CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

8400.10 CHG 5

6/30/91

SUBJ: AIR TRANSPORTATION OPERATIONS INSPECTOR'S HANDBOOK

1. PURPOSE. This change transmits the following:

a. Volume 1. General Concepts, Direction, Guidance, and Definitions
   Chapter 1. Handbook Organization, Use, and Revision
      Sections 1, 2, 3, and 5

b. Volume 3. Air Operator Technical Administration
   Chapter 2. Training Programs and Airman Qualifications
      Sections 8, 9, 10, and 11

   Chapter 15. Manuals, Procedures, and Checklists
      Sections 1, 2, 3, 4, and 5

c. Volume 4. Aircraft Equipment and Authorizational Operations
   Chapter 2. All-Weather Terminal Operations
      Sections 5 and 6

   Chapter 3. Airplane Performance and Airport Data
      Sections 1, 2, 3, and 4

d. Volume 5. Airman Certification and Designated Examiners
   Chapter 4. Aircraft Dispatcher Certificates
      Section 1

e. Appendix 3. Handbook Bulletins
   Bulletins 91-1 through 91-10

2. EXPLANATION OF CHANGES. The direction and guidance published in this change supersede RELATED information in FAA Orders 8430.1D and 8430.6C. Major portions of both 8430.1D and 8430.6C remain in effect.

a. Handbook Bulletin 91-1 contains guidance concerning the use of HALON extinguishing agents during firefighting drills.

b. Handbook Bulletin 91-2 contains guidance concerning the implementation of the category D repair interval for MMEL's.

c. Handbook Bulletin 91-3 contains guidance on the conversion period for operator training programs to incorporate new material from Change 1 of FAA Order 8400.10.

d. Handbook Bulletin 91-4 contains guidance on the training and qualification of aviation safety inspectors in air transport operations.

e. Handbook Bulletin 91-5 is a revised table of contents for Order 8430.1D showing which sections of that order remain in effect.

f. Handbook Bulletin 91-6 is a revised table of contents for Order 8430.6C showing which sections of that order remain in effect.

g. Handbook Bulletin 91-7 contains guidance on Part 135 emergency medical services (EMS).

h. Handbook Bulletin 91-8 contains guidance for POI's when reviewing flight attendant emergency evacuation instructions and passenger safety briefing cards.

i. Handbook Bulletin 91-9 contains guidance on the endorsement of flight engineer applicants retesting within 30 days of failure.

j. Handbook Bulletin 91-10 contains guidance on the implementation of TCAS's.

k. This change reissues pages 6-16, 6-138, and 6-168, that were inadvertently left out in Change 4.

l. Pages 4-191 and 4-192 replace the previous pages 4-191 and 4-192 (from Change 3). The only change to these pages are a revision of the number of pages and paragraphs reserved for future use in volume 4, chapter 2, section 4.

3. DISPOSITION OF TRANSMITTAL. This transmittal is to be retained and filed in the back of this handbook until it is superseded by a new basic order.

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VOLUME 1. GENERAL CONCEPTS, DIRECTION, GUIDANCE, AND DEFINITIONS

CHAPTER 1. HANDBOOK ORGANIZATION, USE, AND REVISION

SECTION 1. GENERAL HANDBOOK INFORMATION

1. **PURPOSE.** This order is referred to as a handbook and directs the activities of operations aviation safety inspectors (ASI's) who are responsible for the certification, technical administration, and surveillance of air carriers and certain other air operators who conduct their operations in accordance with Parts 121 and 135 of the Federal Aviation Regulations (FAR's). It also contains regional and district office requirements for the support of ASI's responsible for those activities.

3. **DISTRIBUTION.** This order is distributed to all addressees on special distribution list ZFS 840.

5. **CANCELLATION.** Orders 8430.6C, 8430.1D, and 8430.17 are not cancelled at this time. Direction and guidance in those orders should continue to be used until incorporated in this handbook. After incorporation, those orders will be cancelled.

7. **BACKGROUND.** This handbook has been designed to serve as a multipurpose document that will meet the needs of new inspectors entering the Federal Aviation Administration's (FAA's) Flight Standards workforce, as well as those with many years of experience. Historical information regarding FAA's evolvement, and the latest material available covering current, state-of-the-art aircraft and equipment has been included. A wide variety of information, currently found in many separate documents, has been compiled to make this handbook as comprehensive as possible. When completed, the handbook will consist of nine volumes encompassing subjects from general concepts, direction, guidance, and procedures to very detailed explanations of such programs as automated operations specifications, air navigation, all-weather terminal operations, and training programs.

9. **STANDARDIZATION AND COORDINATION.** A major objective of Flight Standards Service is to standardize the functions of the aviation safety inspector position. For this reason, any change to this handbook must be preceded by formal coordination between all flight standards divisions. The Technical Standards Branch (AFS-550) of the Field Programs Division is responsible for circulating draft material and for coordinating the reconciliation process.

A. *Regional Handbook Coordinators.* Each regional flight standards division manager shall designate a regional specialist to serve as the regional handbook coordinator. The regional handbook coordinator shall serve as an advisor to the regional division manager on the content of the handbook and represent the division manager in discussions with AFS-550 and the other regional handbook coordinators on the content of each proposed change. The regional handbook coordinator shall also act as an expert on the content of the handbook for the flight standards district offices (FSDO's).

B. *Direction and Guidance.* The direction and guidance in this handbook has been written using a "middle of the road" approach. A deliberate effort has been made to provide sufficient direction and guidance to standardize the job functions of the aviation safety inspector position without unnecessarily restricting the initiative of individual inspectors and managers. Should inspectors, supervisors, and managers find the direction and guidance of the handbook too restrictive or inappropriate for a specific case, a request should be made for permission to deviate from the guidance of the handbook. Such requests should be forwarded through the applicable flight standards division to AFS-500. When AFS-500 agrees to a deviation, the guidance in the handbook will be reviewed for possible revision.

C. *Authority to Change This Document.* The Director, Flight Standards Service (AFS-1), must approve all changes to this order and its appendices. Any proposed change must be approved by the Director, Flight Standards Service. All proposed changes to this manual should be addressed to AFS-550 (formerly AFS-230).

D. *Conflicts With Other FAA Orders.* The guidance in

this handbook may be found to be in conflict with that in other FAA orders and directives. This situation may arise inadvertently or because it is impractical to revise all orders simultaneously. In such a case, the order with the most recent date should normally be used. Should the guidance in this order conflict with an FAR, the FAR takes precedence. Inspectors should refer questions about such conflicts to their immediate supervisors. Supervisors and managers may contact AFS-550 through the regional flight standards division handbook coordinator to resolve such questions.

E. *Distribution.* This handbook is available to both FAA personnel and to individuals outside the FAA.

(1) The handbook is distributed to FAA personnel through normal FAA publication distribution procedures. Any problems with distribution should be addressed to the regional distribution officer.

(2) Individuals outside the FAA may order a copy of the handbook from:

FAA Headquarters, APA-200
800 Independence Ave., S.W.
Washington, D.C. 20591
Telephone: (202) 267-3484

(3) A charge of $22.98 is made to outside individuals. This amount may change without notice.

11. APPENDICES. The Operations Bulletins in Order 8430.17 will be incorporated as Appendix 1. As this material is reviewed during the development of the handbook it will either be updated and included in the appropriate chapters, or canceled if no longer pertinent. When this process is complete, Order 8430.17 will be canceled. Appendix 2 is in the development phase and will be designed as a comprehensive cross-reference index that will identify major subjects to help locate specific information in the handbook. Appendix 3 is comprised of handbook bulletins (see section 2, paragraph 25 and section 3, paragraph 33C for more information on handbook bulletins).

13. REVISIONS. During the development of this handbook, individual chapters and sections will be published as they are completed and will become effective upon receipt. Where they have not been completed they will be identified for future development and annotated by the letters "TBD" (to be developed). After the entire document has been published, it will be kept current by revisions as changing situations warrant or new policy is established.

15. HANDBOOK ORGANIZATION.

A. A primary objective of the personnel developing this handbook is to make it as comprehensive as possible, and easy to use. It is numbered sequentially by volumes, with each volume containing chapters and sections. Paragraphs in each volume are consecutive odd numbers. Even numbers have been reserved for expansion. Pages are numbered within each volume and are so identified (for example, page 25 of volume 3 is shown as 3-25).

B. Where material is only referenced by paragraph number, it can be assumed that the referenced paragraph is within the same volume. If reference is made to material in another volume, it will be identified by volume number, chapter and section, or paragraph number.

C. Figures and tables have been kept as close to the pertinent text as possible. Where they are lengthy, they have been placed at the back of the section so as not to create large breaks in the textual material. Figures and tables will be identified numerically by volume, chapter, section, and the figure or table number. For example, the first table in volume 1, chapter 2, section 3 will be identified as table 1.2.3.1 and the second table will be table 1.2.3.2.

17. DIRECTIVE AND GUIDANCE INFORMATION.

A. Directive information is information that is considered directive in nature and will contain terms such as "shall," "must," and means the actions are mandatory. "Shall not" means the action is prohibited. The use of these terms will leave no flexibility and their direction shall be followed unless otherwise authorized by headquarters.

B. Guidance information is information considered guiding in nature and will contain terms such as "will," "should," or "may." These terms indicate actions that are desirable, permissive, or not mandatory, and provide for flexibility.

18. - 22. RESERVED.

[PAGES 1-3 THROUGH 1-8 RESERVED]

SECTION 2. PROVISIONS FOR REVISION AND HANDBOOK BULLETINS

23. HANDBOOK REVISIONS. Individuals at all levels of the FAA and individuals in the aviation industry are encouraged to make suggestions for revisions to the handbook.

A. *Handbook Revision Process.* The process for revising the handbook, from the first recognition of a need for a revision to its final incorporation into the handbook, consists of the following three phases:

(1) *Phase I: Identification.* The need for a revision may become evident when a change occurs in the aviation industry, national and international regulatory bodies, or in the FAR's or FAA policies. After the need for a revision has been identified by any party, that individual should direct the suggestion for revision to AFS-550, Technical Standards Branch, by one of the methods described in subparagraph B.

(2) *Phase II: Development and Approval.* After receiving a suggestion for revision, AFS-550 will evaluate the revision and establish priorities for development of the revision. After the suggested revision has been fully researched and developed, AFS-550 will coordinate the draft material with other flight standards divisions and interested parties, and obtain the AFS-1 approval before incorporating the material into the handbook through a formal change.

(3) *Phase III: Distribution.* Published revisions of the handbook are distributed through the FAA distribution system. The revision package includes a revision control sheet containing instructions for the insertion and removal of revised material. Each revision control sheet should be filed in the back of the handbook. AFS managers at all levels are responsible for ensuring that inspectors and personnel assigned to their units receive each revision.

B. *Methods for Proposing Handbook Revisions.* There are four methods that an organization, inspector, manager, or other interested party may use to recommend a change to handbook material.

(1) *Formal Revision Proposal.* Any employee of Flight Standards may make a formal suggestion for a handbook revision through the regional flight standards division (RFSD) handbook coordinator. The regional handbook coordinator will review the suggestion and forward it to AFS-550. AFS-550 will review all formal suggestions and decide whether or not to develop the suggested revision.

(2) *Direct Input by Mail.* Anyone may make a direct written suggestion to AFS-550. While suggested revisions may be in any format, they should be clear and complete. A pre-addressed mailer is provided at the end of this section (see figure 1.1.2.1) which may be copied and used. It is an acceptable practice for an individual to copy an existing manual page, to highlight the area of concern, and to write the suggestion on the back of the copy. Suggestions should be sent to the following address:

Federal Aviation Administration
Technical Standards Branch, AFS-550
P.O. Box 20034, Gateway Bldg.
Dulles International Airport
Washington, D.C. 20041

(3) *FAA.MAIL.* Inspectors and managers may send suggested revisions to AFS-550 through electronic mail. The electronic mail address is: AFS-550 (formerly AFS-230).

(4) *Program Tracking and Reporting Subsystem (PTRS).* Suggestions for handbook revisions may be made through the PTRS system. The 950 series PTRS code from the key word listing is used for this purpose. An inspector who decides to suggest a revision using this method must select the appropriate primary area and key word listing. These codes should be entered in the comment column of section IV of FAA Form 8000-36, "PTRS Data Sheet." The inspector's opinion should then be indicated by one of the letter codes in the opinion codes column. Next to the inspector's opinion, in the wide column provided for comments, an inspector may write the suggested revision. AFS-550 will periodically retrieve the PTRS Code 1001 from the database and evaluate all suggestions.

C. *Review and Notification.* All suggestions submitted by any method will be reviewed and considered. The originator will be informed of the disposition of all formal suggestions through the regional handbook coordinator. It may not always be practical for AFS-550 to reply to the originator of informal suggestions.

25. HANDBOOK BULLETINS. A handbook bulletin is published when direction and guidance must be disseminated before a formal change to the handbook can be prepared. Handbook bulletins are distributed to all flight standards offices through FAA electronic mail and subsequent hard copies through the normal distribution system. Handbook bulletins are filed in Appendix 3 of the handbook until the bulletin material is either incorporated into the handbook or cancelled.

A. It is recommended that a notation be made next to each paragraph affected by a handbook bulletin.

B. An index to Appendix 3 is published with each change to the handbook. This index contains a list of current and rescinded bulletins. Rescinded bulletins should be removed and destroyed.

26. - 30. RESERVED.

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26. - 30. RESERVED.

SECTION 3. INSPECTOR USE OF HANDBOOK MATERIAL

31. HANDBOOK ORGANIZATION. The Air Transportation Operations Inspector's Handbook is organized by volume, chapter, section, paragraph and subparagraph. A "Handbook Table of Contents" for the entire handbook is located just after the foreword. This table of contents contains a list of the titles of the handbook's volumes, chapters, and sections. Each volume has a more detailed "Volume Table of Contents" which provides not only the titles of chapters and sections, but also the titles of the paragraphs in that volume. The locator used in all of the tables of contents is a full page number which consists of the volume number, a dash, and the page number of the volume. For example, 3-41 indicates volume 3, page 41.

```
3 - 41
|   |
|   |_____________ Page 41
|_______________ Volume 3
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A. *Pagination.* All chapters will begin on right hand pages. Each page in the handbook includes headers and footers containing a locator, paragraph identifier, date, and subject information, which are defined as follows.

(1) The locator consists of the volume number, a dash, and the page number. The locator helps the reader locate the correct volume and page sought. The locator is at the bottom left or right of the page, depending on whether it is an odd or even page. The locator is on the bottom right of the page on odd-numbered pages and on the bottom left on even-numbered pages.

(2) The paragraph identifier consists of the first paragraph number cited on that page. The paragraph identifier helps the reader locate the specific paragraph sought. Like the locator, the paragraph identifier is also located on the bottom left or right of the page, depending on whether it is an odd or even page. The paragraph identifier is on the bottom right of the page on even-numbered pages and on the bottom left on odd-numbered pages.

(3) The date that the page was published is on the top of each page. This date of issue is important because it provides the reader with the timeframe in which that particular portion of the handbook was sent out. The date is either on the left or right side of the top of the page, depending on whether it is an odd or even page. The date is on the top right of even-numbered pages and on the top left of odd-numbered pages.

(4) The subject information is at the top of each page and consists of the order number (8400.10) and the Change number (which is the publisher's number for that particular portion of the handbook material). The subject information is either on the left or right side of the top of the page, depending on whether it is an odd or even page. The subject information is on the top right of odd-numbered pages and on the top left of even-numbered pages.

ILLUSTRATION OF ODD- AND EVEN-NUMBERED HANDBOOK PAGES

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  ┌(paragraph)                              (Locator: page 15
  │                                          of volume 2)┘
 Par. 251                                        2-15
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ILLUSTRATION OF ODD- AND EVEN-NUMBERED HANDBOOK PAGES (Cont'd.)

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8400.10 CHG 3                                  2/14/90
(Subject Info.)                                (Date)

                (even-numbered page)

  (Locator: page 12                (paragraph)
   of volume 2)
2-12                                        Par. 35
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B. *Notes and FYI's.* The handbook also includes "notes" and "FYI's" (informational supplements). Notes are indented, bold paragraphs which appear periodically within the handbook text with the word "**NOTE**" preceding the information. These notes of text are intended to emphasize certain aspects or items of a particular subject or subject area. Notes contain necessary information which an inspector must know to successfully complete a job function. FYI's are indented, italicized paragraphs which appear periodically within the handbook text with the word "*FYI*" preceding the information. These informational supplements offer information which is not necessary to the inspector for purposes of the handbook, but which may significantly add to an inspector's knowledge or understanding of a subject.

C. *Tables and Figures.* Tables and figures are an important part of the handbook. Tables contain factual material, usually in columnar form, from which information can be extrapolated. Figures include many kinds of informational elements. In this handbook figures are used for job aids, sample letters, and charts. Most figures and tables are located within the body of the text and usually directly follow the related subject. When figures or tables are lengthy, as in the case of job aids, they are placed at the end of the appropriate section so as not to create large breaks in the textual material. Figures and tables are identified in sequential numerical order by volume, chapter, section, and the figure or table number. For example, the first table in volume 2, chapter 1, section 1 is identified as table 2.1.1.1 and the second table is table 2.1.1.2.

D. *Examples.* The examples used in this handbook are usually short, textual, or graphic illustrations of methods or procedures used by inspectors in the performance of job tasks. These examples are located within the text immediately following the subject. They are not titled or designated by a numbering system, however, they are separated from the text by bold, solid, horizontal lines. This method of separation is also used occasionally to differentiate between levels of involvement in a method or procedure (see the evacuation demonstration discussed in volume 3, chapter 10, section 2).

33. APPENDICES. There are three appendices to the handbook.

A. *Appendix 1.* Appendix 1 is reserved for the operations bulletins currently in Order 8430.1D and 8430.17. The operations bulletins in Orders 8430.1D and 8430.17 will remain in effect until they are incorporated into this handbook. Before these bulletins are incorporated into the handbook, they will be consolidated and updated.

B. *Appendix 2.* Appendix 2 is reserved for the handbook index. This index provides inspectors with direct location references for specific topics and with cross references for related topics. General subjects as well as related topics and subjects can also be located in the index. A locator in the index consists of two numbers: the volume number and the paragraph number separated by a period (for example, volume 1 paragraph 31 is shown as 1.31). Each locator is unique. Once the locator is identified in the index, the subject can be found by the user turning to the volume and leafing through the pages while looking at the footer on each page for the paragraph number. When one subject is discussed in the text for several paragraphs, the sequence of paragraph numbers is given (for example, aircraft noise 3.1861-1868). Subjects are shown as entries and subentries, and are all listed alphabetically. When there are less than four entries for a particular subject, the subject (main entry) is followed by the locators which the user can use to find that subject. For example:

Operations specifications 3.67, 3.79, 3.105

ILLUSTRATION OF ODD- AND EVEN-NUMBERED HANDBOOK PAGES (Cont'd.)

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8400.10 CHG 3                                  2/14/90
(Subject Info.)                                (Date)

                (even-numbered page)

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Operations specifications 3.67, 3.79, 3.105

SECTION 4. DEFINITIONS

[TO BE DEVELOPED]

37. - 38. RESERVED.

[PAGES 1-31 THROUGH 1-34 RESERVED]

SECTION 5. ACRONYMS AND ABBREVIATIONS

39. GENERAL. Several acronyms and abbreviations for both old as well as new aviation terminology, are used throughout this handbook. Inspectors can refer to the following alphabetical listing of frequently used acronyms and abbreviations and their meanings when using this handbook.

ACARS - Air-Ground Passive Communications Systems
ACO - Aircraft Certification Office
ADE - Air Carrier Designated Examiner
ADR - Advisory Route
AEG - Aircraft Evaluation Group
AES - Automated Exemption System
AFM - Airplane Flight Manual
AFS - Flight Standards Services
AFS-1 - Director of Flight Standards Services
AFTN - Aeronautical Fixed Telecommunications Network
AH - Alert Height for Category III Operations
AIA - Office of International Aviation
AIP - Aeronautical Information Publication
ALPA - Airline Pilots Association
AOPA - Aircraft Owners and Pilots Association
APM - Aircrew Program Manager
APU - Auxiliary Power Unit
AR - Airborne Radar
ARA - Airborne Radar Approach
ASAS - Aviation Safety Analysis System (Data Automation)
ASDE - Airport Surface Detection Equipment
ASI - Aviation Safety Inspector
ASR - Airport Surveillance Radar
ATA - Air Transportation Association of America
ATD - Advanced Training Device
ATP - Airline Transport Pilot
AVN - Aviation Standards National Field Office
AVR-1 - Associate Administrator for Regulation and Certification
AVS - Aviation Standards
AWTA - All Weather Terminal Area Operation
AXR-1 - Executive Director for Standards and Compliance
CAA - Civil Aeronautics Administration
CAB - Civil Aeronautics Board
CAM - Civil Aviation Manual
CAR - Civil Aviation Regulation
CASFO - Civil Aviation Security Field Office
CCO - Cockpit-Cutoff-Angle
CDL - Configuration Deviation List
CEPAC - Central East Pacific (Airspace)
CFI - Certified Flight Instructor
CFM - Company Flight Manual
CHDO - Certificate-Holding District Office
CPM - Certificate Project Manager
CRM - Cockpit Resource Management
CVFP - Charted Visual Flight Procedures
DBA - Doing Business As
DH - Decision Height (Precision Instrument Approach)
DNL - Decibel Noise Level
DME - Distance Measuring Equipment
DPA - Decision Point Altitude
DWFAF - Downwind Final Approach Position
EA - Environmental Assessment
EPR - Exhaust Pressure Ratio
ER-OPS - Extended-Range Operations
FA - Forecasts Area
FA Act - Federal Aviation Act of 1958
FAF - Final Approach Fix
FAR - Federal Aviation Regulation
FBO - Fixed Base Operation
FE - Flight Engineer
FIFO - Flight Inspection Field Office
FIR - Flight Information Region
FMS - Flight Management System
FMRB - Flight Manual Review Board
FOEB - Flight Operations Evaluation Board
FOD - Foreign Object Damage
FONSI - Finding Of No Significant Impact
FOPM - Flight Operations Policy Manual
FSAS - Flight Standards Automation System
FSB - Flight Standardization Board
FSDO - Flight Standards District Office

FT - Forecast Terminal
GMM - General Maintenance Manual
GOM - General Operations Manual
GS GC - Ground School Graduation Certificate
HAA - Height Above Airport (Non-precision approach)
HAT - Height Above Touchdown (Precision approach)
HMR - Hazardous Materials Regulation
HUD - Heads-Up Display
IAP - Instrument Approach Procedure
IATA - International Airport Transport Association
ICAO - International Civil Aviation Organization
IF - Intermediate Approach Fix
IFR - Instrument Flight Rules
ILS - Instrument Landing System
IM - Inner Marker
IMC - Instrument Meteorological Conditions
IMLS - Instrument Microwave Landing System
INM - Integrated Noise Model
IOE - Initial Operating Experience
IRA - Instrument Rating Airplane
ISARP - International Standard and Recommended Practice
JAD - Job Aid Disk
JTA - Job Task Analysis
LOP - Line of Position
LRA - Lowest Radar Altitude
MAP - Missed Approach Point
MCT - Maximum Continuous Thrust
MDA - Minimum Descent Altitude (non-precision approach)
MDPR - Master Differences Program Requirement
MID - Mid Runway Rollout
MNPS - Minimum Navigation Performance Specification
MRB - Maintenance Review Board
MSG - Maintenance Steering Group
MTOW - Maximum Takeoff Weight
NAT - North Atlantic Track
NDB - Nondirectional Beacon
NFDC - National Flight Data Center
NFDD - National Flight Data Digest
NOAA - National Oceanic and Atmospheric Administration
NOPAC - North Pacific
NOS - National Ocean Service
NOTAM - Notice to Airmen
NPRM - Notice of Proposed Rule-Making
NSPM - National Simulator Program Manager
NTSB - National Transportation Safety Board
OC - Obstruction Chart
OCA - Obstacle Clearance Altitude
OCH - Obstacle Clearance Height
OCL - Obstacle Clearance Limit
OpSpecs - Operations Specifications
OPSS - Operations Specifications Subsystem
OSAP - Offshore Standard Approach Procedure
PANS-OPS - Procedures for Air Navigation Services Aircraft Operations
PAR - Precision Approach Radar
PASI - Preapplication Statement of Intent
PATCO - Professional Air Traffic Controllers Organization
PCA - Positive Control Area
PCB - Production Certification Board
PIC - Pilot-in-Command
PF - Pilot-Flying
PMI - Principal Maintenance Inspector
PNF - Pilot-Not-Flying
POI - Principal Operations Inspector
PTRS - Program Tracking and Reporting Subsystem
PTS - Practical Test Standards
RFM - Rotorcraft Flight Manual
RFSD - Regional Flight Standards Division
RMA - Radar Minimum Altitude
RNAV - Area Navigation System
RTCA - Radio Technical Commission for Aeronautics
RVR - Runway Visual Range
RVV - Runway Visibility Value
SAFE - Aviation Safety Analysis and Functional Evaluation
SAR - ICAO-Standard and Recommended Practice
SEATAC - Seattle Tacoma International Airport
SIC - Second-in-Command
SIAP - Standard Instrument Approach Procedure
STC - Supplemental Type Certificate
STOL - Short Takeoff and Landing
TACAN - Tactical Air Navigation
TCH - Threshold Crossing Height
TCO - Training Course Outline
TDZ - Touchdown Zone
TERPS - Terminal Instrument Procedures
UTC - Coordinated Universal Time
VASI - Visual Approach Slope Indicator

VERTOL
- Vertical Takeoff and Landing

VFR - Visual Flight Rules

VIS - Vital Information Subsystem

VOR - Very High Frequency Omnidirectional Range Station

VORTAC/VHF
- Omnidirectional Range/Tactical Air Navigation

WPMS - Work Program Management System

40. RESERVED.

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SECTION 8. SPECIAL CURRICULUM SEGMENTS

567. GENERAL. This section contains direction and guidance to be used by POI's for the evaluation of an operator's special curriculum segments for approval. To conduct such an evaluation, POI's should be aware of the following distinction between basic training and special training.

A. *Basic Training.* The six training categories defined in this chapter in section 1 (see paragraph 289) contain the basic training required for crewmembers and dispatchers for qualification in a specific duty position on a specified aircraft type. Training in the operations and procedures necessary to operate in the standard service volume to standard minimums is an integral part of these curriculums. This basic training must be conducted by all operators. Training methods and events are specified either in regulations or advisory circulars and are well understood in the air transportation industry.

B. *Special Training.* "Special" training is that training conducted by an operator to qualify crewmembers and dispatchers beyond the scope of basic training. Each operator is required to conduct only that special training required for the operator's specific operations. Special training consists of either curriculum segments integrated into one or more of the six defined training categories or of curriculum segments grouped as an independent program. Special training is normally required for operations which require specific authorization by the operator's OpSpecs, such as the following:

- Class II navigation
- CAT II and CAT III approaches
- Lower-than-standard minimums takeoffs
- Extended-range operations with two-engine airplanes
- Use of an autopilot instead of a second-in-command
- Airborne radar approaches

569. SPECIAL CURRICULUM SEGMENT CONTENT. When evaluating an operator's training program, POI's must ensure that the operator's special curriculum segments contain the necessary and appropriate elements. Since operators may develop special curriculum segments to accomplish almost any objective, the curriculum content is a result of the specific objective and should be no more or less than what is required to achieve the objective. Generally, POI's should ensure that an operator's special curriculum segments have been developed from a clearly stated objective, a task analysis, and specified performance standards. Special curriculum segments must be designed to develop each crewmember's knowledge, skill, and judgment in the performance of the stated tasks. Special curriculum segments must contain qualification criteria for the assessment of each crewmember's ability to perform identified tasks to the specified standard. Special training curriculum segments may also be required to be conducted on a recurring basis.

571. SPECIAL CURRICULUM SEGMENT APPROVAL. POI's should follow the five-step process described in section 2 of this chapter for the approval of special curriculum segments. The POI should evaluate an operator's initial curriculum outline to ensure that it includes appropriate segments, modules, elements, and events. Advisory circulars about the various special operations can also be an aid to the POI in defining training requirements for those operations (see table 3.9.8.4 for a partial listing of these advisory circulars). The POI should evaluate the initial curriculum outline using both the applicable advisory circulars and this handbook. The POI may grant initial approval when the operator's outline is in compliance with such guidance. When such direction and guidance does not exist, the POI must have the operator perform a task analysis to identify the required tasks and appropriate performance standards for the special curriculum segment. The task analysis and performance standards should be submitted by the operator as supporting documentation along with the initial curriculum outline. The POI must evaluate the supporting documentation in conjunction with the outline before granting initial approval. When the operator proposes a new or unique type of training, AFS-210 shall be informed for evaluation purposes through the regional flight standards division (RFSD).

573. SPECIFIC APPLICATIONS OF SPECIAL CURRICULUMS. POI's should know of several common situations in which special curriculum segments are required. Some examples of specific applications of special curriculums follow.

A. *Flag Operations.* In flag operations it is a requirement that flight crewmembers possess knowledge of those procedures and OpSpecs applicable to these operations. For Class II navigation it may be required for flight crewmembers to have knowledge of specialized navigation procedures (such as MNPS) and equipment (such as INS, LORAN, OMEGA). POI's should ensure that in flag operations, flight crewmembers are required to have supervised practice and to demonstrate their competence in these operations before performing them without supervision (see volume 4, chapter 1).

B. *CAT II and CAT III Approaches.* For training in CAT II and CAT III approaches, POI's must ensure that the required training includes special equipment, procedures, practice, and a demonstration of competency. While some operators have successfully integrated this training into the six defined categories of training, others have conducted this training as a separate curriculum. POI's may approve either method of organization (see volume 4, chapter 2).

C. *Lower-Than-Standard Minimum Takeoffs.* Before pilots may conduct takeoffs with lower-than-standard minimums in revenue service, they must be given training and practice in, and have successfully demonstrated competence in, performing takeoffs in minimum authorized visibility conditions. POI's must ensure that training is given in: runway and lighting requirements; rejected takeoffs at, or near, V_1 with a failure of the most critical engine; taxi operations; and in procedures to prevent runway incursions under low visibility conditions. While the preferred method of conducting this training is in a simulator, other methods may be approved by the POI for operators who do not use simulators in flight training (see volume 4, chapter 2, section 7).

D. *Autopilot Instead of SIC.* Pilots of general purpose, single-engine and multiengine families of aircraft used in Part 135 operations may be authorized to conduct IFR operations without an SIC, provided they have completed a special curriculum segment for qualification in such operations. Both the instrument-proficiency check required by FAR 135.297 and the competency check required by FAR 135.293 (when conducted qualifies the applicant for IFR operations) are to be conducted using an SIC. During these checks, the applicant must demonstrate adequate crew coordination and leadership skills. When the applicant is qualifying for single pilot IFR operations, the applicant must also demonstrate the ability to safely conduct IFR flight without the assistance of another pilot or an autopilot.

574. - 578. RESERVED.

[PAGES 3-325 THROUGH 3-330 RESERVED]

SECTION 9. DIFFERENCES TRAINING - ALL TRAINING CATEGORIES

579. GENERAL. This section contains information, direction, and guidance to be used by inspectors when evaluating an operator's differences training program in all categories of training.

A. *Background.* Due to differences in instrumentation and installed equipment, the skills and knowledge required to operate two aircraft of the same make and model can differ. The range of differences between variations of a basic aircraft model has become extremely wide in recent years with the introduction of computerized guidance systems, electronic instrument displays, and two-crewmember flightcrews. Crewmembers trained on one variant of an aircraft may require additional training to safely and efficiently operate other variants of that aircraft. Both Parts 121 and 135 require that operators conduct "differences" training in all categories of training when the crewmember is authorized to serve on more than one variant of an aircraft.

B. *Terminology.* The following terminology is defined as it applies to differences training and as it is used throughout this handbook:

- *Base Aircraft:* The aircraft or group of aircraft designated by the operator for use as a reference to compare differences with other aircraft within the operator's fleet. This comparison of differences between aircraft is for items that affect, or could affect, flightcrew knowledge, skills, or abilities pertinent to flight safety. Operators designate base aircraft by the "N" number (such as "N 611DL"), the airline tail number (such as "aircraft 801-820"), the make/model/series (such as "DC9-31"), and/or other classifications which can uniquely distinguish between the operator's different aircraft pertaining to the different configurations, handling characteristics, performance procedures, limitations, controls, instruments, indicators, systems, equipment, options or modifications. A base aircraft may either be a single aircraft or a group of aircraft with the same features and may be redesignated at the discretion of the operator. Base aircraft are typically those aircraft within a fleet which the flightcrews are first trained in, which the airline has the most number of, or which represent a target configuration for the operator to eventually use as a standard.

- *Variant Aircraft:* An aircraft or a group of aircraft with the same features, that have pertinent differences from a base aircraft. Pertinent differences are those which could affect flight safety. Typical pertinent differences are those relating to configuration, handling qualities, performance, procedures, limitations, controls, instruments, indicators, systems, equipment, options, or modifications. Variants exist within a model or series, due to differences in installed equipment. For example, a B737-200 ADV with a performance data computer system, Omega, SP-177 autopilot, dual cue flight director, and autoland is a different variant than another B737-200 ADV with a single cue flight director, SP-77 autopilot, and basic VOR/DME navigation equipment. An operator may have a number of variants, in addition to a base aircraft within a fleet.

581. METHODS FOR ACCOUNTING FOR DIFFERENCES. There are several acceptable methods operators may use to account for differences. Inspectors should be knowledgable of the following acceptable methods.

A. *Standardized Configurations.* The simplest and most traditional method for operators to use when dealing with differences is to avoid them by installing common instruments and equipment in each aircraft in the fleet.

B. *Separate Fleets.* Some operators treat variants of an aircraft as if they were different aircraft by developing separate curriculums for each variant and by scheduling crewmembers to operate only that variant of aircraft on which they have been trained.

C. *Integrated Training.* An operator can conduct differences training as an integral part of each of the six defined categories of training. When the operator chooses to use this method, POI's must ensure that an analysis of the differences between the variants of aircraft in the operator's fleet has been made and that instructional elements have been provided in each curriculum segment to account for the identified differences. POI's may approve this method when systems differences between the

aircraft are minor, procedural differences are minor, and flight training is not required. Approval of integrated differences training is accomplished in conjunction with the approval of the curriculum of which it is a part. When the operator chooses this method, a differences evaluation should be submitted as supporting documentation for the initial curriculum outline.

D. *Separate Differences Curriculum Segments.* The operator may choose to limit instruction throughout a curriculum to one specific "base" aircraft and then conduct training as to the differences present in variations of the aircraft as a separate and distinct curriculum segment. For example, an operator might designate the 100-series aircraft as the base aircraft in a B-737 transition course. Ground, integration, flight, and qualification curriculum segments would be based on this aircraft. At an appropriate point in the instruction, a distinct segment of training would be presented to cover differences in the 200-, 300-, or 400-series aircraft. This method is advantageous when the operator operates numerous variants of an aircraft.

583. SPECIFIC SITUATIONS REQUIRING DIFFERENCES TRAINING. Inspectors should be knowledgable in the several situations in which differences training may be required, as follows:

- When an operator contracts for training from another party or conducts training in a leased simulator or aircraft having instrumentation or equipment different from the aircraft operated by the operator
- When an operator generates a need for differences training by introducing a variation of an aircraft into an existing fleet or by creating a variant aircraft by modifying one or more aircraft in the fleet
- When airline mergers and acquisitions generate the need for fleets to be merged in operations

585. DIFFERENCES EVALUATION. Differences training must be based on an accurate analysis of the differences in systems, equipment, and operating procedures of the aircraft involved. In 1989, the flight standardization boards (FSB's) began analyzing differences in variants of existing aircraft during certification. This analysis is published in a Master Differences Program Requirements (MDPR) document. The MDPR document contains a listing of differences and differences training requirements. When an MDPR has been published which covers all variants involved, the operator's proposed differences training program must comply with the requirements in the document. An operator preparing a training program for which an MDPR has not been published, must submit a difference analysis conducted by the operator or other qualified party (such as a manufacturer or another operator). The analysis may take any form as long as it accurately identifies all differences which are significant to the operator's crewmembers. One acceptable way of constructing a differences analysis, but not the only means, is to construct a curriculum outline for the base aircraft and to identify each curriculum item in which there is a difference.

FIGURE 3.2.9.1
EXAMPLE OF DIFFERENCES WORKSHEET

DIFFERENCES EVALUATION WORKSHEET	
BASE AIRCRAFT	VARIANT AIRCRAFT
Aircraft Systems Subject Areas	
Hydraulic Systems o Pumps o Supply o System A components o System B components o RAT o Limitations	 Pneumatic pump deleted Electric pump added Same Same Yaw damper added Deleted Electrical pump time Yaw damper off below 100′
Electrical System Module Air Conditioning Module Etc.	Same Same
Systems Integration Subject Areas	
Normal Procedures Module o Loran Receiver o INS Operation	 Deleted New procedures
Nonormal Procedures Module Hydraulic Systems o Fluid Loss Procedure o Pump Failure o Fluid Overheat o Electrical System Etc.	 Contain differences Same Different Same Same
Flight Training Subject Areas	
Normal Procedures Preflight No-Flap Approach Emergency Procedures Pressurization Loss Engine-Out Approach Etc.	Contain Differences Contains Differences Contains Differences Contain Differences Same Contains Differences

587. DEGREES OF DIFFERENCES. POI's must ensure that the methods and devices used to conduct differences training are appropriate to the degree of difference between the base aircraft and the variant aircraft. For purposes of describing degrees of difference and for defining acceptable training methods, five levels of differences have been defined (Levels A - E). These levels are compatible with those described in MDPR's but are discussed here primarily for guiding POI's in approving differences training programs that are not based on MDPR's.

A. *Level A Differences.* Level A differences are those differences which the crewmember needs to be aware of, but which have little effect on systems operations. For example, an engine starter on one variant aircraft has different time limits but does not have differences in controls, indicators, function, or procedures. Self-instruction methods such as highlighted pages of operating manuals or training bulletins are acceptable for these differences. At the Level A of differences, testing may not be required or may be delayed until the next period of recurrent training. Among the several appropriate means of conducting such testing are open book tests, verbal quizzes, and computer-based instruction (CBI). Once such differences are incorporated into the operator's aircraft operating manual, there is usually not a requirement for currency events.

B. *Level B Differences.* Level B differences are those differences in systems, controls, and indicators that have only minor procedural differences. Level B differences are of great enough degree to require formal training in either general operating subjects, aircraft systems, or both, but are not of great enough degree to require systems integration training. An example of a Level B difference might be a fuel system with additional fuel tanks, pumps, and gages. Procedural differences are limited to the operation of transfer valves and pumps while an aircraft is in cruise flight. Appropriate instructional methods for Level B differences include, but are not limited to, tape slide/presentations, lectures, and CBI. The testing that is appropriate to Level A differences is also appropriate to Level B differences, however, testing must be conducted immediately after training.

C. *Level C Differences.* Level C differences are those differences of great enough degree to require a systems integration training module but that are not of great enough degree to require actual flight training (see paragraph 443 of this volume for a definition and description of integration training). An example of a Level C difference is the installation of a flight management system (FMS) computer. Appropriate training and testing methods in the general operating and systems training modules are the same as those used for Level B differences. Appropriate training devices in the integration module are dedicated systems trainers or training devices of level 4 or greater. Testing methods appropriate to Level C differences are demonstrations of skill in the procedures affected by the difference. In the case of the installation of an FMS computer, testing might consist of preflight programming of the computer and a demonstration of its use in navigation, climbs, and descents. In this case, the qualification curriculum segment should also contain supervised operating experience.

D. *Level D Differences.* Level D differences are those differences for which there is a requirement for flight training modules but not for high fidelity simulation for landings. When Level D differences exist between two aircraft, general operating training modules, systems training modules, and integration training modules may be required. An example of a Level D difference might be the installation of an electronically-integrated flight instrumentation display. Aircraft operations using such a display are required to contain flight training in most phases of flight, except landings. Level 6 or greater flight training devices are appropriate for conducting Level D differences training and qualification modules. The testing required consists of applicable events of a Part 121 proficiency check or a Part 135 competency check.

E. *Level E Differences.* Level E differences are those differences for which there is a requirement for flight training, including landing events. An example of a Level E difference is the installation of a STOL (short takeoff and landing) kit on an aircraft resulting in a very different flare and landing attitude. A Level C or higher (Phase II) simulator, or an airplane is required for flight training in Level E differences. The testing required in Level E differences consists of the applicable events of a Part 121 proficiency check or a Part 135 competency check.

589. RECURRENT DIFFERENCES TRAINING AND CURRENCY EVENTS. When operators schedule crewmembers on multiple variants of an aircraft, some form of differences training must be included in the recurrent training curriculum. The amount and type of required training depends on the degree of difference involved and the operator's circumstances. Levels A and B differences should be reviewed within recurrent ground training curriculum segments. Levels C, D, and E differences require some degree of proficiency testing in a flight

training device, simulator, or aircraft. Recurrent differences training and testing can be reduced when the operator adopts a system to ensure that crewmembers remain current in all variations of the aircraft operated. For example, when a crewmember is operating aircraft equipped with servo-mechanical and CRT cockpit displays, currency could be expressed by the operator in terms of the number of flightlegs in each variant of the aircraft each quarter.

591. APPROVAL PROCESS. The approval process for differences training follows the five-step process described in section 2 of this chapter. The operator must submit an outline of the differences training program. This outline should contain appropriate modules and elements. Before the POI may grant initial approval of the training program, the operator must also submit documentation supporting the differences analysis. The documentation may consist of a reference to other documents available to the POI, such as the MDPR. The documentation may also be a differences analysis prepared by the operator or other qualified party. When the operator chooses to use the integrated method of training, differences training appears in the outline as differences modules in the appropriate curriculum segment. When the operator conducts differences training as a separate and distinct curriculum segment, all differences modules are grouped in that segment. In either case, the POI's approval should be predicated on the operator meeting the following required criteria:

- Differences analysis is complete and accurate (but not necessarily in great detail)
- Outline contains the appropriate instructional elements to account for the differences identified in the analysis
- The appropriate modes of instruction and devices to conduct the training are used

593. SEAT DEPENDENT TRAINING. Pilots operating aircraft from the left and right pilot seats are frequently confronted with special skill and training requirements. The differences in crew duties and skill requirements vary from insignificant to highly significant in various makes and models of aircraft. For this reason, POI's must evaluate an operator's seat dependent training requirements on a case-by-case basis. POI's may require that operators use a differences evaluation (as described in this section) for making this determination.

594. - 598. RESERVED.

[PAGES 3-336 THROUGH 3-342 RESERVED]

SECTION 10. FLIGHTCREW RECURRENT TRAINING CURRICULUMS

599. GENERAL. This section contains information, direction, and guidance to be used by POI's in the evaluation of an operator's flightcrew recurrent training curriculums. The information covered includes the objectives and content of these recurrent training curriculums. The recurrent category of training is conducted for flight crewmembers who have been previously trained and qualified by the operator, who are continuing to serve in the same duty position and aircraft type, and who must receive recurring training and/or checking within a specific eligibility period to maintain currency. Parts 121 and 135 flightcrew recurrent curriculums contain the following curriculum segments: aircraft ground training, general emergency training, flight training, and qualification. Special operations and differences training curriculum segments must also be included when applicable.

601. OBJECTIVE OF RECURRENT TRAINING. The objective of recurrent training is to ensure that flight crewmembers continue to be knowledgeable of, and proficient in, their specific aircraft type and duty assignment. Periodic recurrent training also provides operators with an opportunity to introduce crewmembers to changes in company operating procedures, in crewmember duties and responsibilities, and in developments within the operating environment and aviation industry.

A. POI's must ensure that the operator conducts the required number of hours of training for each cycle of recurrent training, and within the time period specified by the FAR's. Furthermore, POI's must take into account that although an operator may have satisfied the FAR's, the operator may not have satisfied the objective. The POI can consider the objective to have been met when the crewmember is able to perform at the required standard of proficiency immediately before entering the next cycle of required training.

B. POI's shall review recurrent training curriculum segments to ensure that the subject matter is appropriate, and of the proper scope and depth. The training given by the operator in each segment must meet the objective of that segment. Since there are limits as to the amount of recurrent training operators can reasonably conduct, POI's must ensure that operators use the time allocated for recurrent training efficiently and effectively. POI's and operators should carefully consider the following:

(1) The FAR's require that all required subjects and topics in initial training be covered in recurrent training. Crewmembers must remain proficient in these subjects as long as they continue to serve in the aircraft and crew position. Operators must give sufficient training to ensure that crewmembers continually remain proficient. The training required to meet this objective must be given even if it is in excess of the scheduled hours or listed topics.

(2) The FAR's do not require that every subject and topic of training be reviewed during each cycle of training. POI's should encourage operators to construct recurrent training outlines with different topics and elements emphasized in each cycle of training, so that when an element is addressed, it may be addressed in adequate depth.

(3) Recurrent training curriculum segments may not contain material that is not pertinent to flightcrew aircraft training, ground training, flight training, and general emergency training requirements (such as security training - a separate training requirement and curriculum segment).

(4) Recurrent training syllabuses (not necessarily curriculum outlines) should be revised frequently (preferably annually). Operators must remove any unnecessary, outdated, superfluous, or inappropriate material and replace it with current and timely material. POI's should encourage operators to construct recurrent training curriculum segment outlines in a manner that allows for training syllabus variation in subsequent cycles of training, while not necessitating a new program approval (see paragraph 605).

(5) POI's shall encourage operators to use pretesting to identify areas in which crewmembers are deficient. While operators do not have to train in areas in which crewmembers demonstrate competence, they must, however, be able to identify areas with deficiencies and conduct training to proficiency in those areas.

603. TRAINING/CHECKING MONTH AND ELIGIBILITY PERIODS. Both Parts 121 and 135 require that for flight crewmembers to be scheduled or serve in revenue service, they must have completed various recurrent training and checking events within 12 calendar months. When an

operator adopts a modular approach for recurrent training, all such training elements and events must be grouped into specified modules to be administered and recorded as a recurrent training curriculum segment. When an operator does not adopt a modular training approach, records must be kept of each airman's accomplishment for each element of required training and each element or event must be scheduled separately. POI's should use the following direction and guidance when reviewing an operator's recurrent training and checking events.

A. *Training/Checking Month.* The training/checking month is that calendar month during which a flight crewmember is due to receive recurrent training. Calendar month means the first day through the last day of a particular month. PIC's conducting Part 121 operations or Part 135 IFR are also due a recurrent training or checking module 6 months after the training/checking month.

(1) *Designating the Training/Checking Month.* When a crewmember completes an initial, transition, upgrade, or requalification training program within a 3-calendar month period, the month in which the qualification curriculum segment is completed is then considered to be that crewmember's training/checking month. If the training has been completed within the 3-month period, the operator may make a single record of the entire curriculum without noting when individual events occurred. Subsequent scheduling of recurrent training may then be based on the training/checking month. If the time taken to complete initial, upgrade, transition, or requalification training has exceeded 3-calendar months, however, the operator must record and schedule the accomplishment of recurring events separately.

NOTE: The requirement that PIC's of turbojet aircraft must accumulate 100 hours in command is not considered for the purpose of establishing the 3-month period.

(2) *Adjusting the Training/Checking Month.* Operators may adjust a crewmember's training/checking month by administering a period of recurrent training and qualification. When training is accomplished before it is due, operators must ensure that all requirements are accomplished within the 12 calendar months allowed by the regulations. Requirements are sometimes omitted when an airman completes an initial-equipment, transition, or upgrade training curriculum at some time other than the previous eligibility period. When a training/checking month is adjusted, the reason for the adjustment must be noted in the airman's record. A coding system for this adjustment may be used for computerized recordkeeping systems.

(3) *Requalification.* When an airman's qualification has lapsed due to not completing recurrent training or checking requirements, that airman must complete requalification training (see section 11 of this chapter). When an airman is entered into requalification training, a record of the reason for entry must be placed in the airman's record. The operator may establish a new training/checking month or retain the airman's original training/checking month after the airman successfully completes the requalification training.

B. *Eligibility Period.* The eligibility period is a 3-month period comprised of the calendar month before the month in which training is due, the month in which training is due, and the calendar month after the month in which training is due. In both Part 121 and Part 135 operations, required recurrent training or checking that is completed any time during the eligibility period is considered to have been completed during the month in which training is due. A crewmember who has not completed all recurrent training or checking requirements in the month due may be scheduled and may serve in revenue service during the remainder of the eligibility period, but not thereafter. A flight crewmember who fails to complete all required training and qualification modules within the eligibility period must complete requalification training before serving in revenue operations.

605. RECURRENT AIRCRAFT GROUND TRAINING CURRICULUM SEGMENTS. POI's must ensure that an operator's recurrent aircraft ground training consists of instruction in three subject areas: general operational subjects, aircraft systems, and systems integration training. Differences and special operations training (such as windshear) may also be required. FAR 121.427 and FAR 135.351 both require that recurrent aircraft ground training must contain instruction in the same subjects required for initial training. This requirement does not mean that each element of initial training must be reaccomplished during each period of recurrent training. It means that pertinent subject areas must be reaccomplished often enough to ensure that crewmembers remain competent in the performance of their assigned duties. The FAR's also require that certain subjects, such as emergency training be covered each year.

A. *Training Hours.* Ground training hours must be specified in the recurrent training curriculum segment. The number of training hours required for various aircraft and

the approval of training hours are discussed in section 5, paragraph 433 of this chapter. Operators may be required, however, to conduct more than the minimum number of hours specified by the regulations to achieve the training objective. FAR 121.427(a)(2) and FAR 135.351(a)(2) require that training in all subject elements which are required in initial aircraft ground training must be given "as necessary" in recurrent training. A recommended means of constructing recurrent training segments is to focus on one or two training modules within each subject area. During recurrent training, additional training modules may be accomplished at subsequent cycles of training until all of the areas of initial training have been completely reviewed. A complete cycle should not exceed 3 years.

B. *Differences and Special Operations Training.* When either aircraft differences training or special operations training is applicable, it must be included in recurrent training curriculums. This training may either be presented as a separate and distinct curriculum segment or the training may be integrated into other modules. An effective way for an operator to conduct differences training is to discuss the differences in individual systems and procedures as an integral part of the training. When special operations are conducted, special curriculum modules are normally required as opposed to integrating the training into other segments. Recurrent training should also include updated information on equipment, operational practices and procedures, information from accidents and incidents, and on areas which require emphasis as a result of line and proficiency check evaluations.

607. WRITTEN OR ORAL TESTING. POI's must ensure that the following written or oral testing requirements are in the operator's recurrent training curriculum.

A. Written or oral testing is a required module of the recurrent flight checks for both Part 121 and Part 135 curriculums. This testing may either be conducted in conjunction with the flight check module or separately. The testing must be accomplished within the airman's eligibility period (see previous paragraph 603.B).

NOTE: Although operators may use computer-based instruction, programmed instruction, or "open book" instruction and testing to obtain a reduction in ground training hours, this training/checking is not intended to be a substitute for the testing required in the qualification segment.

B. *Composition of Written and Oral Test Modules.* The oral or written test module must contain three distinct sets of test elements.

(1) The first set of test elements is general in nature and covers the applicable provisions of: Parts 61, 63, 91, 121, and 135; the operator's OpSpecs; and the operations manual. This segment only has to be completed once during each qualification cycle and does not need to be repeated if the crewmember is qualifying on more than one aircraft.

(2) The second set of test elements includes aircraft systems, operating procedures, weight and balance, and performance data relative to each specific make and model of aircraft. This segment of the test module must be completed on each make and model aircraft on which the airman is to serve. When the airman is qualifying to serve on more than one variation of an aircraft, a written or oral differences test segment is also required.

(3) The third set of test elements consists of special or unique operations. Special operations testing may be included in the general or aircraft specific segments, as appropriate.

609. RECURRENT GENERAL EMERGENCY TRAINING CURRICULUM SEGMENTS. Both Part 121 and Part 135 operators are required to conduct recurrent general emergency training. This curriculum segment is separate from the aircraft ground recurrent training curriculum segment. Recurrent general emergency training consists of emergency situation and emergency drill training modules. Section 4 of this chapter contains additional direction and guidance on the scope and content of general emergency training modules.

A. Recurrent general emergency training for Part 121 consists of all the items required by FAR 121.417. Recurrent general emergency training for Part 135 consists of all the items required by FAR 135.331. This training must be conducted every 12 months, typically at the same time recurrent aircraft ground training is conducted.

B. The emergency situation training modules that are part of the recurrent general training curriculum segment must include at least the following elements:

- Rapid depressurization (if applicable)
- Fire in flight (or on the surface) and smoke control procedures

- Ditching and evacuation situations
- Illness, injury, or other abnormal situations involving passengers or crewmembers

C. Part 121 crewmembers must complete emergency drill training at least once every 24 months. During alternate 12-month periods, training may be accomplished by the operator using pictorial presentations or demonstrations. Part 135 crewmembers must complete emergency drill training every 12 months. The emergency drill training modules that are part of the recurrent general emergency training curriculum segment must include at least the following events:

- Operation of each type of emergency exit in the normal and emergency modes
- Operation of each type of hand-held fire extinguisher
- Operation of each type of emergency oxygen system
- Donning, use, and inflation of each type of life preserver and the use of other flotation devices (if applicable)
- Ditching procedures (if applicable) including cockpit preparation, crew coordination, passenger briefing and cabin preparation, the use of lifelines, and the boarding of passengers and crewmembers into a liferaft or slideraft

D. The following illustration clarifies the chronological order of recurrent general emergency training requirements:

TABLE 3.2.10.1.
PART 121 RECURRENT GENERAL EMERGENCY TRAINING TIMETABLE

	MONTHS SINCE FIRST GENERAL EMERGENCY TRAINING CURRICULUM SEGMENT WAS COMPLETED			
TYPE OF RECURRENT GENERAL EMERGENCY TRAINING REQUIRED	12 MONTHS	24 MONTHS	36 MONTHS	48 MONTHS
Emergency Situation Training	X	X	X	X
Emergency Drill (either hands-on or pictorial demonstration)	X		X	
Emergency Drill (hands-on required)		X		X

611. RECURRENT FLIGHT TRAINING AND QUALIFICATION CURRICULUM SEGMENTS - PART 121. POI's must refer to FAR's 121.431 and 121.443 when determining the various acceptable means that an operator may use to construct recurrent flight training and qualification curriculum segments. POI's should use the direction and guidance that follows when making these determinations.

A. FAR 121.433(c)(1)(i) requires that all pilots complete a flight training curriculum segment every 12 calendar months in each airplane in which the pilot is to serve. This regulation also requires that the applicable flight test (as prescribed in FAR 121.441) be accomplished. The flight training and flight test requirements are separate and distinct but are both due in the pilot's training/checking month.

B. FAR 121.433(c)(iii) requires PIC's to complete a flight training module annually in addition to the module conducted in the airman's training/checking month. This module is due in the calendar month 6 months after the training/checking month.

C. FAR 121.433(c)(2) allows a course of simulator training described under FAR 121.409(b) to be substituted for alternate periods of recurrent flight training. A course of flight training in a simulator under FAR 121.409(b)(1)

consists of 4 hours at the controls practicing at least the procedures, maneuvers, and events in Appendix F. A course of flight training in a simulator under FAR 121.409(b)(3) consists of line oriented flight training (LOFT).

D. FAR 121.433(c)(2) permits an operator to conduct a proficiency check instead of recurrent flight training but does not authorize training instead of a required proficiency check. This provision is not intended to allow perpetual substitution of checking for training. POI's must emphasize that training is of primary importance, and checking is the means of verifying that training has been adequate. POI's shall ensure that operators conduct adequate refresher and remedial flight training in addition to conducting the required checks. The provision allowing for the substitution of checks for training is intended to allow the following:

- Realignment of a crewmember's training/checking month
- Relief for crewmembers requalifying after losing qualification
- Necessary flexibility for operators when realigning and revising training programs

E. FAR 121.441 requires that a PIC must have completed a proficiency check within the last 12 calendar months and either a proficiency check or one of the simulator courses of training described under FAR 121.409(b) within the last 6 calendar months.

F. FAR 121.441 requires an SIC to have completed a proficiency check or a course of simulator training described under FAR 121.409(b) every 12 calendar months. An SIC must also have completed a proficiency check or LOFT within 24 calendar months.

FYI: FAR 121.441 states that within the previous 6, 12, and 24 calendar months, crewmembers must complete specified requirements. FAR 121.401, however, allows an additional, calendar-month grace period for crewmembers to complete these requirements.

G. Table 3.2.10.2 that follows, contains a summary of the methods that a Part 121 operator may use to comply with the combined recurrent qualification requirements of the cited regulations.

TABLE 3.2.10.2.
METHODS FOR COMBINING RECURRENT TRAINING, PART 121

Months	0	6	12	18	24
PIC	P	P	P	P	P
	P	T or L	P	T or L	P
	P	P	L or T	P	L or T
SIC	P		P		P,L,T
	P		L		P,L,T
	P		T		P or L

P = Proficiency check in an airplane or simulator
L = LOFT
T = Simulator training

H. For recurrent training, flight engineers must have completed a proficiency check within 12 calendar months.

I. When a crewmember flies more than one aircraft type, the training/checking month for each subsequent airplane is the same calendar month that is one year after the original check on that type of airplane. Operators normally find it advantageous to align the training/checking month on the second airplane 6 calendar months after the training/checking month on the first airplane. This arrangement permits the competency check for the second airplane to simultaneously count as the instrument proficiency check for the first airplane.

613. RECURRENT FLIGHT TRAINING AND QUALIFICATION CURRICULUM SEGMENTS - PART 135. The recurrent qualification check requirements for pilots in Part 135 operations are as follows:

A. Each pilot serving in a transport or commuter category airplane, turbojet airplane, or helicopter must have completed a competency check in each make and model of aircraft in which the pilot serves within 12 calendar months. Part 135 operators who operate these families of aircraft may comply with Subparts N and O of Part 121 instead of Subparts G and H of Part 135. A Part 135 operator who does comply with Subparts N and O of Part 121 is considered to be in full compliance with Subparts G and H of Part 135. POI's should encourage operators of transport category, turbojet, and commuter airplanes to adopt this option to take full advantage of advanced simulation and LOFT.

B. Each pilot serving in airplanes of the multiengine, general purpose aircraft family must have completed a competency check in one model of airplane of the equivalent aircraft family within 12 calendar months. A competency check in one airplane of an equivalent aircraft family qualifies the pilot in all airplanes of that family (see figure 3.3.7.8 for a listing of established equivalent aircraft families).

C. Each pilot serving in single-engine airplanes other than turbojets must have completed a competency check in any make and model of the aircraft family within 12 calendar months. Only one competency check is required to qualify the candidate in all single-engine airplanes of this family.

FYI: The provisions of previous subparagraphs B and C do not relieve a pilot from having to complete recurrent differences training and that portion of the oral or written competency test applicable to each make, model, and variation of the airplane that the pilot will operate as required by FAR 135.293(A)(2).

D. *Instrument Proficiency Check.* FAR 135.297 requires a PIC conducting IFR operations to have completed an instrument proficiency check in one aircraft in which the pilot serves, and within the preceding 6 calendar months. The competency test for IFR operations as described in section 7 of this chapter satisfies the requirements of an instrument proficiency check. A PIC is due an instrument proficiency check in the calendar month 6 calendar months after the training/checking month.

(1) FAR 135.297 specifies that the instrument proficiency check consists of those maneuvers and events required for original issuance of the certificate required for the operation being conducted (either ATP or commercial/instrument). The events required on an instrument proficiency check are discussed in section 7 of this chapter.

(2) FAR 135.297 allows a pilot operating both single-engine and multiengine aircraft to alternate the instrument-proficiency checks in the two classes of aircraft and be considered qualified in both classes. The pilot must, however, have completed an IFR check in a multiengine aircraft before beginning the alternating sequence. This provision does not, however, relieve the pilot from having to accomplish a competency check (as discussed in section 7 of this chapter) in each family of aircraft or, when required in each individual aircraft, once every 12 calendar months (see section 8, paragraph 549 of this chapter).

NOTE: FAR 135.297 was written before competency checks for IFR operations were required for operators to satisfy the requirements of FAR 135.297 as well as 135.293. The provision for alternating checks has little practical application under the current requirements.

E. *Autopilot Instead of SIC.* Before a PIC may be authorized to conduct IFR operations with an autopilot instead of an SIC, the PIC must satisfactorily demonstrate this ability once every 12 calendar months. This demonstration should be conducted in conjunction with an IFR competency check.

F. *Multiple Currency.* When a pilot flies two or more aircraft of different families, or aircraft requiring individual qualification, the pilot's training/checking month for each airplane or family of airplanes is the same calendar month 1 year after the original qualification on that aircraft or aircraft family. Operators will usually find it advantageous to align the training/checking month for the second airplane 6 calendar months after the training/checking month for the first airplane. This arrangement eliminates the need for separate instrument proficiency checks.

614. - 616. RESERVED.

[PAGES 3-349 THROUGH 3-352 RESERVED]

SECTION 11. FLIGHTCREW REQUALIFICATION TRAINING CURRICULUMS

617. GENERAL. This section contains information, direction, and guidance to be used by POI's and other inspectors for the review and approval of requalification training curriculums. In this section a formal definition of requalification training is given; a definition is not included in the FAR's. Since crewmembers qualified for operations in revenue service under Parts 121 and 135 do sometimes lose their qualification, it is useful for the operators to have a definition of requalification training, including the reasons for it and its objectives.

A. *Definition.* For the purposes of this handbook, requalification training is defined as that category of training conducted specifically to restore a previously qualified crewmember to a qualified status. The operator's requalification training curriculum must contain the specific duty position and aircraft type for the applicable operations (in some cases, aircraft family for certain Part 135 operations). To be eligible for training in a requalification curriculum, a crewmember must have been previously qualified in that aircraft type and duty position and have subsequently lost that qualification.

B. *Reasons for Crewmembers Losing Qualification.* A crewmember may lose qualification status and become "unqualified" for any of the following reasons: failure to accomplish all of the recency of experience requirements required by the regulations (noncurrent); failure to complete recurrent training within the eligibility period established by the regulations (becoming overdue); or failure of a checkride (becoming disqualified). A crewmember may be simultaneously qualified in one airplane or duty position and unqualified in another.

NOTE: If a crewmember fails a checkride in one airplane, that crewmember cannot fly in revenue service in another airplane until the crewmember's qualification has been re-established.

C. *Objectives of Requalification Training.* Crewmembers meet requalification training objectives by completing a combination of aircraft ground, flight, and qualification curriculum segments, as applicable. The training and qualification curriculum segments needed for a crewmember's requalification are determined by the reasons for, and the length of, the crewmember's unqualified status. A crewmember's requalification after a loss of currency may be as simple as re-accomplishing the currency events in which the crewmember is delinquent, such as landings. Requalification, however, may be as complex as the crewmember having to accomplish the events in the initial equipment category of training when the crewmember has been unqualified for an extended period of time. Remedial training after disqualification should be tailored to the specific case.

619. RE-ESTABLISHING LANDING CURRENCY OF PART 121 PILOTS. FAR 121.439(a) requires that each pilot operating under Part 121 must have made at least three takeoffs and three landings in the airplane type in which the pilot is to serve in the previous 90-day period. A pilot who fails to meet this requirement is unqualified to serve in Part 121 operations. In such a case, the qualification curriculum segment for requalification training consists of either an experience module or a basic qualification module (proficiency check) in accordance with Appendix F of Part 121, and section 7 of this chapter. Aircraft ground training curriculum segments and flight training curriculum segments are usually not required. POI's must ensure that the operator's training modules for requalification meet the requirements that follow.

A. A recency-of-experience qualification module may be used which contains at least three takeoffs, three landings, and the following:

- A takeoff and landing with a simulated failure of the most critical powerplant
- A landing from an ILS approach to the lowest ILS minimums the pilot is authorized in revenue operations
- A landing to a full stop

B. The recency-of-experience qualification module may be accomplished in one of the following devices:

- An airplane, in nonrevenue operations under the supervision of a check airman
- An approved Level B, C, or D simulator under the supervision of a check airman
- In a Level A simulator under the supervision of a check airman (The pilot must have previously

logged 100 hours in the same type airplane. The pilot must also be subsequently observed during the first two landings in line operations by a check airman. The pilot may not conduct approaches to minimums lower than CAT I, as specified in the operator's OpSpecs, until this requirement has been satisfied. The landings must be made within 45 days after completion of simulator training.)

C. When a simulator is used to re-establish currency, all flightcrew positions must be occupied by individuals qualified in the operator's procedures and in the specified duty positions. The crewmember's level of qualification does not have to be equivalent to that level required of a crewmember serving in revenue operations. The simulator must be operated in a normal flight scenario. Repositioning is not allowed.

D. The check airman must certify to the proficiency of the pilot and enter that certification into the pilot's records.

621. RE-ESTABLISHING CURRENCY OF PART 121 FLIGHT ENGINEERS. FAR 121.453 requires that flight engineers (FE's) must have acquired at least 50 hours of flight time as FE's in the preceding 6 months in the airplane type in which they are to serve. An FE who becomes noncurrent for failing to meet this requirement must re-establish currency by completing a basic qualification module (proficiency check) conducted either by an FE check airman or by an FAA inspector, in accordance with section 7 of this chapter. The check may be conducted in an airplane in nonrevenue operations, or in an "engineer simulator" as defined in volume 5, chapter 3.

623. RE-ESTABLISHING LANDING CURRENCY OF PART 135 PILOTS.

A. FAR 135.247 requires that each pilot-in-command (PIC) operating under Part 135 accomplish at least three takeoffs and three landings in an aircraft of the same category and class within the preceding 90 days. Additional requirements apply to the following specific situations:

(1) If a PIC is required to hold a type rating, the PIC must have accomplished the three landings in that type of airplane.

(2) If night operations are authorized, a PIC must have made three takeoffs and landings during the period extending from 1 hour after sunset to 1 hour before sunrise, in an aircraft or in a Level B, C, or D simulator, of the same category and class within the preceding 90 days.

(3) If an airplane is equipped with a tailwheel, a PIC must have made three takeoffs and landings to a full stop in an airplane equipped with a tailwheel in the preceding 90 days.

B. A PIC who has become unqualified because of a failure to accomplish the required landings may requalify by completing either a basic VFR or IFR qualification module (competency check) as specified in FAR 135.293 and section 7 of this chapter, or by completing a recency-of-experience qualification module. A VFR recency-of-experience qualification module consists of three takeoffs and three landings. One of these landings must be to a full stop. If the PIC is to operate a tailwheel airplane, the three landings must be to a full stop and completed in an airplane with a tailwheel. POI's must ensure that the operator's IFR recency of experience qualification module contains the following:

- A takeoff with a simulated failure of the most critical powerplant (when using a multiengine aircraft that has the performance characteristics which allow this event to be accomplished safely)
- A landing from an ILS approach to the lowest ILS minimums that the pilot is authorized to use in revenue operations
- A landing with the simulated failure of the most critical powerplant (when using a multiengine aircraft)
- At least one landing to a full stop

C. The recency-of-experience qualification module may be accomplished in the following ways:

(1) A PIC may re-establish currency by performing the three takeoffs and landings in an airplane of the same category and class. When the PIC is required to have a type rating to command the airplane, the landings must be in that airplane type. These landings do not have to be supervised by a check airman. The PIC must record the completion of the required landings and provide the operator with a record copy to be kept on file. A safety pilot is required for the IFR module.

(2) The pilot may conduct at least three takeoffs and three landings in an approved Level B, C, or D simulator

under the supervision of a check airman.

(3) The pilot may conduct three takeoffs and three landings in a Level A simulator under the supervision of a check airman. When a Level A simulator is used, the pilot must have previously logged 100 hours in the same airplane type. The pilot must be subsequently observed by a check airman while conducting two landings. If the landings are made in revenue service they must be the first two landings the pilot conducts. The landings must also be conducted within 45 days after the completion of simulator training.

D. When a simulator is used to re-establish landing currency for a pilot, all required flightcrew positions must be occupied by individuals qualified in the operator's procedures and in the specific duty position. The individuals participating do not have to be qualified to serve in revenue operations. The simulator must be operated in a normal flight scenario. Repositioning is not allowed.

E. The check airman must certify to the proficiency of the pilot. The operator must enter that certification into the pilot's records along with the reason that requalification was required.

F. Recency-of-experience modules for PIC's who operate airplanes of the transport category or commuter category should be accomplished under the supervision of a company flight instructor or a check airman.

G. Part 135 does not specify landing currency requirements for SIC's. POI's should encourage operators to establish a minimum requirement that SIC's must perform at least three landings within the previous 90 days in an aircraft of the same category and class. SIC's in IFR operations must, however, have flown and logged 6 hours of instrument flight (three of which may have been in an approved simulator or training device) and six instrument approaches in the preceding 6 calendar months in accordance with FAR 61.57. SIC's in IFR operations who fail to meet the instrument currency requirements may requalify either by accomplishing a recency-of-experience module or an SIC, basic IFR qualification module in an aircraft of the same category in which revenue operations are to be conducted. The recency-of-experience module must consist of the hours and events in which the SIC is delinquent. The events required in an SIC, basic IFR, qualification module are specified in section 6 of this chapter. The basic qualification module may be administered by an inspector or check airman. The aircraft, simulators, and flight training devices specified in tables 3.2.6.6. through 3.2.6.9. may be used to accomplish these events, flight hours, and checks. When requalification is accomplished by means of a basic qualification module, the check airman conducting the check must certify to the competency of the airman. When the airman requalifies by accomplishing the required hours and events without the supervision of a check airman, the airman shall record that accomplishment in a logbook and supply a record copy to the operator. The operator is responsible for keeping a record of these events.

625. REQUALIFICATION FOR FAILURE TO COMPLETE RECURRENT TRAINING DURING THE ELIGIBILITY PERIOD. A requalification curriculum segment is required when a crewmember fails to complete recurrent training hour during a pre-established eligibility period. The minimum amount of training required in each segment of the curriculum is determined by the length of time the crewmember has been unqualified. Crewmembers must be trained to proficiency and complete a qualification module before being returned to revenue service. Requalification curriculum outlines must specify minimum training hours and events. Both Parts 121 and 135 allow crewmembers to be trained to proficiency. In each individual case, more or less training hours called for in the curriculum outline may be required. Tables 3.2.11.1. through 3.2.11.3. contain the requalification requirements for Parts 121 and 135 crewmembers who have exceeded their respective eligibility periods for required training or checks.

TABLE 3.2.11.1.
PART 121 REQUALIFICATION CURRICULUMS
FLIGHT CREWMEMBER OVERDUE TRAINING

Time Past Month Due	RGT SEGMENT	RFT SEGMENT	QUALIFICATION SEGMENT
Up to 12 calendar months	The portion of RGT not accomplished when due.	The elements not accomplished when due.	The modules not accomplished in the eligibility period: PC, LC, or special.
12 to 35 months	16 hours	8 hours	All qualfication modules of the transition curriculum.
36 to 59 months	24 hours	16 hours	All qualification modules of the transition curriculum.
More than 59 months	-- SAME AS INITIAL EQUIPMENT TRAINING --		

KEY: RGT - Recurrent Ground Training PC - Proficiency Check
RFT - Recurrent Flight Training LC - Line Check

TABLE 3.2.11.2.
PART 135 REQUALIFICATION CURRICULUMS
FLIGHT CREWMEMBER OVERDUE TRAINING
TURBOJET AIRPLANES, TRANSPORT CATEGORY AIRPLANES,
COMMUTER CATEGORY AIRPLANES, AND LARGE HELICOPTERS

Time Past Month Due	RGT SEGMENT	RFT SEGMENT	QUALIFICATION SEGMENT
Up to 12 calendar months	The portion of RGT not accomplished when due.	The elements not accomplished when due.	The modules not accomplished in the eligibility period: PC, LC, or special.
12 to 35 months	16 hours	8 hours	All qualification modules of the transition curriculum.
36 to 59 months	24 hours	16 hours	All qualification modules of the transition curriculum.
More than 59 months	-- SAME AS INITIAL EQUIPMENT TRAINING --		

KEY: RGT - Recurrent Ground Training CC - Competency Check
RFT - Recurrent Flight Training LC - Line Check

TABLE 3.2.11.3.
PART 135 REQUALIFICATION CURRICULUMS
FLIGHT CREWMEMBER OVERDUE TRAINING
SINGLE AND MULTIENGINE GENERAL PURPOSE AIRPLANES
AND SMALL HELICOPTERS

Time Past Month Due	RGT SEGMENT	RFT SEGMENT	QUALIFICATION SEGMENT
Up to 12 calendar months	The portion of RGT not accomplished when due.	The elements not accomplished when due.	The modules not accomplished in the eligibility period: PC, LC, or special.
12 to 35 months	50% of hours for initial equipment	50% of hours for initial equipment	All qualification modules of the transition curriculum.
More than 35 months	-- SAME AS INITIAL EQUIPMENT TRAINING --		

KEY: RGT - Recurrent Ground Training CC - Competency Check
RFT - Recurrent Flight Training LC - Line Check

627. CREWMEMBERS WHO ARE NONCURRENT OR OVERDUE UPON REASSIGNMENT TO A DIFFERENT TYPE OF AIRCRAFT. A crewmember who is reassigned to a duty position or aircraft type in which the crewmember was previously qualified, but is not currently qualified, must receive requalification training. The method used to requalify the crewmember differs according to the reason for the requalification, as follows:

A. A crewmember who is unqualified solely because of not having accomplished the required currency events, may be requalified in accordance with paragraphs 623 through 627 of this section, as applicable.

B. A crewmember who is unqualified for being overdue recurrent training may be requalified in accordance with tables 3.2.11.1. through 3.2.11.3., as applicable.

629. CREWMEMBERS REASSIGNED TO A PREVIOUSLY HELD DUTY POSITION IN AN AIRCRAFT CURRENTLY BEING FLOWN. When a crewmember is reassigned to a duty position previously held in the same type of aircraft the crewmember currently flies, requalification training may be necessary. The method used to requalify the crewmember differs according to the reason for the requalification, as follows:

A. When a pilot is returning from SIC to PIC or from FE to SIC, the crewmember must meet both the recency of experience and recurrent training requirements for the duty position or be placed in requalification training.

(1) A crewmember who is unqualified solely for being noncurrent may be requalified in accordance with paragraphs 623 through 627 of this section as applicable.

(2) A crewmember who is unqualified for being overdue for a recurrent training module may be requalified in accordance with tables 3.2.11.1. through 3.2.11.3., as applicable.

B. When a crewmember is moving from a pilot crewmember position to the flight engineer position, requalification must be accomplished in accordance with paragraph 625 (see table 3.2.11.1.).

C. When a PIC moves to an SIC position, requalification training consists of seat-dependent tasks related to the SIC position, such as checklist flow, and paperwork such as flight logs and weight and balance. Seat dependent requalification training requirements vary depending on the length of time the pilot was out of the

SIC position and the complexity of the aircraft. Because of the wide variance in these situations it is not practical for each situation to be addressed in this handbook. POI's must exercise judgment when reviewing each case.

631. REQUALIFICATION OF FLIGHT CREWMEMBERS WHO HAVE FAILED A CHECK. A flight crewmember who fails a required check must be entered into requalification training. The requalification training segment must consist of at least that remedial training required to restore the airman's competence in the failed events. Training may consist of as little as a detailed debriefing or it may need to be very extensive. Additional training should be given to strengthen the crewmember's overall performance. The reasons for the disqualification and the training given must be entered in the airman's records.

A. The instructor or check airman conducting this training must certify to the crewmember's proficiency before the crewmember reaccomplishes the checkride. This certification is not limited to the events the crewmember failed but it encompasses all events of the qualification module.

B. The operator must notify the POI of all failures. Notification must be timely, so that the POI may arrange for an inspector to conduct or observe the qualification module when, in the POI's judgment, this action is required. Observation should be accomplished in the case of PIC's failing basic qualification modules or line check modules. Operators may conduct as much requalification training as necessary before scheduling and conducting the qualification module.

C. The qualification curriculum segment for an SIC or FE shall consist of the module previously failed. The qualification curriculum segment for a PIC shall consist of either the basic qualification module, the line check module, or both, if appropriate.

633. EVALUATION OF REQUALIFICATION TRAINING CURRICULUMS FOR INITIAL APPROVAL. When evaluating a requalification training curriculum outline for initial approval, inspectors must determine that the appropriate aircraft ground, flight, and qualification curriculum segments are listed and that each curriculum segment contains the required elements.

A. Recency-of-experience modules only have to contain a listing of the events to be accomplished and the method the operator intends to use to accomplish them.

B. The curriculum should contain training and qualification segments for remedial training of disqualified crewmembers. The training segment only needs to contain a simple statement that the training given will be prescribed for the individual case in order to re-establish the crewmember's proficiency. The qualification segment, however, shall contain a listing of the modules the crewmember must complete to regain qualification.

C. Separate curriculum outlines should be prepared for crewmembers overdue training in accordance with tables 3.2.11.1. through 3.2.11.3., as appropriate. The curriculum outline should provide sufficient information to allow the POI to determine that the elements and events in each training module are adequate to properly requalify the crewmember. An example of a requalification training curriculum outline, with a sample training module (autoflight/flight director), is in figure 3.2.11.1. The subject area content of aircraft ground and flight training curriculum segments and of qualification curriculum segments are in sections 5, 6, and 7, respectively, of this chapter. The job aids associated with these sections should be used in conjunction with tables 3.2.11.1. through 3.2.11.3. by POI's when determining the adequacy of an operator's proposal.

D. One technique an operator may use to construct requalification curriculum segments for approval is to start with ground and flight training modules from other curriculums (such as PIC transition aircraft ground training) and to remove unnecessary elements or to adjust the content of the elements as necessary. In the example shown in figure 3.2.11.1., the number of elements and events in the training modules have been reduced from those provided for initial equipment training.

634. - 636. RESERVED.

FIGURE 3.2.11.1.
EXAMPLE OF A REQUALIFICATION TRAINING CURRICULUM OUTLINE

I. PIC B737 REQUALIFICATION TRAINING CURRICULUM <— Title of Curriculum

A. Objective of Training: To requalify a B737 PIC who has been unqualified for more than 11 months and up to 35 months <— -Objective Statement

B. Requalification Ground Training: (16 Training Hours) <— Title of Curriculum Segment

1. General Operational Subjects: <— Title of Subject Area

a. Operations Specifications
b. Aircraft Operations Manual
<— -Training Modules

2. Aircraft Systems: <— Title of Subject Area

a. Electrical System
b. Powerplants, APU
c. Fuel System
<— -Training Modules

3. Systems Integration Training: <— Title of Subject Area

a. Autoflight/Flight Director
b. Vertical/Longitudinal Navigation
<— -Training Modules

C. Requalification Flight Training: (8 Training Hours) <— Title of Curriculum Segment

1. Flight Training Device Period
2. Flight Simulator Period
<— -Training Modules

D. Qualification Curriculum Segment: <— Title of Curriculum Segment

1. Proficiency Check
2. Line Check
<— -Qualification Modules

3. a. Autoflight/Flight Director <— Descriptive Title of Training Module

(1) Autoland Operation
(2) Flight Director Set-up
(3) CAT II Procedures
<— Elements Within A Training Module

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CHAPTER 15. MANUALS, PROCEDURES, AND CHECKLISTS

SECTION 1. BACKGROUND AND DEFINITIONS

2075. INTRODUCTION. This chapter contains direction and guidance to be used by POI's and inspectors for processing, reviewing, and accepting or approving manuals, procedures, and checklists.

A. Section 1 contains general background information and definitions of the terms used in this chapter.

B. Section 2 contains guidance to inspectors and POI's for approving or accepting an operator's manuals, procedures, and checklists.

C. Section 3 contains guidance for the review and evaluation of general operations manuals.

D. Section 4 contains guidance for the review and evaluation of flight manuals.

E. Section 5 contains guidance for the review and evaluation of aircraft checklists.

2077. OVERVIEW OF MANUAL REQUIREMENTS. The FAR's require operators to prepare and keep current various manuals and checklists for the direction and guidance of flight and ground personnel conducting air transportation operations.

A. *Flight Manual.* FAR 121.141 or FAR 135.81(c) (as applicable), and FAR 91.31(b) require that an FAA-approved flight manual be carried aboard each aircraft for the guidance of crewmembers when conducting flight operations. A flight manual is any manual approved by the FAA that an operator uses to comply with this requirement. A flight manual may be an approved Airplane Flight Manual (AFM), an approved Rotorcraft Flight Manual (RFM), or an approved Company Flight Manual (CFM) (see paragraph 2079 for definitions). If an operator carries a CFM aboard the aircraft, that operator is not required to carry an AFM in addition to the CFM.

B. *General Manual.* FAR 121.133 and FAR 135.21 require that each operator prepare and keep current a manual providing guidance for all categories of flight and ground personnel conducting air transportation operations. This requirement does not apply to Part 135 single pilot operators and those operators granted a deviation from this requirement by paragraph A5 of the OpSpecs. For purposes of this handbook, the manual the operator prepares in compliance with FAR 121.133 or FAR 135.21 is termed a "general manual." The operator's general manual must include the duties and responsibilities of each category of employee. The manual must also include adequate policy, direction, and guidance for the safe and efficient performance of the duties assigned to each category of employee. The FAR's only require an operator to produce a single manual. In practice, however, a system of manuals is usually necessary, even for relatively simple operations. Operators have wide latitude in structuring their manuals.

2079. DEFINITIONS. The following terms are defined according to their use in this handbook:

- *Manual:* A collection of the information, policies, procedures, and guidance prepared by an operator to instruct company employees in the performance of their assigned duties.

- *General Operations Manual (GOM):* That segment of the general manual which applies to flight operational activities as opposed to airworthiness activities. The GOM is one of two major segments of an operator's general manual.

- *General Maintenance Manual (GMM):* That segment of an operator's general manual system which pertains to the airworthiness of aircraft. The GMM is one of two major segments of an operator's general manual.

- *User Manual:* A segment of a GOM or a GMM that provides instruction, policies, procedures, and guidance to a specific category of employee. Examples of user manuals that are commonly used in the air transportation industry include:

  - Flight operations policy manuals (FOPM's)

  - Airport analysis or data manuals

- Security manuals
- Flight attendant or cabin service manuals
- Flight dispatch manuals
- Station operations manuals
- Route and airport manuals
- Hazardous material handling manuals

NOTE: The user manual titles previously listed are only examples of common titles currently in use in industry. Inspectors should not interpret this as a list of required titles. Operators may choose to divide the GOM in any convenient way and may select different user manual titles.

- *Airplane Flight Manual (AFM):* An approved airplane flight manual is prepared by the manufacturer and approved by the FAA Aircraft Certification Office (ACO) under the provisions of FAR 21.5.

- *Rotorcraft Flight Manual (RFM):* An approved rotorcraft flight manual are prepared by the manufacturer and approved by the FAA Aircraft Certification Office (ACO) under the provisions of FAR 21.5.

- *Company Flight Manual (CFM):* An approved aircraft flight manual that is developed by, or for, a specific operator for a specific aircraft type and which is approved by the POI, in accordance with the provisions of FAR 121.141(b) or FAR 135.81(c).

- *Policy:* A written requirement established by an operator's management which is expected to be complied with by appropriate employee personnel. A policy may be within a procedure or stated separately. A written requirement such as, "No flight may depart on a cross-country flight without a spare case of oil" is an example of a policy.

- *Recommendation:* A preferred technique or action described by the operator which employees are expected to follow whenever practical. A recommendation is not a policy requirement.

- *Procedure:* A logical progression of actions and/or decisions in a fixed sequence which is prescribed by an operator to achieve a specified objective. In short, a procedure is step-by-step guidance on how to do something.

- *Abbreviated Procedure:* A list of sequential procedural steps without an amplified description or amplified set of instructions.

- *Amplified Procedure:* A description of sequential procedural steps with detailed explanatory descriptions and/or instructions accompanying each step.

- *Technique:* A method of accomplishing a procedural step or maneuver.

- *Checklist:* A formal list used to identify, schedule, compare, or verify a group of elements or actions. Although a checklist may be published in a manual, it is usually intended to be used by itself, so that reference to a manual is made unnecessary. Checklists are usually formatted and presented on paper, however, they may be formatted on electronic or mechanical devices, or presented in an audio format. A checklist may or may not represent an abbreviated procedure. The items listed on a checklist may be unrelated and may not represent a procedure, such as most "normal" checklists. Abnormal and emergency checklists, however, do represent procedures.

FYI: Checklists and procedures are often confused. Operators have sometimes titled procedures "expanded checklists" or titled checklists "abbreviated procedures." A procedure is a set of actions or decisions prescribed to achieve a specified objective. A checklist is a physical aid used to overcome the limitations of human memory.

- *"Normal":* When "normal" is used to describe a procedure or checklist, it refers to a routine operation (without malfunctions).

- *"Emergency":* When "emergency" is used to describe a procedure or checklist, it refers to a nonroutine operation in which certain procedures or actions must be taken to protect the crew and the passengers, or the aircraft, from a serious hazard or potential hazard.

- *"Nonnormal" or "Abnormal":* When "nonnormal" or "abnormal" is used to describe a procedure or checklist, it refers to a nonroutine operation in which certain procedures or actions must be taken to

maintain an acceptable level of systems integrity or airworthiness.

- *"Alternate":* When "alternate" is used to describe a procedure or checklist, it refers to a procedure which may be employed instead of another procedure. Alternate procedures may either be normal, nonnormal, or abnormal procedures.

- *"Supplemental":* When "supplemental" is used to describe a procedure or checklist, it refers to a procedure which may be employed in addition to a normal, nonnormal, or abnormal procedure. Supplemental procedures may either be normal or nonnormal procedures.

- *Phase Checklist:* A checklist used to establish and/or verify aircraft configuration during a specific phase of flight. An example of a phase checklist is an "after-takeoff checklist."

- *Normal Checklist:* A checklist comprised of all of the phase checklists used sequentially in routine flight operations.

- *"Approved":* When "approved" is used to describe a document, manual, or checklist, it means that a regulation requires FAA approval and that the FAA has evaluated and specifically approved the document, manual, or checklist.

- *"Accepted":* "Accepted" is used to describe a document, manual, or checklist which does not have, or is not required to have, FAA approval. Only a portion of an operator's manuals are required to have FAA approval. The remaining portions are "accepted" by the FAA. Operators are required to submit the entire general manual to the FAA for review. If the FAA concludes that an accepted section of the general manual is not in compliance, the FAA must formally notify the operator of the deficiency. Upon notification, the operator must take action to resolve the deficiency.

- *"Document":* A written description of a system, a method, or a procedure; a written statement of authorizations, conditions, or limitations; or a file of information. A document serves as an official record of understanding and agreement between the FAA and the operator as to the means the operator will use to comply with regulatory requirements. An approved document is not a manual. Relevant information from a document, however, may be extracted and published in user manuals. For example, the operations specifications are not a manual but an approved document from which information is extracted.

- *Pilot-Flying (P-F):* The pilot who is controlling the path of the aircraft at any given time, whether or not the aircraft is in flight or on the ground.

- *Pilot-Not-Flying (P-N-F):* The pilot who is not controlling the path of the aircraft.

- *Immediate Action:* An action that must be taken in response to a nonroutine event so quickly that reference to a checklist is not practical because of a potential loss of aircraft control, incapacitation of a crewmember, damage to or loss of an aircraft component or system - which would make continued safe flight improbable.

- *High Workload Environment:* Any environment in which multiple demands on the flightcrew necessitate the prioritizing of work functions. For example, IFR operations below 10,000 feet during arrival or departure from a terminal area (including taxiing) are considered to be high workload environments.

- *Systems Management:* The management of those systems which sustain the mechanical functions of the aircraft as opposed to the management of the aircraft's thrust, flightpath, or aerodynamic configuration.

- *Warning:* An instruction about a hazard that if ignored could result in injury, loss of aircraft control, or loss of life.

- *Caution:* An instruction concerning a hazard that if ignored could result in damage to an aircraft component or system - which would make continued safe flight improbable.

- *Note*: That information or instruction of such significance that special emphasis is required.

2081. DISTRIBUTION AND AVAILABILITY OF MANUALS. Each operator is required to maintain a complete manual (or set of manuals) at its principal base of operations and to furnish a complete manual (or set of manuals) to the FAA certificate-holding district office (CHDO). In addition, each operator must make available or furnish applicable parts of the manual (user manuals) to flight and ground operations personnel who conduct or

support flight operations. The manual may be in conventional paper format or in another form that is convenient for the user. Each employee to whom the manual or a user manual is furnished must keep it current. Each employee must have access to appropriate manuals or parts of manuals when performing assigned duties. FAR 121.139 requires that each Part 121 supplemental air carrier and commercial operator carry appropriate parts of the manual on each aircraft when away from the principal base of operations - for use by ground and flight personnel.

2083. REVIEW OF MANUALS. Manuals must be reviewed by POI's and other qualified inspectors to ensure they contain adequate content and are in compliance with applicable regulations, safe operating practices, and the operator's OpSpecs. While POI's are encouraged to provide guidance and advice to operators in the preparation of their manuals, the development and production of an acceptable manual is solely the responsibility of the operator.

A. *Initial Review.* Before the initial certification of an applicant, a comprehensive review of the applicant's flight manuals and GOM must be conducted by the POI and other qualified inspectors. During the initial review of the GOM, POI's must ensure that the operator has addressed the applicable topics discussed in sections 3 and 4 of this chapter. In addition, those items in the operator's final compliance statement which require the operator to develop a policy statement, system, method, or procedure, must be addressed. If user manuals are furnished, those topics which apply to the specific user must be addressed. Each topic must be presented with enough detail to ensure that the user can properly carry out the portion of the policy or procedure for which the user is responsible.

B. *Review of Changes to Manuals.* The POI should review each revision or proposed revision to a manual. Inspectors should not limit this review to a strict consideration of the change itself but should also consider the impact of the change on the operator's overall manual system, training program, and type of operation. Changes in the operator's OpSpecs should be accompanied by a review of applicable sections of the operator's manual.

C. *En Route and Ramp Surveillance.* Inspectors conducting en route and ramp inspections should review the flight manual and those portions of the GOM carried by the flightcrew for completeness and currency. When a flight is long enough to make it practical, inspectors should review these manuals more indepth, particularly those sections that are operationally relevant to the flight in progress.

D. *Periodic Review of Manuals.* The continual review of an operator's manuals is necessary because both the aviation environment and the operations conducted by the operator are constantly changing. Each POI is responsible for developing a surveillance plan for the operator's manual system. At least one portion of the operator's general manual should be reviewed annually, and the entire general manual should be reviewed over a period of 1 to 3 years (depending on the complexity of the operation). This periodic review should be planned as a distinct event so that every portion of the manual is systematically reviewed at some time over a 1- to 3-year cycle. This periodic review should be coordinated between principal airworthiness inspectors and other inspectors to ensure an appropriate exchange of information and to avoid redundant reviews.

2085. FORMAT AND STYLE OF MANUALS. Both Parts 121 and 135 require that each page of a manual must include the most recent revision date. In general, manuals and checklists should be easy to use and understand, and in a format that can be easily revised. When evaluating manuals and checklists for ease of use and understanding, inspectors should consider the following guidance concerning format and style:

A. *Form.* All or part of a manual may be prepared and maintained in conventional paper format (book form) or in other forms, such as microfilm or computer-based storage with electronic image.

B. *Preface Page.* The first page of a user manual should be a preface page containing a brief statement of the manual's purpose and intended user. The preface page should also contain a statement which emphasizes that the procedures and policies in the user manual are expected to be used by company personnel.

C. *Revision Control.* Each manual should be easy to revise. Also, each manual should contain a revision control page or section from which the user can readily determine whether the manual is current. This page or section should preferably follow the preface page but it can be organized in any logical manner. The control date of the most recent revision of each individual page must appear on each page. Complex operators should establish a bulletin system to bring temporary information or changes which should not be delayed by a formal revision process, to the attention of the user. The bulletin system should have a means of control that includes giving bulletins a limited life and

systematically incorporating them into appropriate manuals in a timely manner. Users should be able to easily determine whether they possess all current bulletins.

D. *Table of Contents.* Each manual should have a table of contents containing lists of major topics with their respective page numbers.

E. *References.* Manuals must include references to specific regulations when appropriate. A reference to regulations or other manual material is appropriate when it is necessary to clarify the intent of the text or when it is useful to the user for looking up specific subject matter. References should not be made to advisory circulars and to preambles of FAR's, as these sources are advisory and not binding in nature. Operators should use caution when adapting the text of advisory documents into their manuals. Advisory text may not translate into a directive context.

F. *Definitions.* Significant terms used in manuals should be defined. Any acronym or abbreviation not in common use should also be defined.

G. *Elements of Style.* Manuals and checklists should be composed in the style of general technical writing. This style should be clear, concise, and easy to understand. When evaluating manuals, inspectors should be knowledgable of the following suggestions for accomplishing clarity in technical writing:

(1) Whenever possible, short, common words should be used. Examples of this include: using the words "keep" or "hold" instead of "maintain"; using the word "start" instead of "establish"; and using the word "stop" instead of "terminate."

(2) When a word has more than one meaning, the most common meaning should be used. For example, the word "observe" should be used to mean "see and take notice of" rather than "obey and comply."

(3) Operators should standardize terminology whenever practical. For example, since the terms "throttles" and "thrust levers" refer to the same item, the operator should choose one term and use it consistently throughout the manual. Once a particular term has been used in a specific sense it should not be used again in another sense.

(4) Terms which command actions should be clearly defined, such as "checked," "set," and "as required." Since auxiliary verbs such as "may" and "should" are ambiguous and can create room for doubt, they should not be used when a definite action is commanded. Instead, verbs such as "shall" and "must" are preferable to use when an action is commanded, because they are more definite.

(5) All "instructions" should be given in the imperative mood and the active voice. For example, "Hold the speed between V_{ref} and V_{ref} plus 10 knots" is preferable to "The speed needs to be held between V_{ref} and V_{ref} plus 10 knots."

(6) To provide appropriate degrees of emphasis on specific points in the text, "cautions," "warnings," and "notes" should be in the operator's manuals and checklists.

(7) Any instruction, particularly a warning or a caution, must begin with a simple directive in the imperative mood that informs the reader precisely what must be done. To avoid obscuring the directive in the background information, the directive must be stated first and then followed with an explanation. An example of how a directive can be obscured in background information is as follows: "Warning - To avoid the hazard of striking ground handling personnel with the free end of a swinging tow bar, do not place feet on rudder pedals until the captain takes the salute from the ground handler. The hydraulic nosewheel steering can sling the towbar with hazardous force." In contrast the following is an example of the preferred method of placing the directive first: "Warning - Do not place feet on rudder pedals until the captain takes the salute from the ground handler. The hydraulic nosewheel steering can sling a towbar with sufficient force to cause serious injury to ground handling personnel."

(8) Descriptions in the manual should not be overloaded, but should be presented simply and sequentially. An example of an overloaded description is as follows: "A CSD per engine drives the AC generator at a constant speed of 8,000 RPM regardless of the speed of the engine or the load on the generator." The following is an example of a clearer, more concise description: "A CSD is mounted between each engine and generator. The CSD holds the generator speed at a constant 8,000 RPM."

(9) Long sentences should be avoided in the manual. The following example consists of subject matter put into a long sentence which makes it difficult to understand: "During gear retraction, the door-operating bar located on the landing gear leg contacts and turns the latch, withdrawing the roller from the slot as a second roller entraps the door-operating bar." The following example

consists of the same subject matter used the previous example, however, when it is broken down into shorter sentences, it is easier to understand: "During landing gear retraction, the door-operating bar on the landing gear leg is pressed against the door latch. The latch turns, freeing the door roller. The roller moves out of the slot. A second roller then traps and holds the door-operating bar."

2087. ADEQUACY OF PROCEDURES. Specific guidance for the evaluation of flight manual procedures is in section 4 of this chapter. The following general guidance, however, is provided for inspectors to use when evaluating procedures in any manual, including flight manuals:

A. *Objective.* The objective of a procedure must be stated clearly unless it is so commonly understood that a statement of the objective is not necessary.

B. *Logical Sequence.* Procedures are to flow in a logical step-by-step sequence. The most effective procedures are usually simple and each contain only the information necessary for accomplishing that procedure. Preferably procedures should be described in a sequential step-by-step format rather than a narrative format.

C. *General Considerations.*

(1) A procedure must be an acceptable method for accomplishing an intended objective.

(2) The individual responsible for each step of a procedure must be clearly identified.

(3) The acceptable standards of performance for a procedure are to be stated if those standards are not commonly understood or clearly obvious.

(4) Since a variety of personnel with differing degrees of expertise are involved in procedures, adequate information concerning the accomplishment of a procedure must be provided for the least experienced individual. A procedure may be described very briefly and concisely when the user is capable of achieving the objective without extensive direction or detail. When the user has limited training or experience, however, a procedure must be described in enough detail for the user to correctly accomplish it. When the user has limited access to other sources of information and guidance while performing a procedure, enough detail should be provided to make the user independent of other sources of information.

(5) When a form, checklist, or tool is necessary to accomplish a procedure, the location of that item must be indicated in the procedure.

(6) Enough time should be available under normal circumstances for the user to accomplish a procedure. If sufficient time is not available to the user for accomplishing a procedure, either the procedure itself or the user's duties must be revised.

2088. - 2098. RESERVED.

[PAGES 3-2061 THROUGH 3-2068 RESERVED]

SECTION 2. APPROVAL AND ACCEPTANCE OF MANUALS AND CHECKLISTS

2099. GENERAL. This section contains direction and guidance for POI's when approving or accepting an operator's manuals and checklists. This process is based on the general process for approval or acceptance described in volume 1, chapter 4, section 6.

A. *The Approval Process.* The approval process for a manual, manual section, or a Part 121 operator's checklist normally consists of phases one, two, three, and five of the general process (see volume 1, chapter 4, section 6). It may be necessary, however, for a POI to require that phase four (the demonstration phase) be included in the approval process.

B. *The Acceptance Process.* The acceptance process for a manual, manual section, or a Part 135 operator's checklist normally consists of phases one, two, and three of the general process. The operator must submit to the POI current copies of required manuals, and in the case of Part 135 operators, aircraft checklists for FAA review. An operator's entire manual system must be reviewed during the document compliance phase of initial certification (see volume 2, chapter 2, section 3). Once an operator is certified, the operator may revise, distribute, and use accepted material even though the POI has not completed a review of it. If after review, the POI determines that portions of the manuals or checklists are unacceptable, the operator must revise the unacceptable portions.

NOTE: Each phase of the general process for approval or acceptance is discussed as if it is separate and distinct, however, at times the phases may overlap.

C. *Evaluation of Manuals for FAA Acceptance or Approval.* An operator may develop and publish in its manual any policy, method, procedure, or checklist that the operator finds necessary for the type of operations conducted. These policies, methods, procedures, and checklists, however, must comply with the FAR's and be consistent with safe operating practices. POI's should encourage operators to be innovative and progressive in developing such policies, methods, procedures, and checklists. The POI's role in the review process is to provide an independent and objective evaluation of the operator's manual material. The POI must ensure that the operator's material complies with the FAR's, is consistent with safe operating practices, and is based on sound rationale or demonstrated effectiveness.

D. *Discrepancies.* When a POI finds a discrepancy in an operator's existing manual material, the POI shall take action to have that discrepancy resolved. Usually such discrepancies can be resolved through informal discussions. When informal discussion cannot resolve the discrepancy, however, the POI is required to formally withdraw FAA approval or acceptance from the operator (see paragraph 2111 for guidance on the formal actions that may be taken).

2101. PHASE ONE: ESTABLISHING A FRAMEWORK FOR REVIEW. The first phase of the approval or acceptance process begins with communication between the FAA and the operator (either a current certificate holder or an applicant for a certificate). There are three occasions when approval or acceptance of manuals and checklists is required, as follows:

- When an applicant applies for a certificate
- When an existing operator determines that a change is necessary
- When, as the result of an investigation or normal surveillance, the POI determines that a manual, manual section, or a checklist is inadequate or deficient

A. *Determining Basic Requirements Applicable to the Operator.* The primary task of the POI during phase one is to determine the basic requirements that the operator must meet to obtain acceptance or approval of a manual or checklist. The POI must communicate these requirements to the operator. To do this, the POI should review the appropriate sections of this handbook (particularly figures 2.1.1.1. through 2.1.1.3 in volume 2, chapter 1, section 1) and any advisory circulars, air carrier operating bulletins (ACOB's), exemptions the operator may hold or is applying for, OpSpecs, and any deviations applicable to subjects the operator must address in its manual or checklist. Both the POI and the operator must clearly understand the topics and level of detail the operator is required to have in the material to be submitted during phase two of the process. During phase one, the POI should make the following determinations and communicate them to the operator:

- Whether the submission will involve approval or acceptance
- Whether there is a need for validation tests or other demonstrations
- Whether there is a need for supplementary documentation, analysis, or other data to support the submission

B. *Methods for Manual or Checklist Organization.* During phase one, the POI should inform the operator that there are various methods which can be used to organize and format those manuals, manual sections, and checklists requiring FAA approval. The following subparagraphs describe at least four possible methods that POI's may inform an operator about, as possible methods that the operator may use:

(1) *Limited Content.* An operator may choose to limit the content of the manual solely to approved material. When this method is used, the entire manual must be approved and the operator may not revise the manual without additional approval by the POI. While this method facilitates FAA review and approval, the manual may be difficult to use because the intended user may have to frequently switch back and forth between the approved manual and other manuals containing accepted material. When the operator chooses this method, POI's must ensure that a header or footer is on each page indicating the material is FAA approved.

(2) *Grouping Material.* An operator may choose to group the FAA-approved material in specified sections of the manual and place accepted material in the remaining sections. With this method, the POI must ensure that a header or footer is on each page of the approved sections indicating that the material on that page is FAA approved. The operator may submit the approved and accepted sections to the POI as separate packages.

(3) *Interspersed Material.* An operator may choose to intersperse FAA-approved material and accepted material throughout the manual. When an operator chooses this method, the POI must ensure that the operator has clearly identified approved material each time it appears in the manual. This method of organization allows for efficient manual use, but makes the operator's publication process and the approval process difficult.

(4) *"Approval Document."* The operator may choose to place material in an "approval document" solely for the purpose of obtaining FAA approval of that material. An approval document is a document and therefore may not be used as a manual. After the document has been approved, the operator must develop user manuals which incorporate the approved information from the document along with detailed guidance and supplementary information. When this method is used, the user manuals are treated as "accepted" material and do not have to be individually approved. The POI must, however, review the user manuals to ensure that the information in them is consistent with the approval document. When using this method, the operator may revise the information in user manuals without prior FAA approval, provided the revision is consistent with, and does not conflict with, the information in the approval document. If the operator or the POI finds it necessary for the approval document to be revised, the operator must submit the proposed revision for review and approval. A revision to an approval document must be approved before the operator can incorporate the changed information into the user manuals. When an operator uses this method for submitting manual or checklist material for FAA approval, POI's must ensure that the operator has stated on the first page of the user manuals that the manual contains FAA-approved material. The manuals or checklists provided to the user, however, do not have to be specifically identified as being FAA-approved ones.

C. *Submission of Material.* During phase one, the POI should advise the operator on how to submit the documents, manuals, checklists and subsequent revisions for approval or acceptance.

(1) *FAA Approval Submission.* For material that requires FAA approval, the POI should advise the operator to submit the following:

- Two copies of the document, manual, manual section, checklist, or revision to be approved; or
- One copy of the document, manual, manual section, checklist, or revision, and two copies of the page control sheets for the material (the page control sheets, must show an appropriate revision number or "original" page number for each page, and the effective date of each page)
- A copy of any supporting documentation or analysis

(2) *FAA Acceptance Submission.* For material that is to be evaluated for acceptance by the FAA, the POI should advise the operator to submit the following:

- A copy of the manual, manual section, checklist, or revision to be reviewed
- A copy of the page control sheets for the material to be reviewed, when appropriate

D. *Coordination of Submitted Documents.* POI's should encourage operators to coordinate drafts of manuals and checklists and revisions before making a formal submission. Mutual agreement on major points should be reached between the operator and the POI before the material is put in final form. Operators should be advised by the POI's not to publish or distribute material requiring FAA approval until after they have received written notification that the material has been approved. An operator who prepares and distributes such material before receiving approval may have to make costly changes. The POI should encourage the operator to establish methods which streamline and simplify the process for both the operator and the POI.

2103. PHASE TWO: PRELIMINARY REVIEW. Phase two consists of the POI or a qualified inspector conducting a preliminary review (as opposed to a detailed analysis) of the operator's submission. This preliminary review is intended to ensure that the operator's submission is clear and contains all required documentation. The phase two review should be conducted promptly after receipt of the operator's submission. If after preliminary review, the submission appears to be complete and of acceptable quality, or if the deficiencies are immediately brought to the operator's attention and can be quickly resolved, the POI may begin the phase three indepth review (see paragraph 2105). If the submission is incomplete or obviously unapprovable or unacceptable, the process is terminated and the POI must immediately return the submission (preferably within 5 working days) with an explanation of the deficiencies. POI's should return the submission to the operator promptly so that the operator will not erroneously assume that the POI is continuing the process to the next phase.

2105. PHASE THREE: INDEPTH REVIEW. Phase three is a detailed analysis of the operator's submission. During this phase, a qualified inspector must review the operator's submission in detail to determine that the submission is complete and technically correct. The time to complete phase three depends on the scope and complexity of the submission. During the phase two preliminary review, the POI should determine whether the review can be completed within 10 working days. If any part of the submission requires FAA approval, and the POI determines that it will take longer than 10 working days to complete the review and approval process, the POI shall give the operator an estimate of the time it should take to complete the process.

A. The phase three review and analysis should confirm that the operator's submission conforms to, or is consistent with, the following:

- Federal Aviation Regulations
- Criteria and guidance in this handbook
- The operator's OpSpecs
- Criteria and guidance in advisory circulars
- Applicable AFM's, manufacturer's operating bulletins, and airworthiness directives
- Safe operating procedures
- The operator's cockpit resource management policies
- FSB and FOEB training recommendations

NOTE: The direction and guidance in this chapter for reviewing procedures and checklists have been developed after consultation with knowledgeable and experienced personnel in the air transportation industry, aircraft manufacturers, and the FAA. The information presented is considered to be the best guidance currently available on the topic. POI's should realize, however, that circumstances vary widely. The best set of procedures for one circumstance may not work well in another circumstance. Two recommendations may be in conflict. In such cases, the appropriate resolution must be achieved through compromise. For example, it may be more important for an operator's checklist and procedures design policies to be internally consistent than for an individual procedure to be designed in a specific way.

B. The POI should thoroughly consider the operator's experience and history when evaluating procedures and checklists. When an operator has a history of successful

operations, the POI should normally approve submissions consistent with the operator's existing procedures. When an operator has an incident or accident attributable to crew error, the POI must thoroughly examine the basic assumptions and policies in the design of the operator's checklists and operating procedures.

C. Even when thorough and effective design policies are used in the development of checklists and procedures, unanticipated results or effects may be encountered when the checklists and procedures are put to use. Therefore, procedures and checklists must be validated through operational tests.

2107. PHASE FOUR: VALIDATION TESTS. Operators should be encouraged by POI's to conduct validation tests of operating procedures and checklists during the development process. These validation tests should be conducted before the operator submits the proposed procedures and checklists for FAA review and approval. Whenever possible, the POI or a qualified inspector should observe these tests. Under certain circumstances a validation test may have to be conducted after the phase three indepth review. In other circumstances, especially for minor types of revisions or simple procedures or checklists, validation tests may not be warranted or appropriate. Before approving operating procedures and checklists, POI's should consider the following guidance concerning validation tests.

A. Aircraft operating procedures and checklists should be tested in realistic real-time scenarios, with a full crew complement.

B. Validation tests of normal procedures may be conducted in a simulator, in a training device, on training flights, or in conjunction with proving tests.

C. Validation tests of nonnormal, abnormal, and emergency procedures or checklists should be conducted in a simulator or training device. Tests of nonnormal and emergency procedures and checklists may be conducted in an aircraft, however, the operator must ensure that the test can be conducted safely. Testing of nonnormal and emergency procedures and checklists shall not be conducted during revenue service.

D. Operators may submit evidence that a qualified party (such as the manufacturer or another operator) has already conducted a validation test of a procedure or checklist. When such evidence is available, the POI should not require a validation test unless the operator's circumstances are significantly different from those in which the original tests were conducted.

E. Changes in the wording of a procedure may not actually change the procedure. In such cases, validation tests are not necessary.

F. POI's shall require that operators validate the safety and effectiveness of any addition, deletion, or change of sequence in the steps of a nonnormal or emergency checklist, through validation testing.

G. For those operators who intend to convert immediate action items to or from challenge-do-verify items on an emergency checklist, POI's shall require that they test the modified procedure to ensure that it is safe, effective, and has no adverse effects. POI's shall consult with the appropriate Aircraft Evaluation Group (AEG) before approving such changes.

H. The addition or deletion of individual items to a normal phase checklist does not usually need to be validated by a test. If the POI is of the opinion that the change significantly alters crewmember assignments or workload distribution, the POI shall require a validation test.

2109. PHASE FIVE: GRANTING FAA APPROVAL. Phase five consists of the POI granting FAA approval to manuals, manual sections, and checklists. During this phase the POI must formally notify the operator of the approval and also complete a specific record of the approval. For manuals, manual sections, and Part 135 aircraft operating checklists which are not required to have FAA approval, written notification of acceptance is not required and shall not be given (see paragraph 2099 of this section).

A. *Notification of Approval.* When the POI decides to approve a document, manual, manual section, or checklist, the following procedures apply:

(1) For a document, manual, or checklist that contains page control sheets, the POI shall annotate both copies of the page control sheets with the phrase "FAA Approved." Under the words "FAA Approved," POI's shall enter the effective date of approval and sign both copies. The operator may preprint the words "FAA Approved" and blank lines for the date and signature on the page control sheets or the POI may use a stamp to add the approval annotation on each sheet.

(2) For manuals, manual sections, or checklists that do not contain page control sheets, the approval annotation

must be placed by the POI on each page of the material. In this case the approval annotation must be made on two copies of the material. The annotation shall be the same as discussed in previous paragraph (1). This procedure should be used only for very short manuals, manual sections, or checklists (usually fewer than 5 pages) or when the use of page control sheets are not practical or serve little purpose.

(3) When page control sheets are used, the POI shall return one copy of the annotated page control sheets to the operator. In the remaining cases one copy of the approved material must be returned to the operator with a notification letter which states that the material is approved. This letter should also contain a statement advising the operator to maintain for its records the signed page control sheets or the material with the approval annotation. The POI shall retain the second copy of the signed page control sheets or the annotated material in the district office files.

B. *Notification of Disapproval.* The coordination, revision, and editing activities that take place throughout all phases of the process should eventually result in approved products. Under certain circumstances, however, it may be appropriate for the POI to terminate the process. For example, the operator may not take any action on the material for 30 days. To terminate the approval process, the POI shall return the entire submission to the operator with a letter which states that the FAA is unable to grant approval, along with the reasons why it cannot be granted.

C. *District Office Records.* The POI shall maintain a record of approval for each operator-submitted document, manual, manual section, and checklist. Records of approval to revisions of this material must also be maintained. The records should consist of page control sheets (or approved material if page control sheets are not used), notification letters, and any other related correspondence. While superseded portions of documents, manuals, or checklists do not have to be retained, POI's may retain this type of material if they determine that it is appropriate. The POI should include with the material in the operator's file a brief memorandum containing the reasons for the material being retained.

2111. NOTIFICATION OF DEFICIENCIES. When any portion of approved material that is currently in use is found to be deficient, the POI shall notify the operator and request prompt action to resolve the deficiency. Deficiencies can usually be resolved through an informal process, however, when this cannot be done, the POI must formally notify the operator by letter that the deficiency must be corrected.

A. If the deficiency involves FAA-approved material, the letter must contain a clear statement that FAA approval of the material will be withdrawn as of a specific date if corrective action is not taken. The letter should also contain a statement that the material does require FAA approval and that after the specified date, any operations without that approval will be in violation of the FAR's.

B. If the deficiency involves operator-developed material that is accepted by the FAA, the letter should clearly indicate the material that is deficient and the reasons why it is deficient. If, after such notification, the operator still fails to take appropriate corrective action, the POI should attempt to negotiate a reasonable solution. When these attempts fail, the POI may, with RFSD approval, amend the operator's OpSpecs to withdraw the authorization for conducting the operations affected by the deficiency.

2113. EMERGENCY REVISIONS. Sometimes an operator may find it necessary for safety reasons to immediately revise FAA-approved material before there is an opportunity to coordinate the revision with the POI. In such cases, the operator should take action as necessary to make the revision effective (such as alert bulletins and dispatch messages). For example, an operator may become aware of a deficiency after business hours, on a weekend, or on a holiday. In such cases, the operator should take immediate action. When emergency revisions to FAA-approved material are made, the operator shall notify the POI of the revision at the earliest practical opportunity (first working day after the action). Because there is a wide variety of reasons that an emergency revision action may be necessary, the POI must determine the best course of action to be taken after being notified of the emergency revision. POI's shall make assigned operators aware of this guidance.

2114. - 2124. RESERVED.

[PAGES 3-2074 THROUGH 3-2080 RESERVED]

SECTION 3. GENERAL OPERATIONS MANUALS (GOM's)

2125. GENERAL. This section contains information, direction, and guidance to be used by POI's in the evaluation of an operator's general operations manual (GOM). The operator's general operations manual is a segment of the operator's general manual system. FAR 121.133 and FAR 135.21 require that each operator prepare and keep current a general operations manual containing guidance for flight and ground personnel during the conduct of the operator's operations.

2127. CONTENT OF GENERAL OPERATIONS MANUALS. FAR 121.135 and FAR 135.23 specify topics which must be addressed in an operator's GOM. The operator's GOM must contain the duties and responsibilities for each category of employee. This manual must also provide sufficient policy, direction, and guidance to its employees for the safe and efficient performance of their duties. In addition, an operator's GOM must address the policies, systems, and procedures necessary to comply with the operations specifications (OpSpecs) provisions and safe operating practices. This section contains discussions of selected topics which POI's should look for when evaluating an operator's GOM, and which may be required by the operator's initial and final compliance statements (see volume 2, chapter 2, paragraphs 73 and 117).

NOTE: The requirement to develop a GOM does not apply to a Part 135 single pilot operator or a Part 135 operator issued an exemption to FAR 135.21 by paragraph A5 of the OpSpecs (see volume 2, chapter 3, section 2, paragraph 181).

2129. OPERATOR MANAGEMENT STRUCTURE. When evaluating an operator's GOM, POI's must ensure that the operator's management structure is included in the GOM, and that it meets the following guidelines:

A. The GOM must contain a description of the operator's management structure as it pertains to flight operation activities. Organizational entities, areas of responsibility, and titles of key management positions must all be identified in the management structure. This description should contain information on how the flight operation management structure interfaces with the airworthiness management structure and the responsibilities of both. Organizational charts and diagrams may also be useful in showing the relationship between operational units within the company.

B. For Part 135 operators, the names of the individuals filling required management positions must be listed in the GOM. An acceptable way for the operator to meet this requirement is to include a copy of its OpSpecs in the manual. The FAA may approve management structures and titles different from those specified by FAR 135.37(a) and FAR 121.59, by granting a deviation to these FAR's. When such a deviation is granted, it must be listed in paragraph A5 in the OpSpecs along with the names and titles of the approved management positions listed in paragraph A6 of the OpSpecs.

2131. AUTHORIZED OPERATIONS. When evaluating an operator's GOM, POI's must ensure that the operator's authorized operations are included in the operator's GOM, and that they meet the following guidelines:

A. The GOM must contain clear descriptions of the types and kinds of operations which the operator is authorized to conduct. The GOM must prohibit those operations which a flightcrew could possibly conduct but which the operator is specifically prohibited from conducting by the OpSpecs. The GOM must contain information on the authorized areas of en route operation in which flights may be conducted, including the types of aircraft authorized, crewmember complements, and any special en route and instrument approach procedure authorizations or requirements. One way an operator may describe the types and kinds of authorized and prohibited operations is to include a copy of the operator's OpSpecs in the GOM. Since the OpSpecs is designed to address a variety of situations and is not easily understandable as it applies to specific operational circumstances, POI's should encourage operators to extract the applicable information and incorporate it in the GOM. Clearly written direction and guidance on how to comply with authorizations and limitations should also be included. It is acceptable for operators to contract a charting and publishing service (such as Jeppesen/Sanderson) to prepare manual material concerning these authorizations and limitations. In these cases, the charting and publishing service's product is considered to be a part of the operator's GOM. POI's must review this portion of the operator's GOM as well as all other portions.

B. Flight operations policies, methods, and procedures may be located in either the GOM, in a section of the GOM such as a flight operations policy manual, or in a company flight manual (CFM) (see section 1 of this chapter for a definition of CFM). When an operator operates a variety of aircraft, it may be preferable for the flight operations policies, methods, and procedures that are common to all aircraft to be published in the GOM instead of each CFM. Crewmembers are required to comply with the flight operations policies, methods, and procedures, regardless of whether they are published in the GOM or the CFM. Therefore flight operations policies, methods, and procedures should be written in directive language, and provide specific operational criteria. An example of a flight operations policy statement that does not provide a clear directive or specific operational criteria is as follows: "Use caution when arriving or departing a terminal area when thunderstorms are present." An example of a flight operations policy statement that is clearly directive and that provides specific operational criteria is as follows: "Takeoffs and landings shall not be attempted when thunderstorms are within 3 miles of the airport or the takeoff or arrival path."

2133. WEIGHT AND BALANCE PROCEDURES. When evaluating an operator's GOM, POI's shall ensure that an operator's weight and balance procedures are included in the operator's GOM, and that they meet the following guidelines:

A. Each type of airplane used by the operator may require a separate weight and balance procedure. In such cases, it may be appropriate for the operator to place the weight and balance procedure to be used by flightcrews in the CFM and the procedures to be used by other flight operations personnel in sections of the GOM. If the operator develops a single weight and balance procedure for all aircraft operated, it may be appropriate for the operator to place the procedure to be used by flightcrews and other flight operations personnel in the GOM. Operators may develop their own weight and balance procedures or use the procedures furnished by aircraft manufacturers. POI's should recommend the following advisory circulars to the operator:

- AC 43.13, "Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair"
- AC 91-23, "Pilot's Weight and Balance Handbook"
- AC 120-27, "Aircraft Weight and Balance Control"

B. The approval of weight and balance procedures is granted in paragraph E96 of the OpSpecs. Reference to the OpSpecs may be made in the GOM, however the reference may not be used instead of a detailed description of the procedures to be used by flight operations, ground handling, and flightcrew personnel. POI's must ensure that the information and guidance in the operator's GOM is consistent with that in the GMM. The weight and balance procedures described in the operator's manuals should normally address the following topics:

- Procedures for complying with weight and balance limitations for each type of aircraft
- For Part 135 operators that operate multiengine aircraft, procedures for ensuring that the empty weight and center of gravity of each multiengine aircraft is determined by actually weighing the aircraft within the preceding 36 months
- Procedures for determining the weight of passengers, crew, cargo, and baggage
- Procedures for making the center of gravity calculations including loading schedules or other approved methods, if applicable
- Procedures for the completion and disposition of load manifests and weight and balance records
- Procedures for loading the aircraft

2135. OPERATIONAL CONTROL. When evaluating an operator's GOM, POI's must ensure that an operator's operational control procedures are included. The procedures, duties, and responsibilities of flightcrew and operational control personnel must also be described. Furthermore, the GOM must contain staffing requirements for operational control personnel during periods of time that flights are operational. When training and operational control requirements for operational control personnel are not contained in a training and qualification document, they must be listed in the GOM. The POI must ensure that the following requirements are met:

A. *Part 121 Domestic and Flag Operations.* The

description of the operational control system used by Part 121 operators conducting domestic and flag operations must be comprehensive. The GOM must contain flight dispatch procedures as well as flight-watch procedures. The interrelation of flight dispatch, crew scheduling, and airworthiness control must be outlined in detail. The communication facilities to be used for operational control purposes, procedures to be used with ATC, and methods for handling delayed flights, must all be addressed. Procedures to be used during adverse weather conditions and for discontinuing flight in unsafe conditions must also be covered in the GOM. The procedures to be used to operate unscheduled flights under supplemental regulations must be outlined if the operator conducts these kinds of flights (see volume 3, chapter 6 (TBD) for more detailed information on flight dispatch systems).

B. *Part 121 Supplemental Operations.* The description of the operational control system used by Part 121 operators that conduct only supplemental operations must contain the flight release and flight-watch procedures to be used by operational control personnel and flightcrew personnel. The interrelation of flightcrews, persons authorized to release flights, and airworthiness control personnel must be outlined. The communication facilities to be used and the procedures for using these facilities must also be covered in the GOM. GOM's must contain procedures to be used during adverse weather conditions and for discontinuing flight in unsafe conditions. FAR 121.125(d) requires that the OpSpecs specify the flight-following system and the location of the flight-following centers. Paragraph A8 of the OpSpecs is allocated to authorize this type of operational control system. If the GOM contains a comprehensive description of the system, only a reference to that GOM section needs to be placed in paragraph A8 of the OpSpecs (see chapter 6 (TBD) for more detailed information on flight-following systems).

C. *Part 135 Operations.* The description of the operational control system used by Part 135 operators must, as a minimum, contain a list of the names and titles of the personnel who are authorized by the operator to exercise operational control. If the operator does not establish a flight-watch system, the GOM must contain directions to flightcrews for filing an FAA flightplan for each flight conducted. If a flight-watch system is established, the GOM must contain an outline of the procedures which provide the operator with at least the information included in a VFR flightplan for each flight operated. The GOM must also contain an outline of the procedures which provide the operator with information on the location, date, and estimated time for re-establishing radio or telephone contact if flights are conducted in areas where such communications cannot be maintained with the operator. The flight-locating system must also be provided for timely notification to an FAA facility or a search and rescue facility when an aircraft is overdue or missing. The GOM shall also contain a description of the procedures for retaining flight location information until a flight has been completed. If a Part 135 operator uses a flight control system more sophisticated than the basic requirements of the regulation, the GOM shall contain a description of the system and procedures actually used (see chapter 6 (TBD) for more detailed information on Part 135 flight control systems).

2137. FLIGHTPLANNING. When evaluating an operator's GOM, POI's shall ensure that an operator's flightplanning procedures are included. The direction and guidance for flightplanning must be comprehensive and address the responsibilities of both flight control and flightcrew personnel. The GOM must contain a discussion of weather minimums, special airports, and other special requirements such as driftdown, re-release, and diversion contingencies. Some operators may elect to place the flightplanning procedures in the CFM and the operational control procedures in a dispatch or flight control user manual.

2139. NOTAM's AND PIREP's. When evaluating an operator's GOM, POI's shall ensure that procedures for the acquisition of NOTAM's and PIREP's and for the distribution of these NOTAM's and PIREP's to applicable personnel are included. The GOM should also contain a description of the procedures for obtaining applicable NOTAM's that are only distributed to a local area.

2141. RESTRICTED OR SUSPENDED OPERATIONS. The regulations require operators who know of conditions that preclude safe operations (including hazardous airport and runway conditions), to restrict or suspend operations until those conditions change. POI's must evaluate an operator's GOM to ensure that it contains a description of the procedures for employees to follow should they become aware of such conditions.

2143. INTERNATIONAL OPERATIONS. For an operator that conducts international operations, POI's must evaluate the operator's GOM to ensure that it includes pertinent and necessary flight control information. In the GOM, particular emphasis should be placed on fuel and performance requirements, communications, weather reports and forecasts, flightplanning, and any specialized means of navigation.

POI's should refer operators to the following advisory circulars concerning international operations:

- AC 90-76, "Flight Operations in Oceanic Airspace"
- AC 90-79, "Recommended Practices and Procedures for the Use of Electronic Long-Range Navigation Equipment"
- AC 91-49, "General Aviation Procedures for Flight in North Atlantic Minimum Navigation Performance Specifications Airspace"
- AC 120-31, "Operational and Airworthiness Approval of Airborne Omega Radio Navigation Systems as a Means of Updating Self-Contained Navigation Systems"
- AC 120-33, "Operational Approval of Airborne Long-Range Navigation Systems for Flight Within the North Atlantic Minimum Navigation Performance Specifications Airspace"
- AC 120-37, "Operational and Airworthiness Approval of Airborne Omega Radio Navigational Systems as a Sole Means of Long-Range Navigation Outside the United States"
- AC 121-13, "Self-Contained Navigation Systems (Long-Range)"

2145. FORWARD OBSERVER'S SEAT. POI's should ensure that the operator's GOM includes the requirement that the operator must provide the forward observer's seat (jumpseat or a forward passenger seat) to FAA inspectors and other specified personnel. Usually operators assign the authority to control the use of these forward observer's seats to a flight control department. Gate agents and passenger handling personnel must also be aware of these requirements. Crewmembers must also be aware of the procedures to be used for forward observer seat assignments. Information to comply with FAR's 121.547, 121.548, 121.581, and 135.75, must be included in the GOM, such as the following:

- Priorities of FAA inspectors, NTSB personnel, Secret Service agents, crewmembers, manufacturer's technical representatives, and other personnel (The FAA has second priority after Secret Service when they are protecting someone on the flight.)
- Methods for ensuring that no more than one person is assigned to a jumpseat at any particular time
- Procedures for disseminating jumpseat assignments to other stations

2147. LINE STATION OPERATIONS. Line station operations are those activities performed by the operator's personnel (or by other personnel for the operator) to originate, turn around, or terminate flights conducted by the operator. For an operator that conducts line station operations, POI's must evaluate the operator's GOM to ensure that it includes the necessary information on the various topics that follow.

A. Line station operations should include the use of the following types of facilities and equipment:

- Ramp areas including markings, signs, signaling devices, lighting, and blast fences
- Ramp facilities and equipment, such as passenger and cargo deplaning and enplaning equipment (towing, refueling, catering, and ground power equipment)
- Crewmember meeting areas, facilities for crewmember flightplanning (preparation for flight), and post-flight activities
- Ground station personnel work areas and facilities, communications equipment, and administrative support

B. Inspectors must ensure that an operator's GOM contains the policies, procedures, and guidance to be used by the personnel who support the operator's flight operations at line stations. This manual material must include those situations in which the operator maintains line stations as well as situations in which the operator contracts or purchases line station support. This type of material is usually located throughout various user manuals, such as ground station operations and maintenance manuals, passenger service manuals, facilities and equipment manuals, fueling manuals, and other special types of manuals. An operator may format and organize this type of manual material in a manner which is most consistent and usable for the operator's kind and type of operation. Regardless of the format and organization, however, this type of manual information is considered to be GOM material. The following are examples of the types of information that should be addressed in manual material concerning line

stations operations.

(1) *Duties and Responsibilities.* The GOM or GMM, as appropriate, must contain an outline of the duties and responsibilities of line station supervisory personnel. The types of positions that should be addressed include: ground station operations personnel, passenger handling agents, cargo and baggage handling personnel, and aircraft servicing personnel (when not addressed in the GMM). When an operator contracts for, or purchases, line station support, the GOM or GMM, as appropriate, must contain outlines of the procedures to be used by the personnel providing the support.

(2) *Passenger Handling and Protection.* The GOM must contain procedures and guidance for ensuring the safety of passengers during line station operations. The following are examples of passenger handling and protection subjects that must be addressed in the GOM:

- Passenger enplaning and deplaning procedures
- Procedures for use of jetways, passenger boarding stairs, air stairs and other types of passenger boarding equipment
- Safety of passengers on the ramp including the subjects of restricting of ground equipment and vehicle operation on ramps; and directing passengers to and from aircraft, around equipment, and to painted pathway lines on the ramp
- Procedures and guidance for protecting passengers from jet intake and blast, rotating and static propellers and rotors, ice on the ramp and boarding equipment, and tripping hazards
- Procedures for prohibiting smoking in no-smoking areas
- Procedures for assisting and ensuring safety of handicapped persons
- Procedures for handling intoxicated, hostile, or unruly persons
- Procedures for handling and controlling carry-on baggage

(3) *Aircraft Servicing and Ramp Operations.* The GOM and GMM must contain detailed procedures and guidance on servicing and maintaining aircraft during line station operations. These manuals should also contain instructions on the maintenance and use of ramp areas. The following are examples of procedures for aircraft servicing and ramp operations that should be addressed in the GOM:

- Procedures for the safety and protection of personnel working on the ramp
- Procedures and/or guidance for the maintenance and catering of aircraft, with or without passengers on board
- Procedures for fueling aircraft with or without passengers on board, including any requirements for crewmembers to be on board during fueling or prohibitions against positioning fuel trucks next to open exits with passengers on board
- Procedures for operating ground equipment including the capabilities and limitations of the equipment and the training and qualification of persons before using such equipment
- Procedures and guidance for properly locating and stowing ground equipment
- Procedures for the operation of aircraft cargo doors, baggage and cargo loading, closing and checking the security of doors
- Procedures for FOD control and periodically inspecting ramp areas
- Procedures to be used during adverse weather conditions such as thunderstorms, high winds, low visibility
- Procedures for the inspection and removal of ice, snow, or standing water

(4) *Hot and Cold Weather Operations.* POI's

should evaluate an operator's GOM to ensure that it (as well as the GMM) contains detailed procedures and guidance on hot and cold weather operations, including:

- Procedures for the inspection of ramps for accumulations of ice, snow, or standing water
- Precautions for the operation of vehicles and equipment
- Restrictions and cautions on aircraft movements
- Restrictions and cautions for the protection of passengers and ramp personnel

(5) *Deicing Procedures.* Aircraft ground deicing procedures should be clearly delineated by the operator. While such procedures are usually in the GMM, the operator's GOM must contain the following types of information concerning deicing for crewmembers and ground operations personnel:

- Assignment of responsibility for ensuring that aircraft is clear of ice and snow accumulation
- Conditions which require aircraft ground deicing
- Effectiveness of deicing, including the frequency of applications, proper mixtures, and the time periods permitted between a deicing application and takeoff
- Parts of the aircraft to deice
- Locations on the ramps or airports where deicing will be conducted
- Engine APU and ground equipment operation during deicing
- Passenger and ramp personnel protection during deicing
- Procedures to be used by contract personnel when the operator contracts for deicing services

(6) *Aircraft Movement in the Ramp Area.* POI's must ensure that the operator's procedures and guidance for the movement of aircraft in the ramp area is carefully coordinated between the operator's GOM and GMM (or appropriate user manuals). The definitions of signaling devices, signs, and ramp markings (such as taxi lines, stop lines, boundary and clearance lines) must be the same and be mutually understood by both crewmembers and ground handling personnel. Specific procedures for engine start, pre-taxi pushback, powerback (if approved), taxi out, taxi in, and parking while in the ramp area must be provided in the GOM (or in an applicable user manual). Communication procedures for ground handling personnel and crewmembers must be thoroughly coordinated. POI's must ensure that the interphone terminology and hand signals used by ground handling personnel and crewmembers have the same meaning. The need for common terminology and hand signals is also important for crewmembers and passenger handling agents. Illustrations of standard hand signals and their meanings should be provided in the GOM and GMM (or appropriate user manuals). The training and qualification requirements of personnel authorized to move aircraft on the ramp or on the airport must be described in the appropriate manuals. For example, when an operator is approved to powerback, the GOM must contain specific procedures for those operations for each airport and gate where authorized. Powerback communications and hand signals must be thoroughly coordinated between crewmembers and ground handling personnel.

(7) *Line Station Emergency Procedures.* POI's must ensure that the operator's GOM and GMM contain procedures to be used by crewmembers or ground personnel in case of emergency situations during line station operations. Line station emergency procedures must contain the specific duties and actions of appropriate personnel. This type of manual material must also include notification procedures and requirements. The notification procedures and requirements should contain specifications as to who will be notified, who will make the notification, how the notification should be made, and when it will be made for the various types of emergency situations that could occur at line stations. Usually this type of manual material should also include a quick reference telephone listing for obtaining firefighting and medical assistance, and for notifying appropriate company management, law enforcement officials, and FAA and NTSB officials. Line station emergency procedures should be published in a distinct section of the GOM or GMM so that they

are easily accessible. For large, complex operators, line station emergency procedures are usually published as a manual under separate cover to assure rapid accessibility. Operators may publish a line station emergency procedures manual for each station because of the uniqueness of each line station. POI's should encourage this as a preferred practice. The types of situations that should be covered in line station emergency procedures include the following:

- Aircraft accidents and incidents (Operators should be encouraged to develop guidance to be used by ground personnel for handling passengers immediately after a survivable type accident, such as providing suitable transportation for injured passengers to locations where medical assistance can be obtained.)
- Bomb threats, hijack procedures, and other types of security incidents
- Fuel spills and hazardous materials mishaps
- Procedures for post-flight handling of passenger injury, illness, or incidents involving passenger altercations and interference with crewmembers
- Employee/passenger accidents and injuries
- Adverse weather conditions such as tornadoes and hurricanes or other adverse conditions such as earthquakes (if such conditions are likely to occur at the operator's line stations)

(8) *Contract Services.* POI's must ensure that the GOM and GMM, as appropriate, contain policy and guidance concerning the interrelationship between the operator's personnel and the personnel of organizations who provide contract services at line stations. Contractor personnel are required to be trained on operator-specific procedures. The appropriate manual must contain the specifications for: the types of training to be given to contractor personnel; who is responsible for providing the training; and who is responsible for keeping records of the training. Although the contractor may be delegated this responsibility, the operator has final responsibility.

(9) *Trip Records.* POI's must ensure that the operator's GOM contains policies, procedures, and guidance concerning the preparation and disposition of trip records at line stations. Trip records include documents such as dispatch and flight releases, flightplans, weather NOTAM's, oceanic plotting charts, load manifests, and weight and balance documents. The manual material must specify who is responsible for preparing the trip records, the coordination activities that must be accomplished during the trip record preparation process, and the intermediate and final disposition of the trip records. The POI must ensure that the policies, procedures, and guidance in this manual material consistently contain accurate information for crewmembers and flight operational control personnel.

(10) *Local Conditions at Line Stations.* Personnel at line stations have immediate access to and knowledge of various conditions and activities that could affect flight operations at those line stations. Examples of local conditions and activities include: weather conditions, runway and taxiway conditions, construction activities, and obstacles. As such, inspectors must ensure that an operator's GOM contains instructions and procedures so that line station personnel can provide the operator with local condition reports. This manual material must contain clear instructions about the circumstances in which line station personnel are authorized to suspend or delay flight operations.

2149. PASSENGER BRIEFING PROCEDURES. POI's must ensure that the operator's GOM or flight manual, as appropriate, specifies the procedures to be used for pre-takeoff, en route, and post-landing briefings of passengers. Operators who use flight attendants may publish flight attendant user manuals as sections in their GOM's. The GOM or flight attendant user manual must contain the briefings to be given. Passenger briefing cards must be used to supplement the oral briefings. These passenger briefing cards must depict all of the required items that are addressed during the oral briefings. Advisory Circular 121-24, "Passenger Safety Information Briefing and Briefing Cards," contains guidance on passenger safety information and briefing cards.

2150. - 2160. RESERVED.

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SECTION 4. FLIGHT MANUALS

2161. GENERAL. This section contains direction and guidance to be used by POI's in the evaluation of flight manuals for Parts 121 and 135 operators. FAR 121.141 requires that Part 121 operators maintain a current flight manual for each aircraft used in their air transportation operations. FAR 135.81(c) requires that Part 135 operators maintain a current flight manual (or the equivalent information for certain aircraft certified without a flight manual) for each aircraft used in their air transportation operations. FAR 91.9 requires that a flight manual (or the equivalent information for aircraft certified without a flight manual) be available in the aircraft for flightcrew personnel use and guidance during flight operations. To satisfy the Parts 121 and 135 requirements, operators may use either the approved airplane flight manual (AFM) or the approved rotorcraft flight manual (RFM), as applicable, or they may develop, obtain approval for, and use a company flight manual (CFM). AFM's or RFM's (as applicable) are acceptable for satisfying the FAR's in cases of small, simple aircraft. The FAA-preferred practice for all other aircraft, however, is for operators to develop a company flight manual (CFM) which includes procedures specifically tailored to the operator's operations. Operators who operate multiple aircraft types usually find it efficient to collect policies, procedures, and guidance common to all aircraft in a single manual such as a flight operations policy manual (FOPM). In this case, the CFM contains only those policies, procedures, and guidance that apply to the operation of the specific aircraft. POI's shall use this section as guidance when evaluating an operator's AFM's, RFM's, or CFM's.

2163. APPROVED AIRPLANE FLIGHT MANUALS (AFM's) OR APPROVED ROTORCRAFT FLIGHT MANUALS (RFM's). FAR 21.5(a) requires that aircraft manufacturers provide an approved airplane flight manual (AFM) or an approved rotorcraft flight manual (RFM) with each aircraft certified after March 1, 1979. Prior to this date, approved flight manuals were only required for transport category airplanes. Proposed AFM's and RFM's are reviewed by a flight manual review board (FMRB) and, based on the FMRB's recommendation, are approved by the manager of the applicable aircraft certification office (ACO) when the aircraft is certified.

A. *Approved Sections of AFM's and RFM's.* AFM's of transport category airplanes contain three sections which are reviewed by the FMRB and approved by the ACO. These are the procedures, performance data, and limitation sections. Weight and balance limits for transport category airplanes are given in the limitations section. AFM's of airplanes approved under Part 23 or rotorcraft approved under Part 27 or Part 29 contain four approved sections: procedures, performance data, limitations, and weight and balance.

(1) *Procedures Section of AFM's for Complex Aircraft.* The procedures section of an AFM of complex aircraft is typically not suitable for flightcrew use in air transportation operations. The certification regulations only require that the procedures section of an AFM or RFM contain specific and detailed procedural information related to the unique characteristics of the aircraft. These manuals are not required to contain each and every procedure necessary to operate the aircraft. Most manufacturers of complex aircraft develop and have approved only those procedures necessary to certify the aircraft. The certification regulations do not require that procedural information be expressed in sequential, step-by-step format suitable for publication in a checklist. AFM procedural information may be supplied in narrative format. POI's must ensure that operators have rewritten such AFM procedures to make them suitable for flightcrew use in Parts 121 and 135 operations.

(2) *Performance Data Section of AFM's for Complex Aircraft.* AFM's for complex aircraft contain extensive performance data sections. All performance information necessary to operate the aircraft in revenue operations is in this section. The AFM performance data section of a complex aircraft is typically not suitable for flightcrew use. This section is suitable for use by performance engineers.

(3) *Procedures and Performance Data Sections under Parts 23 and 27.* AFM's and RFM's of smaller, less complex aircraft certified under Part 23 and helicopters certified under Part 27 typically contain performance data and procedures sections that are suitable for flightcrew use. POI's of operators using these aircraft shall review the applicable manual to ensure that these sections are appropriate for flightcrew use in the operation being conducted.

B. *Unapproved Sections of AFM's and RFM's.* In addition to the approved sections of AFM's and RFM's, aircraft manufacturers often include other information

which does not require approval under the certification regulations in an AFM and RFM. For example, a manufacturer may include systems descriptions, recommended procedures, or correction factors for wet runways in an accepted section. The FMRB does not formally review this type of information and the ACO does not approve it. The ACO only acts on this type of information when some part of the information has been discovered to be unacceptable and then brought to the attention of the ACO.

C. *Use of AFM's or RFM's as Flight Manuals.* When an operator proposes to use an AFM or RFM as the required flight manual, the POI must review both the approved and unapproved sections of the manual. The POI must determine that the information in the AFM is presented in a manner that is suitable for use by the flightcrew, that it is compatible with the type of operation conducted by the operator, and that it contains all of the required information and procedures.

(1) *Certification Regulations Versus Operational Requirements.* Aircraft currently used in air transportation operations have been certified under the provisions of Parts 23, 25, 27, 29; SFAR 23 or SFAR 41; or preceding regulations such as SFAR 422, CAR 3, CAR 4, or Aero Bulletin 7; or, under the regulations of another government and accepted by the United States in accordance with FAR 21.29. The assumptions, limitations, and requirements of these aircraft certification regulations may differ from the operational requirements of Parts 121 and 135. The direction and guidance concerning procedures and performance which operators must provide to flightcrews for aircraft operations under Part 121 or Part 135 is normally more comprehensive than that published in an AFM or RFM. For example, basic crew coordination procedures such as standard altitude awareness call-outs during departures and approaches are not usually in an AFM or RFM.

(2) *Supplementary Information.* When a POI finds that the procedures or performance information published in an AFM or RFM is insufficient for the operation to be conducted, the POI shall require the operator to develop supplementary information and make it available to flight crewmembers. It is acceptable for operators using an AFM or RFM as the required flight manual to place supplementary information in a section of the GOM, such as a flight operations policy manual (FOPM) or a flight training manual.

D. *Aircraft Certified Without an AFM or RFM.* An AFM or RFM may not have been prepared for an airplane or rotorcraft certificated before March 1, 1979. FAR 91.31(b)(2) requires that the same information required to be in an AFM or RFM be available aboard these aircraft. The only practical method for meeting this requirement for aircraft of 6,000 pounds maximum take weight (MTOW) or more is for the operator to prepare a CFM which contains performance, procedures, and limitations. Some smaller aircraft may be operated satisfactorily with the information presented by placards in the aircraft.

2165. COMPANY FLIGHT MANUALS (CFM's). A CFM containing the required information and approved by the POI under the provisions of this handbook is an approved flight manual for the purposes of FAR 91.31(b)(1) or (2), FAR 121.141(b), or FAR 135.81(c). An approved CFM is the only flight manual that needs to be carried aboard an aircraft. POI's must evaluate an operator's CFM's using the guidance that follows.

A. *Identification as a Flight Manual.* POI's must ensure that a CFM is clearly marked as an approved flight manual for a specific operator. Sections of a CFM which contain approved information must also be clearly identified (see section 2, paragraph 2109 for specific guidance on identifying approved information).

B. *Approved Sections of a CFM.* POI's must ensure that the approved sections of a CFM contain all of the information that is required by the flightcrew to operate the aircraft. POI's should evaluate the approved sections of a CFM for the following:

(1) The procedures section of a CFM must contain all procedures required by the AFM or RFM and for each operation the operator conducts. As a minimum, the operator must include sufficient detail to allow a trained crew to safely and effectively operate the aircraft. The procedures section of the manual may be divided into subsections such as normal, nonnormal, and emergency procedures.

(2) The operator's performance data in a CFM must contain the data from the AFM or RFM and instructions on how to use that data. Operators may assign the responsibility for performing takeoff and landing data computations to flightcrew or ground personnel. The flightcrew must have access to adequate data in the cockpit, (including information for the specific airport and runway to be used) to perform the computations for which they are responsible. When takeoff and landing data is presented in tabular format for specific runways, it is often referred to as an airport analysis. Performance data may be

published under separate cover and be given titles such as performance manual or airport analysis. When performance data is published under separate cover, it must be identified as a portion of the CFM. Takeoff and landing performance data may be stored in an on-board or ground-based computer (see volume 4, chapter 3 for guidance on the approval of aircraft performance and airport data acquisition systems).

(3) The limitations section of a CFM must be clearly identified as FAA approved. The limitations section of a CFM must contain each limitation which is contained in the AFM or RFM (see paragraph 2185 that follows for further details).

C. *Accepted Sections of a CFM.* Accepted sections of a CFM may contain supplementary information such as aircraft and systems descriptions, an expanded explanation of procedures, special policies and procedures, and other selected topics pertinent to operation of the aircraft type. The accepted sections of a CFM must conform to the regulations and safe operating practices but do not need to conform to corresponding sections of the AFM or RFM, either in format or content. POI's should ensure that the CFM developed by or for the operator contains sufficient explanation and guidance for flightcrew use in the safe operation of the particular aircraft type. Background information or information that is not specific to the operation of the particular aircraft should be placed in a section of the GOM, rather than in a supplementary section of the CFM.

2167. AIRCRAFT SYSTEMS DESCRIPTION. Operators must provide crewmembers with a systems description of an aircraft's systems and components that contains sufficient detail to allow flight crewmembers to adequately understand and perform all procedures in the flight manual. AFM's, RFM's, and CFM's may or may not contain a systems description section. The aircraft systems description section of a manual is "accepted" as opposed to "approved." Operators may choose to place the systems description information in an accepted section of a CFM or in a section of the GOM, such as a training manual.

2169. PROCEDURES. POI's should not construe procedures published in an AFM or RFM to be the only or best means of accomplishing a specific objective. Because AFM or RFM procedures are formulated primarily for aircraft certification purposes, POI's should encourage operators to develop procedures appropriate to revenue operations for inclusion in a CFM.

A. Procedures incorporated in a CFM should be tailored by the operator to accommodate the operator's type of operation, fleet standardization objectives, and cockpit management objectives. As an operator's operations become more complex, it is progressively more important to include detailed guidance in the flight manual, which is specifically tailored to the operator's operations.

B. Aircraft which have been modified by supplemental type certificate (STC) or by field approval (FAA Form 337) may require different procedures than unmodified aircraft. POI's must coordinate approval of procedures with PMI's to ensure modifications are accounted for in the operator's procedures.

C. Procedural information included in a CFM must be presented in a step-by-step format. A procedural step in an AFM or RFM procedure must be included in the equivalent CFM procedure, unless the POI approves the deletion through the process described in subparagraph I that follows.

D. Operators are responsible for developing effective standard operating procedures. The development process for standard operating procedures consists of the operator or other qualified party (such as the manufacturer) conducting a painstaking task analysis of the man-machine-environment relationship. Although this analysis is time consuming and expensive, it is necessary to meet the required level of safety in air transport operations. General guidelines for POI's to use when evaluating these procedures are contained in paragraph 2171 that follows. Specific guidelines for developing aircraft operating procedures are almost nonexistent. This chapter contains the best information available at the time of publication. POI's should bring the information in this chapter to the operator's attention. Further guidance will be added to this chapter as it becomes available. POI's should encourage those operators that do not have extensive experience in developing their own procedures to follow the manufacturer's recommendations.

E. POI's should ensure that operators standardize their operating procedures both within and across aircraft types to the greatest extent possible. POI's should make operators aware of the following information concerning procedures for standardization.

(1) Standardized procedures promote understanding and effective communications between crewmembers. Research has shown that standardized procedures and effective communications are significant factors in reducing

error in the cockpit and in enhancing safety.

(2) Crewmembers of most large operators operate numerous different aircraft during their career. Standardized procedures enhance a crewmember's transfer of learning and minimize negative transfer when the crewmember transitions from one aircraft to another.

(3) A complete standardization of procedures is not possible when there are significant differences between manufacturers and installed equipment. A high degree of standardization, however, is possible. For example, the flight procedures for: engine failure after V_1, engine fire after V_1, and a missed approach with an engine out, can be designed to be identical. Each procedure might include the aircraft climbing at a reference speed to an identical clean-up height, then accelerating, then retracting the flaps, and then continuing the climb at specified engine-out climb speed. The reference speeds might change depending on the aircraft weight, but the procedure could otherwise be identical. If the operator designed these procedures carefully, they could be used on all aircraft in the operator's fleet.

F. POI's may approve combined procedural steps. For example, an AFM or RFM procedure specifies a two-step procedure such as the following: Step 1--Smoke Goggles On, and Step 2--O_2 Mask On. The POI could approve a one-step procedure such as the following: Step 1. Smoke Goggles and O_2 Mask - On. If there is a specific reason, however, for not combining the steps, the POI must not approve such combinations. For instance, if in the previous example, for some reason the smoke goggle has to be put in place before the O_2 mask can be put into place, the two-step procedure should be retained.

G. POI's may approve an arrangement of procedural steps in a different sequence from the sequence in the AFM or RFM. The operator must demonstrate to the POI's satisfaction that the change in sequence is safe and effective through validation testing. The POI shall ensure adverse effects are not introduced. For example, with many aircraft the flaps are required to be extended or the trim to be set to specific settings before an adequate control check can be accomplished. If this sequence is reversed, the control check is invalid.

H. POI's may approve the combination of similar procedures into a single procedure. For example, it may be desirable for an operator to combine engine fire, engine failure, and severe engine damage procedures into a single procedure. POI's may approve the resulting procedure when validation testing shows the procedure to be clear, easy to use, and if it retains the safeguards of the individual procedures it replaces. If the combined procedure results in a complex and error-prone procedure, the POI shall not approve it.

I. The POI shall require the operator to present evidence that newly-developed procedures are effective. This may be done by analysis, documentation, or validation tests. Tests may be conducted by the manufacturer, the operator, or another competent party (such as a contractor). The POI or a designated inspector qualified in the aircraft must evaluate the effectiveness of such tests.

J. If the POI has any question about the validity or safety of an operator-developed procedure, the POI shall consult with the appropriate AEG. When a policy question arises, POI's should request guidance from the regional flight standards division (RFSD) or, if required, from AFS-200 through the RFSD. All such questions must be resolved before the POI approves the procedure.

2171. NORMAL PROCEDURES. The normal procedures section of a CFM must contain procedures for each normal operation that flight crewmembers are required to perform. Each normal procedure should be amplified by the operator with sufficient instruction to ensure that the procedure is properly accomplished. POI's must ensure that this instruction is thorough enough to provide the least experienced flight crewmember with sufficient information to perform the procedures.

A. Many operators include normal operating checklists and an explanation of how to accomplish each step of the checklists in the normal procedures section of the CFM. This is an acceptable practice, however, it is important to understand that an explanation of how to perform the normal checklist is not the only material required in the normal procedures section of a CFM. Guidance for operational procedures for which there are no checklists (such as the takeoff procedure), must also be addressed. Procedures for crew coordination and for the use of checklists must be included. The procedures section of a CFM must contain clearly specified crew duties. For example, the procedures section should contain a specific assignment for the crewmember that is responsible for setting power and maintaining directional control when the SIC is conducting a takeoff.

B. POI's may require the operator to develop and publish normal procedures in a CFM which are not in the AFM or RFM, when the procedures are necessary to ensure an adequate level of safety. Instrument approach procedures, adverse weather operations, long-range

navigation, and special procedures for CAT II and CAT III operations are all examples of required normal procedures which may not be in an AFM or RFM.

C. Operators may need to develop extensive procedures for operating computer-based systems in the cockpit. A description of computer displays and controls does not normally provide a crewmember with adequate information to operate such systems. Procedures for computer operations should be keyed to menus and display prompts. Procedures should be written in an interactive format rather than as a rote listing of key strokes.

2173. MANEUVERS AND PROCEDURES DOCUMENT. FAR 121.403(b)(3) and FAR 135.327 (b)(3) require that operators publish "detailed descriptions or pictorial displays of the approved normal, abnormal, and emergency maneuvers, procedures and functions that will be performed during each flight training phase or flight check, indicating those maneuvers, procedures and functions that are to be performed during the inflight portions of flight training and flight checks." Operators must obtain approval of the maneuvers and procedures descriptions before they may be published. The preferred procedure for obtaining approval is the document method described in section 2, paragraph 2101(B)(4) of this chapter.

A. Before approving the operator's "maneuvers and procedures document," POI's shall ensure that it contains the tolerances which must be maintained in training and checking. POI's shall ensure that the operator's standards are appropriate for the aircraft being flown and for the operation being conducted. Operators should use the Practical Test Standards (PTS) (FAA-S-8081-5 for pilots), any applicable FSB reports, the manufacturer's recommendations, and volume 5 of this handbook, to establish these standards. POI's should use the guidance that follows when evaluating the standards used in an operator's maneuvers and procedures document.

(1) The standards in FAA-S-8081-5 (PTS) are particularly appropriate for pilots of single-engine and multiengine, general purpose families of airplanes and helicopters. There are many cases, however, in which the PTS standards are inappropriate. For example, many large aircraft have speed command systems in which the correct final approach speed varies according to the CG and flight conditions.

(2) When the operator conducts special operations, such as lower than standard minimum takeoffs, the POI shall ensure that the tolerances the operator chooses are appropriate to that operation. For example, on an RVR 600 takeoff with an engine loss, the applicant must be able to continue to track the runway centerline lights until the aircraft is rotated to the takeoff attitude.

B. Operators may choose to publish the maneuvers and procedures description in a section of the GOM for reference by flight crewmembers. The FAA recommends, however, that this description be placed in a section of the flight manual where it is available for inflight reference.

2175. NONNORMAL AND EMERGENCY PROCEDURES. Nonnormal (or abnormal) and emergency procedures in an AFM or RFM are usually presented in more detail than are normal procedures. The steps and the order of steps in these procedures are often critical. POI's must exercise caution in approving the modification of nonnormal and emergency procedures. The effect of most procedural steps on the airworthiness of the aircraft are obvious but the effects of some are not. For example, it may be necessary to depressurize a hydraulic system to successfully perform a manual landing gear extension. Deleting a step or a change in the sequence steps of such a procedure could make the procedure ineffective. There have been instances in which operators have erroneously proposed modifying an AFM or RFM procedure, and POI's have unintentionally approved the modification which invalidated the certification basis of the aircraft. POI's should use the guidance that follows when evaluating an operator's nonormal or emergency procedures in AFM's, RFM's, or CFM's.

A. When an operator proposes to modify a nonnormal or emergency procedure, the operator must show that the modified procedure does not adversely affect the airworthiness of the aircraft. The operator may establish the safety and effectiveness of proposed procedures by analysis, documentation, or validation tests.

B. POI's shall contact the applicable AEG and obtain concurrence before approving deletion of an item or the rearrangement of items on these checklists. AEG concurrence may be expressed informally (by telephone). AEG concurrence is not required if the operator provides evidence that the AEG has already concurred with the identical procedure for another party (such as another operator or manufacturer).

2177. IMMEDIATE ACTIONS. An immediate action is an action that must be accomplished so expeditiously (in order to avoid or stabilize a hazardous situation) that time is not available for a crewmember to refer to a manual or

checklist. Crewmembers must be so familiar with these actions that they can perform them correctly and reliably from memory. POI's must ensure that immediate action situations are included in an operator's AFM, RFM, or CFM, as appropriate. Situations that require immediate action include, but are not limited to the following:

- Imminent threat of crewmember incapacitation
- Imminent threat of loss of aircraft control
- Imminent threat of destruction of a system or component which makes continued safety of the flight and subsequent landing improbable

A. Under this criteria, a flightcrew donning oxygen masks in response to a depressurization or turning off the fuel and ignition in case of a hot-start, are situations requiring mandatory immediate action items. The loss of thrust on a jet engine during cruise, however, would not normally require an immediate action item according to this criteria.

B. POI's must ensure that immediate action items are explicitly identified as such in an operator's CFM. It is not acceptable for immediate action items to be hidden (not specifically identified as an immediate action) in procedures or checklists.

C. Certain situations that either require or appear to require immediate action have proven to be a stimulus for evoking incorrect and inappropriate flightcrew actions. Therefore, immediate action items must be strictly limited to only those actions necessary to stabilize the situation. POI's must ensure that all remaining actions are accomplished by "challenge-do-verify" (CDV) checklists (see section 5 of this chapter).

D. POI's may approve an operator's proposal to replace immediate action items in an AFM or RFM procedure with challenge-do-verify (CDV) checklist procedures in a CFM, provided the operator shows compliance with the criteria in this paragraph and also demonstrates an equivalent level of safety through validation tests.

2179. MANDATORY CONFIRMATION ITEMS. There are certain critical procedural steps that shall be confirmed by a second crewmember before the step may be taken. POI's must ensure that an operator's procedures which contain such critical procedural actions must clearly identify the critical actions and the crewmember who is responsible for giving the confirmation. The types of procedural actions that require this confirmation include the following:

- Actions resulting in the shutting down of an engine
- Actions resulting in the deactivation of flight controls
- Actions that if performed incorrectly, in the wrong sequence, or at the wrong time produce a catastrophic result, even if the incorrect action is not highly likely
- Actions where past experience or analysis has shown that there is a high probability for error or incorrect action and which creates a hazardous situation

2181. CREWMEMBER ROLES. The CFM must clearly define the various crewmember roles and responsibilities. POI's should use the following guidance when ensuring that the operator clearly states policy and guidance for cockpit management in the AFM, RFM, or CFM, as applicable.

A. *PIC Responsibilities.* The operator's policy and guidance should make it clear that the PIC's primary responsibility is to manage the actions of the crew and the conduct of the flight. While the PIC may delegate the management of the flight and manipulation of the controls to the SIC, the CFM must not indicate that the PIC can delegate the responsibility for safe conduct of the flight.

B. *Responsibilities of Flight Crewmembers Not in Command.* The operator's flight manual should contain policy and guidance to those flight crewmembers not in command, as to their responsibilities to the PIC and their responsibilities for the safe conduct of the flight.

C. *SIC Responsibilities.* The CFM must contain guidance for the PIC concerning the conditions and circumstances in which an SIC may operate the aircraft. The operator's policies must delineate the limits of authority delegated to the SIC when the SIC is the pilot flying (P-F). The operator's policies should address crew management in critical situations. For example, there may be certain situations in which the SIC should be the pilot-flying (P-F) so that the PIC can concentrate on managing those situations, particularly ensuring that required actions and appropriate checklists are properly accomplished. Procedures for transfer of control must be clearly addressed in the CFM.

D. *Communications.* In general, proper cockpit management requires effective communication and cooperative action between crewmembers which form consecutive closed loops. A diagram of this interaction is

in the illustration that follows.

```
        P-F ------------------> P-N-F
  Commands Action     Acknowledges Command

"Flaps - Approach"     "Flaps to Approach"

              ^                 |
              |       Takes Action & Reports
              |                 |
              |                 |
              |     "Flaps Indicating Approach"
              |                 |
              |                 |
              |                 |
      "Roger - Verified"        |
              ^                 |
              |                 |
              |_________________|

    Acknowledgement Closes Loop
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E. *Coordination.* Research has shown that effective flightcrews coordinate their actions before any action is required. POI's shall ensure that CFM's contain a requirement for briefings and also adequate guidance for the content of those briefings.

2183. OPERATIONS NOT EVALUATED IN AIRCRAFT CERTIFICATION. If the operator proposes to conduct operations which have not been evaluated during aircraft certification, the POI must ensure that the operator has developed and obtained approval of procedures for the conduct of the proposed operation. Such operations are often indicated by the absence of a procedure for the operation in the AFM or RFM. Examples of such operations could include powerback and taxi with engine shutdown. POI's should use the following guidance when evaluating those operations not evaluated during aircraft certification.

A. POI's must ensure that each operation conducted must be specifically addressed by a procedure. For example, it should not be assumed that a procedure for shutting down and then restarting an engine during a taxi delay is equivalent to a procedure for delaying an engine start on initial taxi-out. The same procedure may not be used for more than one operation unless analysis shows that more than one operation may be safely conducted using the same procedure.

B. POI's must ensure that an operational procedure is thoroughly coordinated with airworthiness inspectors. Since adverse effects that a procedure could cause to the airworthiness of an aircraft or its systems may not be immediately apparent, the POI must ensure that coordination with airworthiness is required. For example, a procedure for taxiing with engine shutdown could have a detrimental effect on the landing gear system if high asymmetrical engine thrust is used during sharp turns. If there is any question concerning the effects a procedure may have on the airworthiness of the aircraft, the POI must coordinate with and obtain concurrence from the appropriate AEG before granting approval of the procedures.

2185. LIMITATIONS. POI's must ensure that when operating limitations are incorporated in a CFM, that each limitation was transferred from the AFM or RFM. POI's should use the following guidance when evaluating the limitations of an operator's CFM.

A. POI's should evaluate the operator's CFM to ensure that all AFM or RFM operating limitations are published in the CFM and are clearly identified as AFM or RFM limitations (see section 2, paragraph 2101(B) of this chapter). The limitations section of a CFM must contain every limitation from the AFM or RFM. Operators may add limitations to CFM's which were not in an AFM or RFM limitation. One method of accomplishing this is for the operator to express all operator-imposed limitations as policy statements in applicable procedures. When the operator chooses to blend AFM or RFM and operator-imposed limitations in the limitations section of a CFM, the POI must ensure that the operator used a method for clearly distinguishing each AFM or RFM limitation from the operator-imposed limitations.

B. The operator is responsible for informing crewmembers of all AFM or RFM operating limitations. Crewmembers are responsible for observing all AFM or RFM limitations. The POI must ensure that the CFM contains a statement that crewmembers are responsible for being aware of and for observing all limitations.

2186. - 2196. RESERVED.

[PAGES 3-2102 THROUGH 3-2108 RESERVED]

SECTION 5. AIRCRAFT CHECKLISTS

2197. GENERAL. This section contains direction and guidance to POI's for the review of aircraft checklists for Parts 121 and 135 operators. All Parts 121 and 135 operators must provide aircraft checklists to their flight crewmembers. Flight crewmembers are required to use these aircraft checklists in air transportation operations. For Part 121 operators, aircraft checklists must be approved by the FAA, and for Part 135 operators these checklists must be acceptable to the FAA (see section 1 of this chapter for definitions of acceptance and approval).

A. *Definition.* A checklist is a formal list used to identify, schedule, compare, or verify a group of elements or actions. A checklist is used as a visual or oral aid that enables the user to overcome the limitations of short-term human memory. Although a checklist may be published in a manual, it is designed for independent use so that the user does not have to reference a manual. Checklists are used to ensure that a particular series of specified actions or procedures are accomplished in correct sequence. Aircraft checklists, in particular, are used to verify that the correct aircraft configuration has been established in specified phases of flight.

B. *Standardization.* Aircraft checklists and the operator's policies for the use of checklists are one means by which operators structure and define flight crewmember roles. Research has shown that standardized procedures and effective cockpit communications are significant factors in flight safety. POI's must review the operator's policies and procedures for checklist use as an integral part of the checklist review process. POI's shall ensure that checklists and the operator's procedures for checklist use are standardized (to the extent allowed by individual aircraft differences) for all aircraft in the operator's fleet.

C. *FAA Approval or Acceptance for Specific Operators.* POI's and operators must understand that aircraft checklists published in AFM's or RFM's are not approved by the Aircraft Certification Office (ACO). When a Part 121 operator proposes to use an AFM checklist, the POI must review and approve that checklist for that operator. When a Part 135 operator proposes to use an AFM or RFM checklist, the POI must review the checklist and determine that it is acceptable for that operator's use.

2199. CHECKLIST CONTENT. Aircraft checklists have traditionally been divided into three categories. For the purpose of this handbook, these categories are referred to as normal, nonnormal, and emergency. Operators may use other titles for these categories such as abnormal instead of nonnormal. Operators may also further divide these categories into subcategories such as alternate and supplemental. POI's shall use the following guidance when evaluating the content of an operator's checklists.

A. *Content.* POI's shall ensure aircraft checklists are limited to action items or verification items. The aircraft checklist should not contain elaboration or explanation. POI's must ensure that the required actions and decisions for flightcrews when performing a checklist are thoroughly described in the operator's manual and training program. POI's should consider the following when evaluating aircraft checklist content:

(1) Nonnormal and emergency checklists must contain each sequential step of a procedure.

(2) A normal checklist is typically a listing of action items to be performed and verified at a particular point in flight. Normal checklist items do not necessarily represent a procedural step and may even represent completion of an entire procedure. For example, the item "Gear - Up and Locked" could indicate the gear handle had been raised, the gear indications checked, the gear handle had been placed in the neutral position to check the up-locks, and that the handle had then been returned to the up position. Most normal procedures do not require itemization or incorporation into a checklist. For example, the procedures for making normal takeoffs and landings are not itemized in a checklist format but described in a narrative format.

B. *Criticality of Checklist Items.* Checklist items can be ranked in criticality according to the potential effect of the crewmember failing to perform the action. Critical items are those items which, if not correctly performed, have a direct, adverse effect on safety. Noncritical items are "housekeeping" items or systems management items, which for operating practices must be routinely accomplished during a specific phase of flight, but if omitted would have a minimal effect on safety.

An item may be considered to be critical on one checklist but noncritical on another checklist. For example, a flightcrew's failure to set the flaps while accomplishing the before-takeoff checklist has had extremely adverse consequences. A flightcrew's failure to retract the flaps while performing the after-landing checklist, however, has had little effect on safety. The operator and POI shall analyze each phase of flight to identify critical items for that phase of flight and to ensure that all critical items are included on the checklist.

C. *Diversion of the Flightcrew's Attention.* The flightcrew's attention is diverted from other tasks when performing a checklist. Checklists must be kept as short as practical to minimize "heads-down" time and diversion of the crew's attention while performing the checklist.

(1) Each additional item that is added to a checklist increases the potential for: interruption when the checklist is accomplished, diversion of the crew's attention at a critical point, and the missing of critical items. Operators and POI's must weigh the benefit of including each item on a checklist against the possible adverse affects that can occur.

(2) Items not associated with aircraft operations (such as calls to the company) shall not be placed on the checklist.

D. *Aircraft Sophistication and Checklist Design.* The degree of technological sophistication in the design of the aircraft directly affects checklist items. In older aircraft, the flightcrew must manually select and monitor most items. In technologically-advanced aircraft the same items are accomplished and monitored by automatic systems which relieve the flightcrew of these tasks. Checklists for technologically-advanced aircraft tend to be shorter and simpler than those for older aircraft. POI's shall ensure that the operator's aircraft checklists are based on a careful task analysis of the operational requirements of the specific aircraft.

E. *Fleet Standardization.* POI's shall ensure that operators standardize checklist items and the sequence of items to the extent allowed by individual aircraft differences across all aircraft in the fleet. Checklists for technologically sophisticated aircraft are typically shorter and simpler than those for older aircraft. The items on checklists for technologically-advanced aircraft, however, are normally present on checklists for aircraft with older technology. POI's shall require operators to evaluate the feasibility of placing common checklist items on checklists with standard titles for all aircraft (such as before-start, before-takeoff, or before-landing checklists). Items should appear in a standard sequence to the degree possible. POI's should not normally approve placing an item on a checklist which is not required for that specific aircraft solely because the item is required in other aircraft of the fleet. POI's may make exceptions, however, when the operator provides adequate justification.

2201. METHODS OF CHECKLIST DESIGN. Operators may choose from at least two accepted methods of checklist design: the "challenge-do-verify" (CDV) method and the "do-verify" (DV) method. Available evidence suggests that safety is enhanced when the operator adopts and applies a consistent checklist design policy. POI's should use the following informative guidance when reviewing the design of an operator's aircraft checklists.

A. *"Challenge-Do-Verify."* The challenge-do-verify (CDV) method consists of a crewmember making a challenge before an action is initiated, taking the action, and then verifying that the action item has been accomplished. The CDV method is most effective when one crewmember issues the challenge and the second crewmember takes the action and responds to the first crewmember, verifying that the action was taken. This method requires that the checklist be accomplished methodically, one item at a time, in an unvarying sequence. The primary advantage of the CDV method is the deliberate and systematic manner in which each action item must be accomplished. The CDV method keeps all crewmembers involved (in the loop), provides for concurrence from a second crewmember before an action is taken, and provides positive confirmation that the action was accomplished. The disadvantages of the CDV method are that it is rigid and inflexible and that crewmembers cannot accomplish different tasks at the same time.

B. *"Do Verify."* The "do-verify" (DV) method (or "clean-up" method) consists of the checklist being accomplished in a variable sequence without a preliminary challenge. After all of the action items on the checklist have been completed, the checklist is then read again while each item is verified. The DV method allows the flightcrew to use flow patterns from memory to accomplish a series of actions quickly and efficiently. Each individual crewmember can work independently which helps balance the workload between crewmembers. The DV method has a higher inherent risk of an item on the checklist being missed than does the CDV method.

C. *Selection of Design Method.* Both the CDV and the DV methods of checklist design are currently being successfully used for normal checklists. Traditionally, operators have preferred the DV method for normal checklists and the CDV method for nonnormal and emergency checklists. Operators have, however, successfully used the CDV method for all checklists. POI's may approve either method for normal checklists. In most circumstances nonnormal and emergency checklists are more effective when the CDV method is used. The correct accomplishment of the actions and procedures incorporated in the nonnormal and emergency checklist categories is critical and warrants a methodical approach. Since these checklists are seldom used, however, crewmembers are usually not as familiar with the procedures incorporated into these checklists as they are with the procedures in normal checklists. In addition, many nonnormal and emergency checklists do not lend themselves to developing flow patterns which crewmembers can readily recall. The CDV method also enforces crew coordination, cross-checking, and verification, all of which aid the crewmember in overcoming the adverse effects of stress. POI's should not approve or accept the DV method for nonnormal or emergency procedures unless the operator can provide substantial evidence that the method is effective for this application.

D. *Mechanical or Electronic Checklists.* Mechanical or electronic devices differ in format from paper, hand-held checklists, but not in the design method or use. The CDV or DV methods can be applied to any type of checklist. POI's should encourage the use of such aids when operators find them effective.

E. *Verification.* POI's should keep in mind that all checklist designs are subject to human error. Crewmembers may omit and skip checklist items. Crewmembers may erroneously respond to a checklist at times believing that an item or task was accomplished when it was not. At times, crewmembers may see what they expect to see rather than what has actually been accomplished. Both the CDV and the DV methods are subject to such human errors. POI's must ensure that operators have developed policies for using checklists which require stringent cross-checking and verification to overcome these human limitations. These policies must be compatible with the operator's cockpit resource management philosophy. POI's shall review the operator's policies as an integral part of the review process.

2203. POLICIES FOR MANAGING THE ACCOMPLISHMENT OF CHECKLISTS. POI's must ensure that the appropriate sections of the operator's manuals contain the specific crewmember responsibilities for monitoring, verifying, and managing the accomplishment of checklists. These responsibilities should appear either as policy statements or as specific directives. POI's should use the guidance that follows when evaluating an operator's policies for the accomplishment of checklists.

A. *Objective of Policy Statements and Directives.* The primary objective of the operator's policy statements or directives is to standardize crewmember interaction. These statements should include, but not be limited to, the following items:

- Flightcrew responsibilities for maintaining aircraft control, analyzing situations, and for requesting the appropriate checklist in nonnormal and emergency situations
- The specified crewmember responsible for initiating each checklist
- The specified time when each checklist is to be initiated
- The specified crewmember responsible for accomplishing each item on the checklist
- The specified crewmember responsible for ensuring that each checklist is completed and for reporting that completion to the crew
- Crewmember responsibilities for bringing to the attention of the PIC and the rest of the crew any observed deviation from prescribed procedures

B. *Methods for Managing Checklist Accomplishment.* The following subparagraphs each contain a discussion of recommended methods an operator may use for managing checklist accomplishment. These methods are not all-inclusive and may not meet all of the operator's needs. POI's shall not interpret these methods as the only ones which are acceptable.

(1) For single-pilot aircraft, the FAA recommends that operators mount the before-takeoff

checklist and the before-landing checklist on the instrument panel by means of a placard. When aircraft characteristics allow, the operator should develop touch-verification procedures which contain a requirement that the pilot touch each control to verify it is in the correct position.

(2) For two-pilot aircraft in which only the PIC has ground steering control, the recommended method for accomplishing checklists is for the SIC to read all checklists when the aircraft is in motion on the ground. The recommended method for those aircraft in which either pilot can steer on the ground is for the pilot-not-flying (P-N-F) to read all checklists. In all two-pilot aircraft, the P-N-F should read all checklists when the aircraft is airborne.

(3) For three-crewmember aircraft, the recommended method is for the SIC to read the flight engineer (FE) portion of the before-engine-start checklist, so that the PIC can observe and verify the configuration of the flight engineer panel as the FE responds to each item on the checklist. Since the P-N-F is the crewmember most subject to interruptions from radio communications, it is recommended that the FE should read all normal checklists and verify that each pilot action has been taken when the aircraft is in motion. The FE should have the explicit task of verifying that critical items have been performed by the pilots, whether or not the FE has verbal responses for those items. In those nonnormal or emergency situations which involve significant activity by the FE, it is recommended that the P-N-F read the checklist and verify FE actions while the FE performs and responds to the items.

(4) For all aircraft, the crewmember responsible for reading the checklist should be responsible for ensuring that the checklist is completed systematically and expeditiously. This crewmember should be responsible for managing interruptions, cross-checking controls and indicators to ensure that the required actions have been accomplished, and for reporting that the checklist has been completed.

(5) The pilot-flying (P-F) should not be distracted from controlling the aircraft to perform a checklist item which another crewmember can accomplish. The P-F should activate only those switches or controls (other than the manual or automatic flight controls, throttles, and nosewheel steering) which are not within practical reach of another crewmember. Only one pilot should be "heads down" at any time.

(6) In the prestart phase, flight guidance and navigation checklist items have proven to be critical items. A response should be required from both pilots (and FE, if applicable) when the same setting is required for more than one device (such as computers, flight instruments, and altimeters). Inertial platform alignment and computer programming should be accomplished by one crewmember and independently confirmed by another crewmember. As many of these checklist items as possible should be accomplished and verified before the aircraft is moved.

(7) In the taxi and pretakeoff phases, aircraft configuration (such as flaps, trim, and speedbrakes) and flight guidance items (such as heading, flight-director, altitude select panel settings, and airspeed bugs) have proven to be critical. All flight crewmembers should confirm these items and at least two crewmembers should respond to applicable checklist items.

(8) On approach, flight guidance checklist items have proven to be critical items. At least two crewmembers should confirm and respond to these items. A response should be required from each pilot when the same setting is required on two separate devices (such as computers, flight instruments, or altimeters).

NOTE: One operator was able to reduce altitude deviations from an average of two per week to one per quarter by using stringent procedures for setting and verifying the altitude alerter.

(9) All checklist items which are critical in the before-landing phase vary with the type of airplane involved. In the operation of small airplanes, the landing gear has proven to be a critical checklist item and both pilots should confirm and respond to this item. Although the landing gear and flaps are critical items for large, transport category airplanes, the multiple warning devices and systems which are associated with these systems make the need for a response and confirmation by both pilots less critical.

(10) All checklists, except the after-takeoff and after-landing checklists, should be accomplished by one crewmember reading the checklist items and a second crewmember confirming and responding to each item. POI's shall ensure that critical items on the before-takeoff and before-landing checklists are confirmed and responded to by at least two crewmembers.

(11) All checklists must be designed so that the flightcrew can maintain an adequate visual scan and monitor ATC communications while simultaneously controlling the aircraft. The recommended method is for the operator to group the systems management checklist items after the configuration, thrust, and flight guidance items for each phase of flight. When systems management checklist items must be accomplished in a high workload environment, it is recommended they be accomplished by a single crewmember. Usually the after-takeoff and after-landing checklists items can be accomplished silently as these items have not proven to be critical. POI's should carefully evaluate the operator's overall operation and experience before approving other checklists in which a single crewmember may accomplish a checklist.

(12) Operators should direct crewmembers to refrain from accomplishing action items assigned to other crewmembers. Crewmembers should be directed that when they observe that another crewmember is not taking or has not taken a required action they must inform the crewmember, the PIC, or the whole crew, as appropriate.

(13) Checklists should not be depended on to initiate changes in aircraft configuration. Operators should key aircraft configuration changes to specific operational events. For example, the operator may direct the landing gear to be extended at glideslope intercept. For any adjustment of thrust, or configuration, a command from the P-F and an acknowledgement from the crewmember taking the action is required.

(14) Flight crewmembers frequently cannot complete a checklist when initiated either because of an interruption or because an item on the checklist has not yet been accomplished. POI's shall ensure that each operator has developed policies for the management of these situations. For short delays, the recommended policy is for the flightcrew to hold the checklist until the interruption is over and the item can be completed. When the checklist item is completed, the challenge should be repeated, the proper response given, and the checklist continued. POI's shall not accept policies that allow flightcrews to skip checklist items that have not been completed and then to depend on memory to accomplish the item later. When a mechanical or electronic device allows checklist items to be accomplished in a random sequence, the POI may allow policies appropriate to the system used.

(15) Procedures must be established to ensure that the correct checklist sequence is re-established when unusual events interrupt the normal sequence of a flight. For example, crewmember actions during normal sequences of flight are interrupted when long delays are encountered on taxi-out. In such a case, operators should require that the flightcrew return to an earlier point on the aircraft checklist and reaccomplish the checklist from that point.

2205. DEVELOPMENT AND SEQUENCING OF CHECKLIST ITEMS. POI's must ensure that checklists are developed from a careful task analysis and are consistent with the procedures section of the operator's flight manual. Phase checklist items must be in an appropriate and logical sequence. When a checklist represents an abbreviated procedure, that checklist must follow the procedural sequence. POI's should use the following additional guidelines concerning individual topics of checklist design.

A. Operators should standardize the sequence of checklist items as much as possible across aircraft types (see paragraphs 2199 (D) and (E)).

B. When the operator has a choice as to where an item should be placed on a checklist, it should be placed at a point where the crew workload is lowest.

C. Operators should keep checklists as short as possible in order to minimize interruptions.

(1) Operators should sequence checklist items to minimize interruptions of checklist accomplishment. For example, sequencing the "INS NAV MODE" as the first item on the engine-start checklist may allow the flightcrew to call for and complete the before-engine-start checklist at a convenient time even though INS alignment is not complete.

(2) Two short checklists may be preferable to a single long one. Operators may place a line or otherwise mark a checklist where the checklist can be held until a specific event occurs. This practice is acceptable because in essence, it creates two separate checklists.

D. Operators must include required preflight tests on checklists but should design checklists to preclude the unnecessary testing of systems.

(1) Warning systems with built-in test and automatic monitor circuits do not need to be checked or included on checklists unless required by the AFM or RFM.

(2) Many test switches in the cockpit are designed for use by maintenance personnel. Operators should not require flight crewmembers to perform these tests as a normal procedure.

(3) With concurrence of the AEG, POI's may approve the operator grouping required functional checks on a specific checklist which is performed before the first flight of the day (or at some other logical interval) and not repeated on subsequent flights.

E. Operators must clearly identify decision points and indicate the correct alternative action or alternative sequence of actions to be taken after each decision point. If the effect of adverse weather requires an alternate action, the operator should design the checklist to account for that alternate action. For example, if the autothrottles are normally engaged for takeoff except when engine anti-ice is being used, the checklist should contain a requirement that the autothrottles cannot be engaged with the engine anti-ice on.

2207. IMMEDIATE ACTION ITEMS. Immediate action items are those items accomplished from memory by crewmembers in emergency situations before the checklist is called for and read.

A. A flightcrew's failure to correctly accomplish all immediate action items can result in a threat to continued safe flight. For example, should a flightcrew fail to close the tank valve during an engine fire procedure, leaking fuel in the engine pylon may be ignited. In such cases, the first items on the corresponding checklist must be a verification that each immediate action item has been accomplished.

B. In some cases, an immediate action procedure may not be incorporated in a checklist. For example, there is no point in verifying that each item of an aborted takeoff procedure has been accomplished after the aircraft has been brought to a stop. In most cases, however, there should be a "follow-on" or "clean-up" checklist to be accomplished after the situation has been brought under control.

C. Immediate actions may be stated as policies rather than as checklist items when appropriate. An example of an immediate action item that can be stated as a policy rather than as a checklist item is the following statement: "All flight crewmembers shall immediately don O_2 masks and report to the captain on interphone in the event of loss of cabin pressure." In this example the loss-of-cabin-pressure checklist would contain subsequent items based on the assumption that the flightcrew is on oxygen and has established interphone contact.

2209. CHECKLIST TERMINOLOGY. POI's should ensure that the operator's aircraft checklists contain terminology that is tightly controlled to ensure clarity and common understanding. The following recommendations should be considered by POI's when reviewing checklists.

A. The challenges and responses on the checklist should be consistent with the labeling on the switches and controls in the cockpit.

B. Terms such as "tested," "checked," and "set" are acceptable terms only when they are clearly defined and consistently used.

C. Operators should have a consistent policy concerning responses to items with variable settings. "As required" may be printed on the checklist but should not be an authorized response. A response that gives the actual setting is normally appropriate. Items which require variable responses should be carefully evaluated. Such items may not actually be required on the checklist or may be more appropriately included in the system management portion of a checklist.

D. Responses to checklist items concerning liquid or gas quantities should be made in terms of the actual quantities on board compared to the specific quantity required, for example: "10,000 pounds required, 10,400 on board." When specific quantities are required, a response of "checked" is not acceptable. A response of "checked" is acceptable when a range of quantity is permitted and the range is marked on an indicator, such as a green arc on an oil quantity gage.

E. Excess verbiage on checklists should be discouraged. For example, a checklist item of "Reduce airspeed to 130 KIAS for best glide" can be abbreviated as "BEST GLIDE - 130 KIAS."

F. Ambiguous verbiage on checklists is not acceptable. For example, "takeoff power" can mean either to advance the power or to retard the power.

2211. AIRCRAFT DIFFERENCES. POI's shall ensure that operators account in the aircraft checklists for differences in various series of aircraft or in installed equipment. When there are only a few minor differences, this may be accomplished by using symbols to designate those checklist items that apply to only one series of airplanes or that apply only when the equipment is installed. When there are a significant number of differences, operators should prepare separate checklists for each series of aircraft. Policies and procedures should be established to account for differences in checklist responses when operations are conducted with equipment removed or inoperative, in accordance with MEL's and CDL's.

2213. SEQUENCING NORMAL CHECKLISTS AND OTHER CHECKLISTS. Normal checklist items may be incorporated in nonnormal or emergency checklists to simplify cockpit management. An acceptable alternative method is to require both the normal and nonnormal or emergency checklists to be accomplished in a specified sequence. This method has the advantage of allowing the normal checklist to be requested and accomplished at the time that it would normally be accomplished. Checklists should be designed so that two checklists are not in progress simultaneously. The method may depend on the degree of sophistication of the airplane involved. In technologically-advanced aircraft with short, simple checklists, it is usually preferable to keep the normal and the nonnormal checklists separate. In older airplanes, however, it may be necessary to add the normal checklist items to the nonnormal or emergency checklist simply to keep the checklist manageable.

2215. CHECKLIST FORMAT. POI's shall ensure that operators present checklists to flightcrews in a practical and usable format. POI's should use the following guidance when evaluating aircraft checklists for proper format.

A. Paper checklists should be protected either by plastic lamination or by being printed on heavy, folded pasteboard stock.

B. Nonnormal, alternate, and emergency checklists must be in a format that allows crewmembers to quickly and accurately find the correct procedure while the crewmember is under stress. To expedite the referencing of these checklists, a tabbed manual or other quick reference format is recommended.

C. For single-pilot aircraft, the before-takeoff checklist and before-landing checklist can be appropriately presented as placards on the instrument panel.

D. The type size and contrast used on a checklist is a compromise. A large type size is preferred for legibility. A small type size is preferred to keep the number of checklist pages to a minimum, which then further ease the locating of a specific checklist. The legibility of printed material depends on the size of the letters, the spacing between letters, and the type of font used. The following is offered as a suggestion to POI's for what to consider in evaluating the legibility of checklists. This guidance must not be interpreted as being the only acceptable print size and contrast that can be used for checklists:

- Checklist headings or titles - 12 point type, all caps, boldface, and a plain (sans serif) font
- Checklist text (challenge and response) and notes - 10 point type, boldface, and a plain (sans serif) font
- Contrast for headings or titles - either black print on white or reversed for emphasis
- Contrast for text - black print on white
- Colored borders for ease of identification green for normal checklists, yellow for nonnormal checklists, and red for emergency checklists

2216. - 2226. RESERVED.

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be airworthy for the proposed operation with an acceptable demonstration of ability and capability by the operator.

A. *Autoland or Heads-Up Display (HUD) Systems.* Before issuing authorization to use autoland or HUD systems in any operation, the inspector must determine that the operator's overall program will ensure that the equipment is properly installed and properly maintained for approach and landing operations. The operator's manuals and training programs must be evaluated to determine that they provide sufficient policy, guidance, operational procedures, and the training and checking necessary for the safe conduct of autoland or HUD operations. Inspectors must determine that these operations will be conducted in accordance with any necessary operational restrictions or limitations, applicable FARs, the standard operations specifications, and accepted safe operating practices. Approval is granted by the issuance of operations specifications paragraphs C61, C62, H110, or H111 as applicable.

B. *VOR/DME and DME/DME-Based RNAV Systems.* Before issuing authorization to conduct instrument approach procedures with RNAV systems, inspectors must determine that the operator's overall CAT I operations program will ensure that the operation can be conducted safely. Inspectors must also determine that the following additional criteria will be met:

(1) *Required Airborne Equipment.* The installed RNAV system must be approved in accordance with AC 90-45A (or equivalent criteria) for CAT I approach and landing operations. This approval must be valid for the areas, airports, and runways where the use of the system is proposed and any other equipment required must be serviceable.

(2) *Authorized Instrument Approach Procedures and Operating Minimums.* The use of the RNAV system must be restricted to those instrument approach procedures and operating minimums where the system can perform its intended function. The instrument approach procedures used must be authorized in accordance with the operations specifications. In general, VOR/DME-based RNAV and DME/DME-based RNAV systems can be used to conduct any VOR/DME-based RNAV and DME/DME-based RNAV instrument approach procedure established in Part 97. Other special RNAV instrument approach procedures can be authorized by listing them in paragraph C64 or H112 of the operation specifications. During the initial six months of operation with a particular aircraft and RNAV system combination, the authorized CAT I minimums must be increased by adding 200 feet to the HAT/HAA and 1/2 statute mile (RVR 2400) to the VIS/RVR.

(3) *Operations Manuals and Training.* The operator's manuals and training programs must provide sufficient policy guidance on the use of authorized instrument approach procedures and operating minimums. The manuals must include the specific airborne and ground-based equipment required for the RNAV approaches and the means for determining the airworthiness status of the required equipment, including any MEL provisions. The manuals must include the specific flightcrew procedures to be used and any additional dispatch (flight release) restrictions or limitations which must be met. The training and qualification program must ensure that flightcrews acquire any special knowledge, skills, and proficiency necessary for the conduct of RNAV instrument approach operations. If the flight guidance information is presented on a map display, without a simultaneous display of raw data information, the pilot-not-flying must select and display raw data information from the primary NAVAID's of the approach being flown.

(4) *Maintenance Program.* The airworthiness program must ensure that the required equipment is properly installed and maintained and continually adheres to the required system performance and configuration standards.

(5) *Validation Test.* Validation tests are required for initial operations with a particular type of RNAV system unless the use of this system was adequately demonstrated during the proving tests associated with the introduction of an aircraft into revenue service by the operator.

(6) *Higher Headquarters' Review.* Initial authorization for an operator to use a particular type of RNAV equipment requires regional flight standards review and concurrence. AFS-400 review and concurrence is not required unless it is specifically requested.

C. *Loran-C.* The use of Loran-C instrument approaches is not yet operationally mature enough to establish definitive approval standards. When the necessary level of experience is obtained, formal approval standards will be established. During the interim period, any requests for approval to use Loran-C instrument approach procedures must be reviewed and concurred with by AFS-400. AFS-400 will provide the current national policy, criteria, and guidance for authorizing Loran-C nonprecision approaches.

D. *ARA's/OSAP's/HEDA's.* All helicopter operations

using ARA's, OSAP's, or HEDA's must be approved in accordance with AC 90-80 (as amended).

E. *IFR Approaches in Uncontrolled Airspace.* The operator can be authorized to conduct CAT I AWTA operations in uncontrolled airspace if the requirements of the operations specifications are met.

(1) *Non-Scheduled Operations.* For non-scheduled operations, the inspector must ensure that the operator's CAT I operations program provides the policy, and direction and guidance necessary to safely conduct these operations. Inspectors must also ensure that the certificate holder's manuals cover the specific procedures which must be used, and the facilities and services which must be available and operational for the safe conduct of instrument approach operations in uncontrolled airspace.

(2) *Scheduled Operations.* In addition to meeting the requirements for non-scheduled operations, the inspectors must ensure that the facilities and services necessary for the safe conduct of instrument approach procedures in uncontrolled airspace during a scheduled operation are specified in the operations specifications.

(3) *Method of Approval.* The authorizations to conduct instrument approach procedures in uncontrolled airspace are granted by issuing paragraph C64 or H113 of the operations specifications.

563. APPROVAL OF CAT I ALL-WEATHER OPERATIONS. CAT I AWTA operations approvals are granted by issuance of, or amendments to, the operations specifications. The authorizations, limitations, and provisions applicable to CAT I operations are specified in Part C of the operations specifications (see C51, C52, C53, and C54). Operations specifications authorizing reciprocating and turbopropeller-powered airplane CAT I operations that use ICAO standard NAVAID's and ASR's and PAR's may be approved by certificate holding district offices without higher headquarters' review and concurrence, if the applicable conditions of this handbook are met. All turbojet, turbofan and propfan operations authorized to use the standard operating minimums and all RNAV instrument approach operations are required to have regional flight standards division review and concurrence before approval. All operations using NAVAID's which are not ICAO-standard NAVAID's (such as Loran C, GPS, ARA, and OSAP) are required to have both regional flight standards division and AFS-400 review and concurrence before approval.

564. - 580. RESERVED.

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SECTION 5. CATEGORY II OPERATIONS

581. GENERAL.

A. This section contains concepts, direction, and guidance to be used by inspectors for evaluating and approving or denying requests for authorization to conduct CAT II all-weather terminal area (AWTA) operations. This includes all CAT II AWTA operations at airports and runways new to an operator even though previously-approved aircraft, airborne equipment, ground-based equipment, concepts and procedures are being used in these operations. This section contains an amplification of the general concepts, policies, direction, and guidance given in previous sections of this chapter. Specific standards are provided for evaluating CAT II AWTA operations with airborne and ground-based equipment which have well-understood operational characteristics and limitations. When an operator requests approval to conduct CAT II AWTA operations using equipment, concepts, or procedures not addressed by these standards, a request for policy, guidance, and direction must be forwarded through the Regional Flight Standards Division (RFSD) to AFS-400.

B. CAT II AWTA operations are defined, for the purpose of this handbook, as all approach and landing operations conducted in IFR weather conditions in accordance with an instrument approach procedure using CAT II operating minimums. CAT II operating minimums are those minimums which specify a decision height (DH) lower than the equivalent of 200 feet (60 meters) above the touchdown zone but not lower than 100 feet (30 meters) above this elevation and a controlling runway visual range (RVR) below RVR 1800 (below RVR 1600 for helicopters) but not less than RVR 1200. All IFR, AWTA operations with operating minimums less than DH 100 (or no DH) and/or a controlling RVR below RVR 1200 are CAT III operations.

(1) *Types of CAT II Operations.* The only types of CAT II operations which can be currently authorized (1991) for use by U.S. operators are ILS-based operations. MLS-based CAT II operations, however, can probably be conducted in the near future provided the operation is restricted to an "ILS-like" operation which has at least a 4 nm or 5 nm straight-in final approach segment. The flight control laws (computational logic) used in most existing flight directors and autopilots require that a final approach segment be at least this long to perform their intended functions in CAT II operations. Most existing flight control guidance systems will have to be modified and recertificated before CAT II, MLS operations with a short final approach segment can be conducted. This action is necessary for CAT II operations with segmented and/or curvilinear approach paths which result in straight-in final approach segments that are significantly less than 5 nm. Usually this action will include equipment modifications, type design approval, an extensive engineering analysis, and a flight test program. Certain new aircraft, however, will probably be configured with the necessary equipment and certificated for segmented approach paths, and curvilinear approach paths with very short "straight-in" final approach courses, or both.

(2) *Objective of CAT II Operations.* The essential difference between CAT II and CAT I operations is that a CAT II operation places a greater reliance on the guidance provided by the airborne and ground-based equipment. This equipment must be capable of delivering the aircraft to a position from which the flightcrew can accomplish a transition from instrument to visual flight at a height above touchdown (HAT) of 100 feet and complete the landing in the reduced (CAT II) seeing-conditions. The primary objective of CAT II operations is to provide a level of safety equivalent to CAT I precision instrument approach operations even though the seeing-conditions in CAT II operations can be much worse than those encountered in CAT I operations. This objective (the equivalent level of safety) is achieved by the following:

- Enhanced reliability and precision in the airborne and ground-based equipment to increase the precision of flightpath control
- Enhanced flightcrew training and qualifications to increase the precision of flightpath control
- Additional visual aids to enhance seeing-conditions
- Additional criteria to ensure obstacle and terrain clearance
- Additional criteria to ensure ILS/MLS signal protection
- Special operational procedures
- Special ATC procedures, limitations, or both

- Instrument approach procedures which ensure a safe and orderly transition from the en route phase of flight to a point on final approach at a HAT of 100 feet from which a visual landing can be made, or a missed approach can be safely executed with a transition through the missed approach segment back to the en route environment

- Instrument approach procedures, operational flight procedures, and ATC procedures which ensure protection from obstacles near the landing surface (either fixed or mobile) and which also permit safe go-arounds from any point in the approach and landing before touchdown

583. CAT II OPERATIONAL CONCEPTS. The weather conditions in a CAT II operation restrict seeing-conditions so that the external visual references necessary to manually control the aircraft are not acquired until the aircraft reaches a very low altitude (typically 150 to 200 feet AGL). Therefore, the flightcrew must operate and control the aircraft by referring to instruments throughout most of the approach and to a combination of instrument and external visual information during the final stages of the approach, flare (deceleration for helicopters), and landing. Because of the reduced maneuvering capability resulting from CAT II seeing-conditions, the precision of the flight guidance system and the overall precision of flightpath control must ensure that the aircraft can be flown to a position which is closely aligned with the runway centerline, and the desired glidepath. The increased reliability and precision required of the airborne and ground-based equipment is necessary to ensure that when the aircraft arrives at DH, it is on a flightpath which permits the pilot to complete the landing without any significant runway alignment maneuvers. All CAT II operations are conducted in accordance with the DH and RVR concepts used in CAT I operations. Because of the limited seeing-conditions available in CAT II weather conditions, however, the additional requirements outlined under the objective of CAT II operations (see previous paragraph) are necessary to assure that an adequate level of safety is maintained when an aircraft is being operated in these conditions.

A. *Function of Visual Reference.* Because of the limitations in the airborne equipment used in CAT II operations and the available instrument guidance, the pilot must have sufficient visual references to manually control and maneuver the aircraft from the DH to a full stop on the runway. These external visual references are required below DH for the pilot to control and maneuver the aircraft, align the aircraft with the runway centerline, touchdown within the touchdown zone, and then rollout on the runway.

B. *Decision Region.* The "decision region" is that portion of the approach between 300 feet AGL and DH where the tracking performance must be critically evaluated to determine whether the overall system performance is sufficient for the aircraft to continue to DH. As previously discussed, the visual scene normally expands as the aircraft descends because of geometric and slant range effects. The pilot must integrate the instrument information with the visual cues, as they become available, and decide before passing DH to either continue the approach by visual reference or to execute a go-around. This information must be integrated and evaluated in the "decision region" and the pilot must make a definitive decision before the aircraft passes DH. While in the "decision region," the flightcrew should be especially aware of the maximum permissible excursions of the raw, ILS indications (deviations) from which a landing can be safely completed. The tracking performance parameters normally used within the "decision region" are $\pm$ 1/3 dot localizer displacement (maximum) and $\pm$ 1/2 dot glideslope displacement (maximum) with no sustained oscillations about the localizer or glidescope. If the tracking performance is outside of these parameters while within the "decision region," a go-around should be executed because the overall tracking performance is not sufficient to ensure that the aircraft will arrive at the DH on a flightpath which permits the landing to be safely completed.

C. *CAT II DH.* The DH is the lowest height to which the approach can be conducted by instrument reference alone. The DH is the minimum height at which the flightcrew must decide to either continue a CAT II approach by visual reference or to go-around. It is *not* the point at which the evaluation and decision process is begun. The evaluation and decision process must continue after passing the CAT II DH to assure that sufficient visual references are maintained to manually control and maneuver the aircraft and to assure that the aircraft remains aligned with the runway centerline and will safely touchdown within the touchdown zone. The flightcrew must immediately execute a missed approach if the required visual references are not maintained or when the pilot cannot determine that a safe landing will be accomplished.

D. *Purpose of CAT II Operating Minimums.* CAT II operating procedures and minimums have been established to ensure that the desired level of safety is achieved when CAT II seeing-conditions exist. These operating minimums are based on the DH and RVR concepts (see section 3,

paragraphs 489 and 495). The established operating minimums (DH and RVR) determine the minimum safe heights for instrument flight and the minimum RVR at which the landing can safely be completed by external visual reference in a particular aircraft. These operating minimums are based on established CAT II operational concepts and on the required CAT II airborne equipment, ground-based visual and electronic equipment, operating procedures, and pilot training and qualification. These operating minimums, when combined with other CAT II requirements, ensure that the combination of information available from external visual sources and the aircraft instruments and equipment is sufficient to enable properly qualified pilots to safely operate the aircraft along the desired flightpath. As the quality and quantity of external visual information decreases due to reduced seeing-conditions (when operating minimums are reduced), the quality and quantity of the instrument information and the proficiency of the flightcrew must be increased to maintain the desired level of safety.

E. *Establishing Operating Minimums.* The operating minimums (DH and RVR) for CAT II operations are usually determined by the tasks the pilot will be required to perform to complete the landing after passing the DH. When establishing operating minimums, consideration is given to the degree of precision in flightpath control provided by the required electronic equipment, and the enhanced seeing-conditions provided by the required visual aids. Generally, the minimum required seeing condition (RVR) is higher-than-standard (for example, RVR 1600) when the pilot is required to establish visual reference at a higher altitude (for example, HAT 150) because of obstacles or limitations in the ground-based guidance. The RVR minimum is also higher if the pilot has to establish better seeing-conditions because of the complexity or difficultly of piloting tasks required to safely complete the landing (for example, factors related to the design or handling characteristics of a particular aircraft). Two basic sets of operating minimums are established for CAT II operations. These are DH 150/RVR 1600 and DH 100/RVR 1200. Most runways which support CAT II operations permit the use of DH 100/RVR 1200 operating minimums. Operating minimums at some runways, however, are restricted to DH 150/RVR 1600 because of limitations in the ground equipment (such as a single RVR reporting system), limitations imposed by the prethreshold terrain (radar altimeter not authorized) and/or obstacle clearance limitations in the final approach surface, the approach light surface, the touchdown area, and the missed approach area. The CAT II operating minimums are established in accordance with the criteria in AC 120-29 (as amended), this handbook, and U.S. TERPS.

585. STANDARD CAT II OPERATIONS. Standard CAT II operating minimums (DH 100/RVR 1200) are based on the "building block" approach. The building block approach is based on CAT I operations, including standard CAT I requirements, and includes the special aeronautical knowledge, experience, skill, training, and qualifications as well as the special airborne and ground-based equipment specified in AC 120-29. The assumptions and criteria used in aircraft certification and CAT II instrument approach procedure design must be compatible with the operational concepts in this handbook. These assumptions and criteria ensure that flightcrews and aircraft which meet the requirements of this handbook and AC 120-29 can be used to safely conduct CAT II operations using standard CAT II minimums. Any special equipment or procedures necessary for the safe conduct of CAT II operations must be specified in the airworthiness certification basis of the aircraft (type certificate or supplemental type certificate) and in the FAA-approved aircraft flight manual. Any aircraft which cannot be safely operated to standard CAT II operating minimums using flightcrews that meet the minimum requirements of this handbook and AC 120-29 shall not be certificated or otherwise approved for CAT II operations. The operations specifications (OpSpecs) establish the lowest operating minimums which can be used in any CAT II operation, even if the established instrument approach procedure specifies minimums lower than those values. Special airborne equipment, special ground-based equipment and special flightcrew training required for CAT II operations are specified in this handbook, AC 120-29, and the FAA-approved aircraft flight manual.

A. *Standard CAT II Operating Minimums.* The standard CAT II operating minimums for all aircraft are DH 100 and RVR 1200. The DH must be based on the use of either the inner marker or radio (radar) altimetry. Usually the CAT II DH is based on the use of radio (radar) altimetry. Barometric altimetry is not an acceptable means of establishing the DH for CAT II operations using the standard CAT II minimums (DH 100).

B. *Higher-Than-Standard CAT II Operating Minimums.* The higher-than-standard CAT II minimums for all aircraft are DH 150 and RVR 1600. These minimums are usually applied as interim minimums (restricted to higher-than-standard CAT II minimums) for the first 6 months of operation with an aircraft new to an operator. The first 6 months are used to validate the effectiveness of the

operator's maintenance program to support use of the standard CAT II minimums (see paragraph 7A for special credit for fail-passive/fail-operational flight control systems). These minimums are also applied when there are transmissometer limitations (only one installed), obstacle clearance requirements, or prethreshold terrain limitations (radio (radar) altimeter *not authorized*) which preclude the use of standard CAT II minimums. DH 150 and RVR 1600 are also the lowest minimums which can be approved when the DH is based on barometric altimetry.

C. *Operational Approval Basis.* Standard CAT II operations are approved for an operator by the issuance of OpSpecs which authorize the conduct of CAT II instrument approach procedures at specified airports. The basis for this approval depends on the operating rules applicable to the operation (Part 121 or Part 135), the complexity of aircraft (turbine-powered, reciprocating, or helicopter), the passenger capacity of the aircraft, and/or the size of the aircraft (large or small).

(1) *Part 121 Operations.* All CAT II operations conducted under Part 121 are approved in accordance with this handbook and AC 120-29. The CAT II provisions of Part 61 and Part 91 do not apply to these operations.

(2) *Part 135 Airplane Operations.* CAT II airplane operations conducted under Part 135 are approved in accordance with flight standards policy, which is illustrated in the following cases.

(a) *Case 1.* This case involves the operational approval basis for all turbine-powered airplanes, all airplanes certificated with 10 or more passenger seats, and all large airplanes (over 12,500 lbs.). All Case 1 airplanes operated under Part 135 are approved in accordance with this handbook and AC 120-29. The CAT II provisions of Part 61 and Part 91 do not apply to these operations.

(b) *Case 2.* This case involves the operational approval basis for all airplanes operated under Part 135 which are not included in Case 1. All Case 2 airplanes are approved in accordance with this handbook and the provisions of Appendix A to Part 91. CAT II provisions of Part 61 do not apply to these operations.

(3) *Part 135 Helicopter Operations.* All CAT II operations conducted under Part 135 using helicopters are approved in accordance with this handbook and AC 135-(TBD). The CAT II provisions of Part 61 and Part 91 do not apply to Part 135, CAT II helicopter operations.

D. *CAT II Flight Guidance and Control Systems.* Standard CAT II operations are based on the use of special airborne and ground-based equipment which have capability, reliability, and redundancy superior to the equipment required for CAT I operations (see AC 120-29). Although CAT II airborne equipment provides increased capability, reliability, and redundance, the flight control guidance systems used in these operations are not necessarily capable of automatically detecting all potential failures which could significantly disturb the aircraft's flightpath (for example "single-channel" flight control systems). If such failures occur, the flightcrew must be able to quickly detect the failure and to intervene manually to continue safely to the approach and landing or execute a missed approach (see paragraph 587 that follows for special credit for the use of "fail-passive" or "fail-operational" flight control systems). In other words, standard CAT II operations are based on the use of single-channel flight directors, or single-channel autopilots, or combinations of both. Even though some CAT II operations are based on dual-independent flight directors, each of these systems is usually a single-channel system which is not capable of detecting all potential failures. Therefore, even with dual-independent flight directors, the flightcrew must be able to detect failures and manually intervene in certain cases. Standard CAT II operations are also based on the use of: Type II (redundant) ILS ground equipment; dual ILS airborne equipment; radio altimeters (to identify DH); instrument failure detection and warning systems; special missed approach guidance equipment; and rain removal equipment.

E. *Airworthiness of CAT II Airborne Equipment.* Throughout the history of CAT II operations, two processes have existed for showing that the airborne equipment of the aircraft is airworthy for CAT II operations. One process is the type design approval process in which approval is obtained during aircraft certification testing. The other is the operational demonstration and approval process in which approval is obtained after the operator demonstrates satisfactory airworthiness of the equipment in actual flight operations. Currently, the most prevalent process is the type design approval process in which approval is contained in the FAA-approved aircraft flight manual. Aircraft which have CAT II type design approval are not required to undergo an operational airworthiness demonstration. For aircraft which do not have CAT II type design approval, however, an operational demonstration of CAT II airworthiness in accordance with AC 120-29 is required. Generally, this operational demonstration program

includes a requirement that the operator conduct at least 300 approaches to 100 feet in CAT I weather conditions using the proposed CAT II system. AFS-400 concurrence is required before any operational demonstration and approval program may be initiated.

F. *Validation of CAT II Maintenance Program.* The airborne system reliability required for the conduct of CAT II operations is achieved by special design requirements and special maintenance programs. The special maintenance programs necessary for CAT II operations are extensive and expensive and are usually the largest factor affecting an operator's decision of whether or not to conduct these operations. When an operator requests authorization to conduct operations with aircraft equipped with standard CAT II equipment, and that aircraft is new to CAT II operations with the operator, all CAT II operations with those aircraft shall be initially restricted (for at least 6 months) to higher-than-standard operating minimums (DH 150 and RVR 1600). This restriction must remain in place until the operator has successfully validated its maintenance program in accordance with AC 120-29. If an aircraft has type design approval for CAT III operations, it may be possible for the operator to be initially authorized for standard CAT II minimums (DH 100 and RVR 1200) with those aircraft if certain equipment restrictions are specified in the operator's OpSpecs.

G. *Airports and Runways.* All CAT II operations are restricted to airports and runways which meet the special safety requirements necessary for CAT II operations. Within the U.S., all approved CAT II airport and runway operations are conducted in accordance with approved CAT II instrument approach procedures published in Part 97. U.S. CAT II operations shall only be conducted in accordance with an approved Part 97, CAT II instrument approach procedure. In foreign countries, CAT II operations conducted by U.S. operators are restricted to those runways approved in accordance with Order 8260.31. Even though a particular runway is approved for CAT II operations, an operator cannot be authorized to conduct CAT II operations at that location until all requirements of this handbook are met and that particular CAT II operation is authorized in the operator's OpSpecs.

H. *Higher Headquarter's Review and Concurrence.* All initial CAT II approvals for each type of aircraft operated by an operator require review and concurrence by the RFSD and AFS-400 before OpSpecs may be issued for that operation. Unless specified otherwise in AFS-400's review and concurrence, subsequent reductions in CAT II operating minimums for each aircraft type require RFSD concurrence before the revised OpSpecs authorizing the lower minimums can be issued to the operator.

587. SPECIAL CAT II OPERATIONS. Special CAT II operations are those operations which require special airborne or ground-based equipment, and/or procedures. Special CAT II operations include operations which are granted operational credit for the use of special airborne equipment capabilities, such as automatic landing. Special CAT II operations also include those operations which require special ground-based equipment and special procedures to conduct CAT II operations which could not be safely conducted with conventional aircraft using standard airborne equipment and procedures (for example, steep-angle, CAT II, MLS approaches).

A. *Operational Credit for CAT III Equipment.* The installation of CAT III airborne equipment in newly-manufactured large aircraft is becoming common. As a result, in certain cases an operator can obtain operational credit in CAT II operations when these more capable systems are used. Airborne equipment which is type design-approved for CAT III operations has special design features which increase the safety of operations in CAT II seeing-conditions. For example, the flightpath of the aircraft is not normally disturbed when failures occur in the flight guidance and control system. This is because the increased redundancy, reliability, and integrity built into the CAT III systems causes the system either to disconnect "passively" or to remain fully operational for the landing. Even though operating minimums in CAT II operations cannot be reduced below DH 100 and RVR 1200 because of other limitations, operational credit for the use of CAT III airborne systems may be granted to an operator by the authorization of operating minimums of DH 100 and RVR 1200 for initial CAT II operations (first 6 months) with these aircraft. In this case certain restrictions must be specified in the operator's OpSpecs. This operational credit eliminates the requirement to conduct the initial operations using DH 150 and RVR 1600 and permits the operator to use standard CAT II minimums (DH 100 and RVR 1200) at least 6 months earlier than usual.

(1) In standard CAT II operations, the objective of the requirement for an operator to validate the CAT II maintenance program for at least 6 months with minimums restricted to DH 150 and RVR 1600 is to ensure that the required level of airborne equipment reliability is achieved. This is to ensure that frequent malfunctions will not occur in standard CAT II operations (DH 100 and RVR 1200). The design features of CAT III airborne equipment significantly reduce the potential for failures which could

adversely affect standard CAT II operations. As a result, validation of the CAT II maintenance program before conducting operations to DH 100/RVR 1200 is not necessary if these operations are conducted under a restriction that requires the airborne equipment to operate to CAT III standards (for example, fail-passive or fail-operational automatic landing). This permits the operator to conduct operations with standard CAT II minimums during the 6-month period used to validate its maintenance program. When the operator has successfully validated its maintenance program, the restriction which requires the airborne equipment to be operated to CAT III standards can be removed by amending the operator's OpSpecs to authorize the use of DH 100/RVR 1200 minimums with standard CAT II equipment (for example, "single-channel" autopilot, or manually-flown operations).

(2) If the operator requests operational credit for the use of CAT III systems to conduct standard CAT II operations, the operator's OpSpecs which authorize the conduct of these operations must include a limitation which specifies that all CAT II operations using DH 100 and RVR 1200 as operating minimums must be conducted with the airborne equipment operating to CAT III standards. This limitation should read "fail-passive autoland only" or "fail-passive/fail-operational autoland only," as appropriate, for aircraft equipped with CAT III automatic landing systems or "fail-passive HUD only" for aircraft equipped with CAT III, heads-up display systems. These restrictions must remain in the operator's OpSpecs until the CAT II maintenance program for that aircraft is successfully validated.

B. *Operations Requiring Special Airborne Capabilities.* Certain aircraft with unique handling characteristics or unique design features may be required to have special airborne capabilities to permit CAT II operations to be safely conducted. These special airborne capabilities are used to enhance handling characteristics during manual flight (stability augmentation systems), to enhance flightpath control during flare and touchdown (automatic landing systems), and to enhance flightpath control during automatic flight (auto-deceleration and hover systems). Stability augmentation systems are frequently necessary in helicopters to enhance low-speed handling characteristics in CAT II seeing-conditions. Auto-deceleration and hover systems may be used in the future for certain helicopters. Currently (1991), the B-747 is the only airplane which must have autoland capability to conduct standard CAT II operations (DH 100 and RVR 1200). All CAT II operations with the B-747 using operating minimums below DH 150/RVR 1600 must be predicated on the use of the automatic landing system. Either manually-flown or autocoupled CAT II operations can be conducted with the B-747 using higher-than-standard operating minimums (DH 150/RVR 1600).

589. CAT II TERMINAL INSTRUMENT APPROACH PROCEDURES (U.S. AIRPORTS). All CAT II operations conducted in the U.S. must be conducted in accordance with an approved Part 97, CAT II Instrument Approach Procedure. CAT II instrument approach procedures in the U.S. are established in accordance with the criteria in U.S. TERPS and AC 120-29.

A. Paragraphs C59 and H108 of the OpSpecs are used to specify the CAT II instrument approach procedures, airports and runways, CAT II approach and landing minimums, and the aircraft that a particular operator is authorized to use in CAT II operations. These paragraphs also specify the CAT II airborne equipment, RVR equipment, pilot qualifications, missed approach requirements, and the operating limitations which apply to that operator's CAT II operations. If the flightcrew is properly trained and qualified, and the aircraft is properly equipped and maintained, an operator can be authorized to conduct CAT II operations to airports and runways where the CAT II instrument approach procedure is prescribed by any of the following:

- OpSpecs (paragraphs C59 or H108, as applicable)
- Part 97
- U.S. military for military airports
- Prescribed or approved by the government of an ICAO contracting state, provided that the procedure is authorized for CAT II operations by U.S. operators in accordance with Order 8260.31 and listed by AFS-400 as approved for CAT II/III operations

B. The criteria in AC 120-29 and this handbook establish the lowest approach and landing minimums which can be authorized for CAT II operations. The CAT II approach and landing minimums authorized for a particular operator are specified in paragraphs C59 and H108 of the OpSpecs. Inspectors shall not authorize an operator to use approach and landing minimums lower than these values. Additionally, inspectors shall not authorize CAT II approach and landing minimums at foreign airports unless the provisions of this handbook and Order 8260.31 are met.

591. FOREIGN CAT II INSTRUMENT APPROACH PROCEDURES.

A. *Degree of Equivalence.* The CAT II ground-based systems and approach procedures at foreign airports may not be exactly in accordance with U.S. standards. As a result, it is critical that the information and functions necessary for CAT II operations (as provided by the ground-based systems and approval procedures at the foreign airports) are consistent with the intent of U.S. CAT II standards. Foreign airports and runways which have been determined to be equivalent to U.S. CAT II standards are identified by FAA-approved lists in accordance with Order 8260.31. Operators desiring CAT II approvals at foreign airports which are not on these lists should submit a request for approval through the POI and the RFSD to AFS-400. The major factor considered by AFS-400 and the "controlling region" when approving foreign airports and runways for CAT II operations by U.S. operators is the degree of equivalence with U.S. CAT II standards. When determining whether a foreign CAT II operation is sufficiently equivalent to U.S. standards to permit approval for use by U.S. operators, AFS-400 and the controlling region evaluate the following for the degree of equivalence:

- High-intensity approach lights
- High-intensity runway edge lights
- Touchdown zone and centerline lights
- Runway markings
- Quality and integrity of the approach and landing ground-based guidance systems
- RVR reporting capabilities and procedures
- ILS/MLS critical area protection
- Obstacle clearance protection in the approach and missed approach, including the obstacle-free zone
- Airport surface traffic control
- Terminal area air traffic control

B. *Authorizing Foreign Airports/Runways.* The standard OpSpecs, AC 120-29, this handbook, and Order 8260.31 establish the conditions which must be met for all CAT II operations at foreign airports and runways. These documents contain the policies, criteria, procedures, and general requirements that must be used to authorize, restrict, or deny the use of foreign, CAT II instrument approach procedures. This includes all foreign CAT II instrument approach procedures developed by the following types of foreign countries:

- ICAO contracting states (ICAO members)
- Non-ICAO countries (non-ICAO members)
- Countries in which the FAA has developed the CAT II instrument approach procedure for the foreign country

593. FOREIGN FLAG CAT II OPERATIONS IN THE U.S. The airborne equipment, pilot training, and pilot qualification standards required for CAT II operations by foreign authorities and foreign operators may not be in exact accordance with U.S. standards. For safety reasons, however, it is essential that foreign flag operators conduct CAT II operations in the U.S. in a manner which is consistent with the intent of U.S. CAT II standards. The foreign flag operator's aviation authority (State of the operator) has prime responsibility for determining that the operator complies with the special requirements that the foreign aviation authority has specified for CAT II operations at any airport, including U.S. airports. The State of the operator also has prime responsibility for authorizing and restricting operating minimums for any operation by the foreign flag operator. Therefore, the inspector's prime responsibility related to foreign flag CAT II operations is to ensure that they are conducted in the U.S. in a manner consistent with the intent of U.S. standards and procedures.

A. *General Policies.* When evaluating a request by a foreign flag operator to conduct CAT II operations within the U.S., inspectors shall apply the following policies associated with the unique nature of these operations and with the responsibilities of the State of the operator:

(1) A foreign flag operator will not be authorized to conduct CAT II operations in the U.S. unless that operator is authorized by its foreign aviation authority to conduct CAT II operations.

(2) Foreign flag operators will not be authorized to use CAT II operating minimums in the U.S. that are lower than the CAT II operating minimums authorized by the foreign aviation authority for CAT II operations.

(3) Foreign flag operators will not be authorized to use CAT II operating minimums in the U.S. that are lower

than the lowest minimums authorized for a comparably equipped U.S. operator.

(4) All CAT II operations conducted by foreign flag operators in the U.S. must be conducted in accordance with a Part 97, CAT II instrument approach procedure.

(5) The foreign flag operator must provide documentation to the FAA which confirms that its foreign aviation authority has determined that the CAT II program to be used is equivalent to the program required in AC 120-29.

(6) The foreign aviation authority must confirm that the foreign flag operator is authorized to conduct CAT II operations with a particular aircraft type, and that its flight operations and maintenance programs are equivalent to U.S. CAT II standards. Usually this confirmation satisfies the inspector's responsibility for determining whether the operator's aircraft are properly equipped and maintained and whether the operator's flightcrews are properly trained and qualified for CAT II operations.

B. *Foreign Flag CAT II Approach and Landing Minimums.* The criteria in AC 120-29 and this handbook establish the lowest approach and landing minimums which can be authorized, under any circumstances, for foreign flag CAT II operations in the U.S. The CAT II operating minimums authorized for a particular foreign flag operator are specified in the OpSpecs in a manner similar to minimums specified for U.S. operators. Inspectors shall not, however, authorize a foreign flag operator to use CAT II operating minimums lower than the values authorized by the foreign aviation authority. The airborne equipment required by AC 120-29 and any additional equipment required by the foreign aviation authority for CAT II operations must also be specified in the OpSpecs.

(1) *Standard CAT II Operating Minimums.* If a foreign flag operator has at least 6 months of satisfactory experience conducting CAT II operations with a particular aircraft type, that operator can be authorized to use standard CAT II minimums (DH 100/RVR 1200) in the U.S. with that aircraft. This requirement can be met with 6 months of satisfactory experience with that aircraft type in CAT II operations in any country, without obtaining any of the CAT II experience in the U.S.

(2) *Higher-Than-Standard CAT II Operating Minimums.* If a foreign flag operator does not have at least 6 months of satisfactory experience (in any country) in conducting CAT II operations with a particular aircraft type, that operator shall be restricted to higher-than-standard CAT II operating minimums (DH 150/RVR 1600) until it completes a 6-month demonstration program. Because of the high degree of international standardization for CAT II facilities, the data collected during this demonstration program can be obtained at foreign airports as well as U.S. facilities. Following the completion of this demonstration program, the foreign flag operator does not need to submit demonstration data to the FAA. Instead, the foreign flag operator must present confirmation from the foreign aviation authority that the demonstration was acceptable and the operator is authorized to use standard CAT II operating minimums (DH 100/RVR 1200) at U.S. airports.

595. CAT II EVALUATION AND APPROVAL PROCESS. The approval process for CAT II, AWTA operations is generally the same as the general process for approval or acceptance described in volume 1, chapter 4, section 6 of this handbook. The approval process for CAT II operations closely parallels the process used to approve CAT I operations. This paragraph outlines specific criteria related to the evaluation and approval of CAT II operations.

A. *General Criteria.* Before authorizing an operator to conduct CAT II operations, inspectors must evaluate the operator's proposed operations and determine that the operator is competent to safely conduct these operations. Inspectors must also determine that the operator has specified the conditions necessary for the safe conduct of the proposed operations and that those conditions ensure that the following criteria are met:

- Operations are restricted to those aircraft which are properly equipped and airworthy for the CAT II operations being conducted
- Compliance with regulatory requirements for the operations
- Compliance with the requirements of Part C of the standard OpSpecs
- Compliance with the requirements of this handbook
- Compliance with the CAT II criteria of AC 120-29 or Part 91, Appendix A (as applicable)
- Accepted, safe operating practices are provided

- The use of the concepts of stabilized approach and decision region in all CAT II operations is required

- CAT II operations are restricted to those pilots who are properly trained, experienced, qualified, and proficient for CAT II operations

- CAT II operations are restricted to those airports and runways which meet CAT II requirements

- CAT II operations are authorized and/or restricted at foreign airports and runways in accordance with Order 8460.31

B. *Airport, Runway, and Ground-Based Equipment Requirements.* The suitability of the airport and runway for the type of aircraft and the operation being conducted is an integral part of an inspector's evaluation and approval of CAT II operations. The basic requirements for standard CAT I operations and the performance requirements in the applicable operating rules address the majority of the criteria required for CAT II operations. In the operating concepts and criteria for CAT II operations, however, it is required that certain other factors be considered. Inspectors must ensure that the operator fully understands CAT II operational requirements and that the company manuals and training programs provide the policy, guidance, training, and procedures necessary to ensure that these other factors are adequately addressed. When evaluating an operator's overall CAT II operations program, inspectors must consider whether the program accounts for the following factors when designating airports to support CAT II operations:

- Suitability of the runways, runway field lengths, taxiways, and other maneuvering areas on the airport, considering the restricted seeing-conditions associated with CAT II operations

- CAT II instrument approach procedures and NAVAID's to be used

- Procedures for CAT II protection of the runway safety areas, obstacle-free zones, and ILS/MLS critical areas, as well as runway and taxiway incursion prevention procedures in CAT II weather conditions

- ATC facilities and services required for CAT II operations

- Required safety facilities and services (such as crash, fire, and rescue) and any special procedures needed for the CAT II operations

- RVR reporting and weather reporting and forecasting services

- Aeronautical information services related to these operations (such as NOTAM's and ATIS)

- Adequacy of lighting, marking, and other visual aids necessary to support CAT II operations

- Necessity for prohibiting CAT II operations at airports and runways which are not approved for CAT II operations (not authorized by Part 97 or Order 8460.31)

596. - 610. RESERVED.

[PAGES 4-220 THROUGH 4-240 RESERVED]

SECTION 6. CATEGORY III OPERATIONS

611. GENERAL.

A. This section contains concepts, direction, and guidance to be used by inspectors for evaluating and approving or denying requests for authorization to conduct CAT III all-weather terminal area (AWTA) operations. All CAT III operations using aircraft, airborne equipment, ground-based equipment, or, concepts or procedures which are new to a particular operator require approval. In addition, all CAT III operations at airports and runways new to a particular operator require approval even though previously approved aircraft, airborne equipment, ground-based equipment, concepts and procedures are used in those operations. This section contains an amplification of the general concepts, policies, direction, and guidance covered in previous sections of this chapter. Specific standards are provided for inspectors evaluating CAT III AWTA operations with airborne and ground-based equipment which have well understood operational characteristics and limitations. In cases where an operator requests approval to conduct CAT III AWTA operations using equipment, concepts, and/or procedures not addressed in these standards, a request for policy and guidance must be forwarded through the appropriate Regional Flight Standards Division (RFSD) to AFS-400.

B. CAT III AWTA operations are defined, for purposes of this handbook, as all approach and landing operations conducted in instrument meteorological conditions using CAT III approach procedures to CAT III operating minimums. CAT III operating minimums are those minimums which specify a decision height (DH) lower than 100 feet (30 meters) above the touchdown zone and a controlling RVR below RVR 1200 (350 meters). CAT III operating minimums also include those operations conducted with an alert height (AH) of 100 feet (30 meters) or less above the touchdown zone (no DH) and a controlling RVR below RVR 1200 (350 meters).

(1) *Types of CAT III Operations.* The only types of CAT III operations which can be currently authorized for use by U.S. operators are ILS-based. MLS-based CAT III operations, however, may be conducted in the near future, provided these operations are restricted to an "ILS-like" operation which has at least a 4 nm to 5 nm straight-in final approach segment. The flight control laws (computer logic) used in most CAT III flight guidance and control systems (for example, autoland systems) require that a final approach segment of at least this length to perform their intended function in CAT III operation. Before CAT III, MLS operations with segmented and/or curvilinear approach paths with straight-in final approach segments significantly less than 5 nm can be conducted, most existing flight guidance and control systems will have to be modified and recertificated to CAT III criteria. Certain new aircraft, however, will probably be configured with the necessary equipment and certificated for segmented and curvilinear approach paths with very short, straight-in final approach courses.

(2) *Kinds of CAT III Operations.* There are two different and distinct kinds of CAT III operations. These kinds of operations are fail-passive operations and fail-operational operations. Fail-passive operations are restricted to CAT IIIa weather conditions (DH 50/RVR 700). Fail-operational operations can be conducted in either CAT IIIa or CAT IIIb weather conditions (see paragraph 613 C of this section for further descriptions of fail-passive and fail-operational operations).

(3) *Objective of CAT III Operations.* The essential difference between CAT III AWTA operations and CAT I and CAT II operations is that a CAT III operation places a greater reliance on the guidance provided by the airborne and ground-based guidance equipment. The guidance provided by the equipment must continue through touchdown in CAT IIIa operations and through touchdown and rollout to a safe taxi speed in CAT IIIb operations. In contrast to other types of operations, CAT III operations *do not* ensure sufficient external visual cues for the pilot to manually control the aircraft during flare and landing. The primary objective of CAT III operations is to provide a level of safety equivalent to CAT I and CAT II operations without the use of these visual cues. To meet this objective, the instrument approach procedure must provide for a safe and orderly transition from the en route phase of flight to a landing or to a missed approach (which could include a momentary touchdown during the go-around maneuver), and then a transition back to the en route environment for diversion to an alternate airport. CAT III instrument approach procedures and ATC procedures must also include adequate protection from obstacles (mobile or fixed) near the landing surface to assure that a go-around

can be safely initiated from any point in the approach and landing before touchdown. The desired level of safety for CAT III operations is achieved by the following enhancements:

(a) The airborne equipment and ground-based equipment must assure increased precision in flightpath control. The increased reliability and precision of flightpath control (as compared to CAT I and CAT II systems) is achieved through highly reliable and precise ground-based equipment and airborne systems. These systems are capable of guiding the aircraft with significantly increased precision to touchdown or through rollout, as appropriate.

(b) Special flightcrew qualification and training are also required to assure that the aircraft is operated with the required degree of precision during these operations.

(c) The aircraft performance and equipment requirements associated with a missed approach from very low altitudes are enhanced to ensure that these operations can be safely conducted even if a momentary touchdown occurs on the runway after the go-around is initiated.

(d) Additional visual aids are required to enhance seeing-conditions during the final stages of landing, flare, rollout, and taxi operations.

(e) Special criteria are established to provide additional obstacle and terrain clearance to accommodate missed approaches from very low altitudes, which may include a momentary touchdown on the runway after the go-around is initiated.

(f) Special requirements are established to provide enhanced protection for the ILS/MLS signals during the final stages of landing, flare, and rollout to ensure that these signals are not disturbed during these critical phases of flight.

(g) More stringent criteria are specified for the profile of the pre-threshold terrain to ensure that the flight guidance and control systems function properly during the final stages of approach, flare, and landing.

(h) Special operational and ATC procedures and/or limitations are established to ensure the overall safety and efficiency of the operation.

613. CAT III OPERATIONAL CONCEPTS. The weather and environmental conditions encountered in CAT III AWTA operations severely restrict seeing-conditions. External visual reference is not acquired until the aircraft reaches a very low altitude. Typically, external visual references begin to become available below 100 feet in CAT IIIa operations and below 50 feet in CAT IIIb operations. Even though external visual references are usually available before touchdown, the seeing conditions *are not* sufficient for the pilot to consistently perform a safe manual landing. Therefore, the aircraft must be controlled by instruments and special equipment throughout the approach, flare, and touchdown (deceleration for rotorcraft) in CAT IIIa weather conditions and through rollout to a safe taxi speed (air taxi or hover for rotorcraft) in CAT IIIb weather conditions. Due to the reduced seeing-conditions and the hazards associated with a pilot's attempts to manually maneuver the aircraft to landing in those seeing-conditions, the precision of the flight guidance and control system and the overall precision of flightpath control must have certain capabilities. These capabilities include the safe delivery of the aircraft to touchdown in CAT IIIa weather conditions and through touchdown and rollout to a safe taxi speed in CAT IIIb conditions.

A. *Decision Height (DH) and Alert Height (AH).* All CAT IIIa fail-passive operations are conducted in accordance with the decision height (DH) and RVR concepts. All CAT IIIa and CAT IIIb fail-operational operations are normally conducted in accordance with the alert height and RVR concepts (see paragraph 613 C). Decision heights are only used with fail-operational systems in very unique situations (see AC 120-28). DH's and AH's are *never* used together in any operation since the DH requires that external visual reference be established before passing a specified point and AH does not. The very limited seeing-conditions available in CAT III operations require additional criteria to assure that an adequate level of safety is achieved and maintained when operating in this environment (see paragraph 611 B(2)).

B. *CAT III Operating Minimums.* CAT III operating procedures and minimums are established to assure that the desired level of safety is achieved when aircraft are operated in CAT III seeing-conditions. These operating minimums are based on the DH and RVR concepts for fail-passive operations and the AH and RVR concepts for fail-operational operations (see subparagraph 613 C that follows). These operating minimums establish the minimum safe heights for instrument flight (DH 50 for fail-passive operations and touchdown for fail-operational operations) and the minimum controlling RVR's necessary to safely complete the operation being conducted with a particular aircraft. These operating minimums are established in full consideration of the required CAT III: operational concepts;

airborne equipment; ground-based, visual and electronic equipment; operating procedures; and, the pilot training and qualifications required for these operations. These operating minimums, when combined with other CAT III requirements, assure that the combination of information from external visual sources and the aircraft instrument and equipment is sufficient to enable properly qualified pilots to safely operate the aircraft along the desired flightpath, touchdown, and safely rollout. As the quality and quantity of external visual information decreases due to the reduced seeing conditions (for example, going from CAT II to CAT IIIa to CAT IIIb), the quality and quantity of instrument information, the capability of the airborne and ground-based CAT III system, and the proficiency of the flightcrew must be increased to maintain the desired level of safety.

C. *Kinds of CAT III Operations.* There are two different and distinct kinds of CAT III operations: fail-passive operations and fail-operational operations.

(1) *Fail-Passive Operations.* Fail-passive operations are restricted to CAT IIIa and must use a DH of 50 feet (15 meters) and a controlling RVR of RVR 700 (200 meters). Fail-passive operations are also currently (1991) only authorized for aircraft smaller than a DC-10 or L-1011 due to approach geometry factors such as wheel to glideslope antenna height and wheel to pilot's eye height. Inspectors must require that operators provide proof-of-concept testing is required before approving fail-passive CAT III operations with a DC-10 or L-1011 or larger size aircraft. As the name implies, fail-passive CAT III systems are permitted to fail below 100 feet AGL, under certain remote circumstances, *provided that* the flight guidance and control system always fails passively (does not disturb the aircraft's flightpath when it fails) and the flightcrew immediately receives an aural and visual warning of system failure. Since a fail-passive system is permitted to fail, a DH must be used to assure that, before passing 50 feet AGL, the flightcrew establishes external visual reference with the touchdown zone to determine that the flight guidance and control system is functioning properly and to assure that the aircraft is being properly delivered to the runway. Extensive research and operational experience have shown that pilots may not always have sufficient external visual cues in certain CAT III weather conditions to properly conduct this assessment before passing 50 feet AGL if the controlling RVR is less than RVR 700. These research programs clearly show that a go-around is *mandatory* if the flight guidance and control system fails before touchdown during fail-passive operations in CAT III weather conditions. These research programs also clearly show that, if the system fails below 100 feet AGL, the external visual cues are not sufficient to permit the pilot to use these cues to consistently and safely manually complete the landing in certain CAT III weather conditions when the controlling RVR is less than RVR 1000. Additionally, these research programs show that all missed approaches resulting from failures in the fail-passive autoland system in CAT III weather conditions should be manually flown since automatic go-around capability is also lost in most aircraft if the fail-passive automatic landing system fails.

(2) *Fail-Operational Operations.* Fail-operational operations usually use an alert height (AH) instead of a DH (see AC 120-28). Fail-operational landing systems can be used for CAT IIIa operations. Fail-operational landing systems can also be used in CAT IIIb operations if these systems have at least a fail-passive rollout control capability. As the name implies, fail-operational systems remain operational even if failures occur. In other words, the loss of CAT III capability is not permitted when the aircraft is in the critical phases of approach and landing (below 100 feet AGL). Fail-operational systems are designed so that the system remains fully operational following any failure or combination of failures that are likely to occur after the aircraft passes 100 feet AGL. Fail-operational systems have been shown to have the capability to safely deliver the aircraft to the touchdown zone if the system is still fail-operational when the aircraft passes 100 feet AGL, even if failures occur in the system after passing this height. Therefore, there is no requirement to establish external visual reference before touchdown to confirm that the aircraft will land safely. The lowest minimums that may currently be approved for any AWTA operation by a U.S. operator is a controlling RVR of RVR 300 (90 meters). This restriction is based on the difficulties associated with aircraft movement on the taxiways, ramps, and other maneuvering areas on the airport and the on difficulties related to providing timely safety facilities and services (such as crash, fire, and rescue). In addition, fail-operational landing systems and fail-operational rollout control systems will be required if operating minimums less than RVR 300 are approved in the future.

615. ESTABLISHING CAT III OPERATING MINIMUMS.

A. The operating minimums (DH and RVR or AH and RVR) for CAT III operations are usually determined by the tasks the pilot is required to perform to complete the landing and rollout (deceleration and air taxi for rotorcraft). Consideration must be given to the degree of precision and

integrity in flightpath control provided by the required electronic equipment and the enhanced seeing-conditions provided by the required visual aids. The RVR minimums are also higher if the pilot has to establish better seeing-conditions due to the complexity or difficulty of the tasks required to safely complete the landing (for example, factors related to the design or handling characteristics of a particular aircraft). As a general rule in CAT III operations, the minimum required seeing-condition (RVR) is higher than RVR 300 in situations where the pilot is required to perform special tasks during the operation. Some examples of these situations and special tasks are as follows:

- The pilot must establish visual reference before touchdown to confirm that the aircraft is being properly delivered to the runway (fail-passive CAT IIIa)

- The pilot must use external visual references to manually control the rollout (some CAT IIIa aircraft)

- Situations where the localizer (azimuth) cannot be used for rollout guidance (the course structure fails to meet CAT IIIb flight inspection criteria for rollout)

- Situations where the pre-threshold terrain profile at a particular runway creates abnormal but otherwise safe autoland performance in certain aircraft

- Situations where the aircraft has some other unique design feature or piloting task which requires enhanced seeing-conditions to safely perform a particular maneuver

B. Three basic levels of operating minimums have been established and are internationally agreed to for CAT III operations. These basic levels are: CAT IIIa (RVR 700), CAT IIIb (RVR 150), and CAT IIIc (RVR 0). Currently, the lowest CAT III minimums approved for any operator are RVR 250 (75 meters) for certain foreign flag operators conducting operations in Europe. The lowest CAT III minimum approved for any U. S. operator at any airport is RVR 300 (90 meters). For CAT III operations within the U.S., and for operations by U.S. operators at any airport, several additional levels of operating minimums are established within the basic CAT IIIa and CAT IIIb internationally recognized levels. The levels most commonly authorized for U.S. operators are RVR 1000, RVR 700, RVR 600, and RVR 300. Most runways currently (1991) are approved for CAT III operations by U.S. operators are approved for operating minimums as low as RVR 600. Most U.S. airports are currently limited to RVR 600 operations due to limitations in the RVR reporting systems, inadequate CAT IIIb taxiway centerline lighting, and inadequate operational and ATC procedures to control and regulate aircraft and vehicular movement in RVR 300 seeing-conditions. A few airports in the U.S. and many airports in Europe, however, have all of the safety facilities and services necessary to safely conduct RVR 300 operations. Additionally, efforts are currently in progress to upgrade the safety facilities and services at many U.S. CAT III airports to permit RVR 300 operations.

(1) *RVR 1000 Level.* The RVR 1000 level is normally used for initial CAT IIIa operations for an aircraft new to an operator, unless that operator has received operational credit for using the "Special Process For Minimums Reduction" (see paragraph 625 D). Operators receiving this special operational credit may conduct initial CAT IIIa operations with RVR 700 minimums.

(2) *RVR 700 Level.* The RVR 700 level is the basic level for CAT IIIa operations. This level is the lowest minimum that can be authorized for fail-passive operations. RVR 700 is also the lowest minimum that can be authorized for operations with fail-operational landing systems which do not have a rollout control capability. Additionally, operations at runways which have ILS localizer restrictions (such as localizer unusable for rollout) are limited to the RVR 700 minimum.

(3) *RVR 600 Level.* The RVR 600 level is the current (1991) standard level for CAT III operations in the U.S. due to RVR reporting limitations, limitations to taxiway centerline lighting, and ground movement and control limitations. The RVR 600 level is also the lowest minimum that can be authorized at any airport for fail-operational landing systems which do not have at least a fail-passive rollout control system.

(4) *RVR 300 Level.* The RVR 300 level is the lowest minimum that can be currently authorized (1991) for operations by U.S. operators at any airport. This limitation is due to major limitations associated with the ground movement of aircraft and vehicles and the provision of timely crash, fire, and rescue facilities and services when operating in seeing- conditions less than those equivalent to RVR 300. Operations below RVR 300 are not foreseen until all of these limitations are resolved.

(5) *RVR 150 Level.* These operations are not

foreseen in the near future.

(6) *RVR 0 Level (CAT IIIc).* Operations at this level are not foreseen until the aircraft and essential ground vehicles can be reliably maneuvered on the airport without relying on normal external visual references (for example, forward-looking infrared sensors).

617. FUNCTIONAL REQUIREMENTS FOR VISUAL REFERENCE. The function of external visual reference is dependent upon the kind of CAT III operation being conducted. During operations with a DH (all fail-passive and certain unique fail-operational operations), sufficient external visual reference must be obtained to determine (before passing 50 feet AGL) that the flight control and guidance system is properly delivering the aircraft to the touchdown zone. These visual references are necessary for the pilot to determine that the aircraft is aligned with the touchdown zone and tracking so as to touchdown within the lateral confines of the runway. These visual references are also essential during operations with a DH to permit the pilot to detect situations where the aircraft would not touchdown within the longitudinal confines of the touchdown zone. For operators with an AH (fail-operational operations only), however, the external visual references that become available as the aircraft descends serve as advisory information to the pilot. During operations with an AH, the pilot *is not* required to establish visual reference before touchdown. The visual references that are available to the pilot during operations with an AH are used primarily for: assessing the performance of the rollout control system; continuing the rollout manually if a fail-passive rollout control system fails; and for taxiing the aircraft once a safe taxi speed is reached.

619. DECISION REGION. The "decision region" must be used in all CAT III operations. The decision region is that portion of the approach between 300 feet and 100 feet where the tracking performance of the flight guidance and control system is critically evaluated by the flightcrew to determine if the overall system performance is sufficient for the aircraft to continue the approach to touchdown. Since the visual scene normally expands as the aircraft descends due to geometric and slant range effects, the pilot must integrate the instrument and airborne system information with the visual cues as they become available.

A. For operations which use a DH, the pilot must arrive at a decision, before passing the DH, to either permit the flight guidance and control system to be used to touchdown or to execute a missed approach. For a DH operation, the external visual information, the instrument information, and the airborne system information must be integrated in the decision region so the flightcrew can make a definitive decision no later than arrival at the DH. The decision to permit the flight guidance and control system to continue to direct the aircraft to touchdown must be based on an assessment that the airborne system is still fail-passive (fail-operational for CAT IIIb operations), the instrument information confirms that the tracking performance of the airborne system meets the decision region tolerances, and the external visual cues confirm that the aircraft will touchdown within the touchdown zone.

B. For operations with an AH, the pilot must also arrive at a decision, before passing the AH, to either permit the flight guidance and control system to be used to touchdown or to execute a missed approach. In direct contrast to operations with a DH, however, this decision must be based on an assessment that the airborne system is still fail-operational and the instrument information confirms that the tracking performance of the airborne system meets the decision region tolerances. External visual references are not required before touchdown in operations based on the AH concept.

C. Within the decision region, the flightcrew must be especially cognizant of the maximum permissible excursions of the raw ILS/MLS course and glidepath deviation from which a landing can be safely completed. The tracking performance criteria normally used for maximum displacements within the decision region are $\pm 1/3$ dot localizer (azimuth) deviation and $\pm 1/2$ dot glideslope (elevation) deviation with no sustained oscillations about the localizer or the glideslope. When the tracking performance is outside these parameters within the decision region during CAT III weather conditions, a go-around must be executed since the tracking performance is not sufficient to assure that the aircraft will safely complete a landing within the touchdown zone. Also, when operating within the decision region, the flightcrew must be especially alert for sudden, rapid oscillations of the localizer or glideslope deviations since these oscillations (the windshield wiper effect) may indicate that the ILS/MLS critical areas are not adequately protected. If any such oscillations occur below 100 feet AGL, a missed approach must be immediately executed unless adequate external visual cues are available to confirm that the aircraft is being properly delivered to the runway. A missed approach also must be immediately executed at any point in the approach before touchdown if the flightcrew detects or strongly suspects abnormal airborne or ground-based system performance.

621. RADIO ALTIMETER AND PRE-THRESHOLD TERRAIN.

A. The profile of the pre-threshold terrain is important to all ILS/MLS precision approach operations because the flight guidance and control systems in many aircraft use radio altimeter information to change the mode of operation and/or change the localizer or glideslope tracking sensitivity. At runways where the terrain beneath the approach flightpath is not approximately level, abnormal autopilot and/or flight director behavior may result from erroneous radio altimeter signals. Although these abnormalities may not be serious in CAT I or CAT II operations, irregularities in the pre-threshold terrain can have a major effect on the performance of the flight guidance and control systems required for CAT III operations. The profile of the pre-threshold terrain is also important to all ILS/MLS precision approach operations which use an AH or a DH based on radar altimeter information because the terrain can affect the value used for AH or DH. In certain extreme circumstances, the pre-threshold terrain profile can have such an adverse affect on determining the AH or DH from the radio altimeter, that the use of this information must be prohibited (that is, RA not authorized).

B. The operation of almost all CAT III landing systems is dependent on radio altimeter information during the latter stages of the landing. The flare profile, the rate of descent at touchdown, and the distance of the touchdown point from the threshold can be adversely affected by the profile of the terrain immediately before the landing threshold. The terrain which is most critical lies in an area approximately 200 feet on either side of the runway centerline extended from the threshold into the approach area to a distance of approximately 1000 feet before the landing threshold. There are four existing runways used for CAT III operation in the U.S. which have pre-threshold terrain profiles that can induce abnormal landing system performance in certain aircraft. This number is expected to increase as additional CAT III approaches are commissioned with the introduction of CAT III capable MLS facilities. The four CAT III capable runways in the U.S. which have abnormal pre-threshold terrain profiles are Cincinnati (CVG) runway 36, Pittsburgh (PIT) runway 10L, Minneapolis (MSP) runway 29L, and Seattle (SEA) runway 16R. A special operational test and evaluation program is required before approving any CAT III operations for any aircraft on these runways. This test program is essential to assure that CAT III operations can be safely conducted on these runways with a particular CAT III aircraft type (aircraft with similar flight characteristics and similar flight guidance and control systems). This special test and evaluation must be accomplished in non-revenue service in accordance with Order 8400.8. All requests to conduct this evaluation must be forwarded through the RFSD to AFS-400. Inspectors shall not, under any circumstances, authorize any CAT III operations with any aircraft to these runways unless that particular CAT III type aircraft has been specifically evaluated in accordance with Order 8400.8 and specifically approved for that operation by AFS-400.

C. The pre-threshold terrain can also have an effect on AH or DH since the AH or DH used in CAT III operations is normally based on radio altimeter information. The AH used in CAT III operations is either AH 100 or AH 50. The DH used in CAT III operations is either DH 50 for fail-passive operations or a DH of 50 feet or less for fail-operational operations. Therefore, the terrain profile within the last 3000 feet, before the threshold, must be evaluated to establish the proper AH or DH and to ensure that the AH or DH can be accurately determined from radio altimeter information. The use of radio altimeter to determine AH or DH must be prohibited (that is, RA not authorized) in those situations where the AH or DH cannot be accurately and reliably determined from radio altimeter information.

(1) A few CAT II runways currently (1991) have restrictions (that is, RA not authorized) due to the pre-threshold terrain profile which prohibits the use of radio altimeter information to determine the CAT II DH. Standard CAT II operations (DH 100 and RVR 1200) can still be conducted by using the inner marker to determine arrival at the DH. Although the radio altimeter cannot be used to accurately and reliably determine arrival at the CAT II DH (HAT 100), it may still be possible to safely conduct CAT III operations to these runways if the pre-threshold terrain does not adversely affect the performance of the CAT III landing system. CAT III operations may be conducted, however, to these runways when the CAT III AH or DH can be accurately and reliably determined by radio altimeter information or when an alternative means can be used to identify arrival at the AH or DH. Therefore, CAT III operations at all runways which have CAT II radio altimeter restrictions require a special evaluation to determine that the CAT III AH or DH can be accurately and reliably established for that runway. CAT III operations *shall not* be approved to these runways and CAT III instrument approach procedures *shall not* be established for these runways until specific CAT III approval is received from AFS-400 and that runway is approved for CAT III operations in accordance with Order 8400.8

(2) Since the inner marker is normally beneath the CAT II DH (HAT 100), fail-operational operations which are authorized to use AH 100 can use the inner marker to define AH (in lieu of the radio altimeter) at runways where the use of radio altimeter information is not authorized. The CAT III OpSpecs must contain a specific limitation that the inner marker must be used to define AH at that runway. Furthermore, fail-passive operations and those fail-operational operations which require the use of a DH cannot be conducted at such a runway unless radio altimeter information can be used to accurately and reliably define the CAT III DH being used.

(3) Since all DH's used in CAT III operations must be 50 feet or less, the inner marker cannot be used to define the CAT III DH. It may be possible, however, to use radio altimeter information to accurately and reliably establish the CAT III DH even though radio altimeter information cannot be used to define the CAT II DH (HAT 100). Since DH 50 is located very near the runway threshold and a DH less than DH 50 occurs over the runway, the terrain profile within these areas is generally adequate for CAT III radio altimeter-based DH's. The pre-threshold terrain in unusual circumstances, however, can adversely affect the use of radio altimeter information to define a CAT III DH and CAT III operations based on a DH, and therefore must be prohibited in those cases.

D. The operating rules prohibit the use of an autopilot or a HUD to touchdown in any operation unless the operator is specifically authorized to conduct autoland operations with that aircraft in OpSpecs paragraph C61 or H110, as appropriate, or C62 or H111 for HUD systems. It is the operator's responsibility to determine that the pre-threshold terrain profile and ILS/MLS course structures are adequate for operations at any runway where it conducts landing operations using these systems. Therefore, all operators approved to use autoland or HUD-equipped aircraft should be encouraged to routinely use these systems at suitably equipped runways during operations in VFR and in CAT I IFR conditions. They should also routinely monitor equipment performance.

623. TYPES OF ILS SYSTEMS. CAT III operations conducted by U.S. operators at U.S. runways are conducted on two different types of ILS systems. These two types of ILS systems are specified as Type II and Type III ILS systems (see Order 8400.8 and Order 6750.24).

A. The ILS systems that were originally installed in the U.S. to support CAT III operations met all of the ICAO requirements and recommendations for those ILS facilities intended to support CAT III operations. The description of these facilities is specified in ICAO Annex 10 as "Facility Performance CAT III systems". Eleven of these ILS facilities were commissioned in the U.S. for CAT III operations. The U.S. no longer uses the term "Facility Performance Category III Systems" to describe the configuration of ILS systems, but has replaced it with a classification system based on "type". Facility Performance CAT III Systems are included in the U.S. Type III designation system. The primary purpose for transitioning to a different classification terminology was to provide a clear distinction between the ILS system "black box" configuration, the performance of the ILS, and the kinds of operations that could be conducted on a particular kind of ILS. The "type" designator only specifies the "black box" configuration of the ILS (for example, one active localizer transmitter and one "hot" standby transmitter).

B. The ILS systems originally installed in the U.S. to support CAT II operations exceeded the ICAO requirements for Facility Performance CAT II Systems. These systems are now known in the U.S. as Type II, ILS systems and most of these systems are also known as AN/GRN 27 systems. The most significant differences from an operational perspective between the Type II systems and the Type III systems are related to their "black box" configurations. For example, although the Type II system also had redundant localizer transmitters, it used a "cold" standby transmitter instead of a "hot" standby transmitter. The use of a cold standby transmitter resulted in a short, loss-of-signal period when the active transmitter failed and the system automatically switched power to the cold transmitter. The Type II system also used dual far-field monitors to detect localizer out-of-tolerance conditions instead of the triple monitors used in the Type III system.

C. As U.S. experience in CAT II and CAT III operations was gained, it was recognized that the performance, integrity, and continuity-of-service provided by many of the Type II, ILS facilities approached the quality necessary for CAT III operations. In 1976, many of the Type II localizer systems were modified to shorten the transmitter change-over time to reduce the total loss-of-signal and out-of-tolerance time to less than 2 seconds. All CAT III-capable aircraft were evaluated during certification testing to assure that this 2-second signal out-of-tolerance condition would not adversely affect any CAT III operation. In 1978, CAT IIIa operations were authorized on 26 Type II, ILS systems (31 Type II ILS systems were being used in 1989). All operations on these facilities were initially limited to CAT IIIa operations.

CAT III operations using Type II, ILS facilities are currently authorized in accordance with Order 8400.8 and Order 6750.24. Part 97 CAT III approach procedures were not initially established (published) for the Type II facilities approved for CAT III operations since these facilities did not fully comply with all of the ICAO guidance material for Facility Performance CAT III systems. The only Part 97 approach procedures that were initially published for these facilities were the standard CAT II approach procedures. Therefore, CAT III operations at these facilities were initially authorized OpSpecs and the operators had to use special tailored approach plates when conducting CAT III operations at these facilities. As a result, foreign flag operators were not authorized to conduct CAT III operations at these facilities unless the State of the operator specifically approved them to conduct CAT III operations on U.S. Type II facilities.

D. The final steps to fully upgrade Type II facilities to full CAT IIIb began in 1985 with the establishment of a new performance classification system for precision approach systems in ICAO Annex 10. This new ICAO classification system clearly recognized that the overall performance of a particular facility was much more germane than its "black box" configuration. This significant change in international criteria also enabled the U.S. Type II facilities to fully comply with ICAO guidelines and therefore enabled the establishment of Part 97, CAT III approach procedures for these facilities. These standards are reflected in Order 6750.24 and are currently used in the U.S. to classify the level of performance (integrity, continuity-of-service, and course structure) provided by a particular ILS/MLS facility. The classification system in Order 6750.24 specifies the integrity level provided by the facility (I, II, or III); the last point along the runway where the localizer course structure meets flight inspection criteria (Point C, D, or E); and the continuity-of-service (reliability) level for the facility (1, 2, 3, or 4). Therefore, a facility classified as IIIE4 meets all requirements for CAT IIIb operations with conventional autoland systems. This particular classification means that the facility has CAT IIIb integrity, has been flight inspected to CAT IIIb tolerances through rollout, and that it provides CAT IIIb continuity-of-service. In the future it might be possible, however, to conduct CAT IIIb operations using a facility which is classified as a ID2, provided the airborne equipment was designed so that the aircraft could be safely landed independent of any ground-based equipment, once the aircraft has been established on the ILS/MLS final approach course. An example of such airborne equipment would be a properly designed millimeter wave radar and forward-looking infrared system.

E. The program to upgrade all Type II facilities that were used for CAT III operations to support full CAT IIIb operations was initiated in 1985 in conjunction with the amendment of Order 6750.24. This upgrading effort implemented the new ICAO classification system and resulted in several changes to the configuration and performance of the Type II systems. The most significant changes included: the installation of a remote ILS status indicator to immediately alert the ATC facility when the ILS system was performing out-of-tolerance; the establishment of a requirement to confirm on a daily basis that the localizer far-field monitors were functioning properly; and, the adjustment of the localizer course alignment to full CAT IIIb tolerances (±10 feet of the actual runway centerline). These changes brought the Type II facilities into full compliance with all national and international criteria for CAT IIIb operations. These changes also enabled the establishment of Part 97, CAT IIIb instrument approach procedures for these facilities when that particular facility was reclassified in accordance with the new ICAO guidelines and Order 6750.24 criteria. The publication of the Part 97, CAT III instrument approach procedure also permitted foreign flag operators to use these facilities without requiring special approval from the State of the operator.

F. AFS-400 is the Flight Standards Service approval authority for the use of any ILS or MLS facility at any airport or runway for CAT III operations. All ILS and MLS facilities approved for use by U.S. operators to conduct CAT III operations are specified in Order 8400.8 (as amended). Inspectors *shall not* approve any CAT III operations at any airport or to any runway that is not specifically approved for the appropriate CAT III minimums for a particular CAT III type aircraft, as listed in Order 8400.8.

625. APPROVAL OF CAT III OPERATING MINIMUMS. CAT III operating minimums are established in accordance with the criteria in AC 120-28, the U.S. Terps, and this handbook.

A. With each aircraft that is new to an operator, the operator's initial CAT III operations are usually restricted at all airports for at least 6 months until the operator acceptably demonstrates its ability to satisfactorily maintain that aircraft for the various levels of CAT III operations. The actual process for introducing an aircraft that is new an operator, obtaining reductions in operating minimums for that aircraft, and the number of steps required to achieve the lowest possible operating minimums for that particular

operator and aircraft, depend on the operating policies and operational choices made by the operator. Although several alternatives will be discussed in subsequent subparagraphs, all alternatives must comply with the general Flight Standards policy for reductions to operating minimums.

B. The Flight Standards policy for reductions to minimums requires that each operator of each CAT III type of aircraft (aircraft with similar flight characteristics and similar flight guidance and control systems) must follow a certain progression from CAT I operating minimums through CAT II operating minimums before achieving CAT III minimums. Furthermore, each operator of each CAT III type of aircraft must progress through CAT IIIa operating minimums to achieve CAT IIIb minimums. The principle purpose of this progression requirement is to validate the maintenance program for the various categories of operation. At least 6 months of operation at each step of this reduction of minimums process is necessary to properly validate the effectiveness of the AWTA operations maintenance program for that step.

C. In accordance with the normal approval criteria for CAT II operations in AC 120-29 and the CAT III criteria in AC 120-28, the reduction process would require 6 months of operation at DH 150/RVR 1600 to validate the maintenance program before receiving approval of operations at DH 100/RVR 1200.

(1) *Normal CAT IIIa Reduction.* When operating minimums of DH 100/RVR 1200 are approved, the operator can apply for CAT IIIa operations and receive approval for operations with minimums of RVR 1000. After 6 months of successfully maintaining the aircraft to CAT IIIa standards, the operator could be authorized standard CAT IIIa minimums of RVR 700.

(2) *Normal CAT IIIb Reduction.* After receiving CAT IIIa approval, the operator could apply for a CAT IIIb authorization if the aircraft was suitably equipped. The operator could then be authorized minimums as low as RVR 300 6 months later if the CAT IIIb maintenance program was successfully validated.

(3) *Normal Reduction Schedule.* Under the normal approval process, the lowest possible minimums for a CAT IIIb capable aircraft (RVR 300) would be approved at least 18 months after the initial application for CAT II operations. Although this lengthy process is necessary in certain circumstances, the operator can significantly reduce the time required to achieve the lowest minimums by structuring its operations and maintenance validation programs to receive operational credit for use of the special process for minimums reductions.

D. *Special Process for Minimums Reductions.* Since airborne equipment that is type design approved for CAT III operations has special design features which increase the safety of operations in restricted seeing-conditions, it is possible for an operator to receive special operational credit for the use of these enhanced systems. Special operational credit is obtained by the FAA initially authorizing CAT II operations with operating minimums of DH 100 and RVR 1200 with special restrictions specified in the OpSpecs. The maintenance program is then validated in accordance with these special requirements.

(1) *Basic Approach.* The basic approach used in this special approval process is to structure the operational requirements and the data collection requirements so that all approaches used to validate the maintenance program are conducted using the complete CAT IIIa or CAT IIIb airborne system, as appropriate. This approach permits the data collected during the CAT II validation to fulfill both the CAT II and the CAT IIIa requirements, and thereby bypassing the need for the RVR 1600 and RVR 1000 minimums reduction steps. For an operator to receive this credit, however, it is essential that the aircraft be operated to full CAT III standards throughout the validation process and that the CAT II OpSpecs contain a restriction to operate the aircraft in the "fail-passive" or "fail-operational" configuration, as appropriate, for the first 6 months of CAT II operation. Further reductions in operating minimums are obtained in accordance with the guidance and direction in the subparagraphs that follow.

(2) *Fail-Passive Systems.* For fail-passive systems, the special reduction process would require 6 months of operation at DH 100 and RVR 1200 with a restriction that requires the operator to operate in the fail-passive mode to touchdown. After successfully completing this validation, the CAT II restriction to operate in the fail-passive mode can then be removed and the operator authorized for CAT IIIa minimums of DH 50 and RVR 700. This means that the lowest minimums for these aircraft could be achieved 6 months after the initial application for CAT II approval.

(3) *Fail-Operational Systems.* For fail-operational systems, the first 6 months of operation must be conducted at DH 100 and RVR 1200 with a restriction to operate in the fail-passive or fail-operational mode through touchdown and rollout. After successful completion of this validation,

the CAT II restriction to operate in the fail-passive or fail-operational mode will be removed and the operator will be authorized for CAT IIIa minimums of RVR 700 with a restriction to operate in the fail-operational mode through touchdown and rollout for 6 additional months. After successful completion of this second validation period, the operator would be authorized to conduct CAT IIIb operations with the lowest possible minimums. The lowest possible minimums would be RVR 300, unless the aircraft is restricted to higher minimums by the CAT IIIb type design approval. The CAT IIIa restriction to operate in the fail-operational mode will be removed for aircraft smaller than the DC10/L1011 if the operator requests approval to conduct fail-passive CAT IIIa operations. This means that the lowest minimums for these aircraft could be achieved 12 months after the initial application for CAT II operations is approved.

627. STANDARD CAT III OPERATIONS. Standard CAT III operating minimums must be based on a "building block" approach which uses the foundations provided by the special aeronautical knowledge, experience, skills, qualifications, training, and the special airborne and ground-based equipment specified in AC 120-29 for CAT I and CAT II operations. The assumptions and criteria used in aircraft certification and CAT III instrument approach procedure design must be compatible with the operational concepts in this handbook. These requirements must also ensure that flightcrews and aircraft which meet the requirements of this handbook and AC 120-28, can be used to safely conduct CAT III operations with standard CAT III minimums. Any special equipment or procedures necessary to achieve this objective must be specified in the airworthiness certification basis of the aircraft (type certificate or supplemental type certificate) and/or the FAA-approved aircraft flight manual. Aircraft which cannot be safely operated with standard CAT III operating minimums using flightcrews which meet the minimum requirements of this handbook and AC 120-28, shall not be certificated or otherwise approved for CAT III AWTA operations. The OpSpecs establish the lowest operating minimums which can be used in any CAT III operation even if the instrument approach procedure specifies minimums lower than these values. Special airborne equipment, special ground-based equipment, and special flightcrew training are required for CAT III operations. These requirements are specified in this handbook, AC 120-28, and the FAA-approved aircraft flight manuals.

A. *Standard CAT III Operating Minimums.* Standard CAT IIIa operating minimums are DH 50 and RVR 700 for fail-passive systems and either AH 100 or AH 50 and RVR 700 for fail-operational systems. Standard CAT IIIb minimums for U.S. operators and U.S. airports are either AH 100 or AH 50 and RVR 300. CAT III operations at most U.S. airports, however, are currently (1991) limited to RVR 600 until the safety facilities and services at these airports are enhanced to support RVR 300 operations. The AH used in fail-operational operations is normally based on radio altimeter information and must be based on either the inner marker or radio altimeter information. The CAT III DH used in all fail-passive operations and some unique fail-operational operations must be based on radio altimeter information. Barometric altimeter information is not an acceptable means of establishing AH or DH in any CAT III operation.

B. *Higher-Than-Standard CAT III Operating Minimums.* Higher-than-standard CAT III minimums are used in certain special cases. These minimums are usually applied as interim minimums for the first 6 months of CAT IIIa and CAT IIIb operations with an aircraft new to an operator until that operator's maintenance program for that aircraft is validated for standard minimums (see paragraph 625). Higher-than-standard minimums are also applied in special situations where RVR reporting system limitations, pre-threshold terrain limitations, or unique design features in a particular aircraft which preclude the use of standard CAT III minimums (see paragraph 621).

C. *Operational Approval Basis.* All standard CAT III operations are approved by the issuance of OpSpecs which authorize the conduct of CAT III instrument procedures at specified airports. The basis for the approval of all CAT III airplane operations is AC 120-28.

D. *CAT III Flight Guidance and Control Systems.* Standard CAT III operations are based on the use of special airborne and ground-based equipment which provide increased capability, redundancy, integrity, and continuity-of-service. The overall performance of the CAT III airborne equipment must be superior to the equipment required for CAT I and CAT II operations. The very limited seeing-conditions available in CAT III operations and the piloting limitations associated with operating in these conditions *do not* permit the pilot to use visual cues to manually control and maneuver the aircraft during the final stages of approach, flare, and landing (deceleration and air taxi for rotorcraft). Therefore, the flightcrew must rely on the airborne and ground-based equipment to safely deliver the aircraft to the touchdown zone (see paragraph 613).

(1) *Generic Design Philosophy.* The airborne system and the ground-based system must be able to detect

all potential failures which could significantly disturb the flightpath of the aircraft. The ability of these systems to detect such failures requires special design practices and system redundancy. The airborne systems require at least two independent flight guidance and control computations ("dual channel") for detecting significant errors. The airborne system detects errors by comparing the results of these computations. If the results of the calculations are not equivalent, the system knows that an error has occurred. Autoland systems are designed to prevent the autopilot from making control inputs which would significantly disturb the flightpath when these errors occur. Autoland systems also provide the flightcrew with an immediate aural and visual warning when these failures are detected when an immediate crew action is required (such as initiating a go-around). Heads-up display (HUD) systems must also detect significant failures and provide similar warnings when failures occur. Since the pilot is manually maneuvering the aircraft in HUD operations, HUD systems are generally designed to prevent undesired control inputs as a result of failures by denying the pilot any further access to the erroneous information and by clearly annunciating the failure.

(2) *Fail-Passive Design Philosophy.* Fail-passive systems usually use only two independent sets of flight guidance and control computations ("dual channel"). If an error is detected during the comparison process, fail-passive systems cannot determine which computation is erroneous since only two solutions are available. Since fail-passive systems cannot determine which control computation is incorrect, the system fails (disconnects for autoland systems) and immediately provides an aural and visual warning. This warning notifies the flightcrew that immediate action is required (for example, initiating a go-around). Fail-passive capability is typically provided by either two autopilots (two "black boxes") each of which has a single flight control computation capability ("single channel") or one autopilot (one "black box") which provides two independent flight control computations ("dual channel"). The dual, single-channel systems are typically used by Boeing aircraft and the single, dual-channel systems are typically used by Airbus, Douglas, Flight Dynamics (HUD), and Lockheed.

(3) *Fail-Operational Design Philosophy.* Fail-operational systems must use at least three independent sets of flight guidance and control computations ("triple channel") to detect errors and determine which two calculations remain valid. If an error is detected during the comparison process, fail-operational systems remain fully operational by comparing all of the calculations to determine which computation is erroneous. The calculation which disagrees with the rest of the computations is disregarded by the system and the commands from that computation channel are disabled (the bad calculation is voted out by majority rule). The fail-operational system remains fully operational by continuing to use the remaining computations to provide flight guidance and control. Since the system remains fully operational when failures occur, there is no need for immediate crew action or intervention to safely complete the landing. The systems which remain functional following these failures provide adequate redundancy and integrity to safely complete the landing. Fail-operational capability is typically provided by either three autopilots (three "black boxes") each of which has an independent flight control computation capability ("single channel") or two autopilots (two "black boxes") each of which has a dual independent computation capability ("dual channel"). The triple, single-channel systems ("triple-single") are typically used by Boeing aircraft and the dual-channel systems ("dual-dual") are typically used by Airbus, Douglas, and Lockheed.

E. *Airworthiness of CAT III Airborne Equipment.* Currently (1991), there is only one acceptable means for demonstrating that the airborne equipment is airworthy for CAT III operations. This means of approval is CAT III type design approval which is normally reflected in the FAA-approved aircraft flight manual. Inspectors *shall not* approve CAT III operations with any aircraft for any operator unless the operator presents written evidence of CAT III type design approval for the particular aircraft.

F. *Validation of the CAT III Maintenance Program.* The reliability required in the airborne system to conduct CAT III operations is achieved by special design requirements and special maintenance programs. The extensive, special maintenance program necessary for CAT III operations is usually the largest economic factor affecting an operator's decision to conduct these operations. If the operator's aircraft are equipped with standard CAT III equipment, all CAT III operations with aircraft that are new to that operator are usually initially restricted (for 6 months) to higher-than-standard CAT IIIa operating minimums until the operator successfully validates its maintenance program in accordance with AC 120-28. It may be possible for the operator to be initially authorized for standard CAT IIIa minimums (RVR 700), however, if the operator receives operational credit for using the special process for minimums reductions (see subparagraph 625D).

G. *CAT III Airports and Runways (U.S. Operators).* All CAT III operations are restricted to airports and runways which meet the special safety requirements

necessary for CAT III operations. All airports and runways approved for CAT III operations by U.S. operators are specified in FAA Order 8400.8. Even when a particular runway is approved for CAT III operations, an operator *shall not* be authorized to conduct CAT III operations until all requirements of this handbook and FAA Order 8400.8 are met, and the particular CAT III operation is authorized in the operator's OpSpecs for the particular aircraft.

629. SPECIAL CAT III OPERATIONS. Special CAT III operations are those operations which require special airborne equipment, special ground-based equipment, or special procedures to conduct CAT III operations. Special CAT III operations include those operations which are granted operational credit for the use of special airborne capabilities, such as HUD or millimeter wave radar and infrared systems, as well as operations which require the use of special equipment and/or performance capabilities to conduct standard CAT III operations. Special CAT III operations also include those operations which use special ground-based equipment, special aircraft performance, and special procedures to conduct CAT III operations which cannot be safely conducted by conventional aircraft using standard airborne CAT III equipment and procedures (for example, steep-angle CAT III, MLS approaches). All requests to conduct a special CAT III operation must be forwarded to AFS-400 through the RFSD. AFS-400 will evaluate each CAT III operation on a case-by-case basis and will provide additional guidance and direction for the evaluation and approval of these requests.

631. CAT III TERMINAL INSTRUMENT APPROACH PROCEDURES (U.S.) All CAT III AWTA operations conducted in the U.S. must be conducted in accordance the operator's CAT III OpSpecs. Part 97 instrument approach procedures have been published for some of the U.S. runways approved for CAT III operations. The primary means for approving these operations, however, is through the issuance of OpSpecs which specify the runways and minimums authorized for each aircraft used by a particular operator. This means that the operator can conduct CAT III operations to runways in the U.S. which do not have CAT III, Part 97 approach procedures. For example, this includes CAT III operations on Type II facilities approved for CAT III operations with that aircraft in accordance with FAA Order 8400.8, even if the lowest published Part 97 instrument approach procedure is a CAT II procedure.

A. *Procedures Authorized in the U.S.* Paragraphs C60 and H109 of the OpSpecs contain specifications for the CAT III instrument approach procedures, runways, operating minimums, limitations, and aircraft authorized for CAT III operations for a particular operator. These paragraphs also specify the CAT III airborne equipment, RVR equipment, pilot qualification, and missed approach requirements which apply to a particular operator's CAT III operation. If the flightcrew is properly qualified and the aircraft is properly equipped and maintained, an operator can, in general, be authorized to conduct CAT III AWTA operations to any runway approved for CAT III operations in Order 8400.8. The exception to this are those runways specified as *restricted* CAT III runways. The pre-threshold terrain at restricted CAT III runways requires additional analysis and flight testing before CAT III operations can be approved for these runways.

B. *CAT III Approach and Landing Minimums.* AC 120-28 and this handbook establish the lowest approach and landing minimums that can be authorized, under any circumstances, for CAT III operations. The lowest minimums for each kind of CAT III operation for a particular operator are specified in paragraphs C60 and H109 of the OpSpecs, as appropriate. FAA inspectors *shall not* authorize an operator to use minimums lower than these values.

633. FOREIGN CAT III INSTRUMENT APPROACH PROCEDURES. All CAT III operations by U.S. operators at foreign airports must be authorized in accordance with the guidance and direction in this handbook. All foreign runways approved for CAT III operations by U.S. operators must also meet the requirements of this handbook, Order 8400.8, and Order 8260.31.

A. *Foreign Equivalence.* Although it is recognized that the CAT III ground-based systems and procedures at foreign airports may not be in exact accordance with U.S. standards, it is critical for the foreign airports to provide the information and functions which are necessary for CAT III operations in a manner consistent with the intent of U.S. CAT III standards.

(1) *General.* The FAA region which has surveillance responsibility for a particular foreign airport has the responsibility for evaluating any runway at that airport which supports CAT III operations. The controlling region is also responsible for evaluating these CAT III runways in accordance with Order 8400.8 and Order 8260.31 and for recommending approval or disapproval of CAT III operations to those runways. The controlling region's recommendations must be forwarded to AFS-400 for further evaluation and final approval or disapproval. Foreign runways which have been determined to be

equivalent to U.S. CAT III standards and approval for CAT III operators are identified in the list of runways in Order 8400.8. Operators desiring CAT III approvals at foreign airports which are not on this approved list should submit a request for evaluation and approval through their POI and the RFSD to AFS-400. AFS-400 will request that an evaluation be conducted by the controlling region.

(2) *Determining Equivalence.* The major factor which is considered by AFS-400 and the controlling region in approving foreign runways in accordance with Order 8400.8 and Order 8260.31 for CAT III operations by U.S. operators, is the degree of equivalence with U.S. CAT III standards. This determination evaluates the equivalence of:

- High-intensity approach lights
- High-intensity runway edge lights
- Touchdown zone and centerline lights
- Taxiway edge lights
- High-intensity, taxiway centerline lights
- Runway markings
- The quality and integrity of the approach and landing ground-based guidance system
- The RVR reporting capabilities and procedures
- ILS/MLS critical areas, including signs and markings
- Obstacle clearance protection in the approach and missed approach, including the obstacle-free zone
- Airport surface traffic control
- Terminal area air traffic control
- Procedures for regulating the ground movement of aircraft and vehicles during CAT III operations

B. *Authorizing Foreign CAT III Runways.* All CAT III operations conducted in foreign countries must be conducted in accordance with the operator's CAT III OpSpecs. The only means of approving these operations is through the issuance of OpSpecs which specify the foreign runways and minimums authorized for each aircraft used by the operator. Paragraphs C60 and H109 of the OpSpecs specify the CAT III instrument approach procedures, runways, operating minimums, limitations, and aircraft authorized for CAT III operations for a particular operator. These paragraphs also specify the CAT III airborne equipment, RVR equipment, pilot qualification, and missed approach requirements which apply to the operator's CAT III operation. If the flightcrew is properly qualified and the aircraft is properly equipped and maintained, an operator can, in general, be authorized to conduct CAT III AWTA operations to any foreign runway approved for CAT III operations in Order 8400.8. The exception to this are those runways specified as *restricted* CAT III runways. The criteria in AC 120-28 and this handbook establish the lowest approach and landing minimums that can be authorized, under any circumstances, for CAT III operations. The lowest minimums for each kind of CAT III operation for a particular operator are specified in paragraphs C60 and H109 of the OpSpecs, as appropriate. FAA inspectors *shall not* authorize an operator to use minimums lower than these values. Additionally, inspectors shall not authorize the use of CAT III minimums for any foreign runway unless the provision of this handbook, Order 8400.8 and Order 8260.31 are met.

635. FOREIGN FLAG CAT III OPERATIONS IN THE U.S. Although it is recognized that the airborne equipment, pilot training, and pilot qualification standards required by foreign civil aviation authorities for CAT III operations may not be exactly in accordance with U.S. standards, it is essential for foreign flag operators to conduct CAT III operations in the U.S. in a manner consistent with the intent of U.S. CAT III standards. When operating in the U.S., a particular foreign flag operator's foreign civil aviation authority (State of that operator) has the primary responsibility for determining that the operator complies with the special requirements it specifies for CAT III operations at any airport. The State of the operator also has the primary responsibility for authorizing and/or restricting operating minimums for any operation by that foreign flag operator. Therefore, the FAA inspector's primary responsibility related to foreign flag CAT III operations is to ensure that these operations are conducted in the U.S. in a manner compatible with the intent of U.S. standards and procedures and the authorizations and restrictions imposed by that particular operator's State.

A. *General Principles.* When evaluating a request by a foreign flag operator to conduct CAT III operations within the U.S., the inspector must use special criteria which accommodates several general principles associated

with the unique nature of these operations and the responsibilities of the State of the operator. These general principles include at least the following Flight Standards policies:

(1) A foreign flag operator will not be authorized to conduct CAT III operations in the U.S. unless that operator is authorized by its foreign aviation authority to conduct CAT III operations.

(2) A foreign flag operator will not be authorized for CAT III operating minimums in the U.S. that are lower than the CAT III operating minimums authorized by its foreign aviation authority for CAT III operations.

(3) A foreign flag operator will not be authorized for CAT III operating minimums in the U.S. that are lower than the lowest minimums authorized to a comparably equipped U.S. operator.

(4) A foreign flag operator must provide documentation from its foreign aviation authority confirming that the State of the operator has determined that the operator's CAT III program is equivalent to the program required by AC 120-28 for U.S. operators.

(5) The confirmation by the State of the operator that the foreign flag operator is authorized for CAT III operations with a particular aircraft type and that the operators's flight operations and maintenance programs are equivalent to U.S. standards normally satisfies one of the inspector's responsibilities. This responsibility is to ensure that the operator's aircraft are properly equipped and maintained and that the flightcrews are properly trained and qualified for CAT III operations.

(6) All CAT III operations by foreign flag operators in the U.S. must be conducted in accordance with a Part 97, CAT III instrument approach procedure unless that operator's foreign aviation authority specifically authorizes that operator to conduct CAT III operations at those U.S. Type II, ILS facilities which are approved for CAT III operations in accordance with FAA Order 8400.8. If the foreign flag operator is not authorized by its foreign authority to conduct CAT III operations on CAT III- approved U.S. Type II, ILS facilities, that operator shall not be authorized CAT III operations at any airport which does not have a published Part 97, CAT III instrument approach procedure. If a particular foreign flag operator is specifically authorized by its foreign aviation authority to conduct CAT III operations on U.S. Type II facilities which are approved for CAT III operations, that operator can be authorized to conduct CAT III operations to any runway approved for unrestricted CAT III operations in Order 8400.8. Requests by foreign flag operators to conduct CAT III operations to restricted CAT III runways will be evaluated and approved by AFS-400 on a case-by-case basis. All foreign flag requests to conduct CAT III operations on these restricted runways must be forwarded to AFS-400 through the RFSD.

B. *CAT III Approach and Landing Minimums (Foreign Flag).* AC 120-28 and this handbook establish the lowest approach and landing minimums which can be authorized, under any circumstances, for foreign flag CAT III operations in the U.S. These minimums are equivalent to the minimums authorized for a comparably equipped U.S. operator. The CAT III operating minimums authorized for a particular foreign flag operator are specified in paragraph C60 (H109 for rotorcraft) of the OpSpecs, and in a manner similar to minimums specified for U.S. operators. Inspectors *shall not* authorize a foreign flag operator to use CAT III minimums lower than the values authorized by the State of the operator. The airborne equipment required by AC 120-28 and any additional equipment required by the State of the operator for CAT III operations must also be specified in this paragraph in the OpSpecs.

(1) *Standard CAT III Operating Minimums.* If a foreign flag operator has at least 6 months of satisfactory experience conducting CAT III operations with a particular aircraft type, and at least 6 months of satisfactory experience conducting autoland or HUD operations at an appropriate U.S. facility, that operator can be authorized to conduct standard CAT IIIa operations with minimums of RVR 700 or CAT IIIb minimums, and if suitably equipped, with minimums as low as RVR 300.

(2) *Higher-Than-Standard CAT III Operating Minimums.* If a foreign flag operator does not have at least 6 months of satisfactory experience in conducting CAT III operations (in any country) and at least 6 months of autoland or HUD experience using U.S. facilities, that operator must be restricted to higher-than-standard CAT IIIa operating minimums (RVR 1000) until it completes a 6-month demonstration program. This demonstration program is equivalent to the program required for U.S. operators except that the foreign flag operator does not have to submit the documentation required in AC 120-28 if the State of the operator confirms that the demonstration was satisfactorily completed. Following successful completion of this demonstration program, the operator can be authorized for standard CAT IIIa minimums and, if suitably equipped, for standard CAT IIIb minimums (see AC 120-28 for further guidance).

637. CAT III EVALUATION AND APPROVAL PROCESS. The approval process for CAT III AWTA operations is generally the same as the generic approval process for approval or acceptance described in volume 1, chapter 4, section 6 of this handbook. More detailed general evaluation and approval criteria for AWTA operations are provided in section 4, paragraphs 551 through 563 of this chapter. The CAT III approval process also closely parallels the CAT II process. The discussion in this paragraph contains specific criteria and direction related to the evaluation and approval of CAT III AWTA operations.

A. *General.* Conceptually, CAT III AWTA operations are based on the "building block" approach using the foundation provided by the CAT I and CAT II building blocks. Therefore, the discussion to follow includes only those factors that are unique to CAT III operations. When evaluating an operator's request to conduct CAT III operations, the inspector must evaluate the factors addressed in this paragraph and make a judgement related to the operator's ability and competence to conduct these operations. The inspector shall ensure that the operator specifies the conditions necessary to safely and competently conduct the proposed operations, and that those conditions ensure that the following criteria are met:

- Operations are restricted to those aircraft which are properly equipped and airworthy for the CAT III operation being conducted
- Compliance with the regulatory requirements for those operations
- Compliance with the CAT III requirements of Part C (Part H if appropriate) of the OpSpecs
- Compliance with the CAT III requirements of this handbook
- Compliance with the CAT III criteria of AC 120-28
- Accepted, safe CAT III operating practices are provided
- The use of the stabilized approach concept in all CAT III operations is required (see section 4 of this chapter)
- CAT III operations are restricted to those pilots who are properly trained, experienced, qualified, and proficient for CAT III operations
- CAT III operations are restricted to those airports and runways which are approved for CAT III operations in Order 8400.8
- CAT III operations are restricted and authorized at foreign airports and runways in accordance with Order 8400.8 and Order 8260.31
- Fail-passive CAT III operations are restricted to those aircraft approved for these operations by AFS-400
- CAT IIIb operations are restricted to those aircraft which meet the CAT IIIb requirements of AC 120-28
- CAT IIIb RVR 300 operations are restricted to those airports specifically approved for these operations in Order 8400.
- CAT III operations at runways designated as restricted CAT III runways in Order 8400.8 are restricted to only those aircraft approved for these operations in that order

B. *Airport/Runway and Ground-Based Equipment Requirements.*

(1) *General.* The adequacy and suitability of the airport/runway and the ground-based electronic and visual aids for the type of aircraft and the kind of operation being conducted are an integral part of evaluating and approving CAT III AWTA operations.

(2) *Ground-Based Visual Aids.* One of the primary factors in achieving CAT III operations is related to ground-based lighting aids. All CAT III operations are based on the use of: serviceable high-intensity approach lighting systems (Order 6850.21); high-intensity runway edge lights (AC 150.5340-24); high-intensity touchdown zone lights (AC 150.5340-4); high-intensity runway centerline lights (AC 150.5340-4); and precision runway markings (AC 150.5349-1). Sequenced flashing lights must be installed but do not have to be operational for CAT III operations in the U.S. ICAO Annex 14, however, does not require sequenced flashing lights for CAT III operations. CAT III operations can be conducted at foreign airports which do not have sequenced flashing lights provided that the FAA controlling region has determined that the approach lighting system provides adequate guidance and the runway is approved for CAT III operations in Order 8400.8. For CAT IIIb operations with operating minimums

below RVR 600, high-intensity taxiway centerline lights are required for the taxi routings used in CAT IIIb weather conditions (see AC 150.5340-19).

(3) *ILS/MLS Performance Requirements.* The safety of CAT III operations is heavily influenced by several characteristics of the ground-based electronic guidance system, which include: the course structure (ILS/MLS signal quality); the integrity (the degree of trust which can be placed on the precision of the guidance signals); and continuity-of-service (protection from loss of the guidance signals) of the system. CAT IIIa operations can only be conducted at locations where the ground-based ILS/MLS provides acceptable glidepath angles, threshold crossing heights (TCH's), and acceptable lateral and vertical course structure down to touchdown. CAT IIIb operations can only be conducted if these requirements are met through rollout. The course structure, integrity, and continuity-of-service required for U.S. CAT III operations are specified in Order 6750.24. The TCH's required for CAT III operations are specified in Order 8260.24.

(4) *ILS/MLS Critical Areas.* The operation of vehicles and aircraft on or near the runway or the ILS/MLS antennas can significantly disturb the course structure of the electronic signal radiated by these systems. Critical areas have been established to eliminate these undesirable disturbances. Vehicles and aircraft must not be permitted within these critical areas when an aircraft on approach is critically dependent on ILS or MLS guidance. The critical areas which must be protected during CAT III operations in the U.S. are specified in Order 6750.16. The ATC procedures for providing critical area protection are specified in Order 7110.65. The signing and marking requirements for the critical areas are specified in AC 150.5340-1 and AC 150.5340-18.

(5) *RVR Reporting Equipment.* The restricted seeing-conditions and the short-term variability in the weather conditions associated with CAT III operations requires the use of RVR reporting systems to provide meaningful seeing-condition reports to pilots. Three RVR reporting systems must be installed at all runways used for CAT III operations. The touchdown zone and mid-RVR reports are controlling for all CAT IIIa operations. In CAT IIIa operations, the rollout-RVR report provides advisory information to pilots. For CAT IIIb operations, the touchdown zone-, mid-, and rollout-RVR reports are controlling. Although three RVR reporting systems must be installed at all runways used for CAT III operations, CAT IIIb operations using fail-operational landing systems which incorporate a serviceable fail-operational rollout control system, CAT III operations may continue to be conducted in the event any one of these RVR reporting systems is unserviceable. In this case, both of the remaining RVR reports are controlling. Additional information on RVR systems can be found in AC 120-28 and AC 97-1.

(6) *Obstacle Clearance Limitations.* Standard CAT III operations can only be conducted to runways which provide adequate obstacle clearance protection in the final approach area, the approach light area, the touchdown area, and the missed approach area. Obstacle protection must also be provided within the obstacle-free zone (OFZ) and the runway safety area which encompasses and surrounds the CAT III runway. These areas are identified in AC 120-29, U. S. TERPS, and AC 150.5300-13.

(7) *CAT III Airports and Runways.* Before authorizing an operator to conduct CAT III operations with a particular aircraft, the inspector must ensure that the operator fully understands CAT III operational requirements and provides the policies, guidance, training, and procedures necessary to address these criteria in company manuals and training programs. The inspector must also determine that the operator's overall CAT III program assures that the following criteria will be met during the conduct of these operations.

(a) Operations must be restricted to only those airports and runways approved for CAT III operations in Order 8400.8. CAT III operations to runways specified in Order 8400.8 as *restricted* CAT III runways shall be restricted to only those aircraft approved by AFS-400 for operations at that particular runway.

(b) CAT III operations must not be conducted at any airport or runway unless the airport facilities and services meet the followingcriteria for CAT III operations for the particular aircraft.

(i) The runways used must provide an effective runway field length of at least 1.15 (1.3 for certain CAT IIIb operations) times the landing field length required by FAR 121.195(b) or FAR 135.385(b) for the aircraft being used. These field lengths are necessary to account for the tendency to "land long" due to the characteristics of CAT III landing systems, and also to the pilot's increased difficulty in determining vertical height and in precisely assessing the flare and touchdown point in the reduced seeing-conditions associated with CAT III operations.

(ii) The runways must be equipped with serviceable approach, runway, touchdown zone, runway centerline and taxiway centerline lighting systems as required by this handbook, AC 120-28, and the standard CAT III OpSpecs.

(iii) The runway safety areas, obstacle-free zones, and ILS/MLS critical areas must be adequately protected for CAT III operations.

(iv) The ATC facilities and services must be compatible with the CAT III requirements.

(v) The safety facilities and services (crash, fire, and rescue) must be adequate to support CAT III operations with that particular aircraft (see AC 150.5210-9).

(vi) The weather reporting systems must support these operations and the required RVR reporting systems must be serviceable.

(vii) The aeronautical information system must be adequate for CAT III operations (NOTAM's and ATIS, as well as the status of the airfield, runways, NAVAID's, lighting systems, and RVR reporting systems).

(8) *Approval of Airports and Runways.* The airports and runways approved for CAT III operations for a particular operator and aircraft are authorized in paragraph C60 or H109, of the standard OpSpecs, as applicable. Any restrictions or limitations related to the operation of a particular aircraft at a particular runway must also be specified in these paragraphs. Inspectors shall not authorize CAT III operations to any runway unless that runway is approved for CAT III operations for that aircraft type in Order 8400.8. When evaluating and approving an operator's overall CAT III program, an inspector must consider the program's ability to account for at least the following factors in designating airports and runways to support its CAT III operations.

- The suitability of the runways, runway field lengths, taxiways, and other maneuvering areas on the airport considering the seeing-conditions associated with these operations
- The CAT III instrument approach procedures authorized, and the NAVAID's required for these operations
- Procedures for CAT III protection of the runway safety areas, obstacle-free zones, obstacle critical areas, ILS/MLS critical areas, and the runway/taxiway incursion prevention procedures (This also includes procedures to control and regulate the ground movement of aircraft and vehicles in these restricted seeing-conditions.)
- The ATC facilities and services required for CAT III operations
- Safety facilities and services (for example, crash, fire, and rescue) required and any special procedures needed for these operations
- RVR reporting and weather reporting/ forecasting services required
- Aeronautical information services (such as NOTAM's, ATIS) required for these operations
- Adequacy of lighting, marking, and other visual aids necessary to support these operations
- Necessity of prohibiting CAT III operations at airports and runways which are not approved for CAT III operations in Order 8400.8

C. *Airborne Equipment Required For CAT III Operations.*

(1) *Background.* The airborne equipment required for CAT III operations is based on the "building block" approach. The CAT III equipment requirements are based on the foundation provided by the basic CAT I and CAT II equipment requirements. This subparagraph C only addresses the additional equipment which must be serviceable for CAT III operations. The only acceptable means of obtaining airworthiness approval for CAT III operations is type design approval which is usually obtained during aircraft certification testing.

(2) *Type Design Approval.* The only aircraft which are currently authorized to conduct CAT III operations have been evaluated and approved for these operations during aircraft certification testing. These aircraft have received type design approval for CAT III operations and further operational demonstration of airworthiness is unnecessary. The equipment required to conduct CAT III operations with these aircraft is determined by comparing

the equipment specified by the FAA-approved aircraft flight manual for CAT III operations with the equipment specified in AC 120-28 for these operations. All of the CAT III equipment specified in the aircraft flight manual is required. Any additional equipment specified in AC 120-28 is also required for these operations. Therefore, both the approved aircraft flight manual and AC 120-28 must be considered in determining the required equipment. See volume 3, chapter 1, section 5, paragraph 181, for further guidance and direction for specifying the required equipment in the OpSpecs.

D. *CAT III Pilot Training Program.* The operator's approved training and qualification program must provide the flightcrews with the CAT III skills, knowledge, proficiency, and qualification necessary to safely conduct CAT III operations. The use of the "stabilized approach" concept is mandatory for all CAT III operations (see section 4 of this chapter). It is national policy and direction that all operators should be encouraged to use the "Standard Approach Procedures" for all CAT III operations (see section 4 of this chapter). The training and qualification curriculum changes necessary for CAT III operations are directly related to the need for increased precision in flightpath control due to the reduced seeing-conditions encountered in these operations.

(1) *Initial and Recurrent Ground Training.* The CAT III ground training curriculum segments must include the following:

- Required ground-based visual aids
- Required ground-based electronic aids
- TCH requirements for that particular aircraft
- Required airborne equipment
- Authorized minimums
- Controlling RVR requirements
- Limitations and use of RVR information
- CAT III critical areas and the critical need to protect these areas
- Required crew duties and responsibilities
- Seeing-conditions associated with the transition from instrument to visual flight
- Essential nature of maintaining a full-time instrument reference by one pilot throughout the approach and landing
- Critical nature of proper "eye reference position" (proper sitting height)
- Required pilot training and qualifications
- Methods for determining that the aircraft is airworthy for CAT III operations
- Dispatch/flight release requirements

(2) *Initial and Recurrent Flight Training.* The flight training requirements depend on the equipment installed (autoland or HUD), the operating procedures used, and the kinds of CAT III operation authorized (fail-passive or fail-operational). The primary objective of the flight training is to ensure that the flightcrew has the skills, knowledge, proficiency, and qualifications necessary to meet the operational concepts and criteria for CAT III operations. The flightcrews must also be able to demonstrate inflight, or through an acceptable simulation, the competence necessary to safely conduct these operations. To satisfactorily demonstrate competence, the pilot must successfully accomplish the required maneuvers in accordance with the policies, criteria, procedures and crew duties specified in this handbook, AC 120-28, and the specific operator's operating manuals and approved qualification program. The CAT III flight training curriculum segment must include sufficient flight training to permit pilots to acquire the knowledge and develop the skills and abilities necessary to demonstrate competence in the following areas (see AC 120-28 for additional guidance):

(a) Determination of AH and/or DH, including the use of radio altimeters and, if appropriate, the inner markers.

(b) Recognition of, and proper reaction to, significant CAT III system failures before passing the AH or DH, as appropriate.

(c) Proper missed approach techniques and the expected height loss as it relates to manual or automatic go-around and the go-around initiation altitude.

(d) The use and limitations of RVR information, including determination of controlling RVR and the number and locations of the RVR reporting systems required.

(e) The availability and limitations of external visual cues during the latter stages of the approach, flare, and landing. This includes at least the following factors:

- Proper procedures to be used for unexpected deterioration of seeing-conditions (to less than the authorized RVR) during approach, flare, and rollout
- Achieving the proper eye reference position (proper sitting height) and the expected external visual references with the weather at authorized minimums
- The appearance and expected sequence of visual cues during approaches and landings at the authorized minimums
- The effects of vertical and horizontal windshear (in CAT III weather conditions) on system performance, the proper procedures to be used in these windshear encounters, and the wind limitations for these operations
- The proper procedures for transitioning from nonvisual to visual flight
- Recognition of the limits of acceptable aircraft position and flightpath tracking in the approach, flare, and landing with special emphasis on tracking performance in the decision region
- Recognition of, and reaction to, significant airborne or ground system faults or abnormalities during the approach, flare, and landing

(3) *Initial and Recurrent Qualification.* Each PIC and SIC used in CAT III operations must satisfactorily demonstrate the ability to safely conduct CAT III operations to either a company check pilot or an FAA inspector during initial and recurrent CAT III qualification. The events and/or maneuvers which must be demonstrated depend on the airborne equipment installed, the kinds of CAT III operations authorized, and the crew duties and responsibilities used by that operator. See AC 120-28 for a more detailed description of these requirements.

E. *Operations Manuals, Crew Duties, and Responsibilities.* The operator's manuals must contain clear and concise policy, criteria, guidance, and direction to its flightcrews and other persons involved in its CAT III operations. To be acceptable, these manuals must meet the criteria of the FAR's, this handbook, and the appropriate CAT III advisory circulars. These manuals must adequately address the following:

- Airport and runway requirements, including the additional runway field length required
- Airborne and ground-based equipment required for the various minimums
- Methods for determining that the aircraft is airworthy for the intended operation, including MEL/CDL requirements
- Flightcrew procedures, crew duties and responsibilities
- Instrument approach procedures and minimums authorized
- Pilot training and pilot qualifications
- Any operating restrictions or limitations necessary to safely conduct these operations (see AC 120-28 for further guidance)

F. *Maintenance Program.* Before approving the operator's proposal, the inspector must ensure that the operator's CAT III continued airworthiness program includes the special airborne equipment and procedures required for CAT III operations. Close coordination with the PMI and the PAI is essential before granting operational approval. The inspector *shall not* issue OpSpecs that authorize CAT III operations until all requirements are met. This includes approval of the operator's CAT III maintenance program for the particular aircraft involved.

G. *Higher Headquarter's Review and Concurrence.* Due to the specialized technical nature of CAT III operations and the need to standardize these operations on a national and international basis, each make, model and series of aircraft used for CAT III operations must be individually approved for each operator. All initial proposals for CAT III operations for each make, model, and series used by each operator must be forwarded to AFS-400, through the RFSD, for their review and concurrence before the OpSpecs can be issued authorizing the operation. Any modifications required for approval of the proposal will be specified in the AFS-400 response to

the proposal. Subsequent proposals for reductions in CAT III operating minimums for that particular make, model, and series of aircraft used by the particular operator also require RFSD and AFS-400 review and concurrence before the reduction can be authorized (see AC 120-28 for further guidance).

639. OPERATIONS SPECIFICATIONS FOR CAT III OPERATIONS. CAT III AWTA operations approvals are granted by issuance or amendments to OpSpecs. The authorizations, limitations, and provisions applicable to CAT III operations for a particular aircraft's use by an operator must be specified in Part C, paragraphC60 or H109, as appropriate, of the OpSpecs. Inspectors *shall not*, under any circumstances, issue OpSpecs approving any particular CAT III operation until all requirements are met (including the PAI's approval of the operator's CAT III maintenance program for that aircraft) and until the operator is currently capable of commencing safe CAT III operations. See volume 3, chapter 1, sections 5 and 6 for further information related to issuing CAT III OpSpecs.

640. - 644. RESERVED.

[PAGES 4-261 THROUGH 4-280 RESERVED]

CHAPTER 3. AIRPLANE PERFORMANCE AND AIRPORT DATA

SECTION 1. AIRPLANE PERFORMANCE COMPUTATION RULES

901. GENERAL. This chapter contains direction and guidance to be used by inspectors for reviewing and approving performance data sections of company flight manuals (CFM's). The chapter also contains guidance for accepting or approving an operator's system for acquiring airport data. A separate chapter of this handbook (TBD) is devoted to rotorcraft performance.

A. *Chapter Contents.* Section 1 of this chapter is intended as background and reference material. It contains basic explanations of the terms and concepts used in airplane performance computations. Section 2 contains detailed information on the rules applicable to specific airplanes. Section 3 contains specific direction and guidance for the review and approval of performance data sections of company flight manuals. Section 4 contains specific direction and guidance for the review and approval of airport data acquisition systems. Section 5 (TBD) contains direction and guidance concerning specific related topics.

B. *How to Use this Chapter.* Inspectors should first determine the specific make and model of aircraft involved. In many cases, inspectors must know which modifications have been performed by supplemental type certification (STC). Next, inspectors must determine the specific paragraphs which apply to the airplane from figure 4.3.1.1. in this section. An inspector who is generally familiar with the terms and concepts involved may then consult the specific paragraph in section 2. Inspectors who are not familiar with the terms and concepts involved will find it useful to review the background material contained in section 1 before proceeding to section 2.

903. OVERVIEW OF AIRPLANE PERFORMANCE RULES. Aircraft performance requirements are contained in Part 91 and in Part 121 or Part 135, as applicable.

A. *Certification Limitations.* FAR 91.31 requires that all flight operations (both air transportation operations and others) be conducted within the limitations approved for that aircraft. These limitations are determined by the Aircraft Certification Service. Since March 1, 1979 these limitations must be published in an approved airplane flight manual (AFM) or an approved rotorcraft flight manual (RFM). Before March 1, 1979, the limits could also be presented as placards or by other means. Specific limitations are presented as maximum and minimum values, such as the maximum certified takeoff weight (MTOW).

B. *Performance Limits.* Subparts I of Part 121 and of Part 135 require operators conducting air transportation operations to conduct those operations within specifed performance limits. Operators must used FAA-approved data to show this compliance. The aircraft certification rules require the manufacturer to determine the aircraft's performance at capabilities at "each weight, altitude, and ambient temperature within the operational limits." The performance section of the AFM or RFM presents variable data in tabular or graphic format. Operators must use data extracted from the performance data section of the AFM or RFM to show compliance with the operating rules of Part 121 or Part 135. For those aircraft certified without an approved flight manual, the FAA-approved data may be placed on placards or placed in an approved company flight manual (CFM.)

C. *Advisory Information.* Aircraft manufacturers occasionally publish advisory information in flight handbooks that is not required for certification and which has not, therefore, been placed in the limitations section of the AFM or RFM. For example, manufacturers of light, multiengine aircraft certified under Part 23 frequently publish accelerate-stop distances as advisory information. When such information is not placed in the limitations section, it is not a limitation. Inspectors are advised that operators who do not observe such advice are not exhibiting good judgment and may be in violation of FAR 91.9, but are not in violation of FAR 91.31. POI's should ensure that operators enforce such limitations by placing approprate policy statements in a section of the general operations manual (GOM).

D. *Date of Aircraft Certification.* As aircraft performance and complexity have increased, more stringent operating limitations have become necessary for operators to maintain an acceptable level of safety. Certification and

operating rules have also become correspondingly more complex. Once an airplane is certified, however, it normally remains in production and in service under the original rules even though those rules have been superseded. Subparts I of Part 121 and of Part 135 contain a number of sets of rules to account for the progressive enhancement of safety standards. These rules frequently refer to superseded airplane certification rules and effective certification dates. When determining which performance rules apply to a specific airplane, inspectors must determine the airplane certification category, the aircraft size, and whether the aircraft has been modified by STC. This information can be found on the type certification data sheet. Figure 4.3.1.1 contains a summary of the categories into which airplanes have been divided for purposes of performance computations under Part 121 and Part 135.

FIGURE 4.3.1.1.

AIRPLANE GROUPING	CHARACTERISTICS
LARGE TRANSPORT CATEGORY	• More than 12,500 lbs. MTOW. • Certified under CAR 4, 4A, 4B, SR 422, SR 422A, SR 422B, or FAR 25
LARGE NONTRANSPORT CATEGORY	• More than 12,500 lbs. MTOW. • Certified prior to July 1, 1942 under Aero Bulletin 7A.
SMALL TRANSPORT CATEGORY	• Not more than 12,500 MTOW. • Certified under CAR 4, 4A, 4B, SR 422, SR 422A, SR 422B, or FAR 25
COMMUTER CATEGORY	• Up to 19,000 lbs. MTOW, 19 pax. seats • Reciprocating or turbopropeller • Certified under Part 23 • Refined as small for performance computation purposes and large for purposes of pilot certification
NORMAL CATEGORY, Over 12,500 lbs.	• Certified under FAR 23 and 10 to 19 Pax SFAR 41.1(b). • 19 Pax. Seats and 19,000 MTOW • Defined as a small airplanes for performance computation purposes and large airplanes for pilot certification by SFAR 41
NORMAL CATEGORY, 12,500 lbs. or less	• 12,500 pounds or less MTOW 10 to 19 Pax take off weight (MTOW) • Certified under CAR 3 or FAR 23 and one of the following (including STC's): • Special conditions of the Administrator, SFAR 23, & SFAR 41, Paragraph 1(a)
NORMAL CATEGORY, 9 or less Pax. Seats	• 12,500 pounds or less MTOWW • Certified CAR 3 or FAR 23

905. LARGE AIRPLANE CERTIFICATION. On July 1, 1942, Civil Air Regulation (CAR) 4 became effective establishing the transport category for the certification of large airplanes. Large airplanes were first defined in this rule as airplanes of more than 12,500 pounds MTOW.

A. *Large, Nontransport Category Airplanes.* Large airplanes certified under Aero Bulletin 7A (before the establishment of the transport category) and not modified and recertified in the transport category are now referred to as "large nontransport airplanes" in the performance rules. Only three of these airplanes are still in active service which inspectors are likely to encounter. They are the Lockheed 18, the Curtis C-46, and the Douglas DC-3. Many of these airplanes have been modified by supplemental type certificates (STC's) and been recertified in the transport category. These airplanes may only be operated in passenger-carrying service if they have been recertified in the transport category or if operated in accordance with the performance rules applicable to the transport category. In the latter case, the performance data required to comply with these rules must be approved by the POI and carried in the aircraft during passenger operations. Operators of C-46 aircraft must use Part 121, Appendix C to comply with the large nontransport performance requirements.

B. *Reciprocating-Powered Transport Category Airplanes.* By November of 1945, CAR 4 was amended by CAR 4A and CAR 4B. Most large, reciprocating-powered transport category airplanes which remain in operation, such as the DC-6, were certified under these rules. While subsequent rules contain provisions for the certification of reciprocating-powered transport category airplanes, very few of these airplanes have been certified since CAR 4 has been superseded.

C. *Turbine-Powered Transport Category Airplanes.* Effective August 27, 1957, Special Regulation (SR) 422 was the basis for certification of the first turbine-powered transport airplanes, such as the Boeing 707, the Lockheed Electra, and the Fairchild 27. SR 422A became effective July 2, 1958 and was superseded by SR 422B effective August 29, 1959. Only a few airplanes were certified under SR 422A, such as the Gulfstream I and the CL44. The majority of the turbine-powered transport category airplanes now in service, such as the DC-8, DC-9, and B-727, were originally certified under SR 422B. SR 422B was recodified with minor changes to Part 25, which became effective in February 1965.

907. DETERMINING APPLICABLE OPERATING RULES. Until the publication of Part 119, SFAR 38-2, as amended, governs the use of aircraft in air transport operations. Inspectors should use the guidance that follows when determining rules that apply to specific operations.

A. *Part 121 Operations.* SFAR 38-2 requires that airplanes of more than 7,500 pounds payload or more than 30 passenger seats be operated in air transport service under the provisions of Part 121. This requirement applies to both transport and nontransport category aircraft. Transport category airplanes of less capacity may, but are not required to, be operated under Part 121.

B. *Part 135 Operations.* Airplanes with less than 7,500 pounds payload or more than 30 passenger seating capacity (except transport category airplanes) must be operated in air transport service under the provisions of Part 135. Helicopters must be operated under Part 135.

C. *Congruence of Part 121 and Part 135.* Since the adoption of SFAR 38-2, large transport and nontransport category airplanes are operated under both Parts 121 and 135. Subparts I of Part 121 and of Part 135 have identical aircraft performance provisions.

909. SMALL AIRPLANE CERTIFICATION. FAR Part 1 defines a small airplane as one of not more than 12,500 pounds MTOW. Under CAR 3 and Part 23 an airplane could only be certified as a small airplane in the normal category with a MTOW of not more than 12,500 pounds and 9 passenger seats. The "special conditions of the administrator" (FAR 21.16), SFAR 23, and SFAR 41, modified this definition to the extent that airplanes were modified by STC and certified as small airplanes with up to 19 passenger seats. SFAR 41 further modified the definition to the extent that airplanes meeting the requirements of SFAR 41, paragraph 1(b) and having up to 19,000 pounds MTOW were defined as small airplanes. Amendment 34 to Part 23 established the commuter category and defined airplanes of up to 19,000 pounds certified in that category as small airplanes.

A. *Small Transport Category Airplanes.* A small transport category airplane is an airplane 12,500 pounds or less MTOW certified in the transport category. While Part 25 permits certification of small airplanes in the transport category, manufacturers have rarely chosen this option. For example, the Cessna Citation 501 and the Learjet 23 are certified in the normal category under Part 23. Other

models of Citations and Learjets of over 12,500 pounds MTOW (large airplanes as defined in Part 1) are certified in the transport category under Part 25. Small turbojet airplanes certified in the normal category are operated as small, turbine-powered transport category airplanes for the purposes of Part 135.

B. *Normal Category Airplanes with 10 or More Passenger Seats.* Since deregulation, small-reciprocating and turbopropeller, executive transport airplanes have been "stretched" and passenger seats have been added. These airplanes were primarily redesigned versions of existing designs. These aircraft were originally certified under Part 23 because it was considered impractical to redesign them to Part 25 standards. The "special conditions of the administrator," SFAR 23, SFAR 41, and Appendix A to Part 135 were additional airworthiness standards developed to allow for the certification of a Part 23 airplane with more than nine passenger seats. All of these rules except Appendix A of Part 135 have been superseded. Production of airplanes certified under these rules will end in 1991. Currently, airplanes certified under any of these provisions (except SFAR 41.1(b) airplanes) are limited to an MTOW of 12,500 pounds and must meet the additional performance rules of Part 135, Appendix A. SFAR 41.1(b) provided for certification of airplanes with up to 19,000 pounds MTOW and 19 passenger seats in the normal category. These airplanes must meet the provisions of Part 23 and the additional airworthiness standards specified by the SFAR. They are defined as small airplanes by SFAR 41.1(b) for the purposes of Parts 22, 23, 36, 121, 135 and 139. They are defined as large airplanes for the purposes of Parts 61 and 91. These airplanes are not required to comply with the provisions of Appendix A of Part 135, since SFAR 41.1(b) provides additional standards for operations over 12,500 pounds MTOW.

C. *Commuter Category.* In January of 1987, Amendment 34 to Part 23 became effective and established the commuter category. Reciprocating and turbopropeller-powered airplanes with up to 19 passenger seats and 19,000 pounds MTOW may be certified in the commuter category. Commuter category airplanes of over 12,500 pounds MTOW are defined as small airplanes by Part 23 for the purposes of Parts 21, 23, 36, 121, 135, and 139. They are defined as large airplanes for the purposes of Parts 61 and 91.

D. *Determining Allowable Takeoff Weight.* Depending on the specific rule under which an airplane was certified, the calculations that must be performed to determine allowable takeoff weight can include any of the following:

(1) AFM Maximum Weight Limitations (Structural)

- Takeoff
- Zero Fuel
- Landing

(2) Airport Elevation and Temperature

- Departure point
- Destination
- Alternate

(3) Runway Limit Weight

- Accelerate-stop distance
- Accelerate-go (one-engine inoperative)
- All-engines takeoff distance

(3) Takeoff Climb Limit Weight

- First segment
- Second segment
- Transition segment (divided into 3rd and 4th segments under some rules)

(4) Takeoff Obstacle Limit Weight

(5) En Route Climb Limit and Terrain Clearance Weights

- All-engines operative
- One-engine inoperative
- Two-engines inoperative

(6) Approach Climb Limit Weight

(7) Landing Climb Limit Weight

(8) Destination Landing Distance Weight

(9) Alternate Landing Distance Weight

E. *Application of Flight Handbook Performance Limits.* Many of the requirements of Subparts I of Part 121 and Part 135 apply only until the aircraft takes off from the departure point. Other requirements from these Subparts apply at all times as do the AFM limitations. For example, FAR 121.195 and FAR 135.385 prohibit a large, turbine airplane from takeoff unless, allowing for en route fuel burn, the airplane will be capable of landing on 60% of the available runway at the planned destination. The regulations do not, however, prohibit the airplane from landing at the destination when, upon arrival, conditions have changed and more than 60% of the runway is required. In this case, the airplane must only be able to land on the effective runway length as shown in the flight manual performance data.

911. V SPEED DEFINITIONS. Inspectors should be knowledgable in the terminology and defintions that apply to V speeds. The following definitions apply to speeds used in airplane performance computations.

A. *Vmc Speed.* V*mc* is defined in Part 1 as the minimum speed at which the airplane is directionally controllable with the critical engine inoperative.

(1) V*mcg* is the minimum speed at which the airplane can be demonstrated to be controlled on the ground using only the primary flight controls when the most critical engine is suddenly made inoperative. Throttling an opposite engine is not allowed in this demonstration. Forward pressure from the elevators is allowed to hold the nosewheel on the runway, however, nosewheel steering is not allowed.

(2) V*mca* is the minimum speed at which directional control can be demonstrated when airborne with the critical engine inoperative. Full opposite rudder and not more than 5 degrees of bank away from the inoperative engine are permitted when establishing this speed. V*mca* may not exceed 1.2 V*s*.

B. *Vef Speed.* V*ef* is the airspeed at which the critical engine is assumed to fail. V*ef* is selected by the aircraft manufacture for purposes of certification testing, primarily to establish the range of speed from which V*1* may be selected. V*ef* may not be less than V*mcg*.

C. *Vmu Speed.* V*mu* is defined as minimum unstick speed. V*mu* is the minimum speed demonstrated for each combination of weight, thrust, and configuration at which a safe takeoff has been demonstrated.

D. *Vr Speed.* V*r* is defined as rotation speed and is applicable to transport category airplanes certified under SR 422A and later rules and commuter category airplanes. V*r* is determined so that V2 speed is reached before the aircraft reaches 35 feet above the runway surface. V*r* may not be less than V*mu* or 1.05 V*mca*.

E. *V1 Speed.* V*1* speed is defined in Part 1 as "takeoff decision speed" (formerly the critical engine failure speed). V*1* may be selected from a range of speeds. V*1* may be selected as low as Vef but cannot exceed any of the following speeds:

- V*r*
- Refusal speed (the maximum speed the aircraft can be brought to a stop at the selected weight and flap setting on the remaining runway)
- V*mbe* (brake energy limit speed)
- Limiting tire speed (if one has been established)

F. *Vlof Speed.* V*lof* is the speed at which the aircraft becomes airborne.

G. *Vs, Vso, and Vs1 Speeds.* V*s* is power-off stalling speed or the minimum steady speed at which the aircraft is controllable. V*so* is stalling speed in the landing configuration. V*s1* is the stalling speed or minimum controllable speed in a specified configuration.

H. *V2.* V2 is defined in Part 1 as "takeoff safety speed." V2 is used in multiengine transport, commuter category, and large nontransport category airplanes. V2 is the speed at which the airplane climbs through the first and second takeoff segments. V2 must be greater than V*mu* and 1.1 V*mca*. V2 must also be greater than the following:

- 1.2 V*s1* for two-engine and three-engine reciprocating and turbopropeller-powered airplanes
- 1.2 V*s1* for turbojet airplanes without the capability of significantly reducing the one-engine inoperative stall speed (no flaps or leading edge devices)
- 1.5 V*s1* for turbojet airplanes with more than three engines
- 1.5 V*s1* for turbojet airplanes with the

capability for significantly reducing the one-engine inoperative stall speed

I. *Vref Speed.* Vref is 1.3 Vso. Vref is the speed used on approach down to 50 feet above the runway when computing landing distances.

NOTE: All V speeds are measured and expressed as calibrated airspeeds, but may be considered as indicated airspeeds for purposes of general discussion.

913. RUNWAY LENGTH. The usable runway length may be shorter or longer than the actual runway length due to stopways, clearways, and obstacle clearance planes.

A. *Takeoff Runway Length - Nontransport Category Airplanes.* The effective takeoff runway length for nontransport category airplanes is defined by obstacle clearance planes. When a 20:1 obstacle clearance plane does not intersect the runway, the effective runway length is defined as the distance from the start of the takeoff roll to the far end of the runway. When the obstacle clearance plane does intersect the runway, the effective runway length is defined as the distance from the start of the takeoff roll to the point at which the obstacle clearance plane intersects the far end of the runway.

Figure 4.3.1.2
Effective Runway Length

B. *Transport Category Airplanes.* For transport category airplanes the usable runway is not determined by the obstacle clearance plane. An obstacle clearance analysis must be made for each runway. For transport category airplanes certified under SR 422A and subsequent rules, the actual runway length may be extended by clearways and stopways. Clearways and stopways are discussed in paragraph 937 in this section.

C. *Obstructions.* An obstruction is a man-made or natural object which must be cleared during takeoff and landing operations. While fixed towers and buildings can be readily identified as possible obstructions, obstruction heights over roadways, railroads, waterways, and other traverse ways are not so apparent. Unless the airport authority or the operator determines with certainty that no movable objects will project into the airspace over the following passageways when an airplane flies over, obstructions are considered to exist on them to the following heights:

- Over interstate highways - 17 feet
- Over other roadways - 15 feet
- Over railroads - 25 feet
- Over waterways and other traverse ways - the height of the tallest vehicle that is authorized to use the waterway or traverse way

D. *Line-Up Distance.* Takeoff distance is measured from the position of the main landing gear on the runway to the same point as it passes the runway crossing height (RCH). The distance required to place the airplane in position for takeoff is not available for the takeoff run. A significant error may be introduced if this distance in not subtracted from the available runway distance when takeoff performance is computed. Large airplanes can use several hundred feet of runway when turning into position on the runway. Also, rolling starts from a taxiway can reduce effective runway by an additional increment because of

slow acceleration while takeoff thrust is being set. The allowance may be included in the published data or published as a correction in the AFM. POI's should ensure operators have appropriate guidance for flightcrews.

915. RUNWAY LIMIT WEIGHT - TRANSPORT AND COMMUTER CATEGORIES. The required takeoff distance is the longest of three takeoff distances: accelerate-stop, accelerate-go, and all-engines. Since the available runway length is a fixed value, allowable takeoff weight for any given runway is determined by the most restrictive of the applicable distances.

A. *Accelerate-Stop Takeoff Distance.* The accelerate-stop distance is the total distance required to perform the following actions:

- Accelerating, with all engines operating at takeoff thrust, from a standing start to V*ef* speed at which the critical engine is assumed to fail
- Making a transition from takeoff thrust to idle thrust, extending the spoilers or other drag devices, and applying wheelbrakes (no credit may be taken for reverse thrust)
- Decelerating, and bringing the airplane to a full stop

B. *Accelerate-Go Takeoff Distance.* The accelerate-go (with one-engine inoperative) takeoff distance is the total distance required to perform the following actions:

- Accelerating with all engines operating to V*ef* speed with recognition of the failure by the flightcrew at V*1*
- Continuing acceleration with one engine inoperative to V*r* speed at which time the nosegear is raised off the ground (V*r* is V2 for all airplanes certified prior to SR 422A)
- Climbing to the specified RCH, crossing the RCH at V2 speed

C. *All-Engines Takeoff Distance.* All-engines takeoff distance is the total distance required to accelerate, with all engines at takeoff thrust, to V*r* or V2 speed (appropriate to the airplane type), and to rotate and climb to a specified RCH. For airplanes certified under SR 422A and subsequent regulations, this distance is 1.15 the measured distance.

917. TAKEOFF CONDITIONS. Takeoff performance data published in the AFM is based on takeoff results attainable on a smooth, dry, hard runway with a specified flap setting and a specific weight. The FAR's do not require that data for compensating takeoff performance for the effects of wet or contaminated runways be published in an AFM. These factors, however, must be accounted for during revenue operations (see paragraph 921 for more information on wet or contaminated runways).

A. *Airport Elevation.* Airport elevation is accounted for in takeoff computations because the true airspeed (groundspeed in no-wind conditions) for a given takeoff increases as air density decreases. As airport elevation increases, the takeoff run required before the airplane reaches V*1*, V*lof*, and V2 speeds increases; the stopping distance from V*1* increases; and a greater air distance is traversed from lift-off to the specified RCH because of the increased true airspeed at the indicated V2 speed.

B. *Temperature.* As air temperature increases, airplane performance is adversely affected because of a reduction in air density which causes a reduction in attainable takeoff thrust and aerodynamic performance.

C. *Density Altitude.* Takeoff performance is usually depicted in an AFM for various elevations and temperatures. The effect of variations in barometric pressure, however, is not usually computed or required by the FAR's. Some airplanes with specific engine installations, however, must have corrections in allowable weight for lower-than-standard barometric pressure.

D. *Weight.* Increasing takeoff weight increases the following:

- V*l* of and the ground-run distance required to reach the lift-off point
- The air distance required to travel from the lift-off point to the specified RCH
- The distance required to bring the

aircraft to a stop from V*1* speed and the energy absorbed by the brakes during the stop

E. *Flap Selection.* Many airplanes have been certified for takeoff with variable flap settings. The effect of selecting more flap (within the allowable range) reduces V*r*, V*lof*, and the required ground-run distance to reach lift-off. All of these increase the accelerate-stop distance limit weight, the accelerate-go distance limit weight, and the all-engines operating limit weight. The additional flap extension increases aerodynamic drag and also decreases the climb gradient the airplane can maintain past the end of the runway. In the case of a short runway, it may not be possible to take off without the flaps set at the greatest extension allowed for takeoff. In the opposite case, at a high elevation and a high ambient temperature, it may only be possible to climb at the required gradient with the minimum allowable takeoff flap extension. See table 4.3.1.1. for an example of the effect of flaps on required runway length and climb gradient.

TABLE 4.3.1.1.

Wing Flaps Inoperative Position	Runaway Length Required for Takeoff	One-Engine Climb Gradient
25°	6350 feet	2.9%
15°	7000 feet	4.5%
5°	7950 feet	5.3%

NOTE: This is an example only.

F. The effect of runway slope on the acceleration, stopping distance, and climb-out to the end of runway crossing height (RCH) must be accounted for. Uphill grades increase the ground run required to reach the points at which V*1*, V*r*, and V*lof* are attained, but they also improve stopping distance. An airplane climbing over an uphill grade runway will require more distance to reach the specified RCH. The reverse is true of downhill grades. Gradient corrections are computed for both runway length and takeoff speeds and the average runway gradient is normally used. The average gradient is determined by dividing the difference in elevation of the two ends of the runway by the runway length. For large variations in runway height (±5 feet), the retarding effect on the uphill segment is proportionally greater than the acceleration gained on the downhill portion. In such a case, the slope used for computations should be proportionately greater than the average slope.

919. WIND CONDITIONS DURING TAKEOFFS AND LANDINGS. Runway performance computations for both takeoffs and landings must always account for the effect of wind conditions in a conservative manner.

A. *Headwinds.* Although it is not required, the beneficial effect of a headwind on takeoff and climb distances may be used to compute performance. Only one half of the reported steady-state wind component (parallel to the runway) may be used.

B. *Tailwinds.* For a downwind takeoff or landing, at least 150% of the reported steady-state tailwind component must be used to compute the performance effect. While most airplanes are certified for takeoff with not more than 10 knots of tailwind component, some airplanes have been certified with higher limits. To use these higher limits, the operator must not be limited by the AFM and must be authorized by the operations specifications.

C. *Crosswinds.* The maximum-gust velocity must be used in the most unfavorable direction for computing the effective crosswind component. Inspectors should be aware of the following guidance.

(1) Crosswind values in most AFM's are stated as "demonstrated values" rather than as limits.

(2) While a crosswind may not directly limit an operation from a specific runway, crosswinds and runway

conditions affect V*mcg*. Under some runway conditions, an increase of 1 knot of crosswind component may raise V*mcg* by as much as 4 knots. Inspectors should be aware that the flight manual may contain different V*mcg* values for wet and dry conditions and crosswind components.

NOTE: V*1* may not be less than V*mcg*.

921. WATER AND CONTAMINATION OF RUNWAYS. AFM performance data is based on a dry runway. When a runway is contaminated by water, snow, or ice, charted AFM performance values will not be obtained. Manufacturers typically provide guidance material to operators so that appropriate corrections for these conditions may be applied to performance calculations. Inspectors should be aware of the following guidance concerning these conditions.

A. Any runway which is not dry is considered to be wet. Standing water, puddles, or continuous rain are not necessary for a runway to be considered wet. Runway braking friction can change when there is a light drizzle. In some cases, even dew or frost which changes the color of a runway will result in a significant change in runway friction. The wet-to-dry stopping distance ratio on a well-maintained, grooved, wet runway is usually around 1.15 to 1. On a runway where the grooves are not maintained and rubber deposits are heavy, the stopping distance ratio could be as high as 1.9 to 1. On ungrooved runways, the stopping distance ratio is usually about 2 to 1. In the case of a runway with new pavement or where rubber deposits are present, the ratio could be as high as 4 to 1. Some newly-surfaced asphalt runway surfaces can be extremely slippery when only slightly wet.

B. Inspectors should consult AC 91-6, "Water, Snow, and Slush on the Runway" for operations on runways which have snow, slush, ice, and standing water. Such conditions typically require corrections for takeoff calculations because of two factors. The first factor is the reduction of runway friction which may increase stopping distance in the case of a rejected takeoff. The second factor is the impingement drag of water or slush on the landing gear or flaps which could cause a retarding force and deceleration force during takeoff.

923. TIRE SPEED AND BRAKE LIMITS. Inspectors should be aware that allowable takeoff weight may be limited by either tire speed limits or the ability of the brakes to absorb the heat energy generated during the stop. The energy the brakes must absorb during a stop increases by the square of the speed at which the brakes are applied. Accelerate-stop distances are determined with cold breaks. When the brakes are hot, they may not be able to absorb the energy generated, and the charted AFM stopping distances may not be achieved. The heat generated by the stop may cause the wheels or tires to fail. The peak temperature is usually not reached until 15 to 20 minutes after the stop, which can result in the wheels catching on fire. The wheels of most large airplanes are protected by frangible plugs which melt and allow air to escape from the tires before they explode. Short turn-around times and rejected takeoffs present a potential hazard in terms of heat build-up in tires and in brake assemblies. Most manufacturers publish short turn-around charts to provide a minimum cooling period for subsequent takeoffs. POI's should ensure that operators include these charts and procedures in the operator's GOM's or CFM's.

925. TAKEOFF CLIMB LIMIT WEIGHT. The climb limit is the weight at which the airplane can climb at a specified minimum climb gradient or specified minimum climb rate in still air through the segments of the takeoff flightpath.

A. *Turbine-Powered Transport Category and Commuter Category Airplanes.* Climb performance for airplanes in these categories is measured in terms of a gradient (height gained divided by distance traveled - expressed as a percent) in specified climb segments. The gradients for each group of airplanes are provided in section 2 of this chapter.

B. *Other Airplanes.* All airplanes other than turbine-powered, transport category and commuter category airplanes must be able to maintain a specified rate of climb throughout the takeoff climb segments. Rates of climb are expressed as multiples of V*s*. The required rates of climb for various categories of airplanes are given in section 2 of this chapter.

927. TAKEOFF WEIGHTS LIMITED BY OBSTACLES. To obtain obstacle clearance throughout the takeoff flightpath, operators of transport category and commuter category airplanes must identify obstacles and limit takeoff weight. Obstacles in the takeoff path that are not cleared horizontally must be cleared vertically by at least the amount specified in the certification rule.

A. *Definition of Obstacle.* Any object inside the airport boundary which is within a horizontal distance of 200 feet of the flightpath or outside the airport boundary within 300 feet of the flightpath, must be considered an obstacle for takeoff computations.

B. *Net Flightpath.* A "net" flightpath for takeoff is derived by subtracting a specified percentage from the actual demonstrated climb gradient. This has the effect of adding a progressively larger clearance margin as the airplane travels away from the runway. Specified percentages for airplanes certified under different rules are listed in section 2 of this chapter.

C. *Conditions for Computing Net Flightpath.* The takeoff weight limited by obstacle clearance is computed in a manner similar to the runway takeoff weight limit as follows:

(1) One engine is assumed to fail at V*ef*. The remaining engines are at takeoff thrust.

(2) Landing gear retraction is assumed to begin immediately after lift-off. The airplane should climb out at a speed as close as practical to, but not less than, V2 speed until the selected acceleration height is reached. The acceleration height is chosen by the operator but may not be less than 400 feet.

(3) After the airplane reaches the acceleration height, the final segment begins with the transition to en route climb configuration (which is to accelerate to climb speed, retract wing flaps, and reduce to maximum continuous thrust (MCT)). The operator has considerable latitude in choosing the transition method. The operator may choose the flightpath for any runway that gives the best results for the particular height and distance of the obstacles. One extreme is to climb directly over the obstacle at V2, with takeoff flaps and takeoff thrust. The opposite extreme is to level off at the selected acceleration height, accelerate in level flight (negative slope not allowed) to the flaps-up climb speed, and then to continue climbing and reducing thrust to MCT. An infinite variety of flightpaths between these two extremes may be used. In any event, the flightpath chosen to show obstacle clearance must extend to the end of the takeoff flightpath. The takeoff flightpath ends not lower than 1,000 feet for SR 422 airplanes and not lower than 1,500 feet for SR 422A, SR 422B, Part 25, and commuter category airplanes.

D. *Turns.* For analysis purposes, it may be assumed that the airplane turns to avoid obstacles, but not before reaching 50 feet above the runway and by not more than a 15-degree bank. When a turn is used, the rate of climb or gradient must be reduced by the increment of climb performance lost.

E. *Takeoff Minimums.* TERPS criteria is based on the assumption that the airplane can climb at 200 feet per nautical mile (approximately 30:1) to the minimum en route altitude through the takeoff flightpath.

(1) When obstacles penetrate the obstacle clearance plane, the airplane must be able to climb at a steeper gradient or to use higher than standard takeoff minimums to allow the obstructions to be seen and avoided under visual conditions. Authorizations for lower-than-standard takeoff minimums are based on the operator adjusting airplane takeoff weight to avoid obstacles in the takeoff flightpath if an engine fails on takeoff. POI's shall not authorize operators who do not prepare an airport analysis and perform obstacle climb computations to use lower-than-standard takeoff minimums. POI's may approve a system in which the operator makes obstacle clearance computations and performs lower-than-standard visibility takeoffs on specified runways, as opposed to all runways.

(2) The criteria for TERPS does not take into account whether or not the aircraft is operating on all engines. Operators must either show compliance with TERPS criteria with an engine out or have an alternate routing available for use in case of an engine failure. Specific guidance for approval of these procedures is in development and will be included in this handbook at a later date.

929. EN ROUTE PERFORMANCE LIMITS. There are a number of en route performance rules which may limit the weight at which an airplane can be dispatched or released.

A. *Part 121 En Route Obstacle Clearance.* Subpart I of Part 121 contains en route obstacle limitations for all airplanes operated under Part 121. The details of these limitations differ for reciprocating-powered, transport category airplanes; turbine-powered, transport category airplanes; and large, nontransport category airplanes. In general, all airplanes must be operated at a weight at which single-engine failure (two-engine airplanes) or multiple engine failures (3- and 4-engine airplanes) can be experienced and the airplane continued on to destination or diverted to an alternate airport. After the engine failure, the airplane must be capable of clearing all obstructions by a specified margin. Driftdown or fuel dumping may be used to comply with these requirements (see subparagraph E that follows for a discussion of driftdown).

B. *Part 135 En Route Obstacle Clearance.* FAR 135.181 places en route performance limitations on all IFR passenger-carrying operations.

(1) FAR 135.181(a)(1) effectively prohibits the release of passenger-carrying flights under IFR conditions in single-engine airplanes. The rule does permit over-the-top operations under limited circumstances. The flight must be able to reach VFR conditions within 15 minutes after takeoff. At the point the airplane has flown 15 minutes, the weather below any overcast must be VFR. These conditions must exist at all points on the route, including overhead the destination.

(2) FAR 135.181(a)(2) prohibits the release of multiengine airplanes in passenger-carrying IFR operations or VFR over-the-top operations unless specific conditions are met. The airplane must be able to sustain a failure of the critical engine and climb at a rate of 50 feet per minute at the MEA or 5,000 MSL, whichever is higher. The other circumstance in which a multiengine airplane can be released in IFR conditions or VFR over-the-top conditions is when, after an engine failure, a descent can be made to VFR conditions at or above the MEA.

NOTE: Inspectors must be aware that small airplanes of 6,000 pounds or less MTOW are not required to have the capacity to climb or maintain altitude with an engine failed at any altitude for certification.

C. *Part 121 Extended Overwater Operations.*

(1) FAR 121.161 prohibits the release of 2- and 3-engine airplanes (except 3-engine turbojet airplanes) for operations more than 1-hour distance from an acceptable alternate airport, measured at one-engine inoperative cruise speed. The only exception is that extended overwater operations of two-engine turbojet airplanes (ETOPS) may be approved by the POI with prior concurrence of AFS-400. When such approval is granted to an operator, these authorizations are contained in paragraph B42 of the operations specifications.

(2) FAR 121.183 and FAR 121.193 limit the release of 4-engine, transport category airplanes. The limitations of these rules vary with the rule under which the aircraft was certified. In general, the airplanes must be dispatched at a weight which will allow the loss of two engines simultaneously at the most critical point of the flight, while still allowing the airplane to maintain a specified altitude and reach an alternate airport. The two means by which operators may choose to show compliance are by limiting the takeoff weight or by fuel dumping (see subparagraph E). Two points on a route that are frequently critical are the point at which the airplane reaches the top of climb and the point at which the airplane is furthest from an alternate airport.

D. *Part 135 Overwater Operations.* FAR 135.183 prohibits operators from operating a land airplane overwater (except for takeoff and landing) at a weight at which a positive rate of climb of 50 feet per minute cannot be maintained at 1,000 feet above the surface. There are no provisions in Part 135 for the use of fuel dumping to comply with this requirement. A number of Part 135 operators have, however, obtained exemptions to allow the use of fuel dumping (see subparagraph E).

E. *Fuel Dumping and Driftdown.* Part 121 operators may use driftdown or fuel dumping procedures to comply with certain en route performance rules. Part 135 operators may apply for a grant of exemption to use driftdown or fuel dumping as an alternate means of complying with FAR 135.181 or FAR 135.183 in accordance with Part 11 (see volume 1, chapter 4, section 4 of this handbook for information on exemptions).

(1) Driftdown can be defined as a procedure by which an airplane with one or more engines inoperative, the remaining engines at maximum continuous thrust (MCT), and while maintaining a specified speed (usually best L/D X 1.01%), descends to the altitude at which the airplane can maintain altitude and begin to climb (this altitude is defined as driftdown height).

(2) Many modern airplanes can be dispatched or released at takeoff weights which place the driftdown height below the minimum altitude that the airplane is required to maintain by Part 121 or Part 135. In this case, the takeoff weight must be limited or fuel dumping must be used to comply with the en route limit. Compliance must be demonstrated at all points in the en route segment of the flight.

(3) Before approving driftdown or fuel dumping procedures for Part 121 operators (or 135 operators who hold exemptions authorizing the use of these procedures) POI's shall carefully evaluate the operator's proposed data, procedures, and training program. The data must either come from the AFM or from the manufacturer. Unapproved data must be reviewed by the applicable aircraft evaluation group (AEG) either in the exemption process or prior to the POI's approval. The company flight manual (CFM) must contain specific flightcrew procedures. The operator's training program must provide adequate initial and recurrent training in these procedures. Operators must provide for the POI's evaluation for each route, route segment, or area, an analysis of the reliability of wind and

"weather forecasting, the means and accuracy of navigation, prevailing weather conditions - particularly turbulence, terrain features, air traffic control facilities, and the availability of suitable alternate airports. The operator must provide flightcrews with adequate weather briefings.

931. APPROACH AND LANDING CLIMB LIMITS. Approach and landing climb limit weights limit the allowable takeoff weight. To compute the maximum allowable takeoff weight, the predicted weight of the airplane after arrival at the intended destination and alternate airports must be computed by subtracting the estimated en route fuel burn. The resulting weight must allow the airplane to climb at a minimum specified gradient (rate of climb) in both the approach and landing configurations.

A. *Approach Climb.* This requirement is intended to guarantee adequate performance in the go-around configuration after an approach with an inoperative engine (gear up, flaps at the specified approach setting, the critical engine inoperative, and remaining engines at go-around thrust).

B. *Landing Climb.* This requirement is intended to guarantee adequate performance to arrest the descent and allow a go-around from the final stage of a landing (gear down, landing flaps, and go-around thrust).

933. LANDING DISTANCE. The maximum weight for an airplane landing on any runway must be limited so that the landing distance required by the performance rules will be less than the effective landing length available.

A. *Effective Landing Runway Length.* Effective landing runway length for all categories of airplanes is the distance from the point on the approach end of the runway at which the obstruction plane intersects the runway to the roll-out end of the runway. The obstruction plane is a plane that is tangent to the controlling obstruction in the obstruction clearance area that slopes down toward the runway at a 1:20 slope from the horizontal. The area in which the obstruction clearance plane must clear all obstacles is 200 feet on each side of the runway centerline at the touchdown point, which expands to a width of 500 feet on each side at a point 1,500 feet from the touchdown end and beyond. The centerline of the obstruction clearance area may curve at a radius of not less than 4,000 feet, but the last 1,500 feet to the touchdown point must be straight in. Stopways are not usually considered, and clearways may not be considered, as available landing areas.

Figure 4.3.1.4
Landing Distance

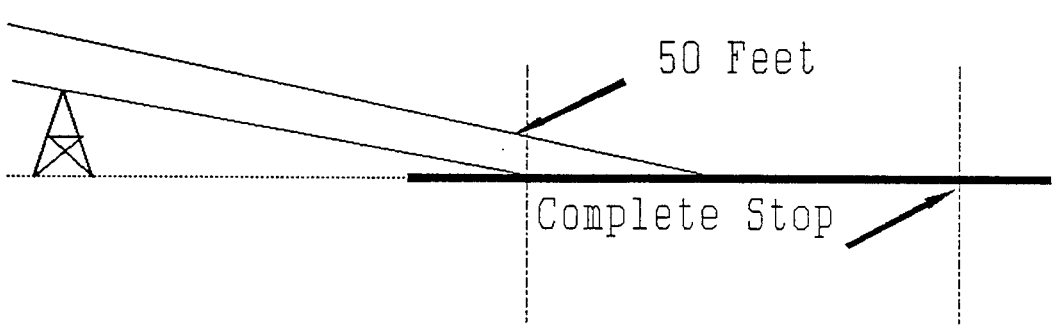

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Figure 4.3.1.4
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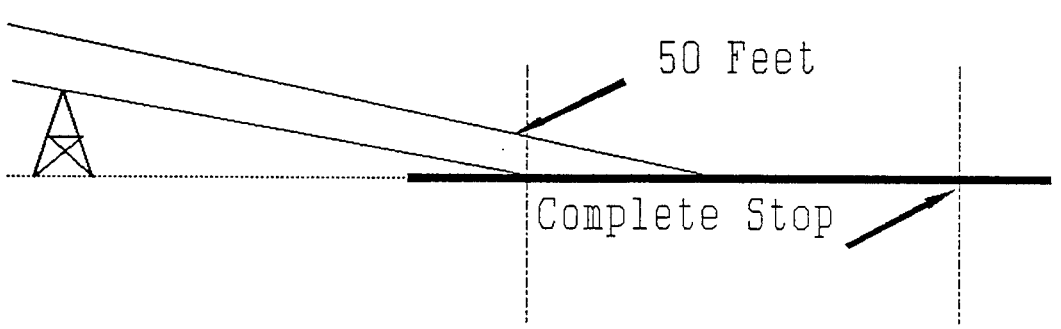


SECTION 2. AIRPLANE PERFORMANCE RULES

947. GENERAL. This section contains detailed information and guidance to inspectors and POI's on the performance rules applicable to specific airplanes. In many cases, tables and figures are provided in this section for inspectors to reference.

949. LARGE, RECIPROCATING-POWERED, TRANSPORT CATEGORY AIRPLANE PERFORMANCE. Large, reciprocating-powered, transport category airplanes must be operated under the performance rules of FAR's 121.173 through 121.187 and FAR 121.173(e) or, under FAR's 135.365 through 135.377 and FAR 135.363(g). Table 4.3.2.1 contains a summary of these rules.

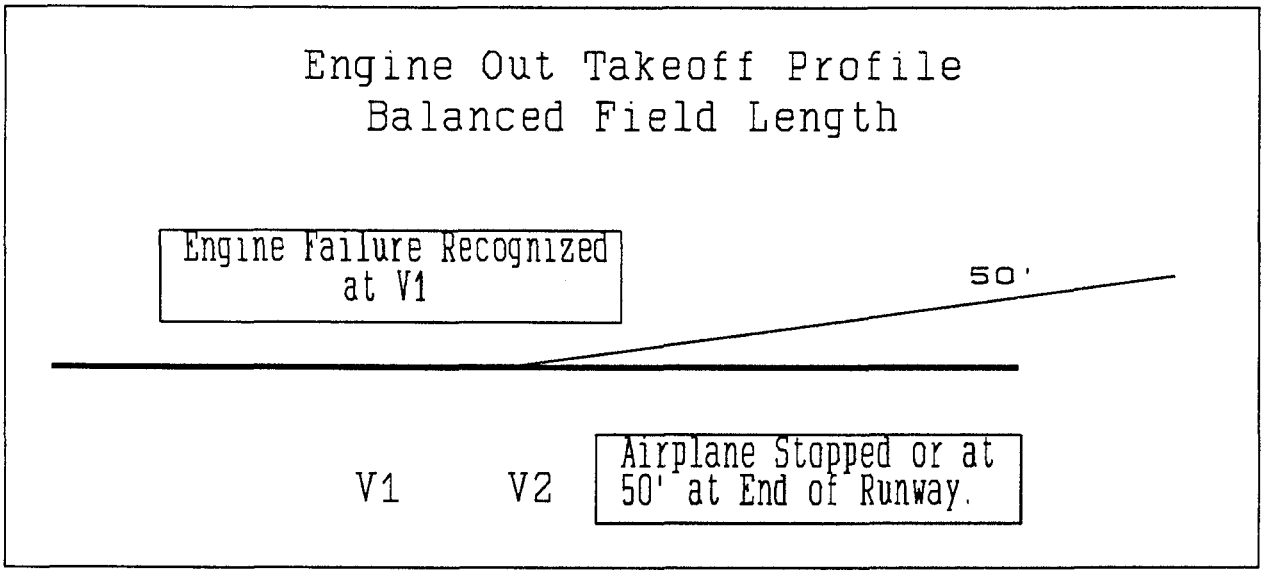
TABLE 4.3.2.1
SUMMARY OF DISPATCH RULES FOR LARGE RECIPROCATING POWERED TRANSPORT CATEGORY AIRPLANES

Temp. Correct.	Yes	FAR 121.173(e), FAR 135.363(g)
Structural Limits		
Maximum Taxi	Yes	AFM Limit
Maximum Takeoff	Yes	AFM Limit
Zero Fuel Weight	Yes	AFM Limit
Takeoff		
Accelerate/Stop	Yes	FAR 121.177(a)(1), FAR 135.367(a)(1)
All-Engines	No	
Accelerate/Go	Yes	FAR 121.177(a)(2), FAR 135.367(a)(2)
Climb Limit	Yes	FAR 121.175(d), FAR 135.365(d)
Obstacle Limit	Yes	FAR 121.177(a)(3), FAR 135.367(a)(3)
En Route Limits		
All-Engines	Yes	FAR 121.179, FAR 135.369
One-Eng. Inop	Yes	FAR 121.181, FAR 135.371
Two-Eng. Inop	Part 25	FAR 121.183, FAR 135.37
Approach Climb	Yes	FAR 121.175(e), FAR 25.121(d) FAR 135.365(e), FAR 25.121(d)
Landing Climb	Yes	FAR 121.175(e), FAR 25.119 FAR 135.365(e), FAR 25.119
Max. Landing Wt.	Yes	AFM Limit
Runway Limit		
Destination	Yes	FAR 121.185, FAR 135.375
Alternate	Yes	FAR 121.187, FAR 135.377

A. *Ambient Temperatures.* FAR 121.173(e) and FAR 135.363(g) require that takeoff performance must be corrected for ambient temperatures. The correction factor is usually published in the flight manual as a specific number of feet to be added to the takeoff distance at a specific elevation for higher-than-standard temperatures or as a specific number of feet to be subtracted for lower-than-standard temperatures.

B. *Runway Limits.* A large, reciprocating-powered transport category aircraft must be able to accelerate to V_1, lose the critical engine, and then stop on the remaining runway or, continue on the runway to V_2, lift-off, and cross the effective end of the runway at not less than 50 feet. Clearways and stopways are not authorized. There is no requirement to compute an all engines operating takeoff distance.

FIGURE 4.3.2.1.



C. *Balanced Field Length.* For any given takeoff condition (gross weight, elevation, temperature) the controlling accelerate-stop distance or accelerate-go distance will be shortest when V_1 is chosen so that these two distances are equal (balanced). Most operators of reciprocating-powered airplanes choose V_1 to produce a balanced field length.

D. *Takeoff Climb Limit.* The following takeoff flightpath is used to establish the takeoff climb limit weight:

(1) The first segment of the flightpath extends from the beginning of the takeoff roll to 50 feet over the end of the runway. The critical engine is assumed to fail at V_1, and the airplane continues to accelerate to V_2 on the runway. The airplane then climbs at V_2 with the gear extended and the propeller on the failed engine either windmilling or stopping by an auto feather mechanism (no pilot action allowed). The airplane may be banked 5 degrees away from the failed engine. The airplane must be capable of climbing at a rate of 50 feet per minute in this configuration.

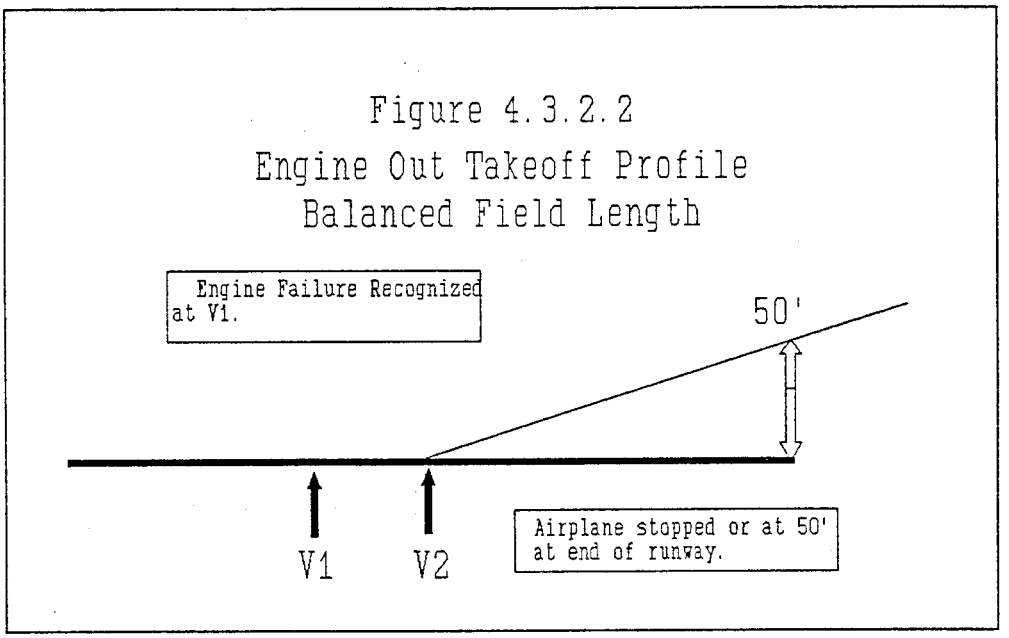
(2) The second segment starts at 50 feet. The landing gear is assumed to have reached the retracted position. This segment ends at 400 feet. The rate of climb must be at least .046 times V_{s1} squared, expressed in feet per minute. For a V_{s1} of 50, the following formula applies:

$$(.046 * [50]^2)$$
$$(.046 * 2{,}500) = 115 \text{ FPM}$$

(3) The third (final segment) begins at 400 feet. The propeller is feathered, the cowl flap is closed on the failed engine, the flaps are set to the en route climb position, and the power on the operating engine(s) is set to MCT. This final segment ends when the en route climb configuration has been achieved, but at not less than 1,000 feet above the runway surface. The rate of climb in the final segment must be ([.079 - .106/N] * V_{so}^2), with N representing the number of engines. For a two-engine airplane with a V_{so} of 50, the following formula applies:

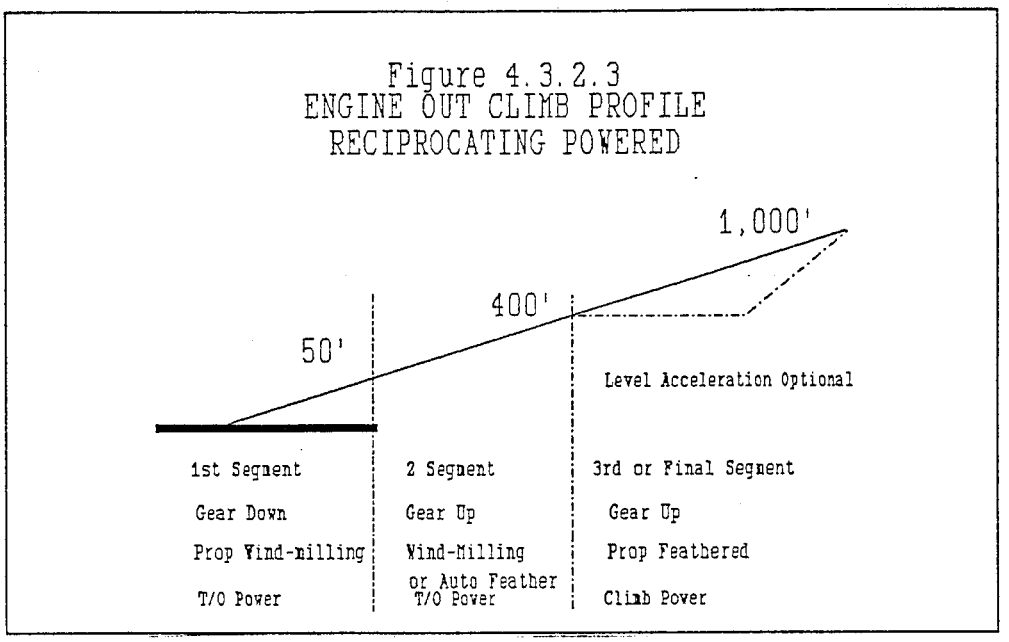
$$([.079 - .106/2] * 50^2)$$
$$([.079 - .053] * 2500)$$
$$(.026 * 2{,}500) = 65 \text{ FPM}$$

FIGURE 4.3.2.2.



E. *Obstacle Limits.* The airplane must be able to clear all obstacles in the takeoff path by 50 feet with the critical engine failed. A "net gradient" is not used and the clearance required is 50 feet at all points throughout the takeoff path. A bank may be used once the airplane reaches 50 feet above the runway surface.

FIGURE 4.3.2.3.



F. *All-Engines Operating En Route Limit.* Airplanes certified under CAR 4A and subsequent rules must be able to climb at a rate of 6.9 V_{so} (in feet per minute) at an altitude of 1,000 feet above all obstacles within 10 miles on either side of the intended track. For a power-off stall speed of 50, the required rate is 345 feet per minute (6.9 X 50). There is no similar limitation for airplanes certified under CAR 4A or previous rules.

G. *Engine-Out En Route Limit.* At an altitude of 1,000 feet above all obstacles within 10 miles of the course to be flown, the airplane must be able to climb at a rate specified as follows:

(1) Airplanes certified under CAR 4B must be able to climb at $.079-(.106/N)V_{so}^2$, expressed in feet per minute, where N is the number of engines. For a four-engine airplane with a stall speed of 100, the following formula applies:

$.079-(.106/4)100^2$ and
.079-.0265 * 10,000 and
.0525 * 10,000 = 525 FPM

(2) Airplanes certified under CAR 4A must be able to maintain a rate of climb of $.026V_{so}^2$, expressed in feet per minute. For an airplane with a stall speed of 50, the following formula applies:

$.026*50^2$ = 65 FPM

(3) Instead of meeting the climb requirement, the operator may substitute an approved diversion. The procedure must be approved by the POI and published in a CFM or a portion of the GOM. When an operator proposes such a procedure, the airplane must be able to maintain an altitude of 2,000 feet above any obstacle within 5 miles of track after the assumed failure. The rate of climb used to show this capability must be taken from the AFM and diminished by $.079-[.106/N]V_{so}^2$ for CAR 4B airplanes or by .026 V_{so} for CAR 4A airplanes to compute a net gradient. The operator's proposed procedure must define a point at which the airplane is assumed to pass over the critical obstacle. The operator's procedure must define this point by means of an approved navigational fix. The airplane must also be able to meet the required rate of climb at an altitude of 1,000 feet above the alternate airport. The procedure must provide an account of winds and temperatures forecast in the area. Fuel may be jettisoned to meet these requirements. An en route alternate airport to which the airplane could divert, which meets the prescribed weather minimums, must be specified on the flight release when these procedures are used.

NOTE: Inspectors must be aware that an operator's compliance with the requirements described in this subparagraph G does not relieve the operator with having to comply with FAR 135.181. The FAR 135.181 engine out en route performance limit can be more restrictive than the limitations described in this paragraph.

H. *Two-Engine Inoperative En Route Limit.* Airplanes certified with four or more engines under Part 25 may not be operated more than 90 minutes away (measured at normal, all- engine cruise speed) from a suitable alternate airport unless the airplane is capable of climbing at .013 V_{so}^2 with the two critical engines failed at an altitude of 1,000 feet above the highest terrain or obstruction within 10 miles on either side of the intended track or 5,000 MSL, whichever is higher.

(1) The engines are assumed to fail at the most critical point with respect to the takeoff weight.

(2) Normal consumption of fuel and oil is assumed in computing weight at the point of the assumed failure.

(3) When the airplane must drift down after the engine failures, the airplane does not have to be capable of the required climb performance until it reaches the minimum altitude. A net flightpath is computed during the driftdown period by subtracting .013 V_{so}^2 from the rate of descent shown in the AFM or other approved data.

(4) If the operator elects to jettison fuel to comply with this rule, enough fuel must remain after jettison to allow the airplane to proceed to a suitable alternate airport and to arrive 1,000 feet directly over the airport. Designated en route alternate airports must be listed on the flight release.

I. *Approach to a Landing Climb.* A reciprocating-powered, transport category aircraft must be able to climb at a rate of $.053V_{so}^2$ expressed in feet per minute in the approach configuration. In the landing configuration, the airplane must be able to climb at a rate of $.092V_{so}^2$.

J. *Landing Distance Limitations.* For dispatch planning, reciprocating-powered airplanes must be able to land within 60% of the effective runway at the destination. A flight may also be dispatched to a destination at which the airplane can land within 70% of the effective runway, if the designated alternate airport is one at which the airplane can land within 70% of the effective runway distance.

951. LARGE, TURBINE-POWERED TRANSPORT CATEGORY AIRPLANE PERFORMANCE. Large, turbine-powered (turbojet and turboprop) airplanes must be operated under the performance rules in FAR 121.189 through FAR 121.197 or FAR 135.379 through FAR 135.387, as applicable.

TABLE 4.3.2.2
SUMMARY OF DISPATCH RULES FOR LARGE, TURBINE POWERED TRANSPORT CATEGORY AIRPLANES

Temp. Correct.	No	Data at Ambient Temp.
Structural Limits		
Maximum Taxi	Yes	AFM Limit
Maximum Takeoff	Yes	AFM Limit
Zero Fuel Wt.	Yes	AFM Limit
Takeoff Weights		
Accelerate/Stop	Yes	FAR 121.189, FAR 135.379
All-Engines	Yes	FAR 121.189, FAR 135.379
Accelerate/Go	Yes	FAR 121.189, FAR 135.379
Obstacle Limit	Yes	FAR 121.189, FAR 135.379
Climb Limit	Yes	FAR 121.189, FAR 135.37
En Route Limits		
All-Engines	No	
One-Eng. Inop	Yes	FAR 121.191, FAR 135.381
Two-Eng. Inop	Yes	FAR 121.193, FAR 135.383
Approach Climb	Yes	FAR 121.195(a), FAR 25.121(d) FAR 135.385(a), FAR 25.121(d)
Landing Climb	Yes	FAR 121.195(a), FAR 25.119 FAR 135.385(a), FAR 25.119
Max. Landing Weight	Yes	AFM Limit
Runway Limit		
Destination	Yes	FAR 121.195, FAR 135.385
Alternate	Yes	FAR 121.197, FAR 135.387

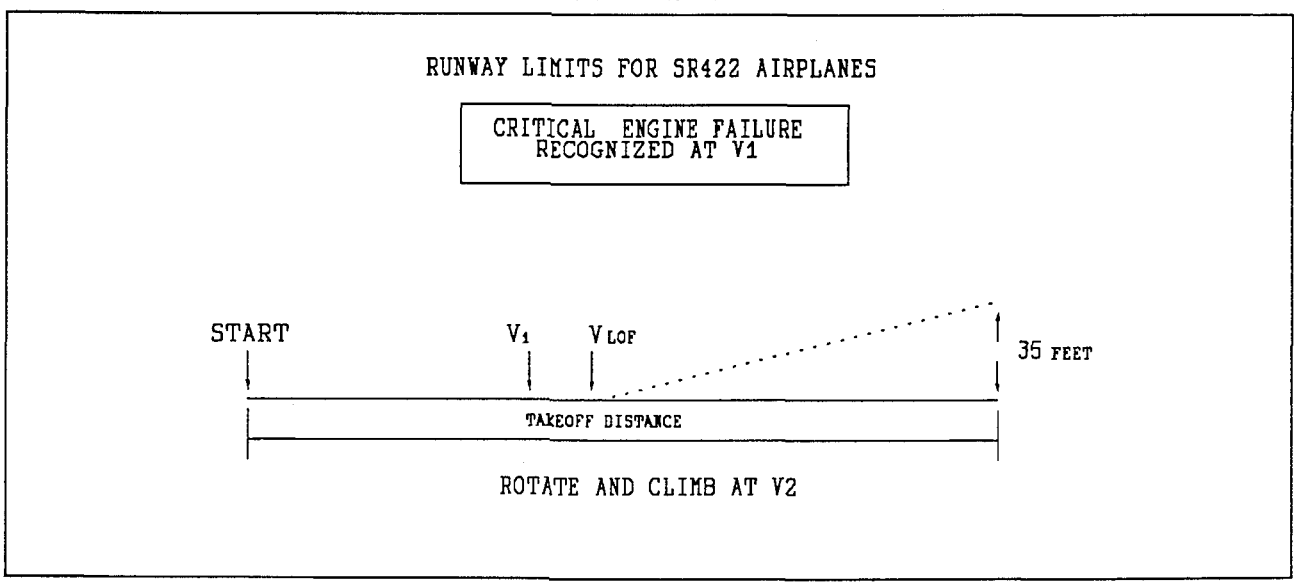
FIGURE 4.3.2.4
VARIATIONS IN TURBINE AIRPLANE TAKEOFF PERFORMANCE

```
CAR 4          SR422          SR422A         SR422B         FAR 25
11/45          8/57           7/58           7/59           2/65

CLIMB
 <--Rate of climb-><--------------------Climb computaions based on gradient ------------------------------>
ALL ENGINES T/O DISTANCE
 <--------------Not computed-------------><----------------115% All engines Takeoff distance-------------->
V2
 <-On Ground------><-----Near Ground-----><-----------------Vr used and V2 reached at 35' ---------------->
CLEARWAYS and STOPWAYS
 <----------------No Clearway -----------><--Level Clearway-----><-Sloping Clearway, Max. 1/2 runway------>
                                          Max.  1/2 T.O. Run
 <----------Balanced Field Length--------><----------------------Unbalanced Field Length----------------->
 <----------------No Stopways------------><-----------------------------Stopways----------------------->
TAKEOFF CLIMB SEGMENT
 <----------------1,000 Feet-------------><-------------1,500 Feet above runway surface------------------>
OBSTACLE CLEARANCE
 <--------50 Feet at all points----------><----.1 X Dist. +35'--><-----------Net Path + 35 ft.------------>
```

A. *Runway Limits for SR 422 Airplanes.* Only accelerate-stop and accelerate-go distance computations are required to determine takeoff distances for airplanes certified under SR 422. In the accelerate-go computation, SR 422 airplanes must reach V_2 before lift-off (V_r is not computed or used). The accelerate-go distance is measured to the point the airplane reaches 35 feet above the runway surface. Clearways and stopways are not allowed. The airplane must cross the end of the runway at or above 35 feet.

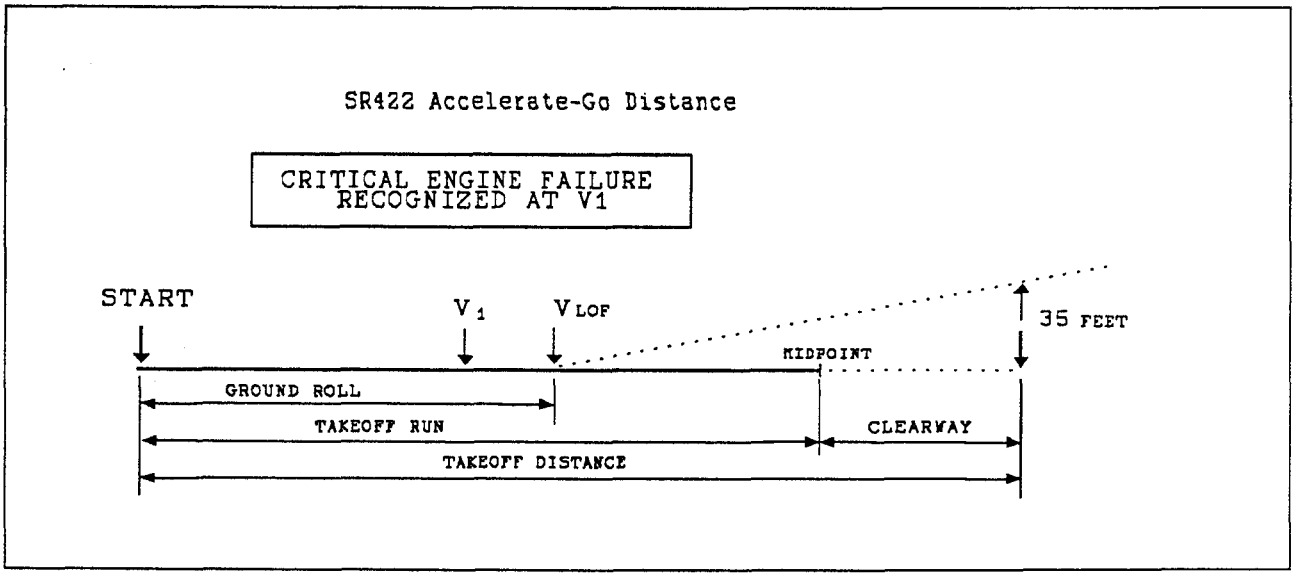
FIGURE 4.3.2.5.



B. *Runway Limits for SR 422A Airplanes.* The takeoff distance for airplanes certified under SR 422A is the longer distance among the 115% all-engines takeoff distance, the accelerate-stop distance, and the accelerate-go distance. The nosewheel is lifted off the ground at V_r which is calculated so that V_2 is reached as the aircraft becomes airborne. Clearways may be used but stopways are not allowed. A clearway under SR 422A is an area beyond the runway that is centrally located around the extended centerline and is under the control of airport authorities. A clearway extends 300 feet on either side of the extended runway centerline at the runway elevation, and into which only runway lights of 26 inches or less height may intrude. The maximum clearway distance may not exceed one half of the takeoff run distance.

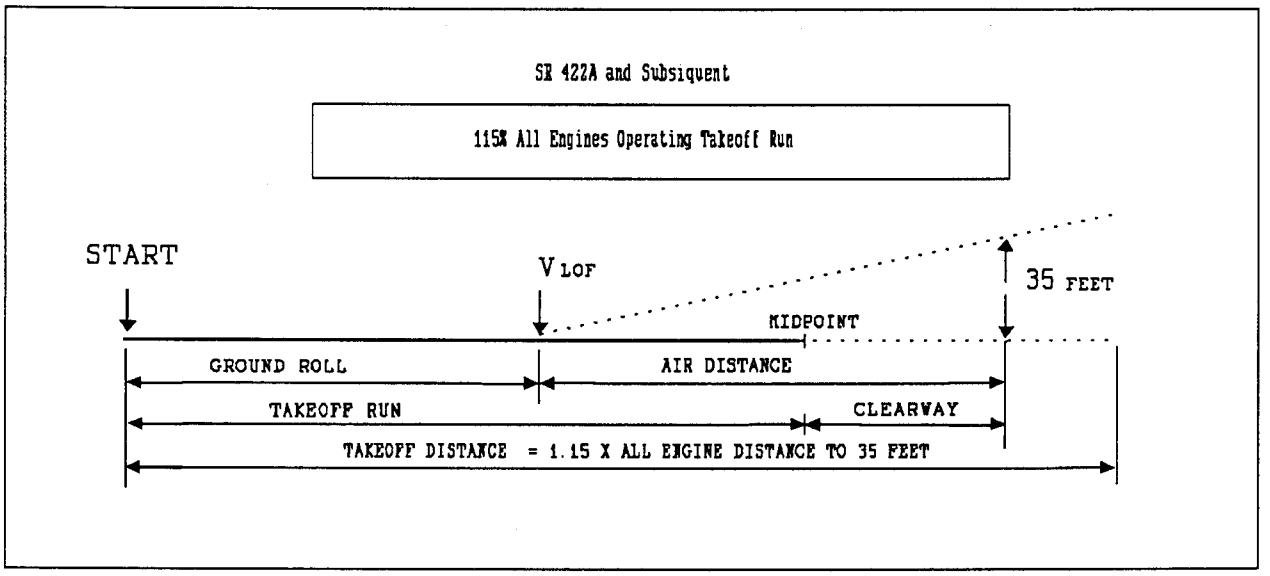
C. *SR 422A and Subsequent Accelerate-Go Distance.* The accelerate-go distance is measured from the start of the takeoff roll to the point at which the aircraft reaches 35 feet above the runway elevation. This point may be over the clearway. Failure of the critical engine is recognized at V_1.

FIGURE 4.3.2.6.



D. *SR 422A and Subsequent 115% All-Engines Takeoff Distance.* The 115% all-engines takeoff distance is the distance from the start of the takeoff run to the point the airplane reaches 35 feet above the runway elevation, plus an additional 15%. This point must be over the runway or the clearway.

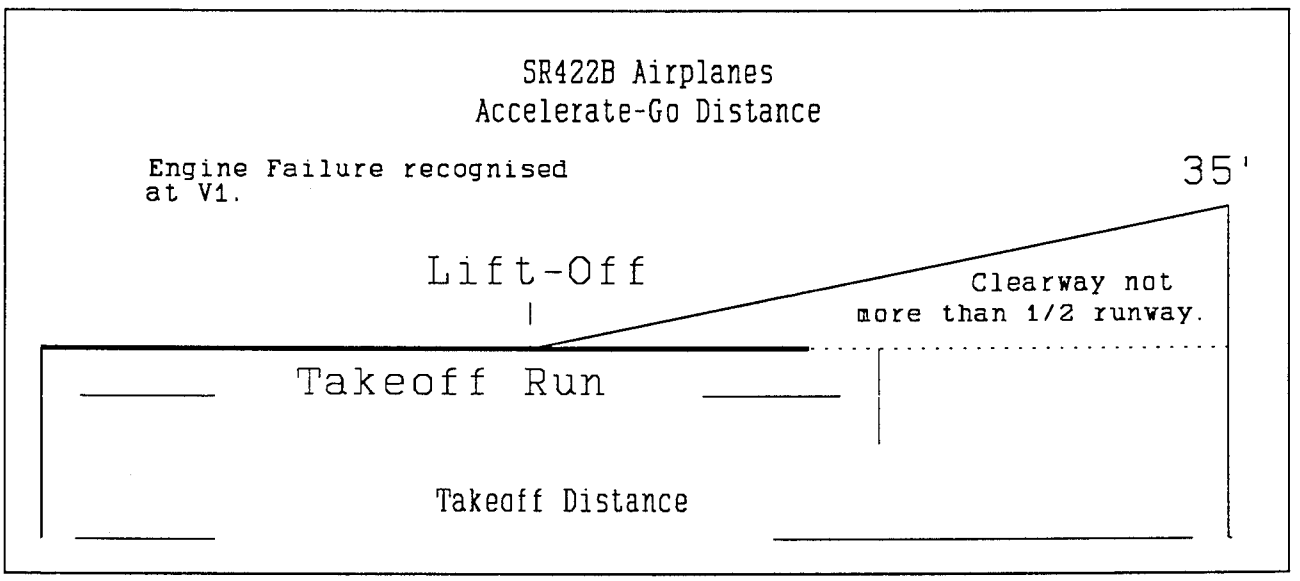
FIGURE 4.3.2.7.



E. *SR 422A and Subsequent Takeoff Run.* If the takeoff distance is computed using a clearway, the takeoff run is the longer of two distances, either the accelerate-go takeoff run distance or the 115% all-engines takeoff run distance.

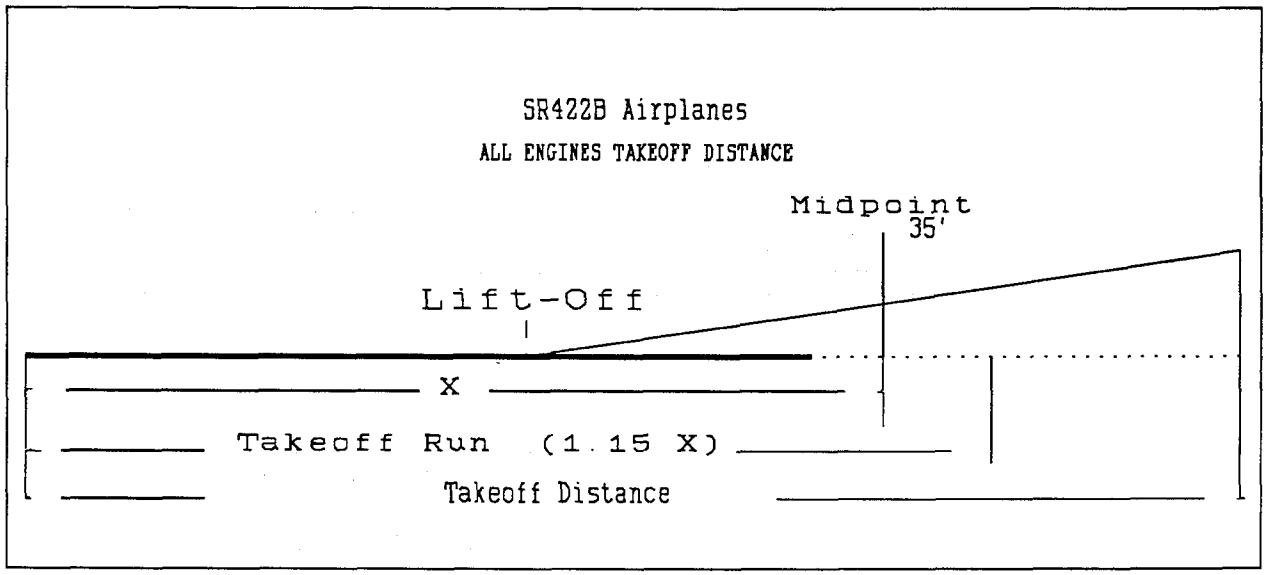
(1) *Accelerate-Go Takeoff Run.* The accelerate-go takeoff run distance is measured from the start of the takeoff roll to a point equidistant from the point at which lift-off occurs to the point at which the airplane reaches 35 feet above the surface. The critical engine is assumed to fail at V_{ef} with recognition V_1. The end of the takeoff run must be on or over the runway.

FIGURE 4.3.2.8.



(2) *115% All-Engines Takeoff Run.* The 115% all-engines takeoff run is calculated by measuring from the start of the takeoff roll to the point midway between the lift-off point and the point at which the airplane reaches 35 feet above the runway surface and by then adding 15%. The takeoff run must be on or over the runway surface.

FIGURE 4.3.2.9.



NOTE: To simplify clearway computations, the maximum allowable clearway is normally stated by the manufacturer as a specified number of feet for a given runway length.

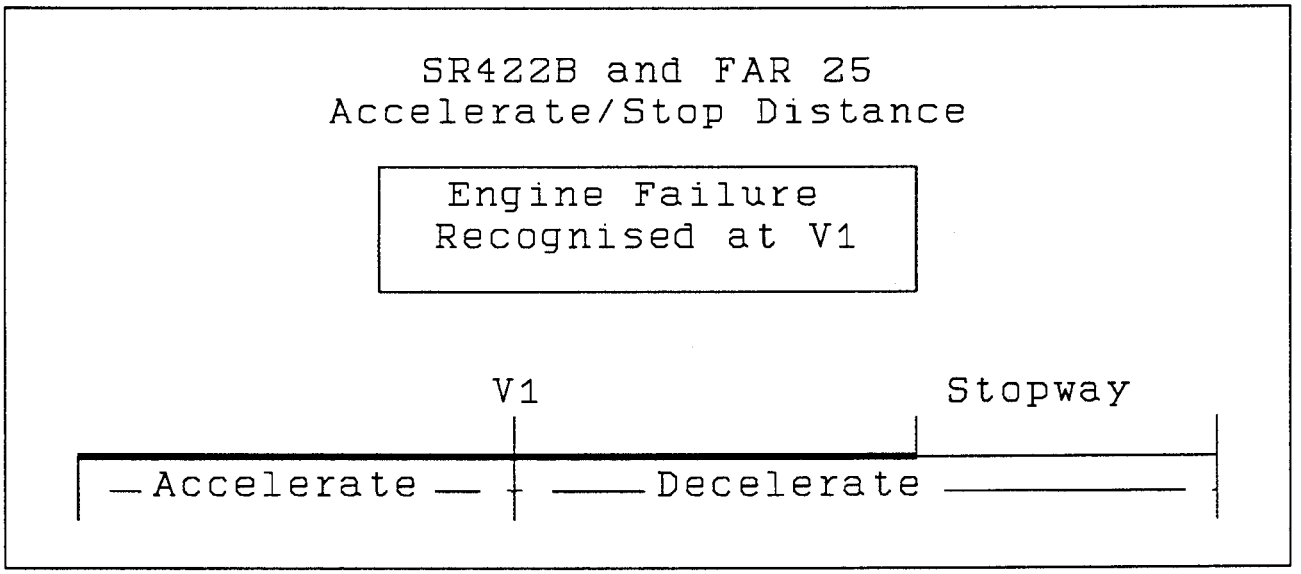
F. *Stopways.* For SR 422B and Part 25 airplanes, a stopway may be used to extend the effective runway length when computing the weight limited by the accelerate-stop distance. A stopway is an area beyond the runway, at least as wide as the runway, that is centrally located about the extended centerline of the runway, and designated by the airport authorities for use in decelerating the airplane during a refused takeoff. A stopway must be capable of supporting the airplane without inducing structural damage. The surface characteristics of the stopway may not differ substantially from those of a smooth, dry, hard surface runway. The airplane must be able to accelerate to V_1, to experience an engine failure, and then to lift-off on the actual runway surface.

G. *Unbalanced Field Length.* The 115% all-engines takeoff distance is usually the controlling distance for SR 422A and subsequent airplanes. A V_1 selected to achieve a balanced field length usually exceeds V_r, a condition which is not allowed by the regulations. For these airplanes, V_1 is normally selected as identical to V_r and the balanced field length concept is not applicable.

H. *Climb Limit Weights.* The takeoff weight of large, turbine-powered airplanes must be limited to allow the aircraft to climb at a specified gradient through each of the defined climb segments of the takeoff flightpath. The climb segments are defined as follows:

(1) The first climb segment starts from lift-off to the point at which the landing gear is retracted, but not

FIGURE 4.3.2.10.



less than 35 feet above the runway. Airplanes certified under SR 422 and subsequent rules must attain V_2 speed before exceeding 35 feet above the runway surface. Airplanes certified under SR 422 must attain V_2 speed as they leave the ground.

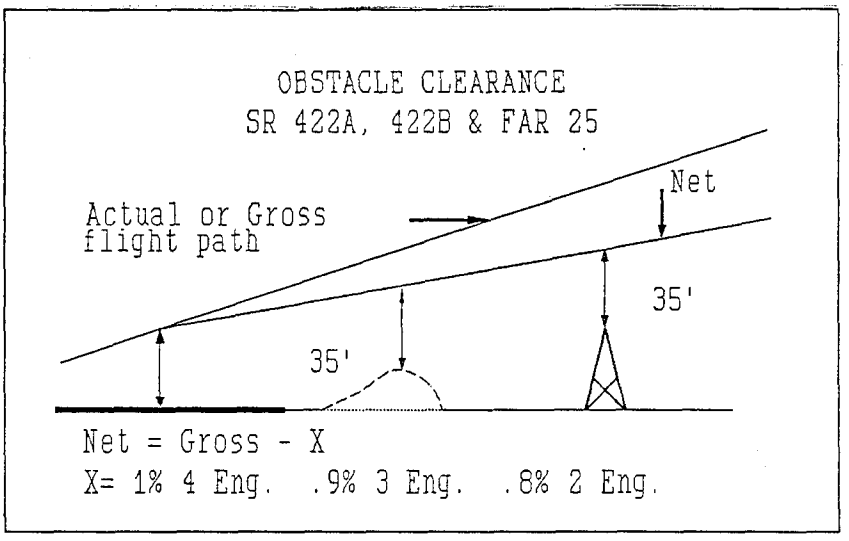
(2) The second climb segment starts when the gear is retracted or at 35 feet, whichever is later, and continues at V_2 until the selected acceleration height (not less than 400 feet above the runway).

(3) The third and final climb segment starts at the acceleration height and continues until the transition to the en route configuration is complete (not lower than 1,000 feet above the runway for SR 422 airplanes and 1,500 feet above the runway surface for SR 422A and subsequent aircraft). The en route speed at the end of the transition segment may not be less than 125% of V_s. The final segment (at the operator's option) may be divided into third and fourth segments. The aircraft may fly level in the third segment (no negative slope allowed), and then accelerate and resume the climb in the fourth segment. The overall gradient, however, is measured from the end of the second segment to the end of the final segment.

I. *Obstacle Clearance Net Flightpath SR 422A, SR 422B and Part 25.* The net takeoff flightpath for SR 422A, SR 422B, and Part 25 airplanes is derived by subtracting an increment from the actual path the airplane can fly (gross flightpath). The increment is 1% for four-engine airplanes, .9% for three-engine airplanes, and .8% for two-engine airplanes. The net flightpath begins at the point the airplane reaches 35 feet above the runway and must pass not less than 35 feet over each obstacle. The use of a net flightpath has the effect of adding 10 feet for four-engine airplanes, 9 feet for three-engine airplanes, and 8 feet for two-engine airplanes with obstacle clearance for each 1000 feet of distance traveled from the end of the runway.

J. *Obstacle Clearance SR 422 Airplanes.* The net flightpath for SR 422 airplanes is computed by multiplying the distance traveled from the end of the runway to the obstacle by 1.01 and by then adding 35 feet.

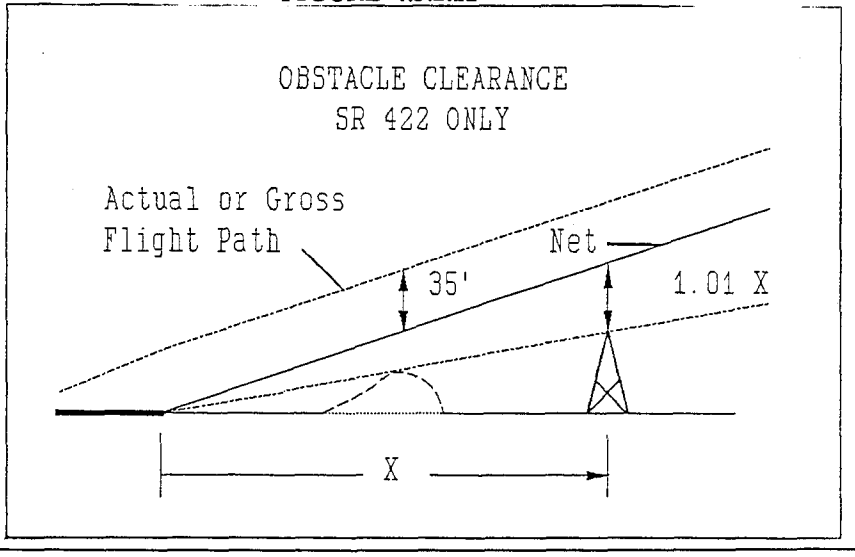
FIGURE 4.3.2.11.



K. *One-Engine Inoperative En Route Performance.* Turbine-powered, transport category airplanes must, at all points along the intended route after an engine fails, be able to clear all terrain and obstructions by 1,000 feet that are within 5 statute miles on either side of the intended track. This requirement must be met at the forecast temperature for the required altitudes at the planned time of the flight.

(1) One means of complying with this rule is to limit the takeoff gross weight so that, considering fuel burn, the aircraft will be light enough to ensure the necessary performance over the most critical point on the route. When the rule is applied in this way, it must be shown that the airplane can at least fly level with one engine inoperative at an altitude of at least 1,000 feet above the terrain and 1,500 feet above the destination

FIGURE 4.3.2.12



airport, using net flightpath data. In this case, the net flightpath is derived by subtracting 1.6% gradient for four-engine airplanes, 1.4% for three-engine airplanes, and 1.1% for two-engine airplanes from the actual climb performance the airplane can produce. Thus, the net climb gradient capability remains a performance margin at the weight, altitude, and temperature anticipated at the critical point on the route.

(2) Takeoff gross weights higher than those obtained by the method in subparagraph (1), may be achieved by fuel jettison or driftdown. When fuel jettison or driftdown is used, the operator must show that the net flightpath available after engine failure would permit the airplane to clear all terrain by at least 2,000 feet while cruising, or when drifting down to an alternate airport within range of the fuel remaining after jettison. An SR 422 airplane must have enough fuel after jettison to reach a point overhead the planned alternate airport. At the planned arrival weight, the airplane must be capable of maintaining a positive climb gradient at an altitude of 1,000 feet above the designated airport. An SR 422A airplane, an SR 422B airplane, or a Part 25 airplane must have enough fuel after jettison to reach the alternate airport and to then fly an additional 15 minutes. The airplane must be capable of maintaining a positive climb gradient at an altitude of 1,500 feet above the designated airport. The prevailing wind and temperature forecast must be taken into account in the area. An en route alternate airport to which the airplane is assumed to divert (at which the weather is forecasted to meet the prescribed weather minimums), must be specified on the flightplan and clearance forms.

(3) POI's should be aware that the engine-out, en route performance limit is particularly critical for two-engine airplanes operated in the mountainous portions of the western contiguous United States and Alaska. POI's must exercise particular care when evaluating this element of an operator's program.

L. *Two-Engines Inoperative En Route.* Any flight during which the airplane is not at all times within 90 minutes of a suitable landing area (measured at normal, all-engines cruise speed), must be assumed to have had a double-engine failure occur at the most critical point along the route. The airplane must be able to reach an alternate airport from this point. Any airport that has sufficient runway length to accommodate the 60% alternate landing requirements may be considered suitable. When establishing the weight limitations to comply with this rule, the takeoff weight is reduced by the normal en route fuel consumption of all engines. Then, at the critical point, two-engines are assumed to fail simultaneously.

FYI: Twin engine, extended-range jet transport operations (ETOPS) will be included at a later date.

(1) For SR 422 airplanes, the airplane must be able to maintain a positive slope at an altitude of 1,000 feet above all terrain or obstacles and within 5 miles on either side of the intended track, or at 5,000 feet MSL, whichever is higher.

(2) For SR 422A airplanes, the airplane must be able to maintain a positive slope of 1,000 feet above all obstructions for 5 miles on either side of the intended track, or at 2,000 MSL, whichever is higher.

(3) For SR 422B and Part 25 airplanes, the airplane must be able to clear all obstructions for 5 miles on either side of the intended track by 2,000 feet vertically.

(4) When the planned airplane takeoff weight exceeds that determined according to the preceding subparagraphs (1), (2), or (3), fuel jettison may be used. The net flightpath must have a positive slope at 1,000 feet above the airport where the landing is assumed to be made for SR 422 airplanes and at 1,500 feet for SR 422A and subsequent airplanes.

(5) SR 422 airplanes must have sufficient fuel after jettison to be able to reach the en route alternate airport. SR 422A and subsequent airplanes must be able to fly for 15 minutes at cruise power after reaching the designated alternate airport. Designated en route alternate airports must be listed on the dispatch release and on the FAA flightplan.

M. *Approach Climb.* Airplane weight during approach must be planned so that a specified gradient of climb is available with one-engine inoperative, at takeoff thrust, and at the temperature forecasted to exist on arrival. The flap angle used to establish approach climb-out performance must be chosen so that the stall speed with this flap setting will not exceed 110% of the stall speed with landing flaps. The climb speed used must not

exceed 150% of the approach stall speed. The specified climb gradient must be the following:

- 2.7% or better for four-engine airplanes
- 2.4% or better for three-engine aircraft
- 2.1% or better for two-engine airplanes

N. *Landing Climb.* For release, the weight of the airplane (allowing for normal en route fuel and oil consumption) must result in a landing approach weight at which the airplane can climb at a gradient of 3.2% or better. Landing climb gradient is measured with all engines operating at the thrust available 8 seconds after the initial moving of the throttles from idle to takeoff position. The flap setting used to establish landing climb-out performance is usually the full-down position. The speed used must not exceed 130% of the stall speed in this configuration.

O. *Landing Distance Limitations.* For release, turbine airplanes must conform to the following limitations:

(1) Turbojets must be able (allowing for normal en route fuel and oil consumption) to land within 60% of the effective runway at both the destination and the alternate airports.

(2) Turbopropeller airplanes must be able to land within 60% of the effective runway at the destination and 70% at the alternate airport.

(3) A flight may be dispatched which cannot meet the 60% runway requirement at the destination if an alternate airport is designated where the flight can land within the distance specified for an alternate airport.

(4) When a runway is forecasted to be wet or slippery at the destination, 15% must be added to the required landing runway length. A correction is not applied to the alternate landing runway length for preflight planning.

953. PERFORMANCE RULES FOR LARGE NONTRANSPORT AIRPLANES. A large nontransport airplane may only be operated under the performance rules of FAR 121.199 through FAR 121.205 or of FAR 135.363 and FAR 135.389 through FAR 135.395.

TABLE 4.3.2.3.
SUMMARY OF DISPATCH RULES FOR LARGE NONTRANSPORT CATEGORY AIRPLANES

Temperature Correction	No	FAR 121.199(b)(4) FAR 135.389(b)(4)
Structural		
Max. Takeoff	Yes	AFM or Placard
Zero Fuel	No	
Takeoff		
Accelerate/Stop	Yes	FAR 121.199(a), FAR 135.389(a)
All-Engines	No	
Accelerate/Go	No	
Climb Limit	No	
Obstacle Limit	No	
En Route Limits		
All-Engines	No	
One-Eng. Inop	Yes	FAR 121.201, FAR 135.391, FAR 135.181
Two-Eng. Inop	No	
Zero Fuel Wt.	No	
Approach Climb	No	
Landing Climb	No	
Max. Landing	Yes	AFM or Placard
Runway Limit		
Destination	Yes	FAR 121.203, FAR 135.393
Alternate	Yes	FAR 121.205, FAR 135.395

A. *Standard Temperatures.* Takeoff performance for large nontransport airplanes may be based on standard temperatures without correction for ambient conditions.

B. *Runway Limit.* The airplane must be capable of stopping on the remaining runway at any point up to 105% of V_{mca} or 115% of V_s, whichever is greater. Wind and the runway gradient must be considered if they adversely affect performance. Effective runway length is defined as the intersection of the rollout end of the runway and the 20:1 obstacle clearance plane or the end of the runway surface, whichever is shorter. The airplane must cross the effective end of the runway at 50 feet above the runway elevation feet with the critical engine inoperative.

C. *En Route Climb Limit Weight.* The airplane must be able to climb at 50 feet per minute at an altitude of 1,000 feet above the highest obstacle, within 5 miles on either side of the intended route or 5,000 feet MSL (whichever is higher), with the critical engine inoperative. POI's may approve a driftdown procedure instead of this requirement. During driftdown, the airplane must be able to clear all terrain within 5 miles of the course by 1,000 feet, based on assuming a descent rate of 50 feet per minute greater than the figure in the approved performance data. Before approving such a procedure, the POI shall consider the following factors:

- Reliability of wind and weather forecasts in the area

- Location and availability of navigational aids
- Prevailing weather conditions in the area (particularly the frequency and amount of turbulence in the area)
- Terrain features
- Possible air traffic control problems

NOTE: Operator compliance with the requirements described in this paragraph does not relieve a Part 135 operator of having to comply with FAR 135.181. The engine-out en route requirements of FAR 135.181 can be more limiting than the restrictions described in this paragraph.

D. *Approach and Landing Climb Limit Weights.* There are no approach or landing climb limits required by Subpart I of Part 121 or Part 135.

E. *Destination and Alternate Runway Limits Weight.* For release, the airplane must be able to land within 60% of the effective runway length at the destination and within 70% of the effective length of the alternate runway.

955. RULES FOR RELEASE OF COMMUTER CATEGORY AIRPLANES. Commuter category airplanes must be operated under the performance rules in FAR 135.363 and FAR 135.398.

TABLE 4.3.2.4.
SUMMARY OF DISPATCH RULES FOR
COMMUTER CATEGORY AIRPLANES

Temp. Corr.	No	(Ambient temp. in AFM data.)
Structural Limits		
Max. Taxi Wt.	Yes	AFM & FAR 135.398(a)
Max. Takeoff Wt.	Yes	AFM & FAR 135.398(a)
Zero Fuel Wt.	Yes	AFM & FAR 135.398(a)
Takeoff Weight		
Accelerate/Stop	Yes	FAR 135.398(a), FAR 23.25(a), & FAR 23.55
All-Engines	Yes	FAR 135.398(a), FAR 23.25(a), & FAR 23.1583(c)(3)(i)
Accelerate/Go	Yes	FAR 135.398(a), FAR 23.25(a), & FAR 23.1583(c)(3)(ii)
Climb Limit	Yes	FAR 135.398(a), FAR 23.25(a), & FAR 23.1583(c)(3)(iii)
Obstacle Wt.	Yes	FAR 135.389(b)
En Route Limits		
All-Engines	No	
One-Eng. Inop	Yes	FAR 135.381
Overwater	Yes	FAR 135.383
Approach Climb	Yes	FAR 135.398(c), FAR 135.385(a)
Landing Climb	Yes	FAR 135.389(c), FAR 135.385(a)
Max. Landing Wt.	Yes	AFM & FAR 135.389(c)
Runway Limit		
Destination	Yes	FAR 135.385(b), (c), or (d)
Alternate	Yes	FAR 135.387

A. *Runway Takeoff Weight Limits.* These rules parallel the rules for large, turbine-powered airplanes certified under Part 25. Takeoff weight must be limited to the lowest weight allowed by the following:

- Accelerate-go
- Accelerate-stop
- 115% all-engines

B. *Climb-Limit Weights.* The climb-limit weight requirements for a commuter category airplane with the critical engine inoperative are as follows:

(1) In the first climb segment, (until the landing gear is retracted, but not less than 35 feet) the following airplane types must maintain the following gradients:

- Two-engine airplanes - a positive gradient
- Three-engine airplanes - a .3% gradient

- Four-engine airplanes - a .5% gradient

(2) The second climb segment begins at gear retraction and extends to 400 feet. During the second climb segment, the landing gear is retracted and the propeller on the failed engine is windmilling or auto-feathered (no pilot action allowed), and the following airplane types must be able to climb-out at the following gradients:

- Two-engine airplanes - a 2.0% gradient
- Three-engine airplanes - at a 2.3% gradient
- Four-engine airplanes - at a 2.6% gradient

(3) In the third and final climb segment (400 feet to 1,500 feet above the runway) the following airplane types must be able to climb at the following gradients:

- Two-engine airplanes - at a 1.2% gradient
- Three-engine airplanes - at a 1.5% gradient
- Four-engine airplanes - at a 1.7% gradient

C. *Obstacle Limits.* Commuter category airplanes must be able to clear all obstacles in the takeoff path either by 200 feet horizontally or by 35 feet vertically within the airport boundaries and 300 feet outside. A net flightpath must be used. The aircraft's actual climb-out path capability must be reduced by the following:

- .8% for two-engine airplanes
- .9% for three-engine airplanes
- 1.0% for four-engine airplanes

D. *En Route.* At takeoff weight, the airplane must be capable of maintaining a specific climb gradient at the ambient, temperature, at 5,000 MSL, and with one engine inoperative. The en route limitation of FAR 135.181 can be more restrictive.

E. *Approach Climb.* Takeoff weight must be limited so that, upon arrival at the destination or alternate airport, and with the critical engine inoperative, the following airplane types must be able to climb at the following gradients:

- Two-engine airplanes - at a 2.1% gradient
- Three-engine airplanes - at a 2.4% gradient
- Four-engine airplanes - at a 2.7% gradient

F. *Landing Climb.* Takeoff weight must be limited so that upon arrival at the destination or alternate airport, in the landing configuration, and with full power available, the airplane is able to climb at a 3.3% gradient.

G. *Landing Runway Requirements.* Takeoff weight must be limited so that, at the planned weight upon arrival at the destination airport, the airplane may land within 60% of the available runway. At the planned weight upon arrival at the alternate airport, the airplane must be able to land within 70% of the available runway.

957. SMALL TRANSPORT CATEGORY AIRPLANES OPERATED UNDER PART 135. A small transport category airplane is an airplane certified in the transport category of less than 12,500 pounds MTOW. FAR 135.363 and FAR 135.397(b) apply to small, turbine-powered airplanes and FAR 135.363 and FAR 135.397(a) to small, reciprocating-powered transport category airplanes. In summary, the dispatch performance rules for small, transport category airplanes are the same as those for large, transport category airplanes - except that operators of small, transport category airplanes are not required to be able to show that the airplane is capable of clearing obstacles in the takeoff path in the case of the loss of an engine. Part 135 operators of these aircraft are not required to maintain a runway analysis.

959. SMALL, NONTRANSPORT CATEGORY AIRPLANES WITH 10 TO 19 PASSENGER SEATS AND UP TO 12,500 MTOW. Reciprocating or turbopropeller airplanes with up to 19 passenger seats that are certified in the normal category under the provisions of the "special conditions of the administrator", Part 23, SFAR 23, or SFAR 41.1(a) have specified performance rules. To be operated with more than nine passenger seats, these airplanes must comply with the additional airworthiness requirements in Appendix A of Part 135 or the equivalent conditions in SFAR 23 or SFAR 41. These airplanes may be operated up to 12,500 pounds MTOW. See figure 4.3.2.16 in this section for a listing of the airplanes operated under these rules.

TABLE 4.3.2.5.
SUMMARY OF DISPATCH RULES FOR SMALL,
NORMAL CATEGORY AIRPLANES
THE SPECIAL CONDITIONS, APPENDIX A, SFAR 23
OR SFAR 41, PARG. 1(a)

Temperature Correction	No	(Ambient temperatures must be used in AFM data.)
Structural Limits		
Max. Taxi Wt.	Yes	AFM & FAR 135.399(a)
Max. Takeoff Wt.	Yes	AFM & FAR 135.399(a)
Zero Fuel Wt.	No	(Not AFM limit)
Takeoff		
Accelerate/Stop	Yes	FAR 135.399(a), App.A, Par. 5(c)
All-Engines Dist.	Yes	App. A, Paragraph 5(d)
Accelerate/Go	Yes	App. A, Paragraph 5(e)
T/O Climb Limit	Yes	FAR 135.399(a), Appendix A Paragraph 6(b)
Obstacle Limit Wt.	No	
En Route Limit		
All-Engines	No	
One-Eng. Inop	Yes	FAR 135.381
Overwater	Yes	FAR 135.383
Approach Climb	No	
Landing Climb	Yes	App. A, Par. 6(a)
Max. Landing Wt.		
Sp. Cond. & SFAR 23	Yes	AFM Limit
App. A & SFAR 41.1(a)	Yes	FAR 135.399(a), FAR 23.25(a)
Runway Limits		
Destination		
Sp. Cond. & SFAR 23	No	
App. A & SFAR 41.1(a)	Yes	FAR 135.399(a)
Alternate		
Sp. Cond. & SFAR 23	No	
App. A & SFAR 41.1(a)	Yes	FAR 135.399(a)

A. *Applicable Performance Rules.* FAR 135.399 requires that these airplanes be operated within the takeoff and landing weight limitations of the AFM. Paragraph 19 of Part 135, Appendix A specifies those performance limitations which must be included in the flight handbook. A summary of these takeoff and landing weight limits follows.

(1) *Takeoff Runway Limit Weights.* The takeoff weight for each runway and temperature is limited by:

- Accelerate-stop distance

- Accelerate-go distance
- All-engines climb to 50 feet distance

(2) *Climb Limit Weights.* Takeoff weight must be limited so that the following capabilities of the airplane are required:

(a) The airplane must be capable of climbing with all engines operating, at the airport elevation, in the takeoff configuration, at 300 feet per minute.

(b) The airplane must be capable of a positive rate of climb at V_1 with the gear extended and the critical engine failed.

(c) The airplane must be capable of a climb gradient of 2% at V_2 with the gear retracted and the critical engine failed.

(d) The airplane must be capable of climbing to a height of 1,000 feet above the runway at V_2 speed, in the takeoff configuration, with the critical engine failed.

(e) The airplane must be capable of maintaining a climb gradient of 1.2% at 1,000 feet above the runway elevation, in the en route configuration, with the critical engine failed.

NOTE: In the case of the loss of an engine, these airplanes are not required to be able to clear obstacles in the takeoff path.

(3) *En Route and Overwater Limits.* The FAR 135.181 and 135.183 restrictions apply to passenger-carrying operations.

(4) *Landing Climb Limit.* The takeoff weight must be limited so that upon arrival at the destination and the alternate airport, assuming normal fuel burn and with all engines operating, the airplane is able to climb at a 3.3% gradient.

B. *Destination and Alternate Airport Limits.* For airplanes certified under Part 135, Appendix A or SFAR 41, paragraph 1(a), the airplane must be able to land within the AFM limits. The weights shown in the AFM have been corrected to 60% of the effective runway length at the destination airport and to 70% of the effective runway length at the alternate airport.

961. RULES FOR RELEASE OF SFAR 41.1(b) AIRPLANES. SFAR 41.1(b) applies to turbopropeller and reciprocating-powered airplanes of more than 12,500 pounds, but not more than 19,000 pounds MTOW, with up to 19 passenger seats.

A. FAR 135.399 requires that these SFAR 41.1(b) airplanes be operated within the takeoff and landing weight limitations of the AFM, FAR 135.385, and FAR 135.387.

B. SFAR 41.1(b) airplanes must meet all of the requirements of paragraph 947 of this chapter and operators must adhere to the following additional requirements:

(1) A maximum zero fuel weight must be specified in the AFM.

(2) The landing computation rules must be the same as those for turbine-powered, transport category airplanes. The airplane must be able to land at the planned destination airport within 60% of the effective runway length and at the alternate airport within 70% of the effective runway length.

963. RULES FOR RELEASE OF SMALL, NORMAL CATEGORY AIRPLANES WITH LESS THAN 10 SEATS. Reciprocating or turbopropeller-powered airplanes certified in the normal category and operated under Part 135 with less than 10 passenger seats have specified rules. Small turbojet airplanes certified in the normal category are treated as if they were certified in the transport category for the purposes of Part 135 (see previous paragraph 955).

TABLE 4.3.2.6.
RULES FOR RELEASE OF SMALL, NORMAL CATEGORY AIRPLANES WITH LESS THAN 10 PASSENGER SEATS

Temperature Correction	No	AFM data shown at standard temperature.
Structural Limits		
Max. Taxi Wt.	Yes	AFM or Placard
Max. Takeoff Wt.	Yes	AFM or Placard
Max. Landing Wt.	Yes	AFM or Placard
Zero Fuel Wt.	No	(Not an AFM limit)
Takeoff		
Accelerate/Stop	No	
All-Engines	No	
Accelerate/Go	No	
Obstacle Limit	No	
T/O Climb Limit	No	
En Route Limits		
All-Engines	No	
One-Eng. Inop	Yes	FAR 135.381
Overwater	Yes	FAR 135.383
Approach Climb	No	
Landing Climb	No	
Max. Landing Wt.	Yes	AFM
Runway Limit		
Destination	No	
Alternate	No	

A. *Weight Limit.* There are no takeoff weight limits in Part 135 for these airplanes. There are both takeoff and landing weight limits in the AFM. The regulations that make the AFM limitations apply to Part 135 operations are FAR 91.31 and FAR 91.9.

B. *Takeoff Runway Limits.* There are no runway performance limits specified in either the AFM or in Part 135. Many of these airplanes have accelerate-stop distances expressed in flight manuals as advisory information. An accelerate-stop distance is a limitation only when expressed as such by the AFM. Some airplanes of the same make and model have such limitations while others do not, depending on the airplane's date of manufacture.

C. *Climb Limits.* There is no requirement that the airplane must be able to maintain a positive gradient in case of an engine failure. These airplanes are not required to be able to clear obstacles in the takeoff path in case of the loss of an engine.

D. *En Route.* The provisions of FAR 135.181 for IFR operations with passengers and the provisions of FAR 135.183 for overwater operations with passengers apply to these airplanes (see paragraph 929 of this section). Most airplanes with less than 6,000 pounds takeoff weight are unable to meet the FAR 135.181 restriction,

which effectively precludes their use in planned IFR passenger operations. Multiengine airplanes with over 6,000 pounds MTOW must be able to climb at a rate (depending on temperature) specified in Part 23 with one engine out at 5,000 feet MSL. Many of these airplanes are not be able to meet the requirements of FAR 135.181 over any surface higher than sea level.

964. - 974. RESERVED.

TABLE 4.3.2.7.
CERTIFICATION AND OPERATING RULES FOR TURBOPROPELLER AND RECIPROCATING MULTIENGINE PASSENGER AIRPLANES

Airplane	Max. Pax. Seats	Certification Category & Performance Rules
Aerospatiale/Aerilati ATR 42 (series)	50	Large T-Cat. Part 121
Beechcraft		
BE-18 Twin Beech	9	CAR 3
BE-55 Baron BE-58	5	CAR 3
BE-60 Duke	5	FAR 23
BE-76 Duchess	3	FAR 23
BE-90 King Air	10	Special Conditions Part 135.169(b)(2)
BE-100 King Air	10	Parts 23/135 Apx. A Part 135.169(b)(4)
BE-200 King Air	15	Parts 23/135 Apx. A Part 135.169(b)(4)
BE-300 King Air	15	Large T-Cat. Part 135.169(b)(1)
BE-99	12	SFAR 23 Part 135.169(b)(3)
BE-1300 Airliner	13	SFAR 23 FAR 135.169(b)(3)
BE-1900	19	SFAR 41.1(b) FAR 135.169(b)(6)

TABLE 4.3.2.7. (Cont'd.)
CERTIFICATION AND OPERATING RULES FOR
TURBOPROPELLER AND RECIPROCATING,
MULTIENGINE PASSENGER AIRPLANES

Airplane	Max. Pax. Seats	Certification Category & Performance Rules
Boeing (De Havilland)		
Twin Otter (100,200,300)	10+	SFAR 23 FAR 135.169(b)(3)
DH-8	50	Large T-Cat. Part 121
British Aerospace (Hadley Page)		
Bae - 3101 Jetstream	19	SFAR 41.1(b) FAR 135.169(b)(6)
Bae - 3201 Super Jetstream	19	Commuter Category FAR 135.398
Casa		
C212-300	26	T-Cat. Part 135.397Cessna
300 Series	5	CAR 3
402	8	CAR 3
404 Titan	11	FAR 23 FAR 135.169(b)(4)
406 Caravan II	12	SFAR 41.1(a) FAR 135.169(b)(5)
414	7	CAR 3
421	7	CAR 3
Commander		
Turbine-Powered	10	CAR 3
Commuter Air Transport		
CATPASS 200 - 15	13	Part 23/Part 135 APX. A FAR 135.169(b)(4)
Dornner		
DO228-212	19	Part 23/Part 135 Apx. A FAR 135.169(b)(4)
Embraer		
EMB-110-P1 Bandeerante	19	SFAR 41.1(b) FAR 135.169(b)(6)

TABLE 4.3.2.7. (Cont'd.)
CERTIFICATION AND OPERATING RULES FOR
TURBOPROPELLER AND RECIPROCATING,
MULTIENGINE PASSENGER AIRPLANES

Airplane	Max. Pax. Seats	Certification Category & Performance Rules
EMB-120 Brasillia	30	Large T-Cat. Part 135
Fairchild (Swearingen)		SFAR 23
SA 226	8	FAR 135.169(B)(3)
SA 227 - AT/41 Merlin IV	14	SFAR 41.1(b) FAR 135.169(b)(6)
SA 227 - AC Metroliner III	19	SFAR 41.1(b) FAR 135.169(b)(6)
GAF		
N24A Nomad	16	SFAR 23 FAR 135.169(b)(4)
Mooney		
MU-2	8	CAR 3
Pilatus (Britten-Norman)		
BN2B-20&26 Islander	8	Part 23/Part 135 Apx. A FAR 135.169(b)(4)
BN2T Turbine Islander	8	Part 23/Part 135 Apx. A FAR 135.169(b)(4)
Piper		
All	9 or Less	CAR 3, FAR 23
Saab-Scania		
340B	35	Large T-Cat. Part 121
Short Brothers		
330	Large T-Cat. 30	FAR 135
360 Skyvan	Large T-Cat. 36	Part 121
Volpar		
Turboliner (Modified BE-18)	10+	SFAR 23 FAR 135.169(b)(3)

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SECTION 3. APPROVAL OF PERFORMANCE DATA SECTIONS OF CFM's

975. GENERAL. This section contains information and guidance to POI's for reviewing and approving the presentation of performance data in company flight manuals (CFM's). For guidance on the approval of manuals see volume 3, chapter 15, section 2.

A. *Performance Data Computation Systems.* A performance data computation system is defined as the system the operator uses to produce the data required to operate an airplane within the performance limitations specified in the airplane flight manual (AFM) and Subpart I of either Part 121 or Part 135, as applicable. The performance data computation system consists of at least the following components:

- An airport data acquisition, maintenance, and dissemination system (a necessary subsystem for all airplanes operated under Parts 121 and 135)

NOTE: The majority of this data is available from commercial and government aeronautical charting services. Operators of large transport and commuter category airplanes, however, require obstacle data for takeoff computations that are more detailed than those usually supplied by a standard charting service. Operators may contract for obstacle data from commercial sources or may collect the data themselves. Specific guidance for the acceptance or approval of airport data acquisition systems is in section 4 of this chapter.

- Performance data for each variant aircraft the operator operates in a format readily usable by the flightcrew (This data may be obtained from the AFM directly or purchased in a digital format suitable for computer processing.)

- Manual computation procedures or a computer algorithm for converting aircraft performance data from the AFM format to the format used by the flightcrew (The system must make all necessary computations for determining the maximum allowable weight for takeoff and for determining the V speeds to be used at the selected weight.)

B. *Current Industry Practices.* There are a wide range of methods for: collecting airport and obstacle data; preparing airport analyses; and, for preparing, publishing, and distributing the performance data sections of CFM's. To implement each or all of these functions, operators may either establish a department within the company or contract the work out. Operators may contract for the collection of airport and obstacle data but produce the airport analysis in-house. Other operators may supply airport data to aircraft manufacturers or other contractors who prepare the airport analysis. Generally, major airlines do more of this process in-house, while smaller operators contract for these services. Some service contractors provide services tailored specifically to Part 121 supplemental and Part 135 on-demand operators.

C. *Approval Criteria.* POI's may approve any method of performance data computation and presentation that meets the following criteria:

(1) The system must make all of the computations required in the AFM and in the pertinent operating rules (see section 2 of this chapter for a description of these factors for specific airplanes).

(2) Provisions must be made in the system for all makes, models, and variations of aircraft used by the operator.

(3) The system must account for all pertinent variables such as temperature, weight, thrust, runway condition, and obstacles.

(4) The system must be appropriate to the operator's requirements. Large, highly-complex airplanes usually require very different systems from those required for small, simple airplanes.

(5) The system must be reliable in that identical answers must be generated each time the process is entered with identical parameters.

(6) The system must be accurate in that it generates performance data that agrees with AFM data within the degree of accuracy inherent in the original AFM data. For example, when the AFM data is accurate to $\pm$ 2%, the operator's system must produce results that do not deviate from the AFM data by more than $\pm$ 2%.

(7) The system should be relatively simple, easy to use, and not error-prone.

(8) When simplifying assumptions are made, those assumptions must be clearly and completely stated in the operator's CFM or GOM as operator-imposed limitations (for example a maximum field elevation of 4,000 feet and minimum runway length of 5,000 feet). When the assumptions cannot be met, the actions to be taken by the flightcrew, flight followers, and dispatchers must be clearly specified. In such cases, operations must be prohibited or alternate procedures specified.

(9) The flightcrew procedures for generating, obtaining, and verifying data must be thoroughly described in the procedures section of the CFM. In the case of the same procedure applying to all airplanes, the flightcrew procedures must be described in a section of the GOM.

977. MANUAL COMPUTATION SYSTEM FROM AFM DATA. Operators may choose to have flight crewmembers, dispatchers, or flight followers conduct manual data computations from the AFM performance section for each takeoff. Equipment is not necessary to establish the manual computation system. This system is flexible because it can be used for any runway for which the required input parameters can be obtained. The disadvantage of such a system is that computations can be difficult, complex, time-consuming, and error-prone. Flight crewmembers, flight followers, and dispatchers must be carefully and thoroughly trained in such a system. Flightcrews must be supplied with the location of the controlling obstacle for each runway used. While this system is widely used for small airplanes, it is impractical for the routine operations of large airplanes because of the complexity of the required computations and the high probability of human error. The system is, however, available to the operator for backup in the case of computer failure and for special one-time requirements.

979. TABULATED DATA METHOD. AFM data may be combined with airport and runway data and published in tabular format. The product of this tabulated data method is usually termed an airport analysis. Typically, the flightcrew is provided with a table for each runway and flap setting. The flight crewmember enters the temperature on the table to determine maximum allowable takeoff weight and then enters the actual weight to determine the V speeds. Additional corrections are required for factors such as wet or contaminated runways and winds.

A. Tabulated data is easier to use, less error-prone and requires less training than is required for AFM data. A properly designed CFM system retains most of the operating flexibility of the AFM system. A tabulated data system reduces, but does not eliminate, human error. A disadvantage of the tabulated data system is that crewmembers must maintain an up-to-date chart for each runway from which operations are authorized. A means must be available to transmit current charts to the flightcrew before they are needed. Provisions must be made for temporarily shortened runways.

B. The operator must be capable of generating performance data tables which retain the degree of accuracy inherent in the AFM data. Generally, this must be done manually, by carefully picking data points from a graph, entering the data into a computer, and carefully verifying the generated points. The amount of work required to prepare tabulated data from an AFM often precludes operators from generating their own data packages. Most often the operator will be required to buy a digital data package from the manufacturer from which to generate the required tables. POI's may approve other sources, however, when the operator can adequately establish the accuracy of the data.

C. The operator's system must be capable of performing all of the required computations for each takeoff situation, including the selection of the correct controlling obstacle for each flap setting.

981. SIMPLIFIED DATA METHOD. A simplified data system is based on a specified set of assumptions about the conditions under which the aircraft will be operated. For example, takeoffs might be limited to runways longer than 5,000 feet and less than 4,000 feet elevation. In this system, the crew is supplied with a simple chart or set of cards which gives the V speeds at specified weight increments. This chart is used on all runways. The operator performs an airport analysis for each airport served and demonstrates that when the aircraft is operated in accordance with the specified set of assumptions, it will perform either equal to, or better than, the performance required in the applicable regulations on all runways the crew is authorized to use. Some of the system's advantages are: its relative simplicity, the lack of crew error, the ease of crew training, and the speed with which the crew can determine V speeds. Some of the system's disadvantages are: it often imposes severe performance penalties on operators, it is inflexible, and operations must either be terminated or an alternate system used when the simplifying assumptions cannot be met (for such conditions as: construction, part of runway closed, ice, rain, or shortened runways). The system is best suited for operators who serve a limited number of locations regularly and who operate either at large airports, near sea level, or

at moderate temperatures.

983. REAL TIME METHOD. A real time data system is one in which the required computations are made immediately before takeoff for every flight. Usually the data is relayed to the flightcrew by radio or through ACARS. The advantages of such a system are that it is extremely flexible, up-to-date, and efficient. Changes in obstacles due to construction, weight, temperature, and runway can be handled immediately. Also, the operator can take maximum advantage of the performance capabilities of the airplane. Some disadvantages of the system are that it is expensive, it requires extensive equipment and highly trained personnel to operate, and that adequate backup must be available should the main computer go off-line. The operator must be able to collect all of the required data, process it, and transmit it to the crew quickly.

985. EVALUATION OF AN OPERATOR'S SYSTEM. Generally, POI's do not have the capability to verify each data point when approving the performance data section of a CFM. The validity and reliability of the computation system itself, however, can be evaluated.

A. POI's shall require the operator to provide an analysis, with documentation, of the following:

- Source of the computer program
- Assumptions on which the computer program is based (for example, they must determine if the correct factors are used for each type of aircraft; see section 1)
- Source and accuracy of the databases used
- Operator's capability for handling data
- Results of parallel manual calculations made with AFM data to confirm results

B. The POI should coordinate with the PMI to ensure that the operator's airplanes meet the specifications of the certification regulations. For example, a small airplane may have been modified to install more than the original nine seats. To qualify under the additional airworthiness standards of Part 135, Appendix A, several modifications that require supplemental type certificates may have been required. Unless all of the required modifications have been completed, the airplane may not qualify for the proposed operation.

C. When the operator contracts for data or computation, the operator is responsible for the validity of the results. A POI may find that the contractor has been previously evaluated and approved for another operator. The POI may approve reputable sources for these services that have been previously evaluated without the documentation discussed in previous subparagraph A. POI's who are concerned about a specific contractor's qualifications should contact the regional flight standards division (RFSD), who may, in turn, coordinate with AFS-200. If the contractor's capabilities and qualifications have not been previously established, the POI shall require the operator to fully substantiate the contractor's qualifications before granting approval to the operator system.

D. Operators should procure computer programs from a reliable source. The computer programmers should be qualified in both education and experience. The validity of the computer program should be validated by aeronautical engineers and computer specialists.

E. All of the calculations required in the regulations for the type of airplane involved (as discussed in section 1) must be performed, including en route and destination calculations.

F. For real time systems, the operator's method of obtaining data for a specific flight and for transmitting that data to and from the individual performing the calculations must be shown to be accurate and timely.

G. The POI or a designated inspector should review the verification process conducted by the operator. Several runways at different airports should be selected for verification with the AFM data. Short runways with obstacles should be checked by manual calculation, particularly at airports with higher temperatures and elevations.

(1) The operator should be able to identify all of the obstacles evaluated by the computer and the one selected as the limiting obstacle in each case. The POI must be aware that under different temperature and weight conditions, a different flap setting may be required, and different obstacles may be controlling. The inspector should ensure that the operator has verified the limiting obstacle under various conditions and flap settings.

(2) The POI should contact the RFSD or the

applicable AEG through the RFSD for assistance when technical problems arise.

986. - 996. RESERVED.

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SECTION 4. AIRPORT DATA ACQUISITION SYSTEMS

997. GENERAL. This section contains specific information, direction, and guidance to inspectors for the review and approval of airport data acquisition systems. An airport data acquisition system is a subsystem of the performance data system described in section 3 of this chapter. Most of the data required for flight operations can be obtained by a subscription to a standard government or commercial aeronautical navigation charting service, such as the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), or the Jeppesen/Sanderson Company. Operators of large, transport category airplanes and commuter category airplanes require obstacle information for takeoff performance analysis which is more detailed than information provided by standard navigational charting services.

A. FAR 121.97(b) and FAR 121.117(b) require that a Part 121 operator's system of obtaining, maintaining, and distributing airport information be approved. A Part 135 operator's system must be acceptable. The criteria for approval and acceptance for both Parts 135 and 121 is identical.

B. Approval or acceptance of the operator's system of obtaining aeronautical data by the FAA is expressed in paragraph A9 of the OpSpecs. All operators should list one or more standard charting services in paragraph A9. For operators requiring obstacle data and maintaining a department to collect and process that data, a statement that the operator shall maintain the airport data acquisition system in accordance with a specified document should be entered in paragraph A9. For operators who contract from another party for obstacle data, both the contracting party and the contract containing the specific responsibilities of both the operator and contractor shall be identified in paragraph A9, or the document itself should be identified in paragraph A9.

999. OBSTACLE DATA SOURCES. There are several data sources that an operator or contractor may use to acquire obstacle data. POI's should be aware that no one source of data is sufficient and a combination of the following sources is required.

A. *Airport Obstruction Charts (OC's).* Airport obstruction charts (OC's) are produced by the National Ocean Service (NOS) under contract to the FAA. An airport analysis must be based on an OC if one has been published for the airport being analyzed. OC's must be augmented with other information sources, however, for the following reasons:

(1) OC's are primarily produced for airports with precision instrument approaches. Only approximately 750 of 10,000 public-use airports in the U.S. have now been charted. There are 700 to 800 airports which have only nonprecision approaches for which there have not been any OC's prepared.

(2) Terrain surrounding the airport, which can have a significant impact on allowable takeoff weight, may not be shown on an OC. The coverage of OC's is limited to 10,000 feet from a nonprecision runway and 52,000 feet from a precision runway.

(3) Chart revision is usually conducted every 3 years. For many airports, however, the most recent chart revisions are considerably older.

B. *Obstruction Data Sheets (ODS's).* Obstruction data sheets (ODS's) are digital derivatives of the OC which contain runway and obstruction data in a tabular format. ODS's are issued to supplement the OC before its publication. When OC's are ordered for a particular airport from NOS, the ODS's should also be obtained. The NOS publishes quarterly notices that provide the dates of the latest editions of the OC and the ODS.

C. *Terrain Charts.* Terrain or quad charts are produced by the National Geological Survey for aviation usage as well as various other uses. The quad chart accurately depicts all terrain surrounding an airport, however, man-made obstruction data is not depicted. Terrain charts are primarily used for mountainous airports where the obstacles consist of terrain rather than man-made objects.

D. *Local Layout Plans.* Local layout plans may be used when OC's are not available. Since local layout plans must be prepared as a condition of federal funding to airports, the layout plans are available for many of the airports that do not have an OC. Local layout plans contain depictions of obstructions and terrain that penetrate the Part 77 planes. The layout plans may be as much as 3 to 5 years old so local surveys must be made. Local layout plans may be obtained from airport owners.

E. *FAA Form 5010-1.* The FAA Form 5010-1, "Airport Master Record," is prepared for all public-use airports. This master record contains comprehensive data on airports, including obstacles. The master record is updated annually for those airports where scheduled Part 121 or Part 135 operations are conducted. For other airports this data may not be updated for 3 to 5 years. Master records for the entire U.S. are maintained by the National Flight Data Center (NFDC), an agency of the FAA (ACC-330). FAA personnel can access copies of the form which are kept in regional airport division offices for each airport in the region.

(1) Much of the information on FAA Form 5010-1 comes from unverified sources. Often, obstacle heights and positions are estimates which have not been measured and verified by instruments. For these reasons, obstacle information taken from the master record must be verified by other sources before use.

(2) Obstacles that do not penetrate the obstruction planes defined in Part 77 are not necessarily included in the FAA Form 5010-1 data. When the takeoff flightpath passes over an area not covered by a Part 77 plane, obstacles can be present which are not identified. Even when the Part 77 plane overlaps the takeoff flightpath, obstacles lower than 200 feet can be seriously limiting to airplane takeoff performance but not be included in the FAA Form 5010-1 data.

F. *Digital Airport Database.* The digital airport database consists of the information from FAA Form 5010-1 for all U.S. airports. The data is recorded in digital form on magnetic tape and is updated every 56 days. This database is available to the public from the National Flight Data Center (NFDC.)

G. *Digital Obstruction Database.* NOS maintains an obstruction database. This database is revised quarterly, with revisions being available to the public in digital format recorded on magnetic tape from the NFDC. These tapes are revised every 56 days. This database contains all known, man-made objects that penetrate a Part 77 obstruct plane. The database does not, however, contain all obstacles which are significant in the takeoff case.

H. *National Flight Data Digest (NFDD).* The National Flight Data Digest (NFDD) is published daily by the NFDC. The Thursday edition of the NFDD contains changes to obstruction data.

I. *Foreign Government Publications.* Runway and obstacle data, similar to U.S. publications, is available for most (but not all) foreign airports. Access to this information must be obtained through the appropriate government.

J. *ICAO Aeronautical Information Publications.* ICAO publishes several forms of aeronautical data in forms similar to U.S. publications in format, purpose, and coverage. This information is available by subscription.

K. *Station Managers.* Most domestic and flag operators give station managers the tasks of maintaining surveillance of airports, gathering obstruction data, and reporting any actual or potential changes. Managers do this through personal observation, liaison with the airport management, and participation in groups, such as a snow removal committee. Before such information may be used, it must be verified by an official source. For example, one operator performs this verification by sending the airport manager a copy of the OC and requesting that the airport manager plot the new obstacle and then sign and date the chart.

L. *Air Transportation Association (ATA).* The ATA maintains an airport data exchange committee through which members exchange airport and obstacle data.

M. *NOTAM's.* Temporary and immediate changes to airport information are published as Notices To Airmen (NOTAM's).

N. *Customer Interaction.* Large commercial services selling airport data are rapidly alerted to changes in obstacles by their customers. The commercial service then verifies the data from an official source and publishes the change.

1001. APPROVAL OF DATA ACQUISITION SYSTEMS. POI's may approve data acquisition systems using the following information and guidance.

A. *Characteristics of Approvable Systems.* An approvable or acceptable system for the acquisition of obstruction data must have the following characteristics:

(1) The system must include all airports and runways on which operations are conducted. The original data should be based on OC's or the ICAO equivalent. Data must be updated by active surveillance. When an operator serves airports where OC's are not available, other systems based on other data sources may be approved. The operator must show that the data is complete and accurate. To ensure accuracy, the data must be verified by an official source, and documentation must be

maintained. In individual cases, the POI may approve the use of data from an operator-conducted survey.

(2) The operator must demonstrate the capability of maintaining continuous surveillance on the airports and runways served. Subscribing to a government publication is not sufficient surveillance because of the stated limitations of the data in these publications. Updated data must be validated and documented. The operator must have an active and timely revision process with sufficient personnel and physical resources to collect, process, and revise the data.

B. *Contractors and Commercial Sources.* POI's may approve or accept data systems that are operated by a contractor for the operator and that meet the criteria of previous subparagraph A.

(1) The primary issue in approving a contractor-operated system is the contractor's ability to maintain the required airport surveillance. The contractor may do this by demonstrating that its client base adequately performs this function. Further, most legitimate contractors have access to ATA data through their clients. A contractor who cannot demonstrate adequate surveillance capabilities cannot be approved.

(2) POI's do not have to require that operators provide extensive documentation of the contractor's capabilities if the contractor is well established, has a wide client base, and provides a standardized service. When the POI has concerns about the contractor's capabilities, however, or when the operator proposes that the contractor provide a unique service, the POI shall require that the operator conduct a full analysis of the contractor's competence and then submit the analysis to the POI. When the POI is unsure of which course of action to take, the POI should seek guidance from the RFSD.

1002. - 1012. RESERVED.

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CHAPTER 4. AIRCRAFT DISPATCHER CERTIFICATES

SECTION 1. GENERAL INFORMATION

285. GENERAL. This chapter provides inspectors, designated examiners, regional specialists, all flight standards division managers and district office managers with the necessary direction, guidance, and procedures for conducting aircraft dispatcher certification.

287. DESIGNATION OF DISTRICT OFFICES AND INSPECTORS.

A. *District Office Designation.* Each regional flight standards division (RFSD) shall designate, in writing, one or more district offices to conduct aircraft dispatcher practical tests (combined oral and practical) and to issue aircraft dispatcher certificates. The designated district offices should be located where there is the greatest public demand for aircraft dispatcher certificates in the region. The number and location of designated district offices will vary according to the requirements of individual regions. Those district offices not designated for this purpose will not have to maintain the capability to conduct the aircraft dispatcher practical tests.

B. *Inspector Designation.* The manager of a district office designated for conducting aircraft dispatcher tests shall designate, in writing, specific inspectors to conduct such tests. The district office manager shall ensure that these designated inspectors are appropriately trained, obtain aircraft dispatcher certificates, and have access to the appropriate test materials. In addition to aircraft dispatcher certification duties, these designated inspectors shall serve as regional resources for: the surveillance of flight dispatch, flight-following, and flight-locating facilities; any related training programs; and, for the evaluation of aircraft dispatcher examiner candidate qualifications.

C. *Operators with Large Dispatch Sections.* Certificate managers who are responsible for Part 121 operators with large dispatch sections should designate, train, and certificate at least one inspector (preferably an assistant POI) to conduct dispatcher certification for the assigned Part 121 operator. In addition to obtaining an aircraft dispatcher certificate, this designated inspector should be required to observe the operator's dispatch system in operation, attend the operator's dispatcher training program, and become an expert in the operator's dispatch practices and training programs.

289. ELIGIBILITY FOR WRITTEN TEST. There are no prerequisites for the aircraft dispatcher written examination. The written examination may be taken before an applicant meets either the minimum age requirement or any of the experience requirements for the certificate. The applicant's qualifications do not have to be reviewed by an inspector and the applicant does not have to complete an FAA Form 8060-7, "Airman's Authorization for Written Test" before taking the written test. Applicants with inadequate preparation or qualifying experience, or who are under 21 years of age, should be discouraged from taking the test.

291. ELIGIBILITY FOR THE PRACTICAL TEST. With the exception of the age requirement, inspectors and examiners shall ensure that applicants meet all eligibility criteria for the aircraft dispatcher certificate before administering a practical test to the applicant. The inspector or examiner should review the eligibility criteria with applicants as follows:

A. *Age.* An applicant may take the practical test before meeting the minimum age requirement. Those applicants who are under 21 years of age should be discouraged from taking the practical test.

B. *Written Test Results.* Each applicant must present an FAA Form 8080-2, "Airman Written Test Results" showing satisfactory results.

C. *Application.* Each applicant must complete and sign an FAA Form 8400-3, "Application for an Airman Certificate and/or Rating." Instructions for completing the application are on the District Office Job Aid Disk (JAD). A signature is not required in the instructor's recommendation block unless the applicant has qualified for the test on the basis of having graduated from a Part 65 approved school or on the basis of having performed the duties of a dispatcher under the supervision of a dispatch instructor.

D. *Experience.* Applicants must provide documentary evidence of meeting the experience requirements. Acceptable documentary evidence includes, but is not limited to: letters from employers, logbooks, military

service records, graduation certificates and employment records. FAR 65.57 specifies the following as acceptable minimum experience requirements:

(1) Applicants may have been active for 2 of the last 3 years in scheduled Part 121 or Part 135 air carrier flight operations or in scheduled military aviation. Inspectors and examiners may accept other flight operations experience that is clearly equivalent in nature and duration, however good judgment should be used when determining equivalent experience. For example, an applicant could not count 2 years experience as a crop duster toward the experience requirement for the certificate because the experience was not gained in air transport operations. A careful evaluation must be made by inspectors for experience in either a Part 135 on-demand operation, a Part 121 supplemental operation, or an unscheduled military operation. An applicant must be able to show exposure to elements required by the dispatcher function, such as using computer flightplans, and flight-release and flight-following procedures. An individual performing the flight-release function for a Part 121 supplemental operator, for example, would be eligible to qualify for the certificate. The required experience for the aircraft dispatcher certificate may have been acquired in any of the following capacities:

- Pilot member of a flightcrew
- Radio operator (flight or ground)
- Flight navigator
- Meteorologist
- Dispatcher or assistant dispatcher
- FAA aviation safety inspector

(2) Applicants who have been active in ATC as a certified tower operator for 2 of the last 3 years are eligible.

(3) Applicants who have acquired the necessary experience specified in previous subparagraphs (1) and (2) and which total 2 of the past 3 years are eligible.

(4) Applicants who have performed the duties of a dispatcher for 1 of the past 2 years under the direct supervision of a certified dispatcher are eligible.

(5) Applicants who have graduated from a dispatcher training course approved under Appendix A of Part 65 are eligible for the first 90 days after graduation.

293. PRACTICAL TEST. An applicant for an aircraft dispatcher certificate must demonstrate the knowledge and practical skills necessary to dispatch aircraft operated under both domestic and flag rules. The oral examination is conducted simultaneously with the practical test.

A. *Dispatch of Actual Flight.* If possible, the aircraft dispatcher practical test should include the dispatch of an actual flight. In this case, the applicant should arrive at the dispatch center with the inspector or designated examiner conducting the test. The applicant should then become familiar with the situation and receive a briefing from the aircraft dispatcher being relieved. The inspector or designated examiner conducting the test should then observe the applicant dispatch one or more flights. The flight-release information must then be checked and signed by one of the operator's certified aircraft dispatchers before it can be presented to the PIC of the flight. An inspector shall not sign the flight release. A designated examiner may sign the release, but only if the designated examiner is employed by the operator, is current in the operator's procedures, and has successfully completed a competency check within the past 12 months. The applicant and the inspector or designated examiner should then move from the dispatch center to another location where questions can be asked and discussed without impeding the workflow at the dispatch center.

B. *Simulated Dispatch of a Flight.* The practical test may also include the simulated dispatch of a flight. In a simulated scenario, the inspector or designated examiner conducting the practical test shall act as the dispatcher being relieved and shall brief the applicant on the simulated dispatch situation and scenario. The applicant shall then be required to perform an analysis and prepare a release as if an actual flight was being released.

C. *Development of Practical Test Scenarios.*

(1) *District Office Preparation.* Each district office designated to conduct aircraft dispatcher certification shall develop at least three practical test scenarios and acquire the materials necessary for their presentation. The scenarios and materials shall be revised when necessary to ensure they reflect contemporary practices.

(2) *Private Individual Preparation.* When a private individual (other than an FAA inspector) is to be designated as an aircraft dispatcher examiner, the candidate

for designation shall prepare a minimum of three practical test scenarios and shall acquire the materials necessary for their presentation. The inspector evaluating the candidate shall ensure that the scenarios and materials prepared by the candidate are realistic and effective.

D. *Evaluation Criteria.* During the practical test, the applicant for an aircraft dispatcher certificate must demonstrate the following required abilities:

- Ability to read weather reports and forecasts, analyze weather over a large geographical area, and describe the expected impact on the area and specified terminals within the area for a period representing a typical dispatch shift
- Familiarity with operations specifications and the ability to determine weather minimums and the operations authorized for an actual or simulated operator
- Ability to select an alternate airport
- Ability to read and use charts, when required
- Ability to extract the necessary data to compute fuel requirements and airplane load capability from the aircraft performance manual
- Ability to extract the required performance data from the aircraft flight manual and ensure that the aircraft is being operated within those limitations
- Ability to prepare a dispatch release that meets regulatory requirements for the planned flight
- Knowledge of, or demonstrated ability in, extracting a flightplan from a computerized flight-planning service; reading the flightplan; and cross-checking it for input errors
- Sufficient understanding of aircraft systems to interpret an MEL and to make performance adjustments as required by the MEL (For example, the inspector or examiner conducting the test could inform the applicant that a brake has been capped or that the anti-skid is inoperative on a specific flight. The applicant should be able to determine the resulting performance limitations.)
- An understanding of international flight operations and operations in Minimum Navigational Performance Standards (MNPS) airspace (The inspector conducting the test should quiz the applicant on the procedures for obtaining track messages and for filing a flightplan over the track. The applicant should be familiar with the procedures used on the track system.)
- Knowledge of, or demonstrated ability in, contacting a flight en route
- Knowledge of driftdown both in overwater and two-engine domestic situations
- Knowledge of flight and duty time regulations
- Knowledge of currency requirements
- Knowledge of centralized air traffic flow control procedures
- Ability to respond as a dispatcher to an emergency or contingency problem, such as diversion to an alternate airport or an engine failure at ETP (equal time point)

NOTE: If the problem the applicant is given does not include planned redispatch procedures, the inspector must discuss these procedures with the applicant.

E. *Location and Procedures.* The preferred location for conducting the practical test is an actual dispatch center where the necessary data and materials are available. The practical test may, however, be conducted in the flight standards district office (FSDO) or in other locations, such as classrooms. When the applicant has been prepared for the test in an operator's dispatcher training program, the applicant should use the operator's procedures.

F. *Materials and Data.* The inspector or designee administering the practical test shall use real data or shall realistically simulate actual problems using data, such as weather reports, NOTAM's, OpSpecs, airport facility directories, and sets of navigation charts and track messages. Applicants must provide the following materials:

- FAA-approved Airplane Flight Manual for an aircraft of more than 30 passenger seats or 7,500 payload capacity, which contains the approved performance data

- Minimum equipment list (MEL) for the aircraft to be dispatched

295. SUCCESSFUL APPLICANTS. When an applicant has successfully completed the practical test, inspectors and examiners shall accomplish the following, according to the applicant's age.

A. *Applicants 23 Years of Age or Older.* Successful applicants who have completed all requirements for the aircraft dispatcher certificate and are 23 years of age or older are entitled to a temporary certificate. Inspectors and examiners shall complete the paperwork as follows:

(1) The inspector or examiner shall prepare an FAA Form 8060-4, "Temporary Airman Certificate" in duplicate (see chapter 1, paragraph 37 for instructions on completing this form) and then give a copy of the temporary certificate to the applicant.

(2) The inspector or examiner shall mark the applicable square on FAA Form 8400-3, "Application for an Airman Certificate and/or Rating" and date and sign the form on Block 8.

(3) The inspector or examiner shall complete FAA Form 8000-36, "PTRS Data Sheet" (see chapter 1, paragraph 41 for instructions).

(4) The inspector or examiner shall attach the following documents to the application form:

- Original copy of FAA Form 8060-4, "Temporary Airman Certificate"
- AC Form 8080-2, "Airman Written Test Report"
- FAA Form 8060-5, "Notice of Disapproval of Application" (if applicable)
- FAA Form 8000-36, "PTRS Data Sheet"

(5) Inspectors shall forward the certification paperwork to their supervisors. Examiners shall forward the package to the designated FSDO.

B. *Applicants Less than 23 Years of Age.* Successful applicants who are under 23 years of age shall be issued a letter of aeronautical competency containing the statement that the applicant has met all of the requirements for an aircraft dispatcher certificate except for age (see figure 5.4.1.1 for a sample letter). Once an applicant presents proof of having reached age 23, the applicant may exchange the letter of aeronautical competency for a temporary certificate at any FSDO. In such a case, inspectors and examiners shall complete the paperwork as follows:

(1) The inspector or examiner shall mark the applicable square on FAA Form 8400-3, "Application for an Airman Certificate and/or Rating" and date and sign the form on Block 8.

(2) The inspector or examiner shall complete the letter of aeronautical competency in duplicate and give the original letter to the applicant.

(3) The inspector or examiner shall complete FAA Form 8000-36, PTRS Data Sheet (see chapter 1, paragraph 41 for instructions).

(4) The inspector or examiner shall attach the following documents to the application form:

- Copy of the letter of aeronautical competency
- AC Form 8080-2, "Airman Written Test Report"
- FAA Form 8060-5, "Notice of Disapproval of Application" (if applicable)
- FAA Form 8000-36, "PTRS Data Sheet"

(5) Inspectors shall forward the certification paperwork to their supervisors. Examiners shall forward the paperwork to the designated FSDO.

297. UNSUCCESSFUL APPLICANTS. If an applicant's practical test is unsatisfactory, inspectors and examiners shall accomplish the following:

A. The inspector or examiner shall complete FAA Form 8060-5, "Notice of Disapproval of Application" in duplicate, and give the duplicate to the applicant (see chapter 1, paragraph 39 for instructions).

B. The inspector or examiner shall inform the applicant to retain AC Form 8080-2, "Airman Written Test Report" and have the applicant complete FAA Form 8400-3, "Application for an Airman Certificate and/or Rating," by marking the appropriate square and dating and signing block 8.

C. The inspector or examiner shall complete FAA Form 8000-36, "PTRS Data Sheet" (see chapter 1, paragraph 39 for instructions).

D. The inspector or examiner shall attach the original FAA Form 8060-5, "Notice of Disapproval of Application" and the FAA Form 8000-36, "PTRS Data Sheet" to the FAA Form 8400-3, "Application for an Airman Certificate and/or Rating." Inspectors shall forward the certification paperwork to their supervisors. Examiners shall forward the paperwork to the designated FSDO.

299. SUPERVISORY RESPONSIBILITY. Supervisors shall review the certification packages submitted by inspectors and examiners for completeness and accuracy. The PTRS data sheet should be removed from the package and either retained in the district office or destroyed after the computer input has been completed. The FSDO shall then forward the package to the Airman Certification Branch, ACC-260.

300. - 350. RESERVED.

FIGURE 5.4.1.1.
SAMPLE LETTER OF AERONAUTICAL COMPETENCY - SUCCESSFUL APPLICANT FOR AIRCRAFT DISPATCHER CERTIFICATE UNDER 23 YEARS OF AGE

District Office Letterhead

This memorandum is evidence that:

___(Name of Applicant)_____has successfully completed the necessary written, oral, and flight tests for an aircraft dispatcher certificate, however, the applicant has not reached 23 years of age. The applicant may obtain a temporary airman certificate from any flight standards district office upon presenting the following:

1. Proof of being at least 23 years old
2. A current application form
3. This letter

Inspector Signature_____

Inspector Name_____

Date_____

District Office Number Office Location

_____ _____

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SECTION 2. REPORTING ON SURVEILLANCE

25. INTRODUCTION. The Program Tracking and Reporting Subsystem (PTRS) is a comprehensive information management and analysis system used in many flight standards job functions. It provides the means for the collection, storage, retrieval, and analysis of data resulting from the many different job functions performed by inspectors in the field, the regions, and headquarters. PTRS is comprised of four components, each of which is described in detail in this section. This system provides inspectors and managers with current data on airmen, air agencies, air operators, and many other facets of the air transportation system. The various retrieval and reporting features of this system permit managers, supervisors, and principal operations inspectors to effectively plan work programs, prioritize activities and specific job tasks, and to analyze the safety and compliance status of various elements throughout the air transportation industry. This section provides the background and developmental considerations that resulted in the PTRS, discussions and illustrations of the various components of the system, and instruction and guidance on the use of the system.

27. BACKGROUND.

A. Investigations and evaluations of FAA operational procedures by Congress and other government agencies, as well as internal audits conducted by the FAA, have shown that the FAA collects a vast amount of aviation data to support its responsibility for ensuring aviation safety. These studies contain many factors the FAA must consider to obtain optimal compliance with the FAR's and safe operating practices. One of the most important factors is a well-planned and implemented surveillance program carried out by a trained and experienced FAA inspector workforce. These studies revealed, however, that an FAA program did not exist for a consistent and efficient organization and collection of data or for the timely identification and monitoring of trends involving safety in the air transportation industry.

B. Recognizing the need for a modern method to manage aviation data, the FAA established the Aviation Safety Analysis System (ASAS) in August 1982. ASAS is a nationally-distributed information network designed to collect, store, and organize the many types of aviation safety data in a single system. ASAS consists of several separate subsystems designed to improve the FAA's ability to gather and analyze aviation safety data within all aviation standards offices. The primary objectives of ASAS are: to provide data support for identifying potential and existing safety issues; to supply management with information for a more effective use of FAA resources; to provide the FAA with the ability to respond to internal and external requests for information; and, to provide timely and accurate information that is accessible to all appropriate system users. ASAS integrates and standardizes current and future databases and maintains these databases on central host computers. These host computers are presently linked by a telecommunications network to work stations located at all aviation standards facilities.

C. In the early stages of development, however, ASAS did not address the FAA's needs to categorize and effectively analyze surveillance data in a logical and meaningful manner. An integral part of the evolving ASAS was the Flight Standards Work Program Management System (WPMS). WPMS provided a standard method for planning Flight Standards' work functions and for recording the accomplishment of inspector activities. Additionally, it provided rapid access to a large volume of data and could generate reports for district offices, regions, and headquarters. The major objectives of WPMS were as follows: to relieve inspectors of certain paperwork and administrative activities; to standardize and automate the methods for programming and recording work activities; and, to provide an automated capability for retrieving data. WPMS increased the efficiency of scheduling and tracking flight standards work functions. Flight Standards' use of the WPMS demonstrated that it was a viable method for taking advantage of computerized automation capabilities in work activity performance. It became apparent to many users however, that there were ways in which WPMS could be improved to make it more useful to field inspectors and to all levels of FAA management. The computer system could be used in a manner which would allow inspectors to quickly identify trends and deficiencies that could affect aviation safety. For work activity management to be efficient, the system should not only program and record the types of work activity performed, but also identify areas

where work priorities should be changed or areas where increased or different types of activity should be accomplished. WPMS provided information on what type of and how many inspections of a certain type were performed, but did not lend itself to summary or ad hoc reporting of the actual inspection results or comments recorded by inspectors. As a result, the Uniform Task Reporting (UTR) system was developed between 1987 and 1988 in an attempt to resolve these deficiencies. The UTR system provided inspectors with the data processing tools they needed to best accomplish their job function responsibilities.

D. The UTR system included not only the existing WPMS functions, but also a method for readily identifying deficiencies and trends (both negative and positive). The concept included a single reporting form to collect information about many types of inspector work activities. It contained a method for specifically coding the inspector's comments or remarks about the inspection, evaluation, or observation. The codification of inspector comments took advantage of computer capability to generate more defined summary and ad hoc reporting. This codification made possible a variety of information strategies. After extensive field testing of the UTR system, the WPMS and UTR systems were updated and combined into one system currently known as PTRS.

29. OBJECTIVES OF PTRS. The broad objective of PTRS (Program Tracking Reporting Subsystem) is to provide inspectors with an information processing and management system which is comprehensive in scope, provides current data in a manageable format, and offers effective data retrieval and reporting capabilities. In addition to the original were also added to the PTRS:

- To provide a systematic and organized method for inputing data through the use of job aids and standardized codes
- To provide a method for the structured retrieval of stored data in a variety of automated formats (standard reports or with total ad hoc flexibility)
- To have the capability for storing data in a manner which permits effective trend analysis (both positive or negative trends) as well as the identification of specific deficiencies
- To the multiple and nonstandard paper inspection forms with one generic form compatible with computer input requirements
- To permit employment of certain data analysis strategies to determine if specific inspection activities or other job functions warrant either increased or decreased work activity

31. THE COMPONENTS OF PTRS. The four components of PTRS are as follows:

- PTRS Data Sheet
- PTRS comment codes (These are alpha/numeric codes derived from nine "primary area" alpha codes and "key word list" numeric codes.)
- Job aids
- Standard and ad hoc reports

A. *PTRS Data Sheet.* The PTRS Data Sheet is a single form designed to be used for all inspector work functions (see figure 6.1.2.1). This form has spaces for manually recording information that describes the type of job function performed and the results of that activity, including any inspector opinions, comments, and remarks. Once the information from the PTRS Data Sheet is entered into the computer and the computer data is backed-up, the form may be destroyed. Inspectors may enter the information required by the PTRS form directly into the computer without actually completing the form, provided appropriate computer work stations are available. A full description of the form and detailed instructions for its completion are in the FAA, PTRS User Manual. This form is divided into the following sections:

(1) *Section 1 (PTRS Activity Section).* This section has spaces for recording information that describes the type of job function performed, the overall results of the activity, data pertinent to the subject of the activity, and other information required for PTRS input.

(2) *Section 2 (Personnel Section).* This section provides space to record information about personnel that was acquired during the accomplishment of the job function. This personnel information is for persons other than those recorded in section 1. For example, it includes personnel such as SIC's, FE's, flight attendants, supervisors, foremen, fuelers, and any other personnel the inspector wants to include in the record. The inspector may enter in Section 2 any remarks which are significant to the job function such as telephone numbers, duty time,

SECTION 2. RAMP INSPECTIONS

121. OBJECTIVES OF RAMP INSPECTIONS. The primary objective of a ramp inspection is to provide inspectors with the opportunity to evaluate an air carrier operation while the crewmembers and aircraft are on the ground. A ramp inspection is an effective method for evaluating an operator's ability to prepare both the aircraft and crew for a flight to be conducted. Also, when a ramp inspection is conducted after the completion of a flight, it is an effective method for determining whether the aircraft and crew were adequately prepared for the flight, as well as for evaluating the operator's postflight and/or turnaround procedures and crewmember and ground personnel compliance with these procedures. Ramp inspections allow inspectors to observe and evaluate the routine methods and procedures used by an operator's personnel during the period immediately before or after a flight, to determine compliance with regulations and safe operating practices.

123. RAMP INSPECTION AREAS. There are five general inspection areas that can be observed and evaluated during ramp inspections. These inspection areas are as follows:

- Crewmember
- Line station operations
- Aircraft
- Servicing and maintenance
- Ramp and gate condition and activity

A. The "crewmember" inspection area refers to the evaluation of crewmember preparation for flight and compliance with postflight procedures. This area includes evaluations of crewmember manuals and any required flight equipment, flightcrew flight planning, flightcrew airman and medical certificates, crewmember disposition of trip paperwork, and other items that relate to crewmember responsibilities.

B. The "line station operations" inspection area refers to the various methods and procedures used by the operator to support the flight, such as distribution of dispatch, flight release, and flight-locating paperwork;
distribution of weather reports, PIREP's and other flight planning material; passenger handling; boarding procedures; and carry-on baggage screening.

C. The "aircraft" inspection area refers to the aircraft's general airworthiness, logbook entries, MEL compliance, carryovers, and required items of emergency and cabin safety equipment.

D. The "servicing and maintenance" inspection area applies to any ongoing maintenance and servicing, such as fueling, deicing, or catering. This area is usually evaluated in detail by airworthiness inspectors when performing their ramp inspections. Operations inspectors should, however, observe this area and comment on obvious deficiencies for airworthiness inspector follow-up.

E. The "ramp and gate condition and activity" inspection area refers to taxi and marshalling operations, ramp or parking area surfaces, any apparent contamination or debris, vehicle operations, and the condition and use of support equipment.

125. GENERAL RAMP INSPECTION PRACTICES AND PROCEDURES.

A. Ramp inspections may be conducted before a particular flight, at en route stops, or at the termination of a flight. A ramp inspection may be conducted any time an aircraft is at a gate or a fixed ramp location, provided the inspection is conducted when the crew and ground personnel are performing the necessary preparations for a flight or when they are performing postflight tasks and procedures.

B. The operator does not have to be given advance notice that a ramp inspection is going to be conducted. Inspectors must, however, conduct inspections in a manner that does not unnecessarily delay crewmembers and/or ground personnel in the performance of their duties. The

following areas of conduct should be observed by inspectors during ramp inspection activities:

(1) Inspectors should not interrupt crew or ground personnel when they are performing a particular phase of their duties.

(2) When inspection activities require inspectors to interact directly with the crew or ground personnel, the activities should be timed to be accomplished when the crew or ground personnel are waiting to begin another phase of their duties or after they have completed one phase of their duties and before they begin another phase.

(3) Inspection activities must be timed so that they do not delay or interfere with passenger enplaning or deplaning.

(4) Inspection activities should not adversely impede aircraft servicing or catering.

C. Because of the wide range of inspection areas involved, ramp inspections are usually limited in scope. There are many preparatory or postflight actions that occur simultaneously and one inspector cannot physically observe all of these actions for a particular flight. As a result, the inspector should vary the areas of emphasis for an inspection. For example, on one ramp inspection the inspector may decide to observe and evaluate the PIC accomplishing flight planning and the operator's methods for providing the flightcrew with appropriate flight planning support. On another ramp inspection, the inspector may decide to observe the SIC accomplish the aircraft exterior preflight and then evaluate the aircraft's interior equipment and furnishings. As an example of a ramp inspection conducted at the termination of a flight, the inspector may decide to inspect the aircraft's interior equipment, furnishings, and aircraft logbooks, and then evaluate the trip paperwork turned in by the crew. In this example, the inspector may not have an opportunity to interact directly with the crew, therefore the "crewmember" inspection area would not be accomplished. Inspectors should vary both the sequence and the emphasis of the inspection areas during a ramp inspection. Inspectors should describe in their reports how the inspection was limited in scope.

D. Inspectors should use the ramp inspection job aid when conducting ramp inspections. This job aid contains a listing of items ("reminders") that should be observed and evaluated by the inspector during the inspection. The job aid also includes applicable PTRS comment codes to facilitate the writing of the inspection report. There may be items evaluated during a ramp inspection that are not listed on the job aid. In such cases, the PTRS comment code entitled "other" should be used for the appropriate inspection area. The job aid can be used to help describe how the inspection was limited in scope. The job aid can also be used to make notes during the inspection which can be transcribed later to the PTRS Data Sheet.

127. SPECIFIC RAMP INSPECTION PRACTICES AND PROCEDURES.

A. *Crewmember Inspection Area.* When an inspector makes direct contact with a crewmember, the inspector should provide an official but courteous introduction, offer appropriate identification for the crewmember to inspect, and inform the crewmember that a ramp inspection is being conducted. If the direct contact is with a flight crewmember, the inspector should request to see the crewmember's airman and medical certificates. The inspector should review the certificates to see that they meet the appropriate requirements for both the duty position and for the aircraft for the flight to be conducted or that was just terminated. When the direct contact is with flight crewmembers or flight attendants, the inspector should also request to examine the crewmember's professional equipment. Crewmember professional equipment includes any equipment that crewmembers are required to have according to regulation or operator policies, either on their person or that which will be available during the flight. Examples of professional equipment include aeronautical charts, appropriate operator manuals, and operable flashlights. Inspectors should determine whether the charts and manuals carried by crewmembers are current. The following is a list of other items and activities that, depending on the scope of the ramp inspection, should be observed and evaluated:

- Flightcrew flight-planning activities, such as review of weather, flight plans, anticipated takeoff weight and performance data, flight control requirements (dispatch, flight release, flight-locating, ATC flight plans)

- Flightcrew aircraft preflight activities, such as exterior walkaround, logbook reviews, and cockpit setup procedures, including stowage of flightcrew baggage and professional equipment

- Flight attendant inspection of cabin emergency equipment and cabin setup procedures, including

SECTION 4. COCKPIT EN ROUTE INSPECTIONS

161. OBJECTIVE OF EN ROUTE INSPECTIONS. The primary objective of cockpit en route inspections is for an inspector to observe and evaluate the inflight operations of a certificate holder within the total operational environment of the air transportation system. En route inspections are one of the FAA's most effective methods of accomplishing its air transportation surveillance objectives and responsibilities. These inspections provide the FAA with an opportunity to assess elements of the aviation system that are both internal and external to an operator.

A. Elements of the aviation system which are internal to the operator and that can be observed during en route inspections, are items such as the following:

- Crewmembers
- Operator manuals and checklists
- Use of MEL's and CDL's
- Operational control functions (dispatch, flight-following, flight-locating)
- Use of checklists, approved procedures, and safe operating practices
- Crew coordination/cockpit resource management
- Cabin safety
- Aircraft condition and servicing
- Training program effectiveness

B. Elements of the aviation system which are external to the operator and that can be observed during en route inspections, are items such as the following:

- Airport/heliport surface areas
- Ramp/gate activities
- Airport construction and condition
- Aircraft movements
- ATC and airway facilities
- ATC and airspace procedures
- IAP's, SID's, and STAR's
- Navigational aids
- Communications

163. COCKPIT EN ROUTE INSPECTION AREAS. Inspectors should consider all inspection areas, both internal and external to the operator, to be of equal importance. Four general inspection areas have been identified for observation and evaluation by inspectors during en route inspections (see figure 6.2.4.1., Cockpit En Route Inspection Job Aid). These inspection areas are as follows:

- Crewmember
- Flight conduct
- Airport/heliport
- ATC/airspace

A. The "crewmember" inspection area applies to both flight crewmembers and cabin crewmembers. Inspectors should evaluate such items as crewmember knowledge, ability, and proficiency by directly observing crewmembers performing their respective duties and functions. The applicable job aid contains a list of reminder items which should be observed in the crewmember inspection area. These items are not all-inclusive but represent the types of items inspectors should evaluate during a cockpit en route inspection.

B. The "flight conduct" inspection area relates to 10 specific phases of flight which can be observed during an en route inspection. The job aid contains a list of the

items that should be evaluated by inspectors during these phases of flight. These items are not all-inclusive and in some cases (such as "powerback") may not be applicable to the flight conducted. Inspectors are, however, encouraged to observe, evaluate, and report on as many of these items as possible.

NOTE: Inspectors that are unfamiliar with the operator's specific procedures for operating the aircraft, should comment in their inspection reports on any item they believe should be brought to the POI's attention. Inspectors must use good judgment concerning whether to comment on these items when debriefing crewmembers.

C. The "airport/heliport" inspection area pertains to the various elements of airports or heliports that are passed through during the flight such as runways, taxiways, ramps, and aircraft ground movements. Inspectors should observe and evaluate as many of these elements as possible during an en route inspection.

D. The "ATC/airspace" inspection area pertains to the various elements of Air Traffic Control and national or international airspace systems. These elements should be observed and evaluated by inspectors during en route inspections. From an operational standpoint, these evaluations are a valuable information source which can be used not only to enhance safety with respect to air traffic control and the airspace system, but also to enhance the effectiveness of en route and terminal facilities and procedures.

E. Although these four general inspection areas cover a wide range of items, they are not the only areas that can be observed and evaluated during cockpit en route inspections. Inspectors may have the opportunity to evaluate many other areas, such as line station operations, flight control procedures, and flight attendants in the performance of their duties. These types of inspection areas can often be observed before a flight begins, at en route stops, or at the termination of a flight.

165. GENERAL COCKPIT EN ROUTE INSPECTION PRACTICES AND PROCEDURES.

A. Before conducting en route inspections, it is important that inspectors become familiar with the operating procedures and facilities used by the operator. Inspectors can obtain such familiarization by reviewing pertinent sections of the operator's manuals and by asking questions of, and obtaining briefings from, the POI or other inspectors who are acquainted with the operator's procedures and facilities. The inspector is encouraged to comment on any procedure believed to be deficient or unsafe in the inspection report. The inspector must use good judgment, however, when debriefing crewmembers about procedures that may be specifically approved for that operator.

B. POI's are responsible for coordinating with their assigned operators to ensure that each operator has established procedures to be used by inspectors for scheduling the observer's seat (jumpseat). POI's must ensure that an operator's procedures allow inspectors to have free, uninterrupted access to the jumpseat. Inspectors should, however, make jumpseat arrangements as far in advance as possible. Since inspectors may have sudden changes in schedule, and may not always be able to provide the appropriate advance notice, POI's must ensure that the operator's procedures are flexible and permit use of an available jumpseat on short notice.

C. Whenever possible, inspectors should plan cockpit en route inspections in a manner that will avoid disruption of operator-scheduled line checks and IOE flights. Should an inspector arrive for a flight and find a line check or IOE in progress, the inspector must determine whether or not it is essential that the cockpit en route inspection be conducted on that flight. If it is essential, the operator must be so advised by the inspector and must make the jumpseat available to the inspector. If the cockpit en route inspection can be rescheduled and the objectives of the inspection can still be met, the inspector should make arrangements to conduct the inspection on another flight. When a required checkride is being conducted by a check airman from the forward jumpseat and the en route inspection is essential, the inspector should occupy the second jumpseat, if one exists. On IOE flights, the check airman should normally occupy one of the pilot seats and the inspector should occupy the forward jumpseat. When it is essential that the en route inspection be conducted on an aircraft that does not have two jumpseats, the check airman must occupy a pilot seat and the inspector should occupy the jumpseat. In such a case, the flight crewmember not being checked must either be seated in the cabin or not accompany the flight.

D. An inspector should begin a cockpit en route inspection a reasonable amount of time before the flight (approximately 1 hour) by reporting at the operations area or at the gate, as specified by the POI. There the inspector must first complete the necessary jumpseat paperwork for inclusion in the operator's passenger manifest and weight and balance documents. The flightcrew should then be

APPENDIX 3. HANDBOOK BULLETINS

Handbook bulletins are temporary guidance relevant to the contents of FAA Order 8400.10, Air Transportation Operations Inspector's Handbook. These bulletins will be in subsequent changes of the handbook and some bulletins may be deleted when they are no longer required.

KEY: An * is placed next to the bulletin numbers of those bulletins which will comprise Appendix 3 once the appropriate bulletins have been "removed and discarded" and others have been "inserted" with this change.

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HANDBOOK BULLETIN 91-1

USE OF HALON EXTINGUISHING AGENTS DURING FIREFIGHTING DRILLS

It has come to the attention of the FAA that some operators and some FAA inspectors believe that a HALON fire extinguisher must be discharged during the firefighting drills required by FAR 121.417 and FAR 135.331. The discharge of HALON for training purposes is not appropriate unless a training facility is used that is specifically designed to prevent harm to the environment from the discharged HALON. When such facilities are not used, other fire extinguishing agents, which are not damaging to the environment, should be used during the drills. Questions regarding this policy may be addressed to the Air Carrier Training Branch, AFS-210, telephone (202) 267-3718.

HANDBOOK BULLETIN 91-2

IMPLEMENTATION OF CATEGORY D REPAIR INTERVAL FOR MASTER MINIMUM EQUIPMENT LIST (MMEL)

A. *Background.* The FAA has re-examined its MMEL policy regarding repair categories. A new category D repair interval is being implemented on a 2-year test basis. This bulletin conveys the category D repair interval for Master Minimum Equipment List (MMEL) policy that was signed by the Director of Flight Standards Service, AFS-1, on November 7, 1990. Category D items are authorized a nonextendable repair time interval of 120 days. The Boeing 727 MMEL is the first MMEL to incorporate category D items. Additional aircraft MMEL's including category D lists will be released as they become available.

B. *Definitions.* Category D items are those items installed at the discretion of the operator that are in excess of the regulatory requirements, or, installed redundant systems. All category D items were previously recorded in the MMEL as category C items. Before being designated in the D category, each item has been screened to determine that flightcrews are not likely to become dependent on the item during routine operations or by flight training. Further, each item was screened to ensure that its absence did not adversely affect crew workload. New definitions for category D items have been developed, some of which include "As Required by FAR", "Category D", and "Excess Items." These definitions are taken verbatim from the definitions page for MMEL's which has the category D items incorporated.

- *"As Required by FAR":* This term means that the listed item is subject to certain provisions (restrictive or permissive) expressed in the Federal Aviation Regulations operating rules. The number of items required by the FAR must be operative. When the listed item is not required by FAR it may be inoperative for time specified by the repair category.

- *"Category D":* The items in this category shall be repaired within one hundred and twenty (120) consecutive calendar days (2880 hours), excluding the day the malfunction was recorded in the aircraft maintenance log and/or record.

- *"Excess Items":* This term refers to those items that have been installed that are redundant to the requirements of the FAR's.

C. *MEL Approval.* The following guidance is provided to principal operations inspectors (POI's) when approving an air carrier's minimum equipment list (MEL) that incorporates category D items. The POI is encouraged to coordinate with the assigned principal maintenance inspector (PMI) and principal avionics inspector (PAI) in their areas of expertise.

(1) Category D items may only be incorporated in the air carrier's MEL with the release of the specific aircraft MMEL which contains category D items.

(2) The terminology "excess items" used in the MMEL for category D items will not be used in the air carrier's MEL. Those items which are identified as "excess" by the air carrier and authorized category D relief by the MMEL must be specifically listed in the carrier's MEL.

(3) Each POI shall evaluate each category D MMEL item as it relates to the air carrier's operation to determine its suitability. Some items, because of crew training, crew dependency, or operational dependency may not pertain as a category D for an air carrier. An example would be SELCAL. SELCAL may not be required for domestic operations but would be necessary for flag operations. Another example would be the ACARS for a carrier that has developed operational procedures dependent on its use. An inoperative system deferred by maintenance for 120 days should not have an effect on the air carrier's operation. Category D MMEL items that are determined by the POI to be inappropriate for the air carrier's operation should remain a category C repair interval in the operator's MEL.

D. *Further Guidance.* Any questions or clarifications regarding category D MMEL items may be addressed to AFS-260 through the Regional Flight Standards Division (RFSD).

HANDBOOK BULLETIN 91-3

CONVERSION PERIOD REQUIRED FOR OPERATOR TRAINING PROGRAMS TO INCORPORATE NEW TERMS AND METHODS ADOPTED IN CHANGE 1 TO FAA ORDER 8400.10

A. *Background.* Action Notice 8400.4, which expired on July 13, 1990, contained guidance concerning the implementation of Change 1 to FAA Order 8400.10, Air Transportation Operations Inspector's Handbook. In Change 1, new methods for developing and approving training programs and for conducting inspector activities were adopted. Change 1 also contained definitions of many new terms and new titles for flight simulators and training devices.

B. *Adoption of Material in Change 1.* The FAA did not intend for the guidance contained in Action Notice 8400.4 to be ignored after it expired. Accordingly, inspectors and applicants should proceed to use the new terms and methods during initial certification procedures. Operators with currently approved training programs or operators who are introducing new aircraft into service should implement the new terms and methods as changes are made to their programs. Inspectors should work out long-term plans with operators to convert old training programs to the new curriculum formats and to convert old terms to new terms. An advisory circular (AC) is being developed to expedite the training approval process. This AC will contain more detailed information about the construction of training programs and it will also include sample curriculums for various types of aircraft used in air carrier operations. The process of conversion may take time to implement because of the magnitude of changes required. Inspectors should allow operators a 3- to 4-year period, or until August 1, 1993, to implement conversions to their training programs.

C. *Further Information.* AC 120.40A, "Airplane Simulator and Visual System Evaluation" and AC 120.45, "Advanced Training Devices (Airplanes Only) Evaluation and Qualification" are being amended to align with the new titles given to simulators and training devices in Order 8400.10. Any questions or clarifications regarding this bulletin may be addressed to AFS-210 through the Regional Flight Standards Division (RFSD).

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HANDBOOK BULLETIN 91-4

TRAINING AND QUALIFICATION OF AVIATION SAFETY INSPECTORS IN AIR TRANSPORT OPERATIONS

A. *Background.* This bulletin contains interim guidance to managers at all levels of Flight Standards Service (FSS) for the management of flight training and qualification for pilot-rated aviation safety inspectors.

(1) The policy and direction concerning inspector qualification is in chapter 7 of Order 8430.6C and in volume 5 of Order 8400.10. Managers should use this direction and guidance for the qualification of inspectors working with both Part 121 and Part 135 operators. This bulletin contains a repeat of this direction and guidance for purposes of clarification.

(2) A training advisory committee formed by AFS-1 and the Inspector Resources Branch, AFS-520, is currently developing a new program for the training and qualification of pilot-rated inspectors. When this work is complete, the program will be incorporated as permanent guidance in Orders 8400.10 and 8700.1.

(3) In the Flight Standards Service budget for the current year it is required that the flight training resources be carefully managed. This bulletin contains interim guidance to managers on both the scheduling of training and on the maintenance of inspector currency during the current period of fiscal restraint. Managers should observe this guidance to the greatest practical extent.

B. *Qualification.* Operations inspectors must be qualified according to chapter 7 of Order 8430.6C before conducting en route inspections. In addition, inspectors must be qualified according to volume 5 of Order 8400.10 before conducting airman certification (see the following subparagraph C for currency requirements).

(1) *General Requirements.* There are general requirements for qualification which are repeated as follows for clarification. Inspectors performing flight tests must possess the certificate and rating for the test being conducted. Before

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(2) A training advisory committee formed by AFS-1 and the Inspector Resources Branch, AFS-520, is currently developing a new program for the training and qualification of pilot-rated inspectors. When this work is complete, the program will be incorporated as permanent guidance in Orders 8400.10 and 8700.1.

(3) In the Flight Standards Service budget for the current year it is required that the flight training resources be carefully managed. This bulletin contains interim guidance to managers on both the scheduling of training and on the maintenance of inspector currency during the current period of fiscal restraint. Managers should observe this guidance to the greatest practical extent.

B. *Qualification.* Operations inspectors must be qualified according to chapter 7 of Order 8430.6C before conducting en route inspections. In addition, inspectors must be qualified according to volume 5 of Order 8400.10 before conducting airman certification (see the following subparagraph C for currency requirements).

(1) *General Requirements.* There are general requirements for qualification which are repeated as follows for clarification. Inspectors performing flight tests must possess the certificate and rating for the test being conducted. Before

(2) Before an inspector may act as a PIC or safety pilot in any airplane or rotorcraft, the inspector must first be current according to FAR 61.57 and FAR 61.58. Managers are discouraged from allowing inspectors to act as PIC or as safety pilot while conducting a flight check in any airplane that requires a type rating or in any aircraft that requires two pilots (airplane or helicopter).

D. *Interim Guidelines.* In the interim period, Regional Flight Standards Division (RFSD) managers may issue individual inspectors waivers to the requirements of Order 8430.6C and this bulletin. Waivers are strongly discouraged and should be issued only after all efforts to obtain the required training have been exhausted.

(1) *Overdue Training.* Inspectors who have not received flight training in a specific aircraft in the preceding 7 calendar months may be given a waiver to that requirement. Managers should limit these waivers to a period of no longer than 13 months since the last period the inspector received training and a proficiency check (in any aircraft). Managers should schedule an inspector who has not completed recurrent flight training in the past 12 months for recurrent training as soon as practical.

(2) *Retirement or Termination.* Inspectors who have indicated an intention to retire or terminate their service within the 6-calendar month period after the month in which recurrent training is due should not be sent to recurrent training. Inspectors in this category may be placed on a waiver to this requirement for a period of up to 6 months.

E. *Priority of Training.* Managers should categorize each individual inspector to a "line" or "staff" category for purposes of recurrent training priorities.

(1) *Line Inspectors.* A line inspector is defined as an inspector assigned to a FSDO, whose work program contains airman certification and surveillance events. Managers should ensure that those line inspectors placed on waivers receive recurrent flight training and a proficiency check in one aircraft every 12 calendar months.

(a) Inspector recurrent flight training and proficiency checks that are accomplished in the month before they

are due or in the month after they are due are considered to have been accomplished in the month due. This 3-month period is termed the "eligibility period." Managers should ensure that line inspectors currently in the eligibility period are given first priority for available training quotas.

(b) Managers must plan on using programmed training quotas as it is unlikely that funds will be available for special flight requests.

(2) *Staff Inspectors.* For purposes of this bulletin, a staff inspector is defined as an inspector assigned to regional headquarters, to national headquarters, or to management duties at the FSDO level. Staff inspectors should be scheduled for recurrent flight training every 12 months when resources permit.

(a) When current, staff inspectors may perform airman certification duties. Staff inspectors may and should perform en route surveillance while traveling. See paragraph 980 of Order 8430.6C for guidance for inspectors performing en route inspections.

(b) Staff inspectors should be given second priority for available training quotas. A staff inspector should not be scheduled for flight training until all line inspectors who are in the eligibility period have been scheduled.

(3) *Initial Qualification.* Managers should ensure that initial aircraft qualification training is allocated to those line inspectors requiring specific type ratings to complete their work program.

(a) A line inspector should not be scheduled to attend a type rating course until the inspector is selected to fill a position for which that type rating is required.

(b) A staff inspector who does not possess a type rating should be scheduled for a course only when there are no line inspectors eligible for the course.

(c) Both line and staff inspectors may be scheduled for type rating courses in conjunction with FSB requirements with the concurrence of AFS-200.

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HANDBOOK BULLETIN 91-7

PART 135 EMERGENCY MEDICAL SERVICES (EMS)

A. Part 135 Emergency Medical Services (EMS) operators have experienced a higher accident rate than other Part 135 operators. AFS-250 has prepared two advisory circulars to aid EMS operators in conducting safe operations which are in compliance with the FAR's. These advisory circulars are AC 135-14A, "Emergency Medical Services/Helicopter" and AC 135-15, "Emergency Medical Services/Airplane."

B. Principal operations inspectors (POI's) for EMS operators shall obtain and review the applicable advisory circular. POI's shall use the guidance of the applicable advisory circular to evaluate the EMS operator's manuals, procedures, and training program. Should the POI discover any omissions or errors in the operator's manuals, procedures, or training program, the POI shall proceed according to the guidance in volume 3, chapter 15, paragraph 2099 D of this handbook.

C. POI's for Part 135 EMS operators shall use the guidance from these two advisory circulars while conducting the next regular review of the operator's manuals, procedures, and training programs.

HANDBOOK BULLETIN 91-8

POI REVIEW OF FLIGHT ATTENDANT EMERGENCY EVACUATION INSTRUCTIONS AND PASSENGER SAFETY BRIEFING CARDS

A. Principal operations inspectors (POI's) are directed to review the assigned operator's flight attendant manuals, passenger safety briefing cards, and approved Company Flight Manuals (CFM's). POI's must ensure that flight attendant instructions to passengers in emergency evacuations are consistent with the information on the passenger safety briefing cards, and comply with the approved procedures in the CFM's.

B. POI's shall make a PTRS entry to record this review. The PTRS entry should be listed as Activity Number "1302" in Section 1, and as code "A307" in the "Primary/Key" column in Section IV. Also in Section IV, in the "Comment Text" column, the following entry should be made,"Review for compliance with HHB 90-8." POI's shall review any subsequent changes to the operator's emergency evacuation procedures, passenger safety briefing cards, and flight attendant manuals to ensure that consistency is maintained.

C. This guidance will be incorporated in upcoming sections of Order 8400.10.

D. Regional division managers and office managers shall ensure that the review required by this bulletin is completed by July 1, 1991.

HANDBOOK BULLETIN 91-8

POI REVIEW OF FLIGHT ATTENDANT EMERGENCY EVACUATION INSTRUCTIONS AND PASSENGER SAFETY BRIEFING CARDS

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C. This guidance will be incorporated in upcoming sections of Order 8400.10.

D. Regional division managers and office managers shall ensure that the review required by this bulletin is completed by July 1, 1991.

HANDBOOK BULLETIN 91-9

ENDORSEMENT OF FLIGHT ENGINEER APPLICANTS RETESTING WITHIN 30 DAYS OF FAILURE

A. *Background.* FAR 63.41 states that, "An applicant for a flight engineer certificate who fails a written or practical test for that certificate may apply for retesting --

(a) After 30 days after the date he failed that test; or

(b) After he has received additional practice or instruction (flight, synthetic training or any combination thereof) that is necessary, in the opinion of the Administrator or the applicant's instructor (if the Administrator has authorized him to determine the additional instruction necessary) to prepare the applicant for retesting."

FAR 63.41 is ambiguous, however, about who may endorse an FE applicant's AC Form 8080-2, "Airman Written Test Report" or FAA Form 8400-3, "Application for Airman Certificate and/or Rating" for the purpose of providing a statement attesting that the applicant has received instruction in the subjects failed, and is competent to pass the test. This handbook bulletin provides guidance to help clarify the ambiguity concerning the endorser and the method of endorsement.

B. *Endorser Eligibility.* The following lists contain those persons eligible to provide the appropriate endorsement for an FE applicant to retake either the written test or practical test within 30 days of failure.

(1) *Written Test:*

- A certificated flight engineer with an appropriate class rating
- A U.S. Armed Forces flight engineer instructor or standardization/evaluation flight engineer for that airplane class
- An instructor employed by a training facility approved under FAR 63.43.

(2) *Practical Test*:

- A certificated flight engineer with an appropriate type rating who is current and qualified in accordance with 91.529(b), 121.453(a) or 125.265(b)

- A U.S. Armed Forces flight engineer instructor or standardization/evaluation flight engineer who is current and qualified in the appropriate airplane type

C. *Verification of Endorser's Eligibility.* Before retaking the written or practical test the FE applicant must present verification of their endorser's eligibility. In the case of the endorser being a U.S. Armed Forces flight engineer instructor or standardization/evaluation flight engineer for a specific airplane class or type, the endorser must provide the applicant (for either FAA Form 8400-3 or AC Form 8080-2) with copies of flight logs, military qualification forms, or a statement from the military supervisor. This documentation must evidence the endorser's eligibility. The applicant must present this documentation before retaking the written test, however, this documentation does not have to be attached to the form. If the endorser is an instructor employed by a training facility approved under FAR 63.43, that endorser must provide the applicant with a statement from the approved training facility. The statement must contain certification of the endorser's position as an instructor at that training facility. The applicant must present this statement of the endorser's position before retaking the practical test, however, the statement does not have to be attached to the form.

D. *Endorser Completion of AC Form 8080-2 and FAA Form 8400-3.* The applicant's endorser must fill out either the applicant's AC Form 8080-2 (for the written test) or FAA Form 8400-3 (for the practical test) as follows:

(1) *Completion of AC Form 8080-2.*

(a) A U.S. Armed Forces standardization/evaluation flight engineer or flight engineer instructor for the specific airplane class shall complete AC Form 8080-2 by signing and then listing their branch of service and type of designation

in lieu of a certificate number. An example of this would be: "John Brown, U.S.A.F., FE Instructor."

(b) Instructors employed by a training facility approved under FAR 63.43 shall complete AC Form 8080-2 by signing and then listing their approved training facility name and position title. An example of this would be: "John Brown, UAL, FE instructor."

(2) *Completion of FAA Form 8400-3.* A U.S. Armed Forces standardization/evaluation flight engineer or flight engineer instructor for the specific airplane type shall complete Block 7 in FAA Form 8400-3 by signing and then listing their branch of service and type of designation in lieu of a certificate number. An example of this would be: "John Brown, U.S.A.F., FE Instructor, C-141 (L-300).

E. *Further Information.* Order 8400.10, Air Transportation Operations Inspector's Handbook, contains additional advisory information on this subject in volume 5, chapter 3, "Flight Engineer Certificate and Class Rating." Any questions regarding this bulletin may be addressed to AFS-210 through the Regional Flight Standards Division (RFSD).

HANDBOOK BULLETIN 91-10

GUIDANCE FOR FIELD INSPECTORS DURING THE TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) IMPLEMENTATION PERIOD

A. *Background.* Many operators have started to equip their aircraft with TCAS's in accordance with FAR 121.356. These operators have been working with the FAA on a safe and efficient implementation of the new system. Some operators, however, have found that equipment delivery schedules and crew training capabilities have made it impossible to ensure that flight crewmember training and equipment schedules are consistent. As a result of these scheduling problems, interim procedures have been established to ensure safe operations for operators who may have already installed a TCAS. Until August 1, 1991, inspectors should observe the following guidelines:

(1) Part 121 operators may operate aircraft with the TCAS system *turned off* when the flight crewmember has not completed TCAS training, even though this procedure is contrary to FAR 91.26(b) (new FAR 91.221(b)). This policy was adopted to prevent flight crewmembers who are not appropriately trained from operating TCAS equipment. *Inspectors shall not take enforcement action when operations are conducted in accordance with this policy.*

(2) Principal Inspectors must advise operators that TCAS training is mandatory for all flight crewmembers by August 1, 1991.

(3) Unless relief is provided by means of an approved minimum equipment list (MEL), flight crewmembers who have completed TCAS training shall operate with the TCAS turned on and operating in compliance with FAR 91.26(b) (new FAR 91.221 (b)).

B. *Further Information.* AC 8430.66, "TCAS Training," contains additional information on training. Any questions regarding this bulletin may be addressed to AFS-210 through the Regional Flight Standards Division (RFSD).

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