for Conducting and Use of Flight Standardization Board Evaluations
AC 120-54	Advanced Qualification Program
AIM	Aeronautical Information Manual
FDC NOTAM	National Flight Data Center Notices to Airmen
AFM	FAA-Approved Airplane Flight Manual
MEL	Minimum Equipment List
FSB Reports	Flight Standardization Board Reports
OTHER	Aircraft Operating Manual Flight Manuals Master and Company Minimum Equipment Lists Configuration Deviation List Manufacturer's MEL Procedures Manual/Dispatch Deviation Guide Chart Supplements

Use of the Practical Test Standard Book

The TASKS contained in this practical test standard apply to applicants for an initial flight engineer certificate or when adding a class rating to an existing flight engineer certificate. With certain exceptions, some described by NOTES, all TASKS are required; however, when a particular element is not appropriate to the aircraft or its equipment, that element, at the discretion of the examiner, may be omitted.

It is not intended that the examiner follow the precise order that the AREAS OF OPERATION and TASKS appear in this practical test standard. The examiner may change the sequence or combine TASKS with similar Objectives to conserve time. Although TASKS with similar Objectives may be combined to conserve time, the Objectives of all TASKS must be demonstrated and evaluated at some time during the practical test. Examiners must develop a written plan of action that includes the order and combination of TASKS to be demonstrated by the applicant in a manner that results in an efficient and valid test. It is of utmost importance that the examiner accurately evaluate the applicant, placing special emphasis on operations considered critical to flight safety.

Flight Engineer Practical Test Prerequisites

Age

The minimum age to take the flight engineer practical test is 19; however, the minimum age to hold a flight engineer certificate is 21.

NOTE: An applicant who is less than 21 years of age and successfully completes the flight engineer practical test will be issued a Letter of Aeronautical Competency by the FAA. The letter will state that the applicant has met all the requirements for a flight engineer certificate except the age requirement. When an applicant presents proof of reaching age 21, and presents a second-class medical certificate or higher, the Letter of Aeronautical Competency may be exchanged for a temporary airman certificate at any Flight Standards District Office (FSDO).

In accordance with the requirements of 14 CFR 63.31(b) and ICAO aviation English Language proficiency requirements, the entire application process and testing procedures must be accomplished fluently enough in the English language such that crew coordination and communication is never in doubt.

Medical Certificate

Applicants must present a current second-class medical certificate or higher before taking the practical test.

Knowledge Test Report

Applicants must present a valid AC Form 8080-2, Airman Written Test Report, or Airman Test Report.

The flight engineer knowledge test report is normally valid for 24-calendar months. When an applicant applies for oral and flight tests, the validity period may be extended in some cases. The following requirements must be met:

1. Applicants Employed by Air Carriers. Employment by a 14 CFR part 135 on-demand operator does not qualify an applicant for an extension. Employment by one or more scheduled part 135 operators or by one or more part 121 operators may qualify an applicant for an extension under the following conditions:
 - a. An applicant who is a flightcrew member must have completed initial new-hire training, initial equipment training, or transition training.
 - b. An applicant who is a flightcrew member must currently be participating in a training program that includes a recurrent training curriculum in accordance with part 121 or part 135.

- c. An applicant who is a mechanic must meet the currency requirements of 14 CFR part 65.
 - d. An applicant must be currently employed by a part 121 or part 135 air carrier; however, an applicant is not required to have been *continuously* employed by a qualified air carrier between the time the applicant passes the knowledge test and the time the applicant applies to take the oral and flight tests.
2. Applicants in Military Service. An applicant in military service may qualify for an extension under the following conditions:
- a. The applicant must currently be participating in a scheduled military transport service.
 - b. The applicant must currently be participating in a military flight engineer or maintenance training program.
 - c. The applicant must have participated in a flight engineer or maintenance training program at the time of passing the knowledge test, or must have begun a flight engineer or maintenance training program within 24-calendar months after passing the knowledge test.

Extended Test Report Validity: Documentation

Examiners shall not accept an expired AC Form 8080-2, Airman Written Test Report, or an expired Airman Test Report, unless the applicant presents written evidence supporting extended validity of the report. When such documentation is presented by the applicant and is found satisfactory by the examiner, the examiner shall enter, date, and sign the following statement on the test report: "The period of validity of this test report has been extended in accordance with the provisions of 14 CFR part 63, section 63.35(d)."

Completed FAA Form 8400-3, Application for an Airman Certificate and/or Rating

The applicant must present a completed FAA Form 8400-3, Application for an Airman Certificate and/or Rating, including an authorized instructor's recommendation in box 7 of the form.

Other Practical Test Prerequisites: Documentation

Prerequisites for initial issuance of a flight engineer certificate with a class rating include the seven alternatives shown in 14 CFR part 63, section 63.37(b)(1) through (7). Those seven alternatives specify aeronautical experience requirements and/or training requirements. The applicant must present documentation showing that the requirements have been met in at least one of the seven alternatives, shown in groups 1 through 3 below. Documentation must include satisfactory evidence of the completion of the appropriate flight training in the duties of a flight engineer.

NOTE: Any actual airplane training received to meet the provisions of section 63.37(b) or of part 63, appendix C, must not be acquired during revenue operations.

Group 1: Applicants who qualify for the practical test under the provisions of section 63.37(b) subparagraphs (1), (2), (3), or (4), must present documentation of receiving a minimum of 5 hours' flight training in the duties of a flight engineer in an actual airplane of the same class that will be used for the practical test.

NOTE: The flight time required for the practical test shall not be credited as part of the required flight instruction in an airplane.

Group 2: There is no specific requirement for flight training in the duties of a flight engineer in an airplane for applicants qualifying for the practical test under the provisions of section 63.37(b) subparagraphs (5) and (6); consequently, there is no flight training documentation requirement.

Group 3: Applicants successfully completing part 63, appendix C, flight engineer ground and flight course of instruction under the provisions of section 63.37(b) subparagraph (7), must provide documentation of having received flight instruction in an airplane (see section 63.37(a)), as specified in part 63, appendix C, (a)(3). All of this flight training must be in the same type of airplane used in the approved course. A flight simulation device may be used for a portion of the flight training as described in the following tables.

Table 1. Applicants who do not possess at least a commercial pilot certificate with an instrument rating must receive at least 10 hours of flight training in the duties of a flight engineer. Up to half of that requirement may be satisfied through the use of a flight simulation device as shown in Table 1 below. This training must be in a flight simulation device that accurately reproduces the design, function, and control characteristics, as pertaining to the duties and responsibilities of a flight engineer, of the type of airplane flown.

Flight Simulation Device	Flight Training Substitution Ratio (Training Device: Airplane)	Substitution Limit
Level A or Higher Flight Simulator (SIM)	2:1	5 hours (50%) (Requires 10 hours in SIM and 5 hours in aircraft.)
Level 5 or Higher Flight Training Device (FTD)	3:1	5 hours (50%) (Requires 15 hours in FTD and 5 hours in aircraft.)

Table 2. Applicants who have at least a commercial pilot certificate with an instrument rating must receive at least 10 hours of flight training in the duties of a flight engineer. The 10 hours may be entirely satisfied in a flight simulation device as shown in Table 2 below.

Flight Simulation Device	Flight Training Substitution Ratio (Training Device: Airplane)	Substitution Limit
Level A or Higher Flight Simulator (SIM)	2:1	10 hours (100%) (Requires 20 hours in SIM.)
Level 5 or Higher Flight Training Device (FTD)	3:1	5 hours (50%) (Requires 15 hours in FTD and 10 hours in SIM or 5 hours in aircraft.)

Retesting After Failure: Documentation

When retesting within 30 days after failing a practical test, the applicant must present FAA Form 8400-3, Application for an Airman Certificate and/or Rating, including an authorized instructor's recommendation in box 7 of the form and a notation that additional training, to proficiency, has been conducted in the unsatisfactory areas shown on FAA Form 8060-5, Notice of Disapproval of Application. A copy of FAA Form 8060-5 must be attached.

Adding a Class Rating to an Existing Flight Engineer Certificate: Documentation

When seeking to add a class rating to an existing flight engineer certificate, the applicant must additionally present that certificate before taking the practical test.

Aircraft and Equipment Requirements for the Practical Test

If appropriate to a specific task listed in appendix 1 of this practical test standard, the applicant is required to provide an appropriate and airworthy aircraft for the practical test. Its operating limitations must not prohibit the TASKS required on the practical test. The aircraft and crew complement must require a flight engineer.

Use of FAA-Approved Flight Simulators and Flight Training Devices for Testing

14 CFR part 63 permits, under certain conditions, the use of approved flight engineer training devices for testing emergency and abnormal procedures during the flight portion of the practical test as set forth in the appropriate table of appendix 1 of this practical test standard.

NOTE 1: Any Level 5 or higher FTD equipped with all relevant systems and approved by the FAA, or any level flight simulator so equipped and approved, may be used to meet the flight engineer training device allowances of part 63.

NOTE 2: A Principle Operation Inspector's (POI) approval of a Level 5 flight training device must be coordinated with the National Simulator Program Manager in accordance with AC 120-45, Airplane Flight Training Device Qualification, paragraph 7(L)(2).

Change 4 (1/8/18)

In SECTION TWO, the aircraft “PREFLIGHT INSPECTION” TASKS must be accomplished using the appropriate training equipment, in accordance with the appropriate table in appendix 1.

Each inflight procedure must be performed by the flight engineer applicant in an FTD, flight simulator, or an aircraft. Appendix 1 of this practical test standard must be consulted to identify the procedures that may be accomplished in, and the qualification level of, an FTD or flight simulator.

Testing in TASKS and in Normal, Abnormal, and Emergency Procedures

When the practical test is accomplished in an aircraft, certain TASK elements may be accomplished through simulated actions in the interest of safety and practicality, but when accomplished in an FTD or flight simulator, these same actions would not be simulated. For example, when in an aircraft, a simulated engine fire may be addressed by retarding the throttle to idle, simulating the shutdown of the engine, simulating the discharge of the fire suppression agent, simulating the disconnection of the associated electronics, hydraulics, pneumatics, etc.; however, when the same emergency condition is addressed in an FTD or a flight simulator, all TASK elements must be accomplished as would be expected under actual circumstances. It is important to understand that whether accomplished in an FTD, flight simulator, or aircraft, all TASKS and TASK elements for each procedure will have the same performance criteria applied in evaluating an applicant's performance.

Inspectors and examiners should be guided by the following when conducting the flight test phase of the practical test:

1. **Practical Test Standards.** The TASKS and procedures that must be evaluated are shown in the practical test standards, as amended.
2. **Operator's Manual or Airplane Flight Manual.** The specific manner that TASKS and procedures must be accomplished by the applicant are shown in the operator's manual or airplane flight manual.

3. **Selection of Procedures.** Examiners shall evaluate as many procedures as necessary to determine that the applicant meets the knowledge and skill set forth in the Objective of each TASK. Examiners shall vary the selection and sequence of procedures on successive flight tests in order to evaluate the effectiveness of the operator's training program.
4. **Combining, Compounding, and Overloading.** Good judgment is essential to avoid overloading the applicant with unrealistic combinations of TASKS. On the other hand, if the applicant should fail to accomplish a TASK or procedure satisfactorily, it would be realistic to introduce an additional problem that would logically result from the unsatisfactory accomplishment of an earlier TASK. This guideline confines the compounding of problems to a particular aircraft system or related systems.

Inspector and Examiner Responsibility

The inspector or examiner conducting the practical test is responsible for determining that the applicant meets the prerequisites for certification and the standards outlined in this practical test standard. The examiner shall meet this responsibility by determining that the applicant's knowledge and skill meet the Objectives in all required TASKS.

In accordance with the requirements of 14 CFR 63.31(b) and ICAO English Language proficiency requirements, the examiner must accomplish the entire application process and test in the English language. The English language component of crew coordination and communication skills can never be in doubt for the satisfactory outcome of the test. Normal restatement of questions as would be done for a native English speaking applicant is still permitted and NOT grounds for disqualification."

Practical Test Administered To Applicants Eligible Under 14 CFR part 63, section 63.37(b)(1), (2), (3), or (4)

The practical test is divided into three phases.

Phase 1—Equipment Examination. Phase 1 is conducted on the ground as an oral exam, written exam, or a combination of both, to determine the applicant's knowledge of the aircraft systems, required operating procedures, performance, and limitations.

Phase 2—Preflight. Phase 2 is conducted on the ground using an aircraft consisting of an inspection of the aircraft exterior, cabin interior, and the flight deck.

Change 4 (1/8/18)

Phase 3—Flight. Phase 3 begins on the ground and includes flight phases that must be in an aircraft. This phase includes: flight deck setup; engine start; taxi; before takeoff checks; after takeoff checks; inflight procedures; approach and landing checks; after-landing procedures; parking and securing; and normal, abnormal, and emergency procedures. The flight portion of the practical test may be conducted in as little as 1.5 to 2 hours in instances when the examiner prepares and conducts the flight check scenario effectively and when the applicant performs well.

NOTE: Certain portions of Phase 3, limited to emergency procedure(s) may be conducted in an approved flight engineer training device (Level 5 or higher FTD or any approved flight simulator).

Satisfactory Performance

The practical test is passed if, in the judgment of the examiner, the applicant demonstrates satisfactory performance with regard to:

1. executing TASKS within the aircraft's performance capabilities and limitations, including use of its systems;
2. executing normal, abnormal, and emergency procedures TASKS appropriate to the aircraft;
3. executing procedures expeditiously and accurately;
4. demonstrating crew resource management;
5. applying systems knowledge; and
6. showing mastery of the aircraft systems and procedures, within the standards outlined in this practical test standard, with the successful outcome of a TASK never in doubt.

Unsatisfactory Performance

Consistently exceeding tolerances or limitations stated in the TASK, Objective, or aircraft operating manual(s), or failure to take prompt corrective action when tolerances or limitations are exceeded, are indicative of unsatisfactory performance. Any action, or lack thereof, by the applicant that requires corrective intervention by the examiner or another crewmember to maintain safe flight, shall be disqualifying.

NOTE: It is vitally important that the applicant, other crewmembers, and the examiner use proper and effective scanning techniques to observe other traffic in the area throughout the flight regime.

If, in the judgment of the examiner, the applicant's performance of any TASK is unsatisfactory, the associated AREA OF OPERATION is failed; therefore, the practical test is failed. Examiners shall not repeat TASKS that have been attempted and failed. The examiner or the applicant may discontinue the test at any time after the failure of a

TASK makes the applicant ineligible for the certificate or rating sought. The practical test will be continued only with the consent of the applicant. In such cases, it is usually better for the examiner to continue with the practical test to complete the other TASKS. If the examiner determines that the entire practical test must be repeated, the practical test should not be continued, but should be terminated immediately. If the practical test is either continued or discontinued, the applicant is entitled to credit for AREAS OF OPERATION satisfactorily completed; however, during a retest, and at the discretion of the examiner, any TASK may be reevaluated including those previously passed. Whether the remaining parts of the practical test are continued or not after a failure, a notice of disapproval must be issued.

When the examiner determines that a TASK is incomplete, or the outcome uncertain, the examiner may require the applicant to repeat that TASK, or portions of that TASK. This provision has been made in the interest of fairness and does not mean that instruction or practice is permitted during the certification process. When practical, the remaining TASKS of the practical test phase should be completed before repeating the questionable TASK. If the second attempt to perform a questionable TASK is not clearly satisfactory, the examiner shall consider it unsatisfactory.

If the practical test must be terminated for unsatisfactory performance and there are other TASKS that have not been tested or still need to be repeated, a notice of disapproval shall be issued listing the AREAS OF OPERATION that have not been successfully completed.

When a practical test is discontinued for reasons other than unsatisfactory performance (i.e., equipment failure, weather, air sickness), FAA Form 8400-3, Application for an Airman Certificate and/or Rating, and if applicable, the applicant's knowledge test report, should be returned to the applicant. The examiner at that time should prepare, sign, and issue a Letter of Discontinuance to the applicant. The Letter of Discontinuance should identify the portions of the practical test that were successfully completed.

Recording Unsatisfactory Performance

This practical test standard uses the terms AREA OF OPERATION and TASK to denote areas in which competency must be demonstrated. When a disapproval notice is issued, the examiner must record the applicant's unsatisfactory performance in terms of AREA OF OPERATION and TASK appropriate to the practical test conducted. In addition, the examiner should document the date of satisfactory completion of the oral evaluation. Recording the date of successful oral completion on the disapproval notice is essential for determining when the oral must be reaccomplished.

Crew Resource Management (CRM)

CRM refers to the effective use of all available resources; human resources, hardware, and information. Human resources include all groups routinely working with the cockpit crew who are involved in decisions that are required to operate a flight safely. These groups include, but are not limited to: aircraft dispatchers, cabin crewmembers, maintenance personnel, and air traffic controllers. CRM is not a single TASK. CRM is a set of competencies relating to communication and crew coordination which must be evident in all TASKS. CRM competencies may be grouped into three clusters of observable behavior, as follows.

1. COMMUNICATION PROCESSES AND DECISIONS
 - a. Briefing
 - b. Inquiry/Advocacy/Assertiveness
 - c. Self-Critique
 - d. Communication with Available Personnel Resources
 - e. Decision Making

2. BUILDING AND MAINTENANCE OF A FLIGHT TEAM
 - a. Leadership/Followership
 - b. Interpersonal Relationships

3. WORKLOAD MANAGEMENT AND SITUATIONAL AWARENESS
 - a. Preparation/Planning
 - b. Vigilance
 - c. Workload Distribution
 - d. Distraction Avoidance
 - e. Wake Turbulence Avoidance

How the Examiner Applies CRM

Examiners must exhibit good CRM in conducting tests while requiring the same from applicants undergoing those tests.

The majority of aviation accidents and incidents are due, at least in part, to CRM-related human failures. Valid and reliable criteria have not yet been developed for objective evaluation of CRM competencies; therefore, evaluations of performance in respect to CRM are often largely subjective. Pass/Fail judgments based on CRM-related performance issues must be made carefully.

Some Pass/Fail judgments relating to CRM are entirely objective and simple to make. Judgments about required communications procedures, such as required briefings and required call-outs are good examples. In such cases, the operator or the aircraft manufacturer specifies what should be briefed and when the briefings should occur. The examiner simply makes an objective judgment as to whether the required communications procedure was or was not performed correctly.

Deficiencies in CRM competencies almost always contribute to unsatisfactory TASK performance; therefore, these competencies provide an extremely valuable framework for debriefing. For debriefing purposes, an amplified list of these competencies, expressed as behavioral markers, may be found in AC 120-51, Crew Resource Management Training, as amended.

Applicant's Use of Checklists

Throughout the practical test, the applicant is evaluated on the use of each appropriate checklist. Proper use is dependent on the specific TASK being evaluated. The situation may be that the use of the checklist, while accomplishing elements of an Objective, would be either unsafe or impractical. In this case, a review of the checklist after the elements have been accomplished would be considered appropriate.

**EXAMINER'S PRACTICAL TEST CHECKLIST
FLIGHT ENGINEER**

APPLICANT'S NAME _____

LOCATION _____

DATE/TIME _____

I. PREFLIGHT PREPARATION

- A.** Equipment Examination—Systems Knowledge
- B.** Aircraft Handbooks, Manuals, Minimum Equipment List (MEL), Configuration Deviation List (CDL), and Operations Specifications
- C.** Performance and Limitations

II. PREFLIGHT PROCEDURES

- A.** Preflight Inspection and Cockpit Setup
- B.** Preflight Inspection—Exterior

III. GROUND OPERATIONS

- A.** Powerplant Start
- B.** Taxi and Pretakeoff Checks

IV. NORMAL PROCEDURES

- A.** Takeoff
- B.** Inflight
- C.** Approach and Landing
- D.** Engine and Systems Monitoring

V. ABNORMAL AND EMERGENCY PROCEDURES

- A.** Takeoff
- B.** Inflight
- C.** Approach and Landing
- D.** Engine and Systems Monitoring

VI. POSTFLIGHT PROCEDURES

- A.** After Landing
- B.** Parking and Securing

SECTION 1 — PREFLIGHT PREPARATION

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I. AREA OF OPERATION: PREFLIGHT PREPARATION

A. TASK: EQUIPMENT EXAMINATION—SYSTEMS KNOWLEDGE

REFERENCES: 14 CFR part 63; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant exhibits adequate knowledge appropriate to the aircraft; its systems and components; its normal, abnormal, and emergency procedures; and uses the correct terminology with regard to the following items:

1. Flight controls—ailerons, elevator(s), rudder(s), control tabs, stabilizer, flaps, spoilers, leading edge flaps/slats, and trim systems.
2. Landing gear—indicators, brakes, antiskid, tires, nose-wheel steering, and shock absorbers.
3. Powerplant—controls and indicators, induction system, carburetor and fuel injection, turbocharging, cooling, fire detection and protection, mounting points, thrust reversers, turbine wheels, compressors, deicing, anti-icing, and other related components.
4. Propellers—type, controls, feathering/unfeathering, autofeather, negative torque sensing, synchronizing, and synchrophasing.
5. Fuel system—capacity, drains, pumps, controls, indicators, crossfeeding, transferring, jettison, fuel grade, color and additives, fueling and defueling procedures, and substitutions, if applicable.
6. Oil system—capacity, grade, quantities, and indicators.
7. Hydraulic system—capacity, pumps, pressure, reservoirs, grade, and regulators.
8. Electrical system—alternators, generators, battery, circuit breakers and protection devices, controls, indicators, external and auxiliary power sources, and priority of electrical power distribution and ratings.
9. Environmental systems—heating, cooling, ventilation, oxygen and pressurization, controls, indicators, and regulating devices.
10. Pneumatic systems.
11. Avionics and communications—autopilot, flight director, Electronic Flight Indicating Systems (EFIS), Flight Management System(s) (FMS), Long Range Navigation (LORAN) systems, Doppler Radar, Inertial Navigation Systems (INS), Global Positioning System (GPS/DGPS/WGPS), VOR, NDB, ILS/MLS, RNAV systems and components, indicating devices, transponder, and emergency locator transmitter.

12. Crewmember and passenger equipment—oxygen system(s), survival and emergency equipment and exits, smoke and fire fighting equipment, evacuation procedures and crew duties, and quick donning oxygen mask for crewmembers and passengers.

B. TASK: AIRCRAFT HANDBOOKS, MANUALS, MINIMUM EQUIPMENT LIST (MEL), CONFIGURATION DEVIATION LIST (CDL), AND OPERATIONS SPECIFICATIONS

REFERENCES: 14 CFR parts 63, 91, 121; Aircraft Operating Manual, AFM, Master and Company MEL, CDL, Manufacturer's MEL Procedures, Manual/Dispatch Deviation Guide.

Objective. To determine that the applicant exhibits adequate knowledge of the contents of the Aircraft Operating Manual or AFM with regard to the systems and components listed in TASK A (above), the MEL and CDL, the MEL Procedures Manual or Dispatch Deviation Guide, if appropriate, and the Operations Specifications, if applicable.

C. TASK: PERFORMANCE AND LIMITATIONS

REFERENCES: 14 CFR parts 1, 63, 91, 121; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of performance and limitations, including a thorough knowledge of the adverse effects of exceeding any limitation.
2. Demonstrates proficient use of (as appropriate to the aircraft) performance charts, tables, graphs, or other data relating to items such as—
 - a. accelerate-stop distance.
 - b. accelerate-go distance.
 - c. takeoff performance and calculations, all engines and engine(s) inoperative.
 - d. climb performance, including segmented climb performance, with all engines operating, with one or more engine(s) inoperative, and with other engine malfunctions as may be appropriate.
 - e. service ceiling, all engines, engine(s) inoperative, including drift down, if appropriate.
 - f. cruise performance.

- g. fuel planning, loading, consumption, range, and endurance.
 - h. descent performance.
 - i. go-around performance.
 - j. other performance data (appropriate to the aircraft).
- 3. Describes (as appropriate to the aircraft) the airspeeds used during specific phases of flight.
- 4. Describes the effects of meteorological conditions upon performance characteristics and correctly applies these factors to a specific chart, table, graph, or other performance data. Demonstrates the ability to read METAR weather data and interpret ATIS.
- 5. Computes the weight and balance and center-of-gravity location for a specific load condition (as specified by the examiner), including adding, removing, or shifting weight.
- 6. Determines if the computed center of gravity is within the forward and aft center-of-gravity limits, and that lateral fuel balance is within limits for takeoff, cruise, and landing.
- 7. Demonstrates good planning and knowledge of procedures in applying operational factors affecting aircraft performance, such as high altitude airports, cluttered/contaminated runways, ground and inflight icing precautions, and MEL/CDL corrections.

SECTION 2

PREFLIGHT, GROUND, FLIGHT, AND POSTFLIGHT PROCEDURES

SECTION 2 — PREFLIGHT, GROUND, FLIGHT, AND POSTFLIGHT PROCEDURES

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II. AREA OF OPERATION: PREFLIGHT PROCEDURES

A. TASK: PREFLIGHT INSPECTION AND COCKPIT SETUP

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

NOTE: When the cockpit preflight is accomplished in a flight training device (FTD) or flight simulator, the examiner should include typical failures and inoperative items.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the preflight inspection procedures, while explaining briefly—
 - a. the purpose of inspecting the items which must be checked;
 - b. how to detect possible defects; and
 - c. the corrective action to take.
2. Exhibits adequate knowledge of the operational status of the aircraft by locating and explaining the significance and importance of related documents such as—
 - a. airworthiness and registration certificates and radio station license;
 - b. operating limitations, handbooks, and manuals;
 - c. minimum equipment list (MEL) and configuration deviation list (CDL), if appropriate;
 - d. weight and balance data, aircraft performance data, and airport analysis information, as appropriate; and
 - e. maintenance requirements, tests, and appropriate records applicable to the proposed flight or operation, and maintenance that may be performed by the pilot or other designated crewmember.
3. Uses the approved checklist to inspect the aircraft internally, including the passenger cabin, and configures the aircraft in preparation for flight.
4. Uses the challenge-and-response (or other approved) method with the other crewmembers, where applicable, to accomplish the checklist procedures.
5. Verifies the aircraft is safe for flight by emphasizing (as appropriate) the need to look at and explain the purpose of inspecting items such as—
 - a. powerplant—including controls and indicators;
 - b. fuel quantity—grade, type, contamination safeguards, and normal and alternate servicing procedures;

- c. oil quantity—grade and type;
 - d. hydraulic fluid quantity—grade, type, and servicing procedures;
 - e. oxygen quantity—pressures, servicing procedures, and associated systems and equipment for crew and passengers;
 - f. landing gear—brakes and steering system;
 - g. tires—condition, inflation, and correct mounting, where applicable;
 - h. fire protection/detection systems—proper operation, servicing, pressures, and discharge indications;
 - i. pneumatic system—pressures and servicing;
 - j. ground environmental systems—proper servicing and operation;
 - k. auxiliary power unit (APU)—servicing and operation;
 - l. flight control systems—trim, spoilers, and leading/trailing edge devices; and
 - m. anti-ice, deice systems—servicing and operation.
- 6. Coordinates with ground crew and ensures adequate clearance prior to powering any system which results in device movement such as door hatches and flight control surfaces.
 - 7. Complies with the provisions of the appropriate Operations Specifications, if applicable, as they pertain to the particular aircraft and operation.
 - 8. Demonstrates proper operation of all applicable aircraft systems.
 - 9. Notes any discrepancies, determines if the aircraft is airworthy and safe for flight, or takes the proper corrective action.

B. TASK: PREFLIGHT INSPECTION—EXTERIOR

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the preflight inspection procedures, while explaining briefly—
 - a. the purpose of inspecting the items that must be checked;
 - b. how to detect possible defects; and
 - c. the corrective action to take.
2. Exhibits adequate knowledge of the operational status of the aircraft by locating and explaining the significance and importance of exterior aircraft components.
3. Checks the general area around the aircraft for hazards to the safety of the aircraft and personnel.

NOTE: For initial certification, the exterior and interior preflight must be observed by the examiner or inspector on an actual, airworthy aircraft of the type used during training.

III. AREA OF OPERATION: GROUND OPERATIONS

A. TASK: POWERPLANT START

REFERENCES: 14 CFR part 63; Aircraft Operating Manual, AFM.

Objective To determine that the applicant:

1. Exhibits adequate knowledge of the correct powerplant start procedures, including the use of an auxiliary power unit (APU) or external power source, starting under various atmospheric conditions, normal and abnormal starting limitations, and the proper action required in the event of a malfunction.
2. Exhibits adequate knowledge of normal starts, battery starts, bottle starts, cross-bleed starts, start valve failures, ignition failure, hot/hung starts, fire during start, and APU failure during start.
3. Ensures the ground safety procedures are followed during the before-start, start, and after-start phases.
4. Ensures the use of appropriate ground crew personnel during the start procedures.
5. Performs all items of the start procedures by systematically following the approved checklist items for the before-start, start, and after-start phases.
6. Demonstrates sound judgment and operating practices in those instances where specific instructions or checklist items are not published.

B. TASK: TAXI AND PRETAKEOFF CHECKS

REFERENCES: 14 CFR part 63; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the correct taxi and pretakeoff procedures (as appropriate to the aircraft), including pushback or powerback, as applicable, by stating the reason for checking the items outlined on the approved checklist, and explaining how to detect possible malfunctions.
2. Accomplishes the applicable checklist items and performs the recommended procedures.
3. Ensures that all systems are within their normal operating range prior to beginning, during the performance of, and at the completion of those checks required by the approved checklist.
4. Explains, as may be requested by the examiner, any normal or abnormal system operating characteristic or limitation, and the corrective action for a specific malfunction.
5. Determines if the aircraft is safe for the proposed flight or requires maintenance.
6. Determines the aircraft's takeoff performance, considering such factors as wind, density altitude, weight, temperature, pressure altitude, and runway condition and length.
7. Determines airspeeds/V-speeds and properly sets all applicable instrument and systems references.
8. Upon request, reviews procedures for emergency and abnormal situations which may be encountered during takeoff, and states the corrective action required of the other concerned crewmembers.
9. Monitors and correctly interprets the takeoff and departure clearance as issued by ATC and other radio communications.

IV. AREA OF OPERATION: NORMAL PROCEDURES

A. TASK: TAKEOFF

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of normal takeoff and climbs, including (as appropriate to the aircraft), airspeeds, configurations, meteorological considerations, and normal procedures.
2. Takes into account, prior to beginning the takeoff, operational factors that could affect the maneuver such as Takeoff Warning Inhibit Systems or other aircraft characteristics; runway length, surface condition, obstructions, and other hazards; wind, wake turbulence, and other related factors that could adversely affect safety.
3. Verifies and correctly computes takeoff performance requirements and applies correction for the existing wind component to the aircraft speeds.
4. Adjusts the powerplant controls as recommended by the FAA-approved guidance for the existing conditions.
5. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.

B. TASK: INFLIGHT

REFERENCES: 14 CFR parts 63, 91; AC 61-27; Aircraft Operating Manual, AFM.

Objective To determine that the applicant:

1. Exhibits adequate knowledge of instrument procedures, including SID's, Low and High Altitude Charts, STAR's and related pilot/crew/controller responsibilities.

NOTE: Although not explicitly required by part 63, knowledge of this Objective is necessary by flightcrew positions, including flight engineers.

2. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.
3. Exhibits adequate knowledge of high altitude performance and specific flight characteristics appropriate to the specific aircraft. FSB reports should be used when applicable.
4. Possesses adequate knowledge of the aircraft systems, subsystems, and devices relative to the aircraft type (as determined by the examiner).
5. Demonstrates the proper use of the aircraft systems, subsystems, and devices (as determined by the examiner) appropriate to the aircraft such as—
 - a. powerplant.
 - b. fuel system.
 - c. electrical system.
 - d. hydraulic system.
 - e. environmental and pressurization systems.
 - f. fire detection and extinguishing systems.
 - g. navigation and avionics systems.
 - h. automatic flight control system, electronic flight instrument system, and related subsystems.
 - i. flight control systems.
 - j. anti-ice and deice systems.
 - k. aircraft and personal emergency equipment.
 - l. other systems, subsystems, and devices specific to the type aircraft, including make, model, and series.
 - m. pneumatic system(s).

C. TASK: APPROACH AND LANDING

REFERENCES: 14 CFR parts 63, 91; AC 61-27; Aircraft Operating Manual, AFM.

Objective To determine that the applicant:

1. Exhibits adequate knowledge of descents, precision and nonprecision instrument approaches, visual approaches, missed approach, and other procedures; and aircraft performance requirements, including (as appropriate to the specific aircraft), airspeeds, configurations, meteorological considerations, and normal procedures.

NOTE: Although not explicitly required by part 63, knowledge of this Objective is necessary by flightcrew positions, including flight engineers.

2. Takes into account, prior to beginning the descent, approach and/or landing, operational factors that could affect the maneuver such as inoperative aircraft systems or other aircraft characteristics; runway length, surface condition, obstructions, and other hazards; and wind, wake turbulence, and other related factors that could adversely affect safety.
3. Verifies and correctly computes approach and landing performance requirements, and applies correction for the existing wind component and aircraft configuration to the aircraft speeds.
4. Adjusts the powerplant controls and aircraft systems as recommended by the FAA-approved guidance for the existing conditions.
5. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.

D. TASK: ENGINE AND SYSTEMS MONITORING

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the aircraft systems, including normal procedures and checklists.
2. Adjusts the powerplant controls and aircraft systems, as recommended by the FAA-approved guidance, for the existing conditions.
3. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.

V. AREA OF OPERATION: ABNORMAL AND EMERGENCY PROCEDURES

NOTE: Abnormal or emergency procedures should be tested for engines and each major system such as hydraulic, pneumatic, and electrical.

A. TASK: TAKEOFF

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the technique and procedure for accomplishing a rejected takeoff after powerplant/system(s) failure/warnings, and related safety factors.
2. Exhibits adequate knowledge of the procedures used during powerplant failure on takeoff, the appropriate reference airspeeds, aircraft performance requirements, and the specific crew actions required.
3. Exhibits adequate knowledge of abnormal and emergency procedures, including, as appropriate, airspeeds, configurations, and meteorological considerations.
4. Adjusts the powerplant controls as recommended by the FAA-approved guidance for the existing conditions.
5. Accomplishes immediate action items; calls for and verifies the accomplishment of the appropriate checklist.

B. TASK: INFLIGHT

REFERENCES: 14 CFR parts 63, 91; AC 61-27; Aircraft Operating Manual, AFM.

Objective To determine that the applicant:

1. Exhibits adequate knowledge of the emergency procedures relating to the particular aircraft type (as may be determined by the examiner).
2. Exhibits adequate knowledge of two-way radio communication failure procedures.
3. Identifies malfunctions and applies the proper procedure relating to abnormal operation of aircraft systems, subsystems, and devices relative to the aircraft type (as determined by the examiner) such as—
 - a. powerplant.
 - b. fuel system.
 - c. electrical system.
 - d. hydraulic system.
 - e. environmental and pressurization systems.
 - f. fire detection and extinguishing systems.
 - g. navigation and avionics systems.
 - h. automatic flight control system, electronic flight instrument system, and related subsystems.
 - i. flight control systems.
 - j. anti-ice and deice systems.
 - k. aircraft and personal emergency equipment.
 - l. other systems, subsystems, and devices specific to the type aircraft, including make, model, and series.
 - m. pneumatic system(s).
4. Demonstrates the proper emergency procedures relating to the particular aircraft type, including —
 - a. emergency descent.
 - b. inflight fire and smoke removal.
 - c. rapid decompression.
 - d. emergency evacuation.
 - e. engine fire.
 - f. others (as required by the AFM).
5. Adjusts the powerplant controls, as recommended by the FAA-approved guidance, for the existing conditions.
6. Accomplishes immediate action items; calls for and verifies the accomplishment of the appropriate checklist.

C. TASK: APPROACH AND LANDING

REFERENCES: 14 CFR parts 63, 91; AC 61-27; Aircraft Operating Manual, AFM.

Objective To determine that the applicant:

1. Exhibits adequate knowledge of the emergency procedures relating to the particular aircraft type (as determined by the examiner).
2. Correctly computes approach and landing performance requirements taking into account operational factors that may affect the maneuver such as malfunctioning aircraft systems, abnormal or emergency situations, or other related factors that could adversely affect safety.
3. Adjusts the powerplant controls and aircraft systems as recommended by the FAA-approved guidance for the existing conditions.
4. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.

D. TASK: ENGINE AND SYSTEMS MONITORING

REFERENCES: 14 CFR parts 63, 91; Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the aircraft systems, including malfunctions, abnormal and emergency procedures, and checklists.
2. Identifies and applies the appropriate procedure relating to subtle system failures such as slow leaks in the lubricating or hydraulics system(s), minor electrical overloads, inadequate pressurization, fuel imbalance/transfer/jettison, and abnormal procedures specified by the AFM.
3. Adjusts the powerplant controls and aircraft systems as recommended by the FAA-approved guidance for the existing conditions.
4. Accomplishes or calls for and verifies the accomplishment of the appropriate checklist items to ensure that the aircraft systems are operating properly.

VI. AREA OF OPERATION: POSTFLIGHT PROCEDURES

A. TASK: AFTER LANDING

REFERENCES: Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of safe after-landing/taxi procedures, as appropriate.
2. Accomplishes the applicable checklist items and performs the recommended procedures.

B. TASK: PARKING AND SECURING

REFERENCES: Aircraft Operating Manual, AFM.

Objective. To determine that the applicant:

1. Exhibits adequate knowledge of the parking and the securing aircraft procedures.
2. Accomplishes the applicable checklist items and performs the recommended procedures.
3. Has adequate knowledge of the aircraft forms/logs to record the flight time and discrepancies.

APPENDIX 1

TASK VS. SIMULATION DEVICE CREDIT

APPENDIX 1 — TASK VS. SIMULATION DEVICE CREDIT

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TASK VS. SIMULATION DEVICE CREDIT

Examiners conducting flight engineer practical tests with simulation devices should consult appropriate documentation to ensure that the device has been approved for training and checking the TASKS in question. The documentation for each device should reflect that the following activities have occurred:

1. The device must be evaluated, determined to meet the appropriate standards, and assigned the appropriate qualification level by the National Simulator Program Manager. The device must continue to meet the qualification standards through continuing evaluations as outlined in the appropriate advisory circular (AC). For aircraft flight training devices (FD's), AC 120-45 (as amended), Airplane Flight Training Device Qualification, will be used. For simulators, AC 120-40 (as amended), Airplane Simulator Qualification, will be used.
2. The FAA must approve the device for specific TASKS.
3. The device must continue to support the level of student or applicant performance required by this practical test standard.

NOTE: Users of the following chart are cautioned that use of the chart alone is incomplete.

USE OF CHART

X Creditable

A Creditable if appropriate systems are installed and operating.

Table 1 - Task Authorization

Areas of Operation: Section Two	FLIGHT SIMULATION DEVICE LEVEL									
	4	5	6	7	A	B	C	D	ACFT	
II. Preflight Procedures										
A. Preflight Inspection (Cockpit Only)										NOT AUTHORIZED X
B. Preflight Inspection (Exterior)										NOT AUTHORIZED X
III. Ground Operations										
A. Powerplant Start										NOT AUTHORIZED X
B. Taxi and Pretakeoff Checks										NOT AUTHORIZED X
IV. Normal										
A. Takeoff										NOT AUTHORIZED X
B. Inflight										NOT AUTHORIZED X
C. Approach and Landing										NOT AUTHORIZED X
D. Engine and Systems Monitoring										NOT AUTHORIZED X
V. Abnormal and Emergency Procedures										
A. Takeoff		A	X	X	X	X	X	X	X	X
B. Inflight		A	X	X	X	X	X	X	X	X
C. Approach and Landing		A	X	X	X	X	X	X	X	X
D. Engine and Systems Monitoring		A	X	X	X	X	X	X	X	X
VI. Postflight Procedures										
A. After Landing										NOT AUTHORIZED X
B. Securing										NOT AUTHORIZED X