Civil Aeronautics Manual 41

Certification and Operation Rules for Scheduled Air Carrier Operations Outside the Continental Limits of the United States

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FEDERAL AVIATION AGENCY

November 10, 1959

Introductory Note

This manual contains in consolidated form (1) Civil Air Regulations Part 41, Certification and Operation Rules for Scheduled Air Carrier Operations Outside the Continental Limits of the United States, dated April 15, 1955, Amendments 41-1 through 41-27, and the editorial changes required by Special Regulations SR-430 and SR-431, effective December 31, 1958 and February 13, 1959, respectively; and (2) the rules, policies, and interpretations issued by the Administrator of the Federal Aviation Agency in application to the various sections of the regulations.

FAA *rules* are supplementary regulations issued pursuant to authority expressly conferred on the Administrator in the Civil Air Regulations. Such rules are mandatory and must be complied with.

FAA *policies* provide detailed technical information on recommended methods of complying with the Civil Air Regulations. Such policies are for the guidance of the public and are not mandatory in nature.

FAA *interpretations* define or explain words and phrases of the Civil Air Regulations. Such interpretations are for the guidance of the public and will be followed by the Agency in determining compliance with the regulations.

This manual is arranged to give the number, title, and text of each section of the regulations followed by any rules, policies, or interpretations applicable to that section. These rules, policies, or interpretations of the Administrator are identified by consecutive dash numbers appended to the regulation section number.

This manual supersedes Civil Aeronautics Manual 41 dated February 1956 and all supplements thereto. As amendments and other pertinent materials pertaining to Part 41 are issued, they will be included in this manual.

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Certification and Operation Rules for Scheduled Air Carrier Operations Outside the Continental Limits of the United States

Certificate

41.0 General.

The regulations in this part are prescribed for scheduled air transportation operations conducted by air carriers between a place in any State of the United States, or the District of Columbia, and any place in a Territory or possession of the United States; or between any place in a Territory or possession and a place in any other Territory or possession of the United States; or between places in a Territory or possession; or between any place in the United States and any place outside thereof; or between any two places outside the United States. The regulations in this part shall also apply to:

(a) Scheduled air transportation operations conducted by air carriers between a place in any State of the United States and the State of Alaska or the State of Hawaii, respectively, or between the State of Alaska and the State of Hawaii; and

(b) Any scheduled operations conducted between points within the State of Alaska or the State of Hawaii, respectively, by a common carrier engaged in the carriage by aircraft of persons or property for compensation or hire or of U.S. mail unless such operations are conducted as an Air Taxi Operator under Parts 42 or 47 of this subchapter.

41.1 *Issuance.* An air carrier operating certificate prescribing the type of operation, the routes over which such operation may be conducted, the airports which may be used, and such other specifications and restrictions as may be reasonably required in the interest of safety shall be issued by the Administrator to an applicant who demonstrates that he is capable of conducting the proposed operations in accordance with the applicable regulations specified in this part.

(a) *Alaskan air carriers.* Whenever, upon investigation, the Administrator finds that the general standards of safety required for air carrier operations within the State of Alaska require or permit a deviation from any specific requirement of this part for a particular operation or a class of operations for which an application for an air carrier operating certificate has been made, he may issue an air carrier operating certificate with appropriate changes, specifying therein the period during which such deviations may be permitted.

41.1–1 *Application for air carrier operating certificate (FAA rules which apply to sec. 41.1).*

(a) *General.*

(1) The holder of a certificate of convenience and necessity shall apply to the Administrator for an air carrier operating certificate at least 30 days prior to the date proposed for beginning scheduled air carrier operations outside the continental limits of the United States. The application shall be prepared in looseleaf form, on white paper approximately 8″ x 10½″ in size, using one side of the sheet only. The application shall be executed by a duly authorized officer or employee of the applicant having knowledge of the matters set forth therein, and shall have attached thereto two copies of the appropriate written authority issued to such officer or employee by the applicant.

(2) A minimum of two copies of the application, and of subsequent amendments thereto, shall be filed with the Regional Administrator having jurisdiction over the area in which the principal office of the air carrier is located. If the principal office of the air carrier is not located within the area of a numbered region, the application shall be submitted either to the international field office having jurisdiction over the area in which the principal office of the air carrier is located, or directly to the Regional Administrator, International Region, Washington, D. C.

(3) When any facility or service directly affecting the operation of the air carrier concerned is furnished by other than the applicant or the Federal Government, at least two copies of the contract or working agreement concerning such facility or service shall be submitted with the application. In this connection, if formal contracts covering such facility or service have not been completed, letters showing agreement between the contracting parties shall be accepted until copies of the formal contract are obtainable.

(b) *Format of application.* The outline in this paragraph shall be followed in completing the information to be submitted in the application:

APPLICATION FOR AIR CARRIER OPERATING CERTIFICATE

(Outline)

TO: THE FEDERAL AVIATION AGENCY, *Washington, D. C.*

In accordance with section 604 of the Federal Aviation Act of 1958, as amended, and the Civil Air Regulations, application is hereby made for an Air Carrier Operating Certificate.

Give exact name and full post office address of applicant.

Give the name, title, and post office address of the official or employee to whom correspondence in regard to the application is to be addressed.

SECTION I. *Operations.*

A. State whether the type of service proposed is for the carriage of passengers, goods, or mail, or a particular combination thereof. If the type of service is not the same for each route or portion thereof, specify the type of service for each route or portion of a route.

B. State whether the type of operation proposed is day or night, visual flight rules, instrument or over-the-top, or a particular combination thereof. If the type of operation is not the same for each route or portion thereof, specify the type of operation for each route or portion of a route.

SECTION II. *Schedule.*

A. Submit a proposed schedule plan (or plans if seasonal changes or differences in equipment are involved) indicating the following:

1. Block-to-block time and mileage between scheduled stops.

2. Ground time at each intermediate and terminal stop.

B. Specify the basis upon which the proposed schedule has been computed, indicating the following:

1. Cruising speed and altitude.

2. Percentage of horsepower.

3. Direction and velocity of prevailing winds.

SECTION III. *Route.*

A. Submit a map suitable for aerial navigation on which are shown the exact geographical track of the proposed routes, and information with respect to terminal and intermediate stops, available landing areas, and radio navigational facilities. This material will be indicated in a manner that will facilitate identification. The applicant may use any method that will clearly distinguish the information, such as different colors, different types of lines, etc. For example, if different colors are used, the identification will be accomplished as follows:

1. Regular routes: Black.

2. Alternate routes: Green.

3. Terminal and regular intermediate stops: Orange circle.

4. Alternate landing fields or areas: Purple circle.

5. Other available landing fields or areas: Yellow circle.

6. Indicate the location and normal operating range of all radio navigational facilities

to be used in connection with the proposed operation as follows:

a. Show the projected courses of radio range stations by shaded red areas extended the distance of normal expected usability.

b. Show omnidirectional radio facilities by a shaded red circle extended the distance of normal expected usability.

B. *Airports.* Furnish the following information with regard to each regular, alternate, refueling, and provisional airport to be used in the conduct of the proposed operation.

1. Name (if any) of airport.

2. Location (by coordinates, and by name of nearest city or town, and direction and distance thereto).

3. Class of airport or landing area (municipal, commercial, military, private, or marked auxiliary).

4. Altitude above sea level.

5. Dimensions in linear feet of landing space available.

6. If hard-surfaced runways are provided, give number, direction, length, and width of each and indicate type of surfacing.

7. Obstructions (list adjacent obstructions, giving height and location, or attach appropriate C. G. A. L. charts if available).

8. Airport lighting (include beacon, auxiliary beacon, boundary lights, floodlights, etc., and any emergency lighting equipment; and by whom operated).

9. List refueling facilities available.

10. Is airport control tower provided and by whom?

11. Itemize radio navigational facilities provided and indicate the operating agency.

12. Does runway gradient exceed 2 percent? If so, state gradient.

13. What provisions are made for protection of passengers during loading and unloading at scheduled stop airports?

14. Prevailing winds?

15. Where necessary, are adequate snow removal facilities available?

C. *Weather reporting.*

1. Outline the weather service proposed to be used for dispatching over each route; the source, if other than a United States Weather Bureau Station; list in detail the location and agency in control of stations furnishing reports for each service; the frequency and method of collection and dissemination of weather information. Outline available terminal and route forecasting services, the type of maps and the intervals at which they are made each day.

2. Where it has been determined that additional weather reporting services will be required of the U. S. Weather Bureau for the type of operation involved, the air carrier will apply in writing to the appropriate Weather Bureau Regional Office. The request for the weather reporting services considered essential should be made coincidental with this application to the Federal Aviation Agency.

3. For operation within the continental limits of the United States, if other than a U. S. Weather Bureau Station, show proof of U. S. Weather Bureau approval of the service and specify the meteorological facilities available, the number of personnel and the duties of each, such as the making of weather maps, forecasts, observations, etc.

D. *Airway lighting.* List in detail all airway lighting on the routes other than those airway lighting facilities owned and operated by the Federal Aviation Agency if application includes request for night VFR operation.

SECTION IV. *Radio facilities.*

A. *Communications.* List company radio ground communication facilities installed, proposed to be installed, and those available to, but not owned by applicant, for each route. The expected communication coverage of all MF and HF ground facilities should be provided in map form. In the case of VHF, the expected coverage at exemplary altitudes should be outlined. Aircraft reporting and general change points, and frequencies should be specified either on the maps or as an attachment. (If owned by other than applicant, attach two certified copies of operating agreement.) List the following details for each station:

Transmitters. List the following information in regard to each transmitter:

1. Make and model number.

2. Remotely or locally controlled.

3. Types of emission and antenna power for each type of emission.

4. Number of frequency channels provided and actual frequencies in kilocycles proposed to be used.

5. Method of frequency change (quick shift or manual tuning).

6. Primary power source, voltage, phase, etc., and whether commercial source or locally generated.

7. Auxiliary power source.

8. Functional purpose of transmitter. If transmitter is used for more than one function, list in order of primary and secondary functions as:

a. Radiotelephone plane-to-ground primary purpose and radiotelephone point-to-point secondary purpose, or

b. Radiotelephone point-to-point primary purpose and standby radiotelephone plane-to-ground secondary purpose, etc.

Receivers.

1. List each receiver by type or model number and state its primary function, i. e., plane-to-ground guard, point-to-point C. W. or point-to-point radiotelephony.

2. List frequency range of each receiver and state which frequencies in each receiver are crystal controlled, if any.

3. Describe receiver installation to show number of receivers locally controlled and number remotely controlled.

B. *Radio navigational facilities.* List each ground radio navigational facility, other than those operated by the United States Government, to be used in the conduct of the proposed operations (if privately owned ground radio navigational facilities are to be used and are owned by other than the applicant, attach two certified copies of the operating agreement pertaining to the use of such facilities). List the following information with respect to each facility:

1. Type of facility, i. e., ILS, GCA, Non-Directional Radio Beacon, LF Radio Range, VAR, VOR, Loran, etc.

2. Estimated effective range (in miles).

3. Coordinates and location with respect to field or landing area.

4. Power supply: i. e., commercial or locally generated.

5. Auxiliary power supply.

6. Operating frequency or frequencies.

C. *Aircraft radio equipment.* List and describe the aircraft radio equipment installed in each aircraft by:

1. Type number.
2. Manufacturer.
3. Frequency range.
4. Operating frequencies.
5. Emergency power supply.
6. Antenna system.

SECTION V. *Weather minimums.*

A. Submit in detail the proposed ceiling and visibility limitations for takeoff for instrument flight and let-down-through at each regular, alternate, refueling, and provisional airport. Differentiate between daylight and darkness in the listing, and where more than one type of aircraft is to be utilized, and a differential of limitations exists, indicate proposed limitations for each type of aircraft.

B. Submit for each proposed scheduled stop and alternate airport a detailed flight procedure for instrument approach and let-down-through and where specific procedures are necessary because of terrain or traffic conditions, submit a detailed flight procedure for takeoff and climb (such procedure should be set up on the basis of the ceiling and visibility minimums proposed).

SECTION VI. *Aircraft.*

A. List the following information, as applicable, for each aircraft to be used in the proposed operations:

1. The name of the manufacturer.
2. Certification basis and category.
3. Manufacturer's model number.
4. Name of the manufacturer and type number of engines.
5. Name of manufacturer and type number of propellers.
6. N registration number and aircraft designation.
7. Type of service in which aircraft will be used (carriage of persons, property, mail, or combination thereof).
8. Will aircraft be used in regular or reserve service?
9. What type of operation (day, night, visual flight rules, instrument, over-the-top) will be conducted with this aircraft?

10. List each route or portion thereof over which this aircraft is to be operated and the maximum gross weight proposed for each route or portion thereof.

11. What is the service ceiling of each type aircraft with one engine inoperative?

12. List and describe installation and location of all lifesaving equipment and emergency supplies carried aboard each aircraft, such as life rafts, life preservers, portable emergency transmitters, Very pistols, and emergency rations. (If the same equipment is not carried during all seasons of the year, and on all routes, list and explain the difference.)

SECTION VII. *Maintenance: Aircraft, engines, and accessories.*

A. Furnish an organization chart indicating the authority and the duties of the maintenance and inspection personnel employed by the applicant.

B. Furnish an outline of overhaul, periodic inspections, and check periods relative to the following listed aircraft and engine components (if more than on make, type and model aircraft used, indicate separately).

1. Aircraft components:
   a. Wings.
   b. Fuselage.
   c. Empennage.
   d. Landing gear.
   e. Wheels and brakes.
   f. Center section.
   g. Nacelles.
   h. Control system.
   i. Hydraulic system.
   j. Accessories (aircraft).
   k. Fuel and oil system (aft of firewall).
   l. Fuel tanks.
   m. Cabin pressurizing and heating systems.
2. Engine components:
   a. Engine.
   b. Accessories (engine).
   c. Propellers.
   d. Fuel and oil system (forward of firewall).
   e. Oil tanks.
3. Instruments:
   a. Flight instruments.
   b. Aircraft and engine instruments.

When maintenance functions are performed by outside agencies, copies of the maintenance agreement regarding the extent of such services to be furnished should be attached to the application, as provided for in subparagraph (a) (2) of this section. The agreement should specify that services furnished should conform to the standards approved for the operator, and does not release the operator from responsibility for airworthiness of the aircraft or components.

C. Indicate type of maintenance operations that will be accomplished at each terminal, intermediate and overnight stop, relative to the following:

1. Disassembly and overhaul of aircraft components, engines, propellers, instruments, and accessories (aircraft and engine).

2. Periodic inspection and check of aircraft components, engines, propellers, instruments, and accessories (aircraft and engine).

3. Routine inspection of aircraft components, engines, propellers, instruments, and accessories (aircraft and engine).

4. En route replacements at intermediate and overnight stops.

5. Refueling.

D. Indicate the number of certificated and noncertificated mechanics, helpers, etc., including their company designation (foreman, inspectors, crew chiefs, etc.) located at the main overhaul base and each terminal and intermediate stop.

E. Indicate the distribution of the following items of spare equipment:

1. Aircraft (list quantity, make, and model).

2. Engines (list quantity, make, and model).

3. Propellers (list quantity, make, and model).

4. Instruments (list quantity, make, and model).

F. For each terminal, and intermediate stop at which refueling operation will be performed, describe the following:

1. Number, type (elevated or underground), and capacity of each fuel and oil storage tank.

2. List octane ratings of fuels available.

3. List S. A. E. rating or viscosity of oil available.

4. List facilities for preventing entrance of water into aircraft fuel tanks.

5. Outline method used to check for presence of water in storage tanks.

6. List facilities or method used to remove water from the storage tanks.

7. Outline method and procedure with reference to recording water checks.

8. Type of covered container used to convey oil from storage tank to aircraft.

9. Outline method and procedure of grounding aircraft in protection of fire.

G. For each terminal and intermediate stop, describe the following facilities:

1. Hangars:

a. Number.

b. Dimensions and number of square feet available for aircraft storage.

c. Dimensions and number of square feet available for shop space.

d. Dimensions of hangar doors.

e. Number of largest sized aircraft of applicant which may be housed.

2. Equipment for ground handling of aircraft, as may be required for the proposed operation.

SECTION VIII. *Maintenance: Radio and electrical equipment.*

A. Briefly describe the functional operation of the radio maintenance organization, indicating the number and scope of responsibility of supervisory personnel and the number and distribution of qualified radio mechanics.

B. Indicate the following with respect to aircraft radio equipment maintenance procedures:

1. Disassembly and overhaul periods of aircraft radio equipment and station at which accomplished.

2. Periodic inspection and check periods of aircraft radio equipment and stations at which accomplished.

3. Equipment replacement at intermediate and overnight stops.

C. Indicate whether overhaul, periodic inspection and routine inspection of aircraft electrical equipment are under the jurisdiction of the radio maintenance department or the aircraft, engine, and accessories maintenance department.

D. Indicate the following with respect to aircraft electrical equipment maintenance procedures:

1. Disassembly and overhaul periods of aircraft electrical equipment and stations at which accomplished.

2. Periodic inspection and check periods of aircraft electrical equipment and stations at which accomplished.

3. Routine inspection periods of aircraft electrical equipment and stations at which accomplished.

E. Indicate the distribution of the following items of spare equipment:

1. Radio equipment (list quantity, make, and model).

2. Electrical equipment (list quantity, make, and model).

3. Other electronic equipment (list quantity, make, and model).

SECTION IX. *Airmen.* Indicate the composition of the flight crew. If the composition is different in different aircraft or on different routes, so indicate and show the composition of the flight crew under each different condition. List the following information with respect to the airmen to be employed in the proposed operation:

1. Show the number of first, second, third, etc., pilots to be employed in the proposed operation, and specify the certificate and ratings to be held by each.

2. Show the number of pilots for whom designation "check pilot" will be requested, and specify the certificate and ratings to be held by each.

3. Show the number of flight engineers to be employed in the proposed operation.

4. Show the number of flight radio operators to be employed in the proposed operation.

5. Show the number of flight navigators to be employed in the proposed operation.

6. Show the number of dispatchers to be employed in the proposed operation.

SECTION X. *Additional data.*

A. Furnish such additional information and substantiating data as may serve to implement this application.

Each application shall be concluded with a statement as follows:

I certify that the above statements are true.
Signed this _____ day of _____ 19 _____.

_____
(Name of applicant)

By _____
(Name and capacity of person duly authorized to execute this application on behalf of the applicant)

(Published in 18 F. R. 6750, October 24, 1953, effective December 1, 1953.)

41.1–2 *Amendment of air carrier operating certificate (FAA rules which apply to sec. 41.1).*

(a) The usual procedure by which a change is made in an air carrier operating certificate and operations specifications, which are made a part thereof, is by an amendment. Thus, where the air carrier desires the addition or deletion of an airport, revision of landing or takeoff minimums, changes in approach procedures, minor route changes, etc., such changes may be made by an amendment. Application for such amendments shall be submitted to the aviation safety agent or adviser, operations, assigned to the particular air carrier.

(b) Amendments concerning revisions of maintenance time limitations shall be submitted to the aviation safety agent or adviser, maintenance, assigned to the air carrier.

(c) Details with respect to applications for amendment, number of copies, etc., shall be furnished by the aviation safety agent or adviser concerned upon request.

(d) Amendments to the air carrier operating certificate and the operations specifications are usually initiated by the air carrier. However, if the Administrator considers that the need for an amendment is essential for safe operations, and no application has been received from the air carrier, Federal Aviation Agency personnel authorized to approve any portion of their operating certificate or operations specifications issued thereunder, shall notify the air carrier that an application for such an amendment should be made. This notification shall include full particulars regarding the need for the amendment.

(e) An application to amend an air carrier operating certificate for a new route extension, which has been authorized in a Certificate of Convenience and Necessity, or a new type aircraft to be used, shall be submitted at least 15 days prior to the proposed date for inauguration of service, unless permission for a shorter filing period is approved by the Administrator. The application for such an amendment shall be executed in accordance with the applicable provisions of section 41.1–1.

(Published in 18 F. R. 7650, October 24, 1953, effective December 1, 1953; amended in 19 F. R. 7339, November 13, 1954, effective November 15, 1954.)

41.1–3 *Preface pages to operations specifications (FAA policies which apply to sec. 41.1).* Preface pages to the operations specifications, which are a part of the air carrier operating certificate issued by the Administrator, shall be prepared by the air carrier on a Form ACA–1014. This form is prescribed by the Administrator, and copies of it may be obtained from the aviation safety agent or advisor assigned to the air carrier or from a district or regional office of the Federal Aviation Agency.

(Published in 18 F. R. 6750, October 24, 1953, effective December 1, 1953.)

41.1–4 *Ceiling and visibility minimums (FAA policies which apply to sec. 41.1).*

(a) *General.* The ceiling and visibility minimums authorized by the Administrator for operations into or from airports will be included in the operations specifications issued to the air carrier. The policies set forth in paragraphs (b) and (c) will be used by the Federal Aviation Agency in establishing ceiling and visibility minimums with the following exceptions:

(1) *Military airports.* When an air carrier is authorized to use a military airport, the ceiling and visibility minimums for takeoff and landing at that airport will be not less than those agreed upon by the military authorities having jurisdiction over the facility.

(2) *Foreign airports.* Ceiling and visibility minimums for takeoff and landing at a foreign airport will be not less than those prescribed by the country in which the airport is located. If no minimums have been prescribed by the foreign government, the authorized minimums will be consistent with the policies set forth in paragraphs (b) and (c).

(b) *Takeoff minimums.*

(1) *Regular, provisional, or refueling airports.*

(i) *Twin-engine aircraft.*

(*a*) Takeoff minimums may be approved as low as 300 feet and 1 mile if, after a consideration of all obstructions in the immediate vicinity of the end of the runway used and of the facilities and procedures used to avoid all obstacles in the takeoff area, it is determined that a safe climb to the minimum en route altitude can be made. Takeoff minimum lower than 300–1 and as low as 200–½ may be approved when the air carrier is authorized landing minimums lower than 300–1 through utilization of the ILS or GCA facilities serving the airport, provided such takeoff minimum will not be less than the straight-in landing minimums approved for the particular airport and conditions are such that a straight-in ILS or GCA approach can be executed in accordance with the limitations set forth in the air carrier operating certificate.

(*b*) Takeoff minimums as low as 200–½ may also be approved at airports not served by ILS or GCA facilities, or at airports equipped with ILS or GCA when conditions are such that a straight-in ILS or GCA approach cannot be made in accordance with subdivision (*a*) of this subparagraph. Such approval, however, will be contingent upon the specification in the flight clearance of an alternate airport having an approved instrument approach procedure located within a distance equivalent to 15 minutes at 1 engine inoperative cruising flight in calm air from the airport of takeoff. In addition, at the time of departure, the weather at such alternate airport must be at or above alternate landing minimums. In submitting applications for approval of such minimums, the lowest takeoff minimums applicable without a takeoff alternate should be shown in the takeoff minimum column of the Operations Specifications—Airport. The takeoff minimums applicable when a takeoff alternate is specified in the flight clearance should be shown in the "Remarks" section of the Operations Specifications—Airport as follows: (Show minimums applicable) authorized in accordance with paragraph—Airport Preface Pages.

(ii) *Four-engine aircraft.* Takeoff minimums may be approved as low as 200 feet and ½ mile if, after a consideration of all obstructions in the immediate vicinity of the end of the runway used and of the facilities and procedures used to avoid all obstacles in the takeoff area, it is determined that a safe climb to the minimum en route altitude can be made. At airports, where takeoff minimums of 200–½ have been approved, takeoff minimums of 200–¼ may also be authorized on runways equipped with high intensity runway lights, provided such lights are on and in normal operation in order to insure that the pilot has adequate visual reference to the line of forward motion during the takeoff run.

(2) *Alternate airports.* Takeoff minimums, for both 2- and 4-engine aircraft may be approved as low as 300 feet and 1 mile, if, after a consideration of all obstructions in the immediate vicinity of the end of the runway used and of the facilities and procedures used to avoid all obstacles in the takeoff area, it is determined that a safe climb to the minimum en route altitude can be made. When an air carrier has been approved for takeoff minimums of 200–½ at an airport for regular, provisional or refueling use, this air carrier may have minimums of 200–½ authorized at the same airport when it is used as an alternate.

(c) *Landing minimums.* In the approval of ceiling and visibility minimums for landing, two methods of approach will be considered. These are: A regular approach, involving a maneuver of the aircraft or circling of the airport in order to effect a landing, and a straight-in approach from a navigational aid to a landing. A landing is considered as straight-in when the difference between the runway direction and the track from the navigation aid to the approach end of that runway is 30° or less.

(1) *Regular approach.* Where it is necessary to circle or maneuver to effect a landing, aircraft with higher maneuvering, approach, and landing speeds shall be operated with higher landing minimums than slower type aircraft. To effect this principle, the stall speed as established in the Airplane Flight Manual at maximum certificated landing weight with full flaps, landing gear extended, and power off

will be used to differentiate between the two types of aircraft. Regular approach minimums are generally the same for all instrument approach procedures without regard to the type of radio navigational facility serving the particular airport, and will be established in accordance with the following policy:

(i) For aircraft having stall speeds in excess of 75 m. p. h., the ceiling minimums will be at least 500 feet above the established elevation of the airport and not less than 300 feet above obstructions over which all turns about the airport will normally be made. In addition, the ceiling minimums will be 300 feet above all obstructions within 2 miles on either side of the centerline of the track from the facility to the end of the nearest usable runway. To determine the obstruction clearance, the normal area for all turns about the airport will be considered as extending for 2 miles in all directions from the boundary of the airport, exclusive of any areas over which flight is prohibited. However, in certain cases where the location and characteristics of prominent obstructions within the normal turning area about the airport is such that they can easily be seen and avoided, ceiling minimums may be established, taking into account the aircraft's ability to maneuver around these obstructions. Normally, visibility minimums for such aircraft will be not less than 1½ miles except that visibility minimums of not less than 1 mile may be authorized for twin-engine aircraft having a stall speed in excess of 75 m. p. h. but, which can be safely maneuvered with a radius of turn of not more than ½ mile.

(ii) Aircraft having stall speeds of 75 m. p. h. or less will normally be authorized to operate into airports with ceiling minimums 100 feet lower and visibility minimums of ½ mile less than established for the faster type of aircraft, but in no case will the ceiling be less than 400 feet and the visibility less than 1 mile. The criteria with respect to obstruction clearance will be the same as in subdivision (i) of this subparagraph except that the normal area about the airport for all turns will be considered as extending 1½ miles in all directions from the boundary of the airport.

(2) *Straight-in approaches using a radio range or comparable radio facility (i. e., ADF, VOR, localizer).*[1] Where a radio facility is so located that the difference between the direction of the runway to be used for landing, and the track between the radio facility and the approach end of that runway is less than 30°, straight-in approach minimums lower than the regular approach minimums may be authorized when a rate of descent of not more than 500 feet per minute will bring the aircraft from its final approach altitude over the radio facility to the end of the runway at zero altitude. In this configuration, the speed of the aircraft, having a stall speed in excess of 75 m. p. h. will be considered to be not less than 120 m. p. h. in still air, and the speed of the aircraft, having a stall speed of less than 75 m. p. h., will be considered to be not less than 90 m. p. h. in still air. For both classes of aircraft, the ceiling minimums will not be less than 400 feet, and the visibility minimums not less than 1 mile. The yardstick set forth above will be applied to each airport as a guide, and, where its rigid application would result in unrealistic or unreasonable minimums, such practical adjustment will be allowed as will still provide adequate safety. In such cases, the air carrier's application shall include a full explanation of the reason for a deviation from the yardstick and must be concurred in by the aviation safety agent or adviser, operations, approving the minimums.

When an ADF or comparable facility is located on an airport, the ceiling minimums will not be less than 500 feet.

The use of facilities such as low frequency radio ranges, automatic direction finding facilities (ADF), high frequency radio range facilities (VAR), and omnirange facilities (VOR), is predicated on dependability of operation, location of the facility with respect to the airport, and monitoring of the facility in the case

[1] An ILS localizer course which has a suitable fix, is considered as a facility comparable to a radio range. A fix formed by the intersection of a localized course and a range leg or radio bearing will be considered as being suitable if:

(1) The fix is located, either on the front or back course of the localizer, within 7 miles of the airport, and

(2) The radio range station or source of the radio bearing is within 25 miles of the fix, and

(3) The range leg or bearing intersects the localizer course at an angle greater than 45°.

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of a high frequency radio range or VOR. In exceptional cases, however, an approach may be authorized utilizing a radio facility which is deficient in some respects, such as its location in reference to the airport it is intended to serve, when the ceiling and visibility minimums are adjusted commensurate with the deficiency. In such case complete justification for the authorization of an approach using a low or high frequency radio range or automatic direction finding facility which is located more than 7 miles from the airport must be furnished by the air carrier. The ceiling and visibility minimums in such case will not be less than (i) 500 feet and 2 miles when the facility is located from 7 to 10 miles from the airport, (ii) 700 feet and 2 miles when the facility is located from 10 to 12 miles from the airport, and (iii) visual flight rules will be observed from the radio facility when such facility is more than 12 miles from the airport. At the present time, and until more operational experience has been gained utilizing VOR facilities for letdowns, the abovementioned limitations will also apply with respect to the use of VOR facilities. When a high frequency radio range (VAR) or omnirange facility (VOR) is not adequately monitored, the ceiling and visibility minimums will be at least 1,000 feet and 1 mile unless lower minimums can be fully justified.

(3) *Straight-in approaches using ILS or GCA facilities.* Ceiling and visibility minimums established pursuant to this policy are for straight-in approaches only, utilizing ILS or GCA facilities.

(i) *Components of an ILS.*

(*a*) The components which make up the instrument landing systems are: (*1*) Localizer, (*2*) glide path, (*3*) outer marker, (*4*) middle marker, and (*5*) approach lights.

(*b*) Compass locator stations may be installed at the sites of the outer and middle markers of an instrument landing system, but are not considered a component of the ILS. However, when so installed, they may be used in lieu of the outer or middle marker for establishing a definite position over the fix, provided the aircraft is equipped with dual automatic direction finding receivers. If an aircraft is equipped with a single ADF receiver, only one compass locator may be used in lieu of the marker at the corresponding position.

(ii) *Components of a GCA system.* The components which make up the ground controlled approach system include (*a*) surveillance radar (PPI), (*b*) altitude and azimuth control radar (PAR), and (*c*) approach lights.

(iii) *Demonstration of ability.* Approval of minimums for utilization of ILS or GCA, whichever is proposed for use, will be predicated on satisfactory demonstration of ability by the air carrier to use the proposed facilities. An air carrier will have demonstrated such ability when (*a*) the aircraft has installed and properly functioning, approved airborne receiving equipment and associated controls, indicators and antenna, (*b*) the air carrier's training program includes a satisfactory familiarization program in the use of the proposed facilities and procedures, for all flight personnel to be engaged in the operation, and (*c*) the flight personnel concerned have demonstrated under simulated instrument conditions the ability to safely accomplish the ILS or GCA approach and landing procedures down to the proposed minimums.

(iv) *Transition to lower minimums.* The transition to lower minimums will be made in increments of 100 feet ceiling and ¼-mile visibility from the straight-in minimums which could be authorized at a particular airport for a radio range or comparable facility procedure, as set forth in this section. The first reduction of minimums by these increments will be based on satisfactory demonstration of ability by the air carrier as outlined under subdivision (iii) of this subparagraph. Subsequent reduction in minimums will be based on satisfactory operation by the air carrier at the authorized minimums for an approximate period of 6 months using the particular facilities, unless it is deemed necessary for an air carrier to demonstrate ability either as specified in subdivision (iii) (*c*) of this subparagraph or under actual instrument conditions. The pattern of reduction in minimums is illustrated as follows: When present straight-in approach minimums are 400–1 the initial minimums for ILS or GCA will be 300–¾ and at the end of an approximate 6-month period of satisfactory operation using

the particular facilities, the next reduction would be to 200–½.

(v) *Lowest landing minimums.* Where no adjustment to the ceiling minimums is necessary for obstruction clearance as explained in (*a*) of this subdivision, landing minimums of 200–½ are the lowest minimums which may be approved at the present time with all components of the ILS or GCA facilities in operation. Exception to these minimums may be made at specific locations where the installation of improved navigational aids so warrants.

(*a*) *Adjustment of ceiling minimums for obstruction clearance.* When the minimum obstruction clearance as described in section 609.10 or section 609.12 of Chapter II (i. e., Regulations of the Administrator) of this title cannot be met in the approach area, consideration will be given to establishing ceiling minimums which will afford comparable safety. In this event, the ceiling minimums will be determined by the application of the following formula to all obstructions projecting above the established slope line and located, in the case of an ILS procedure, in the approach area between the outer marker and the end of the runway, or in the case of a GCA procedure, in the approach area within a distance of 5 miles, outward from the end of the runway:

(*1*) Extend a line horizontally outward from the top of each obstruction and parallel with the runway centerline to a point of intersection with the established slopeline, and from that point extend a line vertically to a point of intersection with the glide path. The point of intersection at the highest level of the glide path as established by the foregoing formula will determine the minimum ceiling that may be considered.

(*2*) Where minimum obstruction clearances cannot be met in the transitional and horizontal surfaces immediately adjacent to the approach area and when deemed necessary, consideration will be given to an adjustment in the ceiling minimums commensurate with the degree of interference presented by the particular obstruction or obstructions.

(*3*) When application of the formula set forth in the preceding subparagraphs to an obstruction projecting above the established slope surface indicates a ceiling of less than 300 feet, the ceiling will not be reduced below 300 feet until it has been determined by flight checks that the lower ceiling may be authorized.

(4) *Lowest landing minimums utilizing back course of the ILS.* Straight-in approach minimums of 300–1 or 400–¾ may be approved on the back course of the ILS provided (i) the criteria outlined in section 609.10 of Chapter II (i. e., Regulations of the Administrator) of this title is complied with, (ii) the approach is monitored by surveillance radar, (iii) high-intensity runway lights or approach lights are in operation on the runway to which the approach is being conducted, (iv) the obstruction clearance criteria is complied with as outlined in section 609.10, and (v) the establishment of such a procedure will not adversely affect traffic at the airport concerned.

(5) *PPI approach.* Minimums for a PPI approach will be established in the same manner as outlined in subparagraphs (1) (i) and (ii) of this paragraph for a regular or circling approach.

(6) *Airports not served by a radio navigational or letdown facility.*

(i) *Takeoff minimums.* Takeoff minimums for both 2- and 4-engine aircraft may be approved as low as 300–1 if, after a consideration of all obstructions in the immediate vicinity of the end of the runway used, and of the facilities and procedures used to avoid all obstacles in the takeoff area, it is determined that a safe climb to the minimum enroute altitude can be made.

(ii) *Landing minimums.* Landing minimums as low as 1,000–1 may be approved for airports located outside of control zones; and as low as 1,000–3 for airports located in control zones if, after consideration of the terrain in the vicinity of the airport and the traffic density in that area, the Administrator deems that operations at these minimums assure an adequate level of safety.

(7) *Application of obstruction clearance criteria in determining landing ceiling minimums.* Unless safety requires otherwise, landing ceiling minimums for approaches using a radio range or comparable facility will be shown

on the Operations Specifications—Airport to the nearest 100 feet. For example, assuming that the controlling obstruction at an airport is 249 feet high, a ceiling minimum of 500 feet will normally be considered as meeting the obstruction clearance criteria outlined in subparagraph (1) (i). If, on the other hand, such obstruction were 250 feet high, minimums of 600 feet will normally apply. In cases where the ILS obstruction clearance criteria cannot be met, the ceiling arrived at by application of the formula contained in subparagraph (3) (v) (*a*) will normally be shown to the nearest 100 feet; except that a flight check is required where application of the formula indicates a ceiling of less than 300 feet.

(Published in 18 F. R. 6750, October 24, 1953, effective December 1, 1953.)

(d) *Establishment of alternate airport landing minimums at airports served by ILS.* Alternate airport landing minimums of 600–2, 700–1½, or 800–1 may be authorized at airports where the ILS is not equipped with approach lights.

(Published in 21 F. R. 4999, July 6, 1956, effective July 12, 1956.)

41.1–5 *Form of application for issuance of initial or revised Operations Specifications, Aircraft Maintenance (FAA rules which apply to sec. 41.1).* Applications by the air carrier for new or amended Operations Specifications, Aircraft Maintenance, shall be made on Operations Specifications Form ACA–1014 or equivalent.

Those pages of the Operations Specifications, Aircraft Maintenance, which contain the list of aircraft components, inspections, checks and overhauls, and time limitations therefor, shall be prepared by the air carrier on a Form ACA–1014 or equivalent. Such pages shall be prepared to permit insertion in a suitable loose-leaf binder. Each page shall be consecutively numbered and identified as an Operations Specifications, Aircraft Maintenance.

The air carrier shall list the aircraft components and the overhauls, inspections, checks, and time limitations therefor either on separate pages in the Operations Specifications, Aircraft Maintenance, or together on the same pages. If listed separately, the overhauls, inspections, and checks shall be appropriately and thoroughly identified, by number and/or nomenclature, to include any applicable abbreviations. The list of individual aircraft components shall show proper reference to the overhauls, inspections or checks by means of the applicable number, nomenclature or abbreviation thereof. When so listed, it shall mean that such components are overhauled, inspected or checked at the times identified in the Operations Specifications.

Four copies of the application[3] and attachments shall be submitted to the assigned agents, the first copy of the application bearing the signature of a duly authorized representative of the air carrier. Approval or disapproval shall be indicated on the first and second copies of the application and attachments which will be returned to the air carrier. The air carrier shall, in turn, indicate receipt in the space provided on the second copy and return it to the assigned agent.

(Published in 19 F. R. 7339, November 13, 1954, effective November 15, 1954.)

41.1–6 *Form of application for issuance of initial or revised Operations Specifications, Aircraft Weight and Balance Control (FAA rules which apply to sec. 41.1).* Applications by the air carrier for new or amended Operations Specifications, Aircraft Weight and Balance Control,[4] shall be made on Operations Specifications Form ACA–1014 or equivalent.

Four copies of the application shall be submitted, the first copy of the application bearing the signature of a duly authorized representative of the air carrier. Approval or disapproval of the carrier's application shall be indicated on the first and second copies of the application which will be returned to the air carrier. The air carrier shall, in turn, indicate receipt in

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[3] Application for initial time limitations applicable to new aircraft, engines, propellers or appliances, not previously used in air carrier service may require Washington concurrence prior to final issuance by the FAA regional office and therefore, should be submitted as soon as possible, but not later than 15 days prior to the date that the aircraft or component is to be placed into service.

[4] The Operations Specifications, Aircraft Weight and Balance Control, may combine weight control procedures common to more than one aircraft or they may separate weight and balance procedures specifically adapted to a particular aircraft type and model.

space provided on the second copy and return it to the assigned agent.

(Published in 19 F. R. 7339, November 13, 1954, effective November 15, 1954.)

41.1–7 *Policies, procedures, and limitations governing issuance and amendment of Operations Specifications, Aircraft Maintenance (FAA policies which apply to sec. 41.1).*

(a) *General.* The Administrator will issue and amend Operations Specifications, Aircraft Maintenance, in accordance with the following policies, procedures, and limitations. The criteria hereinafter set forth will be followed by the Administrator in fixing time limitations for the performance of overhaul, inspections, and checks, or in permitting or requiring revisions thereto. The basic principle followed by the Administrator will be that the inspections, checks, maintenance, or overhaul be performed at times well within the expected or proven service life of each component of the aircraft. In determining what the expected or proven service life of an aircraft or any of its components might be, the Administrator will consider the following factors: (1) Geographical area or areas of operation; (2) engine operating powers, procedures, etc.; (3) number of landings, long haul versus short haul, etc.; (4) maintenance organization and inspection procedures; (5) other operators' service experience records; (6) manufacturers' recommendations; (7) service history, particularly of known or evident trends toward malfunctioning. Special reliance will be placed on service experience, including the information obtained from such tests, inspections, or measurements as have been performed in accumulating such service experience.

(b) *Procedure for establishing new or revised time limitations.* Time limitations may be established in terms of hours of operation, multiples of engine overhaul periods, or multiples of inspection periods. Time limitations for components on which deterioration is not necessarily a function of operating hours, such as electronic units, pitot tubes, and emergency flotation equipment, may be established in terms of calendar months. Certain items may be maintained on an on-condition overhaul basis. On-condition overhaul is applicable to components on which a determination of airworthiness may be made by visual inspection, measurements, tests, or other means without a teardown inspection or overhaul.

(c) *Airframe—initial time limitations.* The initial time limitations for overhauls, inspections, or checks of airframe may be established on a recurrent fixed time basis or by adoption of a structural inspection specification covering procedures such as pattern inspections, block overhauls, or progressive inspections. Regardless of the basis upon which the time limitations are established, the same basic standards will be applicable. The maintenance program must specify checks, inspections, and overhauls to be performed and times at which they will be performed.

(d) *Appliances—initial time limitations.* Initial time limitations for inspections, bench checks, major inspections, or overhaul, as applicable, to the appliance involved, shoud not be greater than those limitations applicable to the same or similar appliances used in existing aircraft operated by the air carrier. When the usage or installation of such appliances differs to a substantial extent from the previous usage or installation, the time limitations shall be adjusted to reflect the extent of such difference. When new usage or installation is involved, conservation time limitations should be established until service experience shows that more liberal time limits can be used. In those cases where an appliance has a subcomponent which is subject to wear with time in service, the air carrier will establish maintenance procedures for periodic inspection of such subcomponent to insure its continued airworthiness.

(e) *Powerplants—initial time limitations.* The initial overhaul time limitations for any engine which has never been used in air carrier service will tentatively be established at 1,000 hours. However, the operations specifications will require sample overhaul of a representative number of engines, but not less than three, to be accomplished at each increment of 100 hours, beginning at 800 hours, unless such new model engine incorporates certain unconventional features not previously employed in air carrier

operations, in which case, the initial overhaul period will be established by the Administrator. Satisfactory teardown inspection will be necessary before increasing the fleet overhaul period to the next higher increment. This sample overhaul procedure and evaluation of service experience will provide the operator with necessary information to substantiate the basic 1,000-hour overhaul.

The initial time limitations for overhaul of an engine model which has received substantial air carrier service experience, but not by the applicant, will tentatively be established at 1,000 hours. An engine model will not be considered as having substantial air carrier service experience unless it has been satisfactorily operated by another carrier on an approved 1,000-hour or higher overhaul period. However, the operations specifications will require that the basic 1,000-hour overhaul period be substantiated on the same basis as outlined for a new engine except that sample overhauls of a representative number of engines will be accomplished in increments of 100-hour periods beginning at 900 hours. The initial time limitations for overhaul of accessories which are a part of the power package, including propellers, will be established at the overhaul period fixed for the engine itself, unless service experience permits or requires higher or lower overhaul periods.

(f) *Revision of time limitations—general.* The inspection and overhaul time limitations applicable to airframes, powerplants, propellers, and appliances will be revised on the basis of service experience. Increases in such time limitations may be made when the record of service experience for the previous 90 days indicates that such increase will not adversely affect the continuous condition of airworthiness. When the service records indicate that any component or subcomponent consistently requires repair, adjustment, or other maintenance because of damage, wear, or deterioration, within the current time limitations, the air carrier will be responsible for initiating corrective action.

(1) *Airframe—revision of time limitations.* The increases of time limitations for overhaul (or major inspection in case of pattern system, etc.) of airframes will be based on evaluation of all pertinent service records and examination of at least one aircraft, of the model involved, that has been overhauled at the currently approved time limitations. When a pattern or block overhaul type of maintenance system is used, it will be permissible to reschedule individual items in another block or pattern, if performance and condition of the specific item warrants such an increase.

(2) *Powerplants and associated mechanical appliances—revision of time limitations.* Increases in engine overhaul periods will not be approved in increments greater than 100 hours. Increases in time limitations above the 1,000-hour basic engine overhaul period will be considered on the basis of satisfactory service experience at the currently approved time limitations. The operator may request amendment to the currently approved time limitations by submitting a letter to the assigned FAA agent, indicating the desired time limitations on the particular engines involved, and designating three to five engines for disassembly inspection by the FAA agent. The engines chosen for exhibit must have operated in a satisfactory manner for the maximum time permissible, under currently approved time limitations. If, after disassembly and inspection of the exhibit engines and related components, it is found that the new time limitations are justified, the air carrier may then submit a formal application for an amendment in the routine manner requesting the extension of the overhaul period on the entire fleet of engines and related components of the same type and model. Engine accessories may be operated to double or triple the approved engine overhaul time limitations if it is found that previous satisfactory service and overhaul experience, including the service to be performed at each engine change period, would justify the increase as not adversely affecting the continuous condition of airworthiness of the component involved. The procedure for requesting and granting increases in overhaul time limitations for such component will be the same as used for the basic engine.

(3) *Appliances, general—revision of time limitations.* Increases in established times for inspections, bench tests, or overhaul periods

will be based on consideration of the following factors: (i) Geographical area or areas of operation; (ii) number of landings, long haul versus short haul; (iii) maintenance organization and inspection procedures; (iv) manufacturers' recommendations; (v) service history, particularly of known or evident trends toward malfunctioning. When electrical/electronic appliances are overhauled on an on-condition basis, special consideration will be given to the continued airworthiness of mechanical components of such equipment.

(4) *Emergency equipment.* The inspection periods for first aid kits, flotation equipment, and other emergency equipment will assure the continued serviceability and immediate readiness of such equipment for its intended emergency purposes. Major inspection periods will be established for the purpose of determining that all components of the emergency equipment are complete and airworthy and may be expected to remain in this condition until the next major inspection or actual use under emergency conditions. Routine inspection periods will be established to assure that such equipment (or any component thereof) is installed or stored properly, has not been tampered with, damaged, or had articles removed since the last inspection. All inspection periods will be adjusted in accordance with service experience and pertinent operating conditions.

(Published in 19 F. R. 7339, November 13, 1954, effective November 15, 1954.)

41.1-8 *Content of Operations Specifications, Aircraft Maintenance (FAA policies which apply to sec. 41.1).* The Administrator will issue Operations Specifications, Aircraft Maintenance, which have the following minimum contents:

(a) The Operations Specifications, Aircraft Maintenance, will contain a listing of the components of airframes, engines, propellers, and appliances, and the time limitations for checks, inspections and overhauls applicable to each listed component. The list of components will be complete and inclusive except that subcomponents which are subject to check, inspection, and overhaul at the same time limitations as the components to which they are related may be omitted from the listing (e. g., that form commonly called the "short form"). When this is done, the operations specifications will bear a statement to the effect that parts and subcomponents not listed will be checked, inspected, and overhauled at the same time limitations specified for the component or assembly to which such components are related.

When coded identifications or titles, such as "operation #1, #2, #3, etc." or "line check, intermediate check, base inspection, etc.," are used in connection with specified time limitations in the operations specifications, a brief description of such terms will be included which identifies the operation concerned.

(b) If the carrier proposes Operations Specifications, Aircraft Maintenance, which would permit for all or any part of an aircraft a block overhaul system, a sampling inspection and overhaul system, or any other maintenance system which either (1) does not prescribe a fixed period for overhaul, inspection, or check of each component of an aircraft, or (2) includes alternative standards and procedures under which the air carrier may be given authority to establish and adjust such time limitations, the air carrier will fully define and describe the manner in which such a special maintenance program will be performed.

(c) Operations specifications identified as Operations Specifications, Aircraft Maintenance—General, will contain conditions uniformly applicable to all Operations Specifications, Aircraft Maintenance.

(Published in 19 F.R. 7339, November 13, 1954, effective November 15, 1954.)

41.1-9 *Content of Operations Specifications, Aircraft Weight and Balance Control (FAA policies which apply to sec. 41.1).* The Operations Specifications, Aircraft Weight and Balance Control, as submitted by an air carrier, will contain an accurate description of the procedures used to maintain control of weight and balance of all aircraft operated under the terms of the operating certificates which will insure that the aircraft, under all operating conditions, is loaded within the gross weight and center of gravity limitations. This description should include procedures used for determining weight of passengers, weight of baggage, peri-

odic aircraft weighing, type of loading devices, and identification of aircraft concerned.

(Published in 19 F.R. 7339, November 13, 1954, effective November 15, 1954.)

41.2 *Compliance.* All operations shall be conducted in accordance with the specifications of the air carrier operating certificate and the rules contained in this part.

41.3 *Duration.* An air carrier operating certificate will continue in effect until canceled, suspended, or revoked, after which it shall be surrendered to any officer or employee of the Administrator upon request.

41.4 *Display.* The air carrier operating certificate shall be available at the appropriate operations office for inspection by any authorized representative of the Administrator or Board.

41.5 *Inspection.* An authorized representative of the Administrator shall be permitted at any time and place to make inspections or examinations to determine the operator's compliance with the appropriate requirements of the regulations in this subchapter and the Federal Aviation Act of 1958, as amended.

Passenger Operation Rules

Route Requirements

41.10 *Airport spacing.* In the case of operations employing aircraft having two engines, airports adequate for the aircraft used shall be located so that the aircraft, when flying along the route, will at no time be at a greater distance therefrom than 45 minutes flying at normal cruising speed, except where the Administrator finds that because of the character of the terrain, the type of operation, and the performance of aircraft used adequate safety will be provided with airports spaced at greater distances.

41.11 *Communications facilities.* A two-way ground-to-aircraft radio communications system shall be available at such points as are necessary to insure adequate communication between plane and ground over the entire route.

41.12 *Weather reporting services.* Weather reporting services shall be available at such points along the route as are necessary to insure sufficient weather reports prepared from observations made and released by a source acceptable to the Administrator.

41.13 *Navigational facilities.*

(a) *Short distance operation.* Except in the case of a day contact operation where the characteristics of the terrain are such that navigation can be accomplished by reference to landmarks, each route shall be equipped with radio navigational facilities so located as to permit navigation by such facilities over the entire route. For instrument operation a facility shall be so located with respect to each scheduled stop and required alternate airport as to provide adequate means for making an instrument approach. In day instrument operation such a facility is not required at an alternate used only when the weather conditions are as good as or better than: broken clouds, ceiling 1,000 feet, visibility 2 miles, with conditions stable or improving.

(b) *Long distance operation.* Each route shall be equipped with radio navigational facilities so located as to permit the obtaining of reliable radio bearings when within 200 miles of any regular or approved alternate airport and a facility shall be so located with respect to each such airport as to provide adequate means for making an instrument approach: *Provided,* That the Administrator, at particular airports, may approve facilities which provide less coverage than that required in this section if he finds that adequate safety is provided.

41.13–1 *Day over-the-top short distance operation (FAA policies which apply to sec. 41.13 (a)).*

(a) *General.* The following policies will be applied by the Federal Aviation Agency in authorizing day over-the-top short distance

operations by scheduled United States flag air carriers in certain localities outside the continental limits of the United States where the characteristics of the terrain are such that navigation during such operations can be accomplished by reference to landmarks.

(b) *Areas of application.* In certain localities beyond the continental limits of the United States, en route operations are restricted to day flight, providing 3-mile visibility or better exists, because of the characteristics of the terrain, the operating limits of the aircraft being used, or the en route navigational facilities. On some of the routes so restricted, the terminals and/or intermediate stops are equipped with adequate instrument approach facilities, and instrument departures and approaches have been or can be authorized.

(c) *Provisions for authorization of the operations.* Where the conditions outlined in the preceding paragraph exist, a day over-the-top operation with instrument departures and approaches will be authorized if 3-mile visibility or better exists: *Provided,*

(1) Currently approved and established instrument procedures are in effect at all airports where instrument departures and/or approaches are anticipated, and these procedures are included in the operations specifications of the air carrier.

(2) The segment or segments of the route for which instrument operations are authorized, namely, the departure from and/or arrival at the terminals, are defined as prescribed in section 41.137 (q), (2) or (3), and included in the operations specifications of the air carrier.

(3) Operations over the route segment or segments other than those for which instrument operations are authorized will be conducted entirely during the hours of daylight, providing 3 miles' visibility or better exists.

(4) All arrivals at and departures from the terminals and/or intermediate stops will be made during the hours of daylight, except where otherwise provided in the operations specifications of the air carrier.

(5) Visual aids or nonvisual navigation facilities along each route segment are such that at all times a course can be identified and maintained without deviation of more than 10 miles from the centerline of the route.

(6) The aircraft equipment, reserve fuel, flight altitude rules, and alternate airport requirements are met as specified for IFR flights.

(Published in 14 F. R. 5745, September 20, 1949, effective upon publication in the Federal Register.)

41.14 *Airport lighting facilities.* For night operation each scheduled stop and required alternate airport shall be equipped with adequate lighting facilities.

Aircraft Requirements

41.20 *General.*

(a) Aircraft shall be certificated and equipped in accordance with the airworthiness requirements of this subchapter applicable to the type of operation conducted.

(b) Airplanes not certificated under the transport category requirements shall have such characteristics as to permit safe operation over the routes on which such airplanes will be operated.

(c) Land aircraft operated over water beyond gliding distance from shore without the aid of power shall be equipped with retractable landing gear.

(d) Multiengine airplanes shall be so equipped that engine rotation may be promptly stopped during flight, except that for turbine engine installations means for completely stopping the rotation need be provided only if the Administrator finds that rotation could jeopardize the safety of the airplane.

(e) Irrespective of the basis for certification all aircraft possessing engine(s) rated at more than 600 h.p. (each) for maximum continuous operation shall comply with the following, except that, if the Administrator finds that in particular types of existing aircraft literal compliance with specific items of these requirements might be extremely difficult of accomplishment and that such compliance would not contribute materially to the objective sought, he may accept such measures of compliance as he finds will effectively accomplish the basic objectives of this part: Sections 4b.58, 4b.442, 4b.445, 4b.447, 4b.448 (b) and (c), 4b.478, 4b.484, 4b.503, 4b.516 through 4b.518, 4b.556, 4b.557, 4b.560, 4b.561, 4b.586, 4b.621 through 4b.624, 4b.651

through 4b.655, 4b.661 (a) and (c), and 4b.662 through 4b.676 of this subchapter except that fire detectors of the heat type shall be acceptable in lieu of smoke detectors for installation in Class "B" and "C" cargo compartments.

(f) In determining compliance with the applicable airworthiness requirements and operating limitations, a weight and balance control system approved by the Administrator based upon average, assumed, or estimated weights may be utilized.

Note: All references in this section to sections of Part 4b of this subchapter are those sections in effect on October 1, 1949 (14 F.R. 4102, July 16, 1949).

41.21 *Radio equipment; short distance operation.*

(a) For day contact operations over routes on which navigation can be accomplished by visual reference to landmarks, each aircraft shall be equipped with such radio facilities as are necessary to accomplish the following:

(1) Transmit communications and meteorological information to at least one ground station from any point on the route and transmit, from a distance of not less than 25 miles, to airport traffic control towers located at airports approved for the route;

(2) Receive communications at any point on the route;

(3) By either of two independent means, receive meteorological information at any point on the route and receive instructions from airport traffic control towers located at airports approved for the route.

If appropriate, one of the means provided for compliance with subparagraph (3) of this paragraph may be employed for compliance with subparagraph (2).

(b) For day contact operations over routes on which navigation cannot be accomplished by visual reference to landmarks and for night contact, day or night instrument operations, each aircraft shall be equipped with such radio facilities as are necessary to accomplish the following:

(1) Transmit communications and meteorological information to at least one ground station from any point on the route and transmit, from a distance of not less than 25 miles, to airport traffic control towers located at airports approved for the route;

(2) Receive communications at any point on the route;

(3) By either of two independent means, receive meteorological information at any point on the route and receive instructions from airport traffic control towers located at airports approved for the route;

(4) By either of two independent means, satisfactorily receive radio navigational signals from any radio aid to navigation required by section 41.13(a).

If appropriate, one of the means provided for compliance with subparagraph (3) of this paragraph may be employed for compliance with subparagraph (2) of this paragraph or the means provided for compliance with subparagraph (4) of this paragraph may be employed for compliance with subparagraph (3) of this paragraph.

41.22 *Radio equipment; long distance operation.* Each aircraft shall be equipped with such radio facilities as are necessary to accomplish the following:

(a) By either of two independent means, transmit communications and meteorological information to at least one ground station from any point on the route and transmit, from a distance of not less than 25 miles, to airport traffic control towers located at airports approved for the route;

(b) By either of two independent means, receive communications at any point on the route;

(c) By either of two independent means, receive meteorological information at any point on the route and receive instructions from airport traffic control towers located at airports approved for the route;

(d) By either of two independent means, satisfactorily receive radio navigational signals from any radio aid to navigation required by section 41.13(b).

If appropriate, equipment provided for compliance with paragraph (c) of this section may be employed for compliance with either paragraph (b) or this paragraph.

Instruments and Equipment

41.23 *Emergency and safety equipment.* After May 31, 1957, the equipment required in sections 41.23b, 41.23c, and 41.23d shall be approved by the Administrator.

41.23–1 *First-aid kits (FAA policies which apply to sec. 41.23).* Each first-aid kit should be dust and moistureproof, should contain only materials which meet Federal Specifications GGK 391, as revised, and should include at least the following items or their equivalent:

(a) *No. 1 kit for aircraft of 1–5 persons capacity.*

Adhesive bandage compress, 1″ (16 per unit)	1
Antiseptic swabs, 10 mm. (10 per unit)	1
Ammonia inhalants, 6 mm. (10 per unit)	1
Ammonia, aromatic spirits, 2 cc. with drinking cups (4 each per unit)	1
2″ bandage compress (4 per unit)	1
4″ bandage compress (1 per unit)	1
Triangular bandage compressed, 40″ (1 per unit)	1
Burn compound, ⅛ oz. (6 per unit)	1
Tourniquet, forceps, and scissors (1 each per double unit container)	1

(b) *No. 2 kit for aircraft of 6–25 persons capacity.*[5]

Adhesive bandage compresses, 1″ (16 per unit)	2
Antiseptic swabs, 10 mm. (10 per unit)	2
Ammonia inhalants, 6 mm. (10 per unit)	1
Ammonia, aromatic spirits, 2 cc. with drinking cups (4 each per unit)	2
2″ bandage compresses (4 per unit)	2
4″ bandage compresses (1 per unit)	2
Triangular bandage compressed, 40″ (1 per unit)	1
Burn compound, ⅛ oz. (6 per unit)	1
Tourniquet, forceps, and scissors (1 each per double unit container)	1
Eye dressing packet (3 each per unit) (ophthalmic ointment, ⅛ oz.; eye pads; eye strips)	1

(c) *No. 3 kit for aircraft of more than 25-persons capacity.*

Adhesive bandage compresses, 1″ (16 per unit)	4
Antiseptic swabs, 10 mm. (10 per unit)	2
Ammonia inhalants, 6 mm. (10 per unit)	2
Ammonia, aromatic spirits, 2 cc. with drinking cups (4 each per unit)	2
2″ bandage compresses (4 per unit)	3
4″ bandage compresses (1 per unit)	3
Triangular bandage compressed, 40″ (1 per unit)	3
Burn compound, ⅛ oz. (6 per unit)	2
Tourniquet, forceps, scissors (1 each per double unit container)	1
Eye dressing packet (3 each per unit) (ophthalmic ointment, ⅛ oz.; eye pads; eye strips)	1

[5] Kit No. 2 in canvas may also be used for liferafts.

(Published in 17 F. R. 2748, March 29, 1952; amended in 18 F. R. 1433, March 13, 1953, effective March 15, 1953.)

41.23a *Safety belts.* Aircraft shall have installed a safety belt for each occupant. Safety belts shall be of an approved type. In no case shall the rated strength of a safety belt be less than that corresponding with the ultimate load factors specified in the pertinent currently effective aircraft airworthiness parts of this subchapter, taking due account of the dimensional characteristics of the safety belt installation for the specific seat or berth arrangement. The webbing of safety belts shall be subject to periodic replacement as prescribed by the Administrator.

41.23b *First-aid kits and emergency equipment.* Each airplane shall be equipped with a conveniently accessible first-aid kit adequate for the type of operation involved. Airplanes scheduled over routes requiring flights for long distances over uninhabited terrain must carry such additional emergency equipment as appropriate for the particular operation involved.

41.23c *Equipment for overwater operations.*

(a) The following equipment shall be required for all extended overwater operations: *Provided,* That the Administrator, after appropriate investigation, may require the carriage of all of the prescribed equipment, or any item thereof, for any operation over water, or upon application of an air carrier, permit deviation from these require-

ments for a particular extended overwater operation:

(1) Life vest or other adequate individual flotation device for each occupant of the airplane;

(2) Life rafts sufficient in number and of such rated capacity and buoyancy as to accommodate all occupants of the airplane;

(3) Suitable pyrotechnic signaling devices; and

(4) One portable emergency radio signaling device, capable of transmission on the appropriate emergency frequency or frequencies, which is not dependent upon the airplane power supply and which is self-buoyant and water-resistant.

(b) All required life rafts, life vests, and signaling devices shall be easily accessible in the event of a ditching without appreciable time for preparatory procedures. After May 31, 1957, this equipment shall be installed in conspicuously marked locations approved by the Administrator.

(c) A survival kit, appropriately equipped for the route to be flown, shall be attached to each required life raft.

41.23d *Emergency evacuation equipment.*

(a) *Means for emergency evacuation.* After August 31, 1957, on all passenger-carrying airplanes, at all emergency exits which are more than 6 feet from the ground with the airplane on the ground and with the landing gear extended, means shall be provided to assist the occupants in descending from the airplane. At floor level exits approved as emergency exits, such means shall be a chute or equivalent device suitable for the rapid evacuation of passengers. During flight time this means shall be in a position for ready use: *Provided,* That the requirements of this paragraph do not apply to emergency exits over the wing where the greatest distance from the lower sill of the exit to the wing surface does not exceed 36 inches.

(b) *Interior emergency exit markings.*

(1) After May 31, 1957, all passenger emergency exits, their means of access, and their means of opening shall be marked conspicuously. The identity and location of emergency exits shall be recognizable from a distance equal to the width of the cabin. The location of the emergency exit operating handle and the instructions for opening shall be marked on or adjacent to the emergency exit and shall be readable from a distance of 30 inches by a person with normal eyesight.

(2) After August 31, 1957, in all passenger-carrying airplanes for night operations, a source or sources of light, with an energy supply independent of the main lighting system, shall be installed to illuminate all passenger emergency exit markings. Such lights shall be designed to function automatically in a crash landing and to continue to function thereafter and shall also be operable manually, or shall be designed only for manual operation and also to continue to function following a crash landing. When such lights require manual operation to function, they shall be turned on prior to each night take-off and landing.

41.24 Supplemental oxygen; reciprocating-engine-powered airplanes. Except where supplemental oxygen is provided in accordance with the requirements of section 41.24a, supplemental oxygen shall be furnished and used as set forth below. The amount of supplemental oxygen required for a particular operation to comply with the rules in this part shall be determined on the basis of flight altitudes and flight duration consistent with the operating procedures established for such operation and route. As used in the oxygen requirements hereinafter set forth, "altitude" shall mean the pressure altitude corresponding with the pressure in the cabin of the airplane, and "flight altitude" shall mean the altitude above sea level at which the airplane is operated.

(a) *Crew members.* (1) At altitudes above 10,000 feet to and including 12,000 feet oxygen shall be provided for, and used by, each member of the flight crew on flight deck duty, and provided for all other crew members, during the portion of the flight in excess of 30 minutes within this range of altitudes.

(2) At altitudes above 12,000 feet oxygen shall be provided for, and used by, each

member of the flight crew on flight deck duty, and provided for all other crew members, during the entire flight time at such altitudes.

(b) *Passengers.* Each air carrier shall provide a supply of oxygen for passenger safety as approved by the Administrator in accordance with the following requirements:

(1) For flights of over 30-minute duration at altitudes above 8,000 feet to and including 14,000 feet a supply of oxygen sufficient to furnish oxygen for 30 minutes to 10 percent of the number of passengers carried shall be required.

(2) For flights at altitudes above 14,000 feet to and including 15,000 feet a supply of oxygen sufficient to provide oxygen for the duration of the flight at such altitudes for 30 percent of the number of passengers carried shall generally be considered adequate.

(3) For flights at altitudes above 15,000 feet a supply of oxygen sufficient to provide oxygen for each passenger carried during the entire flight at such altitudes shall be required.

41.24–1 *Supplemental oxygen for crew members (FAA interpretations which apply to sec. 41.24 (a) (1)).*

(a) The phrase, "during the portion of flight in excess of 30 minutes within this range of altitudes" applies to all crew members including the flight crew members on flight deck duty. Thus, oxygen is required to be provided for, and used by, each member of the flight crew on flight deck duty only during the portion of the flight in excess of 30 minutes within this range of altitudes.

(b) The words "and used by" mean continuous use of the oxygen by a crew member during the required periods, except when it is necessary for the crew member to remove the oxygen mask in connection with his regular duties.

(Published in 19 F. R. 549, Feb. 2, 1954, effective Feb. 15, 1954; 21 F. R. 5437, July 20, 1956, effective July 31, 1956).

41.24–2 *Oxygen requirements for standby crew members (FAA interpretations which apply to sec. 41.24 (a)).* Standby crew members who are on call or are definitely going to have flight deck duty prior to the completion of a flight must be provided with the same amount of supplemental oxygen as that provided for crew members on duty other than on flight deck duty. However, if the standby crew members are not on call and will not be on flight deck duty during the remainder of the flight, they must be considered as passengers with regard to supplemental oxygen.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24–3 *Operating instructions (FAA policies which apply to sec. 41.24).* Operating instructions appropriate to the type of system and masks installed should be provided for the flight crew in the appropriate air carrier manual. These operating instructions should contain a graph or a table which will show the duration of the oxygen supply for the various bottle pressures and pressure altitudes.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24–4 *Oxygen requirements for jump seat occupant (FAA policies which apply to sec. 41.24).* When the jump seat is occupied by a check pilot, a crew member, or a flight crew member, as defined by section 41.137 (h), (j), and (i), respectively, oxygen should be provided in accordance with the requirements of section 41.24. The provision of oxygen at the jump seat location may be accomplished either by a portable oxygen unit or an outlet in a fixed system.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24–5 *Oxygen requirements for infants-in-arms (FAA policies which apply to sec. 41.24 (b)).* Provisions should be made for administering oxygen to infants-in-arms and additional oxygen should be carried whenever an unusually large number of infants is carried. This additional oxygen is needed only when there is a passenger or infant for each seat position and the number of infants not provided for exceeds 50 percent of the seat positions. Acceptable methods of administering the oxygen to infants and now used by many operators are: (a) A disposable plastic mask which can be fitted to the face; (b) an infant size BLB oronasal mask and (c) semirigid paper cups, specifically reserved for the purpose, which can be fitted over the infant's nose and mouth, with a hole punched through the bottom through

which an oxygen tube or a Y-connector can be inserted. Any other acceptable method may also be used.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24–6 *Oxygen requirements for clinical purposes (FAA policies which apply to sec. 41.24 (b)).* The regulations do not require that oxygen be provided for clinical purposes; hence, if the air carrier believes that such oxygen is to be desired, he should provide oxygen for this purpose. It is suggested that portable units of any size the air carrier desires be used for this purpose in order that the minimum supply required for supplementary breathing purposes will be preserved. If, however, the operator wishes to use a common source of supply for the oxygen required by the regulations and for clinical purposes, he may do so if he provides an amount of oxygen sufficiently greater than that required by the regulations. A quantity of 300 liters STPD would probably be considered as satisfying reasonable needs.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24–T *Supplemental oxygen for sustenance; turbine-powered airplanes.*

(a) *General.* Prior to November 30, 1959, turbine-powered airplanes shall comply with the provisions of section 41.24 or, alternatively, with the provisions of this section except that effective November 30, 1959, all turbine-powered airplanes shall comply with the provisions of this section. Sustaining oxygen and dispensing equipment shall be furnished by the air carrier for use as set forth in this section. The amount of oxygen provided shall be at least that quantity which will be necessary to comply with paragraphs (b) and (c) of this section. As used in the oxygen requirements hereinafter set forth, "cabin pressure altitude" shall mean the pressure altitude corresponding with the pressure in the cabin of the airplane, and "flight altitude" shall mean the altitude above sea level at which the airplane is operated; for airplanes not equipped with pressurized cabins, "cabin pressure altitude" and "flight altitude" shall be considered identical. The amount of sustaining and first-aid oxygen required for a particular operation to comply with the rules in this part shall be determined on the basis of cabin pressure altitudes and flight duration consistent with the operating procedures established for each such operation and route. The requirements for airplanes with pressurized cabins shall be determined on the basis of cabin pressure altitude and the assumption that a cabin pressurization failure will occur at that altitude or point of flight which is most critical from the standpoint of oxygen need, and that after such failure the airplane will descend in accordance with the emergency procedures specified in the Airplane Flight Manual without exceeding its operating limitations to a flight altitude that will permit successful termination of the flight. Following such a failure the cabin pressure altitude shall be considered to be the same as the flight altitude unless it can be shown that no probable failure of the cabin or pressurization equipment will result in a cabin pressure altitude equal to the flight altitude, under which circumstances the maximum cabin pressure altitude attained may be used as a basis for certification and/or determination of oxygen supply.

(b) *Crew members.* A supply of oxygen for crew members shall be provided in accordance with the following requirements:

(1) At cabin pressure altitudes above 10,000 feet to and including 12,000 feet, oxygen shall be provided for and used by each member of the flight crew on flight deck duty and provided for all other crew members during the portion of the flight in excess of 30 minutes within this range of altitudes.

(2) At cabin pressure altitudes above 12,000 feet, oxygen shall be provided for and used by each member of the flight crew on flight deck duty and provided for all other crew members during the entire flight at such altitudes.

(c) *Passengers.* A supply of oxygen for passengers shall be provided in accordance with the following requirements:

(1) For flights at cabin pressure altitudes above 10,000 feet to and including 14,000 feet, oxygen shall be provided for the

duration of flight in excess of 30 minutes for 10 percent of the number of passengers carried.

(2) For flights at cabin pressure altitudes above 14,000 feet to and including 15,000 feet, oxygen shall be provided for the duration of flight at such altitude for 30 percent of the number of passengers carried.

(3) For flights at cabin pressure altitudes above 15,000 feet, oxygen shall be provided for each occupant carried for the duration of flight at such altitude.

41.24a *Supplemental oxygen requirements for pressurized cabin airplanes; reciprocating-engine-powered airplanes.* When operating pressurized cabin airplanes, the air carrier shall so equip such airplanes as to permit compliance with the following requirements in the event of cabin pressurization failure.

(a) *Crew members.* When operating such airplanes at flight altitudes above 10,000 feet, the air carrier shall provide sufficient oxygen for all crew members for the duration of the flight at such altitudes: *Provided*, That not less than a two-hour supply of oxygen shall be provided for the flight crew members on flight deck duty. (The oxygen supply required by section 41.24c may be considered in determining the supplemental breathing supply required for flight crew members on flight deck duty in the event of cabin pressurization failure.)

(b) *Passengers.* When operating such airplanes at flight altitudes above 8,000 feet, the air carrier shall provide the following amount of oxygen:

(1) Where an airplane is not flown at a flight altitude of over 25,000 feet a supply of oxygen sufficient to furnish oxygen for 30 minutes to 10 percent of the number of passengers carried shall be considered adequate, if at any point along the route to be flown the airplane can safely descend to a flight altitude of 14,000 feet or less within 4 minutes.

(2) In the event that such airplane cannot descend to a flight altitude of 14,000 feet or less within 4 minutes, the following supply of oxygen shall be provided:

(i) For the duration of the flight in excess of 4 minutes at altitudes above 15,000 feet, a supply sufficient to comply with section 41.24(b)(3);

(ii) For the duration of the flight at altitudes above 14,000 feet to and including 15,000 feet, a supply sufficient to comply with section 41.24(b)(2); and

(iii) For flight at altitudes above 8,000 feet to and including 14,000 feet, a supply sufficient to furnish oxygen for 30 minutes to 10 percent of the number of passengers carried.

(3) Where an airplane is flown at an altitude above 25,000 feet sufficient oxygen shall be furnished in accordance with the following requirements to permit the airplane to descend to an appropriate flight altitude at which the flight can be safely conducted. Sufficient oxygen shall be furnished to provide oxygen for 30 minutes to 10 percent of the number of passengers carried for the duration of the flight above 8,000 feet to and including 14,000 feet and to permit compliance with section 41.24(b) (2) and (3) for flight above 14,000 feet.

(c) For purposes of this section it shall be assumed that the cabin pressurization failure will occur at a time during flight which is critical from the standpoint of oxygen need and that after such failure the airplane will descend, without exceeding its normal operating limitations, to altitudes permitting safe flight with respect to terrain clearance.

41.24a–1 *Computation of supply for crew members in pressurized cabin aircraft (FAA policies which apply to sec. 41.24a (a)).*

(a) *Cabin altitudes less than 10,000 feet.* When a pressurized cabin aircraft is certificated to fly with a cabin pressure altitude no greater than 10,000 feet, only the supply of oxygen stipulated by section 41.24a (a) need be provided for crew members. In determining this supply the following policies should be considered:

(1) The supply of oxygen which should be provided for all crew members for the duration of the flight should be computed on the basis of the cabin pressure altitude which would

exist after cabin depressurization has occurred and the aircraft has descended to the altitude which would permit safe flight with respect to terrain clearance. (See sec. 41.24a (c).)

(2) The operator may use the supply furnished for protective breathing purposes for compliance with the 2-hour requirement for supplementary breathing oxygen. For example, the 300 liter STPD supply per flight crew member, which is the protective breathing supply when demand (or diluter-demand) systems are used, will provide a 2-hour supplementary breathing supply for one flight crew member at 20,000 feet, so that both the minimum 2-hour supplementary breathing requirement and the protective breathing requirement would be fulfilled under most emergency conditions resulting from loss of cabin pressure or from contamination of cabin air with smoke or poisonous gases.

(b) *Cabin altitudes greater than 10,000 feet.* When operating a pressurized cabin aircraft which is certificated to fly with a cabin pressure altitude greater than 10,000 feet, a supply of oxygen computed on the basis of the requirements of section 41.24 (a) should be provided.

(1) The oxygen supply required for protective breathing purposes, as defined in section 41.24c, should be provided in addition to the above supply for the flight crew members on flight deck duty. This emergency supply may be used in the event of cabin pressurization failure. In the event that operations occur over terrain which require flights of such duration and altitude as to use up the emergency oxygen supplied either for protective breathing purposes or for the 2-hour supply following pressurization failure, the supply should be increased to provide for this difference, computing it for crew members on the basis of section 41.24a (a).

(2) To provide oxygen for crew members other than the flight crew members on flight deck duty in the event of cabin pressurization failure, a supply of oxygen in addition to the supplies mentioned above should be provided in accordance with the requirements of section 41.24a (a) except that the total supply for these other crew members need not exceed that provided on the basis of section 41.24 (a) for cabin pressure altitudes in excess of 10,000 feet plus an additional supply necessary to satisfy the increased oxygen flow which might be needed following a pressurization failure; this supplement to the section 41.24 (a) supply should be based on the duration of flight at the altitudes which would permit safe flight with respect to terrain clearance.

(3) During normal operation at cabin pressure altitudes above 10,000 feet oxygen should be used by each member of the flight crew on flight deck duty for the duration of the flight in excess of 30 minutes at the cabin pressure altitudes between 10,000 and 12,000 feet and for the duration of the flight at cabin pressure altitudes in excess of 12,000 feet. In the event of the loss of cabin pressurization, oxygen should continue to be used by the flight crew members on flight deck duty for the duration of flight at cabin pressure altitudes greater than 10,000 feet. All other crew members may use oxygen according to their individual needs.

(Published in 19 F. R. 547, February 2, 1954, effective February 15, 1954.)

41.24a–2 *Computation of supply for passengers in pressurized cabin aircraft (FAA policies which apply to sec. 41.24a (b)).*

(a) *Cabin altitudes less than 10,000 feet.* When a pressurized cabin aircraft is certificated to fly with a cabin pressure altitude no greater than 10,000 feet, only the supply of oxygen stipulated by section 41.24 (b) need be provided for passengers. In determining this supply the following policies should be considered:

(1) The altitude which should be used in computing the supply of oxygen required by this section should be the altitude to which the aircraft would descend following a cabin pressurization failure, considering terrain clearance and operation limitations.

(2) Relative to section 41.24a (b) (1) and (2), no oxygen need be provided for the first 4 minutes following a cabin pressurization failure.

(b) *Cabin altitudes greater than 10,000 feet.* When a pressurized cabin aircraft is certificated to fly with a cabin pressure altitude greater than 10,000 feet, the following policies should be considered: When the cabin pressure altitude is above 10,000 feet to and including 14,-

000 feet, sufficient oxygen shall be provided for 10 percent of the number of passengers for the duration of flight between such cabin pressure altitudes. When the cabin pressure altitude is above 14,000 feet to and including 15,000 feet, sufficient oxygen shall be provided for 30 percent of the number of passengers for the duration of flight between such cabin pressure altitudes. When the cabin pressure altitude is above 15,000 feet, sufficient oxygen shall be provided for each passenger for the duration of flight above such a cabin pressure altitude. In addition to the above supply of oxygen, in order to provide for loss of cabin pressure, the supplementary oxygen required by whatever portions of section 41.24a(b) are applicable, shall be provided except that in no case will it be necessary to furnish a supply of oxygen in excess of that necessary to supply oxygen to 100 percent of the passengers for the maximum possible duration of flight at the maximum cabin altitude which could be attained under either of the normal operating or emergency conditions whichever is greater.

(Published in 19 F.R. 547, February 2, 1954, effective February 15, 1954.)

41.24a–3 *Oxygen requirements for clinical purposes (FAA policies which apply to sec. 41.24a(b)).* The regulations do not require that oxygen be provided for clinical purposes; hence, if the air carrier believes that such oxygen is to be desired, he should provide oxygen for this purpose. It is suggested that portable units of any size the air carrier desires be used for this purpose in order that the minimum supply required for supplementary breathing purposes will be preserved. If, however, the operator wishes to use a common source of supply for the oxygen required by the regulations and for clinical purposes, he may do so if he provides an amount of oxygen sufficiently greater than that required by the regulations. It is suggested that a quantity of 300 liters may be considered as satisfying reasonable needs.

(Published in 19 F.R. 547, February 2, 1954, effective February 15, 1954.)

41.24a–4 *Oxygen requirements for infants-in-arms (FAA policies which apply to sec. 41.24a(b)).* Provisions should be made for administering oxygen to infants-in-arms, and additional oxygen over that required by section 41.24a(b) should be carried whenever an unusually large number of infants is carried. This additional oxygen is needed only when there is a passenger or infant for each seat position and the number of infants not provided for exceeds 50 percent of the seat positions. Acceptable methods of administering the oxygen to infants and now used by many operators are: (a) A disposable plastic mask which can be fitted to the face; (b) an infant size BLB oronasal mask and (c) semirigid paper cups, specifically reserved for the purpose, which can be fitted over the infant's nose and mouth, with a hole punched through the bottom through which an oxygen tube or Y-connector can be inserted. Any other acceptable method may also be used.

(Published in 19 F.R. 547, February 2, 1954, effective February 15, 1954.)

41.24a–T *Supplemental oxygen for emergency descent and for first aid; turbine-powered airplanes with pressurized cabins.*

(a) *General.* Prior to November 30, 1959, turbine-powered airplanes with pressurized cabins shall comply with the provisions of section 41.24a, with the additional requirement that, when operating at flight altitudes above 25,000 feet, all flight crew members on flight deck duty shall be provided with oxygen masks, connected to appropriate supply terminals, which shall be immediately available for use; or, alternatively, with the provisions of this section except that effective November 30, 1959, all such turbine-powered airplanes shall comply with the provisions of this section. When operating pressurized cabin airplanes, the air carrier shall furnish oxygen and dispensing equipment necessary to permit compliance with the requirements set forth in this section in the event of cabin pressurization failure.

(b) *Crew members.* When operating at flight altitudes above 10,000 feet, oxygen shall be provided to permit compliance with section 41.24–T except that not less than a 2-hour supply shall be provided for the flight crew members on flight deck duty. The oxygen required by section 41.24c may be included in determining the supply required

for flight crew members on flight deck duty in the event of cabin pressurization failure.

(c) *Use of oxygen masks by flight crew members.* When operating at flight altitudes above 25,000 feet, one pilot at the controls of the airplane shall wear and use an oxygen mask at all times and all other flight crew members on flight deck duty shall be provided with oxygen masks, connected to appropriate supply terminals, which shall be worn in a manner that will permit immediate placing of the masks on their faces for use, properly secured and sealed.

(d) *Use of portable oxygen equipment by cabin attendants.* Portable oxygen equipment of not less than a 15-minute oxygen supply shall be carried by each attendant during the entire time flight is conducted above 25,000 feet flight altitude, unless it is shown that sufficient portable oxygen units equipped with masks or spare outlets and masks are distributed throughout the cabin to insure immediate availability of oxygen to the cabin attendants regardless of their location at the time of cabin depressurization.

(e) *Passenger cabin occupants.* When operating at flight altitudes above 10,000 feet, the following supply of oxygen shall be provided for the use of passenger cabin occupants:

(1) When an airplane is certificated to operate at flight altitudes to and including 25,000 feet, and if at any point along the route to be flown the airplane can descend safely to a flight altitude of 14,000 feet or less within 4 minutes, oxygen shall be available at the rate prescribed by this part for a 30-minute period for not less than 10 percent of the number of passenger cabin occupants carried.

(2) When an airplane is operated at flight altitudes to and including 25,000 feet and cannot descend safely to a flight altitude of 14,000 feet within 4 minutes, or when an airplane is operated at flight altitudes above 25,000 feet, oxygen shall be available at the rate prescribed by this part for not less than 10 percent of the number of passenger cabin occupants carried for the duration of flight following cabin depressurization at cabin pressure altitudes above 10,000 feet to and including 14,000 feet and, as applicable, to permit compliance with section 41.24–T (b) (2) and (3), except that not less than a 10-minute supply for all passenger cabin occupants shall be provided.

(3) For first-aid treatment of occupants who for physiological reasons might require undiluted oxygen following descent from cabin pressure altitudes above 25,000 feet, a supply of oxygen in accordance with the requirements of section 4b.651(b)(4) (see section 41.24b) shall be provided for 2 percent of the occupants for the duration of flight following cabin depressurization at cabin pressure altitudes above 8,000 feet, but in no case to less than one person. An appropriate number of acceptable dispensing units, but in no case less than 2, shall be provided. Means shall be provided to enable the cabin attendants to use this supply.

(f) *Passenger briefing.* Before flight is conducted above 25,000 feet, a crew member shall give instructions and demonstrations to the passengers sufficient to insure that all passengers are adequately informed regarding the location and operation of the oxygen-dispensing equipment and the necessity of using oxygen in the event of cabin depressurization.

41.24b *Equipment standards.*

(a) *Reciprocating-engine-powered airplanes.* The oxygen apparatus, the minimum rates of oxygen flow, and the supply of oxygen necessary to comply with the requirements of section 41.24 shall meet the standards established in section 4b.651 of this subchapter effective July 20, 1950: *Provided,* That where full compliance with such standards is found by the Administrator to be impracticable, he may authorize such changes in these standards as he finds will provide an equivalent level of safety.

(b) *Turbine-powered airplanes.* Prior to November 30, 1959, turbine-powered airplanes shall comply with the provisions of paragraph (a) of this section or, alternatively, with the provisions of this paragraph except that effective November

30, 1959, all turbine-powered airplanes shall comply with the provisions of this paragraph. The oxygen apparatus, the minimum rate of oxygen flow, and the supply of oxygen to comply with the requirements of sections 41.24–T and 41.24a–T shall meet the standards established in section 4b.651 of this subchapter effective September 1, 1958: *Provided,* That where full compliance with such standards is found by the Administrator to be impracticable, he may authorize such changes in these standards as he finds will provide an equivalent level of safety.

41.24c *Protective breathing equipment for the flight crew.*

(a) *Pressurized cabin airplanes.* Each flight crew member on flight deck duty shall have easily available at his station protective breathing equipment covering the eyes, nose, and mouth, or the nose and mouth where accessory equipment is provided to protect the eyes, to protect him from the effects of smoke, carbon dioxide, and other harmful gases.

(1) Not less than a 300-liter STPD supon flight deck duty shall be provided for this ply of oxygen for each flight crew member purpose.

(b) *Nonpressurized cabin airplanes.* The requirement stated in paragraph (a) of this section shall apply to nonpressurized cabin airplanes, if the Administrator finds that it is possible to obtain a dangerous concentration of smoke, carbon dioxide, or other harmful gases in the flight crew compartments in any attitude of flight which might occur when the aircraft is flown in accordance with either the normal or emergency procedures approved by the Administrator.

41.24c–1 *Protective breathing equipment and installation (FAA policies which apply to sec. 41.24c).* Protective breathing equipment for the flight crew and its installation should comply with sections 4b.651–1 and 4b.651–2 of this subchapter.

(Published in 15 F.R. 8924, December 15, 1950, effective January 1, 1951.)

41.24c–2 *Requirement of protective breathing equipment in nonpressurized cabin airplanes (FAA rules which apply to sec. 41.24c(b)).* Protective breathing equipment for the flight crew shall be required in nonpressurized cabin aircraft having built-in carbon dioxide fire extinguisher systems in fuselage compartments (for example, cargo or combustion heater compartments); except that protective breathing equipment shall not be required where:

(a) Not more than 5 pounds of carbon dioxide will be discharged into any one such compartment in accordance with established fire control procedures, or

(b) The carbon dioxide concentration of the flight crew stations has been determined in accordance with section 4b.484–1 of this subchapter and found to be less than 3 percent by volume (corrected to standard sea level conditions).

(Published in 15 F.R. 8924, December 15, 1950, effective January 1, 1951.)

41.25 *Instruments and equipment required for continuance of flight.* If any required instrument or item of equipment in an aircraft becomes unserviceable in flight, a landing must be made at either the nearest suitable landing area or at the next point of intended landing whichever, in the opinion of the pilot, is the safer procedure, unless the equipment specified in this section for the type of operation indicated is in serviceable condition, in which case the flight may continue as scheduled to the nearest point where repairs or replacements can be made. The items listed in this section are required for all types of operation unless otherwise specified, except that the Administrator may permit or require different instrumentation or equipment for turbine-powered aircraft to provide equivalent safety:

(a) One air-speed indicator and one sensitive type altimeter (contact operation); two air-speed indicators and two sensitive type altimeters (instrument operation),

(b) One approved compass,

(c) A tachometer for one engine, one fuel pressure gauge with warning indicator, one oil pressure gauge with warning indicator, and one oil temperature or cylinder temperature gauge for each engine,

(d) A manifold pressure gauge for one engine,

(e) In addition to fire detecting and fire extinguishing equipment necessitated as a result of compliance with section 41.20(e), a minimum of two hand fire extinguishers of an approved type with an approved extinguishing agent, one of which installed in the crew compartment, others readily accessible to the passengers. Such additional hand fire extinguishers as the Administrator finds necessary for compliance with section 41.20(e),

(f) One landing gear position indicator or equivalent facility, if equipment includes a retractable landing gear,

(g) One or more storage batteries or other source of electrical supply sufficient to operate all radio and electrical equipment necessary for the flight.

(h)

(1) Two of the following three units of radio equipment:

(i) One transmitter for two-way communication,

(ii) One receiver for two-way communication,

(iii) One receiver capable of receiving navigational signals.

(2) In addition to the instruments named in subparagraph (1) of this paragraph, one of the radio navigational systems required by section 41.21(b), if navigational facilities on the route are required by section 41.13,

(i) All radio equipment required by these regulations (night and instrument operation),

(j) Forward position and tail lights, two landing lights, one set of instrument lights, and two class 1 or class 1A landing flares for night extended overwater operations.

(k) Fuel quantity indicators indicating the amount of fuel in each tank to be used for the remainder of the flight, or, in the case of aircraft having a third flight crew member assigned as a member of the operating crew, an alternate means approved by the Administrator for determining the amount of fuel in each tank (night and instrument operation),

(l) An electrically heated pitot tube serving each pilots air-speed indicator (night and instrument operation),

(m) One gyro rate-of-turn indicator combined with a bank indicator, one artificial horizon indicator, and one gyro direction indicator (night and instrument operation),

(n) One outside air temperature gauge with indicating dial in the pilot compartment and one carburetor air temperature indicator or equivalent approved device (night and instrument operation),

(o) If vacuum system is used, one vacuum gauge with warning indicator on the instrument panel installed in lines leading to the rate-of-turn and artificial horizon indicators and the gyro direction indicator (night and instrument operation),

(p) One clock with sweep second hand (night and instrument operation),

(q) Three spare fuses of each capacity, or 25 percent of the number of each capacity, whichever is the greater,

(r) After May 31, 1956, an approved anti-collision light for aircraft having a maximum certificated weight of more than 12,500 pounds; except that in the event of failure of such light, the aircraft may continue flight to the next stop where repairs or replacements can be made (Night),

(s) Effective July 1, 1956, a means shall be provided for each reversible propeller on airplanes equipped with reversible propellers, which will indicate to the pilots when the propeller is in reverse pitch. Such means may be actuated at any point in the reversing cycle between the normal low pitch stop position and full reverse pitch. No indication shall be given at or above the normal low pitch stop position. The source of indication shall be actuated by the propeller blade angle or be directly responsive to the propeller blade angle.

(t) An approved flight recorder which records time, air speed, altitude, vertical acceleration, and heading shall be installed on all airplanes of more than 12,500 pounds maximum certificated take-off weight which are certificated for operations above 25,000 feet altitude, and shall be operating continuously during flight; except that, in the event of failures of such recorder, the airplane may continue flight to the next stop where repairs or replacements can be made. The recorded information from the flight recorder shall be retained by the air carrier for a period of at least 60 days. For a par-

ticular flight or series of flights, the information shall be retained for a longer period if requested by an authorized representative of the Administrator or the Civil Aeronautics Board.

41.25–1 *Warning lights for reversible propellers (FAA policies which apply to sec. 41.25(s)).* In the interest of cockpit uniformity, when warning lights are used to indicate to the pilot that a reversible propeller is in reverse pitch, such warning lights should be amber in color.

(Published in 21 F.R. 4312, June 20, 1956, effective July 1, 1956.)

Limitations

41.26 *Airplane certification requirements.*

(a) *Airplanes certificated on or before June 30, 1942.* Airplanes certificated as a basic type on or before June 30, 1942, shall either:

(1) Retain their present airworthiness certification status and meet the requirements of section 41.36, or

(2) Comply with either the performance requirements of sections 4a.737–T through 4a.750–T of this subchapter or the performance requirements of sections 4b.110 through 4b.125 of this subchapter and in addition shall meet the requirements of section 41.27: *Provided,* That should any type be so qualified, all airplanes of any one operator of the same or related types shall be similarly qualified and operated.

(b) *Airplanes certificated after June 30, 1942.* Airplanes certificated as a basic type after June 30, 1942, and used in passenger operation shall be certificated as transport category airplanes and shall meet the requirements of section 41.27.

41.27 *Operating limitations upon airplanes certificated under transport category requirements.* When operating any airplane certificated in accordance with the provisions of Part 4b of this subchapter, or of sections 4a.737–T through 4a.750–T of this subchapter, the provisions of sections 41.28–41.35 shall apply unless deviations therefrom are specifically authorized by the Administrator when he finds that, due to a peculiarity of a specific case, such application is unnecessary for safety.

In determining compliance with these provisions the data obtained in testing the airplane for type certification may be applied, by interpolation or by computation of the effects of changes in specific variables, to conditions differing from those for which specific tests were made, where such interpolations or computations will give results substantially equalling in accuracy the results of a direct test.

41.28 *General limitations.*

(a) Airplanes shall be operated only from airports at altitudes within the altitude range for which maximum take-off weights have been determined and set forth in the airplane operating manual and shall be dispatched only to airports of intended destination, or to airports specified as alternates, which are at altitudes within the range for which maximum landing weights have been determined and set forth in the airplane operating manual.

(b) The weight of an airplane at take-off shall not exceed the certificated maximum take-off weight for the altitude of the airport from which the take-off is made.

(c) The weight at take-off shall be such that, allowing for the consumption of the amount of fuel and oil which would normally be consumed in flight to the intended destination, the weight on arrival at the destination will not exceed the certificated maximum landing weight for the altitude of the airport of intended destination.

(d) No airplane shall be taken off at a weight which exceeds the allowable weight for the runway being used as determined in accordance with the take-off runway limitations of the transport category operating rules, after taking into account the temperature operating correction factors required by section 4a.749a–T or section 4b.117 of this subchapter, and set forth in the Airplane Flight Manual for the airplane.

41.29 *Take-off limitations to provide for engine failure.* Take-off shall be made only from such airports, in such directions, and under such weight limitations that the fol-

lowing conditions are fulfilled as shown by the performance data determined under section 4a.747–T or section 4b.91 of this subchapter and set forth in the airplane operating manual:

(a) From any point on the take-off up to the time of attaining the critical-engine-failure speed set forth in the airplane operating manual it shall be possible to bring the airplane to a safe stop within the landing area, as shown by the accelerate-and-stop distance data.

(b) If the critical engine should fail at any instant after the airplane attains the critical-engine-failure speed, it shall be possible to proceed with the take-off and attain a height of 50 feet, as indicated by the take-off path data, before passing over the end of the take-off area. Thereafter it must be possible to clear all obstacles either by at least 50 feet vertically, as shown by the take-off path data, or by at least 200 feet horizontally within the airport boundaries and 300 feet horizontally after passing beyond such boundaries.

In determining the allowable deviation of the flight path in order to avoid obstacles, it is assumed that the airplane is not banked before reaching a height of 50 feet, as shown by the take-off path data, and that the maximum bank thereafter does not exceed 15°.

(c) In applying the requirements of paragraphs (a) and (b) of this section, corrections shall be made for any gradient of the take-off surface. To allow for wind effect, take-off data based on still air may be corrected by not more than 50 percent of the reported wind component along the take-off path if opposite to the direction of take-off, and shall be corrected by not less than 150 percent of the reported wind component if in the direction of take-off.

Note: All references in this section to sections of Part 4b of this subchapter are those sections in effect on October 1, 1949 (14 F.R. 4102, July 16, 1949).

41.30 *En route limitations.*

(a) *All airplanes; all engines operating.* Airplanes shall be dispatched only at such take-off weights that, in proceeding along the intended track with the weight of the airplane progressively reduced by the anticipated consumption of fuel and oil, the rate of climb with all engines operating (as set forth in the airplane operating manual), shall be, in feet per minute, 6 V_{s_0} at an altitude at least 1,000 feet above the elevation of the highest ground or obstruction within 10 miles of either side of the intended track; except that this requirement need not apply to airplanes certificated under the performance requirements of the regulations issued prior to November 9, 1945 (Part 4a of this subchapter).

(b) *All airplanes; one engine inoperative.*

(1) No airplane shall be taken off at a weight in excess of that which would permit a rate of climb (expressed in feet per minute), with one engine inoperative, of at least $\left(0.06-\frac{0.08}{N}\right) V_{s_0}^2$ (when N is the number of engines installed and V_{s_0} is expressed in miles per hour) at an altitude of at least 1,000 feet above the elevation of the highest ground or obstruction within 10 miles on either side of the intended track, except that for transport category airplanes certificated under Part 4a of this subchapter, the rate of climb shall be $0.02\ V_{s_0}^2$.

(2) As an alternative to the provisions of subparagraph (1) of this paragraph, an air carrier may utilize an approved procedure whereby its airplanes are operated at an all-engine-operating altitude such that in the event of an engine failure the airplane can continue flight to an alternate airport where a landing can be made in accordance with the provisions of section 41.34, the flight path clearing all terrain and obstructions along the route within 5 miles on either side of the intended track by at least 2,000 feet. In addition, if such a procedure is utilized, subdivisions (i) through (vi) shall be complied with:

(i) The rate of climb (as presented in the Airplane Flight Manual for the appropriate weight and altitude) used in calculating the airplane's flight path shall be diminished by an amount, in feet per minute, equal to $\left(0.06-\frac{0.08}{N}\right) V_{s_0}^2$ (when N is the number of

engines installed and V_{S_0} is expressed in miles per hour) for airplanes certificated under Part 4b of this subchapter, and by 0.02 $V_{S_0}^2$ for airplanes certificated under Part 4a of this subchapter.

(ii) The all-engine-operating altitude shall be such that, in the event the critical engine becomes inoperative at any point along the route, the flight will be capable of proceeding to a predetermined alternate airport by use of this procedure. For the purpose of determining the take-off weight, the airplane shall be assumed to pass over the critical obstruction following engine failure at a point no closer to the critical obstruction than the nearest approved radio navigational fix: *Provided*, That the Administrator may authorize a procedure established on a different basis where adequate operational safeguards are found to exist.

(iii) The airplane shall meet the provisions of subparagraph (1) of this paragraph at 1,000 feet above the airport used as an alternate in this procedure.

(iv) The procedure shall include an approved method of accounting for winds and temperatures which would otherwise adversely affect the flight path.

(v) In complying with this procedure fuel jettisoning shall be permitted if the Administrator finds that the air carrier has an adequate training program, proper instructions are given to the flight crew, and all other precautions are taken to insure a safe procedure.

(vi) The alternate airport shall be specified in the dispatch release and shall meet the provisions of section 41.96.

(3) For the purposes of this paragraph it shall be assumed that the weight of the airplane as it proceeds along its intended track is progressively reduced by normal consumption of fuel and oil.

(c) *Airplanes with four or more engines; two engines inoperative.* The provisions of this paragraph shall apply only to airplanes certificated in accordance with the performance requirements of Part 4b of this subchapter. No airplane having four or more engines shall be flown along an intended track except under the conditions of either subparagraph (1) or subparagraph (2) of this paragraph.

(1) No place along the intended track shall be more than 90 minutes away from an available landing area at which a landing can be made in accordance with the requirements of section 41.34, assuming all engines to be operating at cruising power.

(2) The take-off weight shall not be greater than that which would permit the airplane, with the two critical engines inoperative, to have a rate of climb in feet per minute equal to 0.01 $V_{S_0}^2$ (V_{S_0} being expressed in miles per hour) along all points of the route, from the point where the two engines are assumed to fail simultaneously to the landing area, either at an altitude of 1,000 feet above the elevation of the highest ground or obstruction within 10 miles on either side of the intended track or at an altitude of 5,000 feet, whichever is higher. The point where the two engines are assumed to fail shall be that point along the route which is most critical with respect to the take-off weight. In showing compliance with this prescribed rate of climb, the following shall apply:

(i) It shall be permissible to consider that the weight of the airplane as it proceeds along its intended track is progressively reduced by normal consumption of fuel and oil with all engines operating up to the point where the two engines are assumed to fail and with two engines operating beyond that point.

(ii) Where the engines are assumed to fail at an altitude above the prescribed minimum altitude, compliance with the prescribed rate of climb at the prescribed minimum altitude need not be shown during the descent from the cruising altitude to the prescribed minimum altitude if, at the end of the descent and during the subsequent portion of the flight, the prescribed rate of climb is met at the prescribed minimum altitudes. The descent shall be assumed to be along a net flight path and the rate of descent for the appropriate weight and altitude shall be assumed to be 0.01 $V_{S_0}^2$ greater than indi-

cated by the performance information approved by the Administrator.

(iii) If fuel jettisoning is provided, the airplane's weight at the point where the two engines are assumed to fail shall be considered to be not less than that which would include sufficient fuel to proceed to an available landing area at which a landing can be made in accordance with the requirements of section 41.34 and to arrive there at an altitude of at least 1,000 feet directly over the landing area.

(d) *Special air navigation facilities.* Where special air navigation facilities provide for reliable and accurate identification of high ground or obstruction extending for less than 20 miles along the track, the lateral distance of 10 miles specified in section 41.30 (a), (b), (c) may be reduced to 5 miles.

41.33 *Landing distance limitations.*

(a) An airplane shall be dispatched only under such conditions that it would be possible, as shown by the still-air landing data obtained in section 4b.122 of this subchapter, or section 4a.750–T of this subchapter and set forth in the airplane operating manual, at a weight corresponding to the maximum weight expected to exist at the time of arrival at the airport of intended destination, and under standard air conditions for the altitude of such airport, to bring the airplane to rest from a point 50 feet directly above the intersection of the obstruction clearance line (as defined in section 41.35) and the landing surface, within a total distance not in excess of 60 percent of the effective length of the landing area (as defined in section 41.35) most suitable for landing in still air.

(b) For every probable condition of wind velocity and direction and the corresponding landing direction at the airport of intended destination required either by the ground handling characteristics of the airplane type involved or by other conditions (e.g., landing aids, terrain, etc.) the ratio of landing distance to effective length of landing area shall not be greater than that as specified in paragraph (a) of this section, after allowing for the effect on landing path and roll of not more than 50 percent of the wind component along the landing path if opposite to the direction of landing, or not less than 150 percent of the wind component if in the direction of landing.

(c) If the requirement of paragraph (a) of this section can be met, but the requirement of paragraph (b) of this section cannot be fully met, at an airport of intended destination, a flight to such airport may be dispatched if at least one approved alternate airport is designated in the flight plan at which the requirements of paragraphs (a) and (b) of this section, as modified by section 41.34, are met.

41.34 *Landing distance at alternate fields.* The conditions of section 41.33 will apply with respect to alternate airports specified in the flight plan, except that in the case of alternate airports the landing distance as defined in that section shall not exceed 70 percent of the effective length of the landing area.

41.35 *Definition of effective length of landing area.* The effective length of the landing area is the distance from the point where the obstruction clearance line, as defined in this section, intersects the landing surface to the far end of the landing area.

The obstruction clearance line is a line drawn tangent to or clearing all obstructions showing in a profile of the approach area as defined in this section. The obstruction clearance line is further limited by having a slope to the horizontal of 1:20 as it approaches the landing area.

The approach area, as used in this section, shall be an area symmetrical about a center line coinciding with and prolonging the center line of the runway, except that where there is a multiplicity of parallel runways or a large area continuously available for landing, the center line of the approach area shall coincide with the most probable landing path for instrument approaches. The approach area shall be considered as extending longitudinally from the landing area out to the most remote obstacle touched by the obstruction clearance line, assuming the center line of the approach area in plan view

to be straight for at least 1,500 feet from the intersection of the obstruction clearance line with the landing surface and thereafter continuing in a path consistent with the instrument approach procedures for the runway in question, or, where such procedures are not specified, consistent with turns of at least 4,000 feet in radius; and as extending laterally to a distance of 200 feet on either side of its center line at the point of intersection of the obstruction clearance line with the landing surface, with this distance increasing uniformly to 500 feet on either side of the center line of the area at a longitudinal distance of 1,500 feet from the intersection of the obstruction clearance line with the landing surface, and maintaining a distance of 500 feet from the center line thereafter.

41.36 *Nontransport category airplane operating limitations.* In operating any nontransport category airplane in passenger service, the provisions of sections 41.36a through 41.36d shall be complied with, unless deviations therefrom are specifically authorized by the Administrator on the ground that the special circumstances of a particular case make a literal observance of the requirements unnecessary for safety. Performance data published or approved by the Administrator for each such nontransport category airplane shall be used in determining compliance with the provisions of sections 41.36a through 41.36d.

41.36a *Take-off limitations.* No take-off shall be made at a weight in excess of that which will permit the airplane to be brought to a safe stop within the effective length of the runway from any point during the take-off up to the time of attaining 105 percent of minimum control speed or 115 percent of the power-off stalling speed in the take-off configuration, whichever is the greater. In applying the requirements of this section:

(a) It may be assumed that take-off power is used on all engines during the acceleration;

(b) Account may be taken of not more than 50 percent of the reported wind component along the take-off path if opposite to the direction of take-off, and account shall be taken of not less than 150 percent of the reported wind component if in the direction of the take-off;

(c) Account shall be taken of the average runway gradient when the average gradient is greater than ½ percent. The average runway gradient is the difference between the elevations of the end points of the runway divided by the total length;

(d) It shall be assumed that the airplane is operating in the standard atmosphere.

41.36b *En route limitations; one engine inoperative.*

(a) No take-off shall be made at a weight in excess of that which will permit the airplane to climb at a rate of at least 50 feet per minute with the critical engine inoperative at an altitude of at least 1,000 feet above the elevation of the highest obstacle within 5 miles on either side of the intended track or at an altitude of 5,000 feet, whichever is the higher: *Provided,* That in the alternative an air carrier may utilize a procedure whereby the airplane is operated at an altitude such that, in event of an engine failure, the airplane can clear the obstacles within 5 miles on either side of the intended track by 1,000 feet, if the air carrier can demonstrate to the satisfaction of the Administrator that such a procedure can be used without impairing the safety of operation. If such a procedure is utilized, the rate of descent for the appropriate weight and altitude shall be assumed to be 50 feet per minute greater than indicated by the performance information published or approved by the Administrator. Before approving such a procedure, the Administrator shall take into account, for the particular route, route segment, or areas concerned, the reliability of wind and weather forecasting, the location and types of aids to navigation, the prevailing weather conditions, particularly the frequency and amount of turbulence normally encountered, terrain features, air traffic control problems, and all other operational factors which affect the safety of an operation utilizing such a procedure.

(b) In applying the requirements of paragraph (a) of this section, it shall be assumed that:

(1) The critical engine is inoperative;

(2) The propeller of the inoperative engine is in the minimum drag position;

(3) The wing flaps and landing gear are in the most favorable positions;

(4) The operative engine or engines are operating at the maximum continuous power available;

(5) The airplane is operating in the standard atmosphere;

(6) The weight of the airplane is progressively reduced by the weight of the anticipated consumption of fuel and oil.

41.36c *Landing distance limitations; airport of intended destination.* No take-off shall be made at a weight in excess of that which, allowing for the anticipated weight reduction due to consumption of fuel and oil, will permit the airplane to be brought to a stop within 60 percent of the effective length of the most suitable runway at the airport of intended destination.

(a) This weight shall in no instance be greater than that permissible if the landing were to be made:

(1) On the runway with the greatest effective length in still air, and

(2) On the runway required by the probable wind, taking into account not more than 50 percent of the probable headwind component and not less than 150 percent of the probable tailwind component.

(b) In applying the requirements of this section it shall be assumed that:

(1) The airplane passes directly over the intersection of the obstruction clearance plane and the runway at a height of 50 feet in a steady gliding approach at a true indicated air speed of at least 1.3 V_{s_0};

(2) The landing is made in such a manner that it does not require any exceptional degree of skill on the part of the pilot;

(3) The airplane is operating in the standard atmosphere.

41.36d *Landing distance limitations; alternate airports.* No airport shall be designated as an alternate airport in a dispatch release unless the airplane at the weight anticipated at the time of arrival at such airport can comply with the requirements of section 41.36c: *Provided,* That the airplane can be brought to rest within 70 percent of the effective length of the runway.

Maintenance

41.38 *Maintenance organization.* The air carrier is responsible for the continuous airworthiness of all aircraft, engines, propellers, and appliances. Unless maintenance is performed by another agency under a contract approved by the Administrator, it is responsible for maintaining adequate maintenance facilities, the adequacy and competence of maintenance personnel, and for the preparation of such maintenance reports as are required by the Administrator.

41.39 *Alterations and repairs.* Aircraft, engines, propellers, and appliances must be altered or repaired only in conformity with the procedures and, insofar as they apply, the methods provided for in Part 18 of this subchapter. Reports of such alterations or repairs must be submitted promptly to the Administrator.

41.40 *Inspection.* The air carrier shall maintain an inspection organization which is responsible for determining that all maintenance conforms to at least the minimum standards prescribed by the Administrator as to workmanship, methods employed, and materials used. Each inspector must hold a valid mechanic certificate and rating for the type of inspection involved.

41.41 *Maintenance manual.* The air carrier shall prepare and maintain a manual for the use and guidance of maintenance personnel which contains full information pertaining to the repair and service of flight equipment and clearly outlines the responsibilities of maintenance personnel. It must be in a form approved by the Administrator and copies furnished to all persons designated by the Administrator or Board. All copies in the hands of designated company personnel must be kept up to date.

(a) *Changes.* The extension of any overhaul, check, or inspection period must have

the written approval of the Administrator. Other changes in the maintenance manual may be made without the prior approval of the Administrator, if such changes are not inconsistent with any Federal regulation, the air carrier operating certificate, or safe maintenance practice.

41.41–1 *Contents of manual—methods and procedures for maintaining weight and balance control (FAA policies which apply to sec. 41.41).*

(a) *General.* The air carrier may utilize any loading schedule, procedure, or means by which the air carrier can show that the aircraft is properly loaded and will not exceed authorized weight and balance limitations during operation.

By whatever method used, the air carrier should account for all probable loading conditions which may be experienced in service and show that the loading schedule will provide satisfactory loading. Loading schedules may be applied to individual aircraft or to a complete fleet. Unless otherwise authorized, a copy of pertinent loading data should be carried in each aircraft. When an air carrier operates several types of models of aircraft, the loading schedule, which may be index type, tabular type or a mechanical computer, will be identified with the type or model of aircraft for which it is designed.

(b) *Loading provisions.* All seats, compartments, and other loading stations will be properly marked, and the identification used will correspond with the instructions established for computing the weight and balance of the aircraft. When the loading schedule provides blocking off of seats or compartments in order to remain within the center of gravity limits, effective means will be provided to assure that such seats or compartments are not occupied during operations specified. Cargo compartments will be placarded showing the maximum weight of each compartment, and such placards will be readily legible to the loading personnel. Instructions will be prepared for crew members, cargo handlers, and other personnel concerned, giving complete information necessary regarding distribution of passengers, cargo, fuel, and other items. Information relative to maximum capacities and other pertinent limitations affecting the weight or balance of the aircraft will be included in these instructions. When it is possible by adverse distribution of passengers to exceed the approved c. g. limits of the aircraft, special instructions will be issued to the appropriate crew members so that the load distribution can be maintained within the approved limitations.

(c) *Terms, descriptions, and general standards.* For the purpose of weight and balance control, the following terms, descriptions, and general standards will apply. Deviations from these standards by the individual operator due to the nature of his operation will be acceptable.

(1) *Empty weight.* The empty weight of an aircraft is considered to be the maximum gross weight less the following:

(i) All fuel and oil.[6]

(ii) Drainable antidetonant injector and de-icing fluids.

(iii) Crew and baggage.

(iv) Passengers and cargo (revenue and nonrevenue).

(v) Removable passenger service equipment, food, magazines, etc., including drainable washing and drinking water.

(vi) Emergency equipment (overwater, tropical, frigid).

(vii) Other equipment, variable for flights.

(viii) Flight spares (spark plugs, wheel, cylinder, etc.).

(2) *Operating weight.* The basic operating weight established by the air carrier for a particular model aircraft will include the following standard items of the operator in addition to the empty weight of the aircraft unless otherwise specified:

(i) Normal oil quantity.

(ii) Antidetonant injector and de-icing (winter) fluids.

(iii) Crew and baggage.

(iv) Passenger service equipment, including washing and drinking water, magazines, etc.

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[6] System fuel and oil is that amount required to fill both systems and the tanks, where applicable, up to the tank outlets to the engines. When oil is used for propeller feathering, such oil is included as system oil.

(v) Emergency equipment, if required for all flights.

(vi) All other items of equipment considered standard by the air carrier concerned.

(3) *Aircraft, zero fuel weight.* The zero fuel weight of an aircraft is the maximum weight authorized for such aircraft without fuel. The weight of fuel carried in the fuselage, or equivalent locations, will be deducted from such maximum. When zero fuel weight limitations or equivalent restrictions are specified, proper provision for loading will be made by the operator so that such structural limitations are not exceeded.

(d) *Aircraft weights.* Aircraft weight and balance control will contain provisions for determining aircraft weights in accordance with the following procedures:

(1) *Individual aircraft weights and changes.* The loading schedule may utilize the individual weight of the aircraft in computing pertinent gross weight and balance. The individual weight and balance of each aircraft will be reestablished at the specified reweighing periods. It also will be reestablished whenever the accumulated changes to the operating weight exceeds plus or minus one-half of 1 percent of the maximum landing weight or the cumulative change in c. g. position exceeds one-half of 1 percent of the MAC.

(2) *Fleet weights, establishment and changes.* For a fleet or group of aircraft, of the same model and configuration, an average operating fleet weight may be utilized if the operating weights and c. g. positions are within the limits established herein. The fleet weight will be calculated on the following basis:

(i) An operator's empty fleet weight will be determined by weighing aircraft according to the following table: For fleet of 1 to 3, weigh all aircraft; for fleet of 4 to 9, weigh 3 aircraft plus at least 50 percent of the number over 3; for fleet of over 9, weigh 6 aircraft plus at least 10 percent of the number over 9.

(ii) In choosing the aircraft to be weighed, the aircraft in the fleet having the highest time since last weighing should be selected. When the average empty weight and c. g. position has been determined for aircraft weighed and the basic operating fleet weight (winter and summer, as applicable) established, necessary data should be computed for aircraft not weighed but which are considered eligible under such fleet weight. If the basic operating weight of any aircraft weighed or the calculated basic operating weight of any of the remaining aircraft in the fleet varies by an amount more than plus or minus one-half of 1 percent of the maximum landing weight from the established basic operating fleet weight or the c. g. position varies more than plus or minus one-half of 1 percent of the MAC from the fleet weight c. g., that airplane will be omitted from that group and operated on its actual or calculated operating weight and c. g. position. If it falls within the limits of another fleet or group, it may then become part of that operating fleet weight. In cases where the aircraft is within the operating fleet weight tolerance but the c. g. position varies in excess of the tolerance allowed, the aircraft may still be utilized under the applicable operating fleet weight but with an individual c. g. position.

(iii) Reestablishment of the operator's empty fleet weight or the operating fleet weight and corresponding c. g. positions may be accomplished between weighing periods by calculation based on the current empty weight of the aircraft previously weighed for fleet weight purposes. Weighing for reestablishment of all fleet weights will be conducted on a 2-year basis unless shorter periods are desired by the air carrier.

(3) *Establishing initial weight before use in air carrier service.* Prior to being used in air carrier service, each aircraft will be weighed and the empty weight and center of gravity location established. New production transport category aircraft delivered to air carriers normally are weighed at the factory and are eligible for air carrier operations without reweighing if the weight and balance records have been adjusted for alterations or modifications to the aircraft. Aircraft transferred from one air carrier to another need not be weighed prior to utilization by the latter unless more than 24 calendar months have elapsed since last weighing.

(4) *Periodic weighing—aircraft using individual weights.* Aircraft operated under a loading schedule utilizing individual aircraft weights in computing the gross weight will be weighed at intervals of 24 calendar months. An air carrier may, however, apply for extension of this weighing period for a particular model aircraft, when pertinent records and actual routine weighing during the preceding 24 months of air carrier operation show that weight and balance records maintained are sufficiently accurate to indicate aircraft weights within the established limitations. Such application should be limited to increases in increments of 12 months and will be substantiated in each instance with at least two aircraft weighings. Increases may not be granted which exceed a time which is equivalent to the aircraft overhaul period.

(5) *Periodic weighing, aircraft using "fleet weights."* Aircraft operating under fleet weights should be weighed in accordance with procedures outlined for the establishment of fleet weights. Since each fleet weight will be reestablished every 2 years and a specified number of aircraft weighed at such periods, no additional weighing is considered necessary. A rotation program should, however, be incorporated so all aircraft in the fleet will be reweighed periodically.

(6) *Weighing procedure.* Normal precautions, consistent with good practices in the weighing procedure, such as checking for completeness of the aircraft and equipment, determining that fluids are properly accounted for, and that weighing is accomplished in an enclosed building preventing the effect of the wind, will prevail. Any acceptable scales may be used for weighings provided they are properly calibrated, zeroed and used in accordance with the manufacturer's instructions. Each scale should have been calibrated, either by the manufacturer or by a civil Department of Weights and Measures, within 1 year prior to weighing any aircraft for this purpose unless the air carrier can show evidence which warrants a longer period between calibrations.

(e) *Passenger weights.* The air carrier may elect to use either the actual passenger weight or the average passenger weight to compute passenger loads over any route, except in those cases where nonstandard weight passenger groups are carried. Both methods may be used interchangeably provided only one method is used for any flight from originating to terminating point of the particular trip or flight involved, except as indicated in subparagraph (3). Provisions will be incorporated in the load manifest to clearly indicate to personnel concerned whether actual or average passenger weights are to be used in computing the passenger load.

(1) *Actual passenger weight.* Actual passenger weight may be determined by scale weighing of each passenger prior to boarding the aircraft, and such weight is to include minor articles carried on board by the passenger. If such articles are not weighed, the estimated weight is to be accounted for. The actual passenger weight may also be determined by asking each passenger his weight and adding thereto a predetermined constant to provide for hand-carried articles and also to cover possible seasonal effect upon passenger weight due to variance in clothing weight. The constant may be approved for an air carrier on the basis of a detailed study conducted by the operator over the particular routes involved and during the extreme seasons when applicable.

(2) *Average passenger weight.* An average weight of 160 pounds (summer) may be used for each adult passenger during the calendar period of May 1 through October 31.

An average weight of 165 pounds (winter) may be used for each adult passenger during the calendar period from November 1 through April 30.

An average weight of 80 pounds may be used for children between the ages of 3 and 12. Children above 12 years of age are classified as adults for the purpose of weight and balance computations. Children less than 3 years old are considered "babes in arms."

The average passenger weight includes minor items normally carried by a passenger.

(3) *Nonstandard weight groups of passengers.* The average passenger weight method will not be used in the case of flights carrying large groups of passengers whose average weight obviously does not conform with the

normal standard weight. Actual weights will be used when a passenger load consists to a large extent of athletic squads or other special group which is smaller or larger than the U. S. average. Where such a group forms only a part of the total passenger load, the actual weights may be used for such group and average weights used for the balance of the passenger load. In such instances, a notation will be made on the load manifest, indicating number of persons in the special group and identifying the group (i. e. football squad, Blank Nationals, etc.).

(f) *Crew weight.* The actual weight of crew members may be used or the following approved average weights may be utilized:

(1) Male cabin attendants 150 pounds; female cabin attendants 130 pounds.

(2) All other crew members 170 pounds.

(g) *Passenger and crew baggage.* Procedures should be provided so that all baggage, including that carried on board by the passengers, is properly accounted for. If desired by the air carrier, a standard crew baggage weight may be used.

(h) *Center of gravity travel during flight.* The air carrier will show that the procedures fully account for the extreme variations in center of gravity travel during flight caused by all or any combination of the following variables:

(1) The movement of a number of passengers and cabin attendants equal to the placarded capacity of the lounges or lavatories from their normal position in the aircraft cabin to such lounge or lavatory. If the capacity of such compartment is one, the movement of either one passenger or one cabin attendant, whichever most adversely affects the c. g. condition will be considered. When the capacity of the lavatory or lounge is two or more, the movement of that number of passengers or cabin attendants from positions evenly distributed throughout the aircraft may be used. Where seats are blocked off, the movement of passengers and/or cabin attendants evenly distributed throughout only the actual loaded section of the aircraft will be used. The extreme movements of the cabin attendants carrying out their assigned duties within the cabin will be considered. The various conditions will be combined in such a manner that the most adverse effect on the c. g. will be obtained and so accounted for in the development of the loading schedule to assure the aircraft being loaded within the approved limits at all times during flight.

(2) *Landing gear retraction.* Possible change in c. g. position due to landing gear retraction will be investigated and results accounted for.

(3) *Fuel.* The effect on the c. g. travel of the aircraft during flight due to fuel used down to the required reserve fuel or to an acceptable minimum reserve fuel established by the air carrier will be accounted for.

(i) *Fuel allowance for taxiing and runup.* The weight and balance system may provide for a weight allowance of 3 pounds of fuel for each 100 horsepower (maximum continuous) available to the aircraft from all of its engines to be added to the maximum gross weight of the aircraft to compensate for fuel used during runup and taxiing.

(j) *Records.* The weight and balance system will include methods by which the air carrier will maintain a complete, current, and continuous record of the weight and center of gravity of each aircraft. Such records should reflect all alterations and changes affecting either the weight or balance of the aircraft, and will include a complete and current equipment list. When fleet weights are used, pertinent computations should also be available in individual aircraft files.

(k) *Weight of fluids.* The weight of all fluids used in aircraft may be established on the basis of actual weight, a standard volume conversion, or a volume conversion utilizing appropriate temperature correction factors to accurately determine the weight by computation of the quantity of fluid on board.

(Published in 19 F. R. 7342, November 13, 1954; amended in 20 F. R. 3675, May 26, 1955, effective upon publication in the Federal Register.)

41.42 *Training program.* The air carrier must provide for the proper and periodic instruction of all maintenance personnel, particularly in connection with the introduction into service of new or unfamiliar equipment.

41.43 *Records.* Current records shall be kept of the total time in service, the time since last overhaul, and the time since last

inspection on all aircraft components, engines, propellers, and, where practicable, on instruments, equipment, and accessories, except that in the case of a propeller for which there is no previous operating history, the Administrator may authorize the use of a new record if the hub is rebuilt and is fitted with blades which are free from defects and within the manufacturer's production tolerances. Such rebuilding of the propeller shall be accomplished by the manufacturer or by a certificated repair station having the proper rating. The new record shall be signed by the manufacturer or by the repair agency, giving the date the propeller hub or blade was rebuilt and such other information as the Administrator may require.

41.44 ***Cockpit check list.***

(a) The air carrier shall provide for each type aircraft a cockpit check list, approved by the Administrator, adapted to each operation in which the aircraft is to be utilized. An approved check list shall be installed in a readily accessible location in the cockpit of each aircraft and shall be appropriately used by the flight crew for each flight.

(b) The cockpit check list shall include procedures prior to starting engines, prior to take-off, prior to landing, and for powerplant emergencies.

41.44-1 *Air carrier cockpit checklist (FAA policies which apply to sec. 41.44).*

(a) *General.* The policies set forth in this section are issued pursuant to section 41.44 (a) so as to provide a guide in the approval of an air carrier cockpit checklist by the Administrator and to assist an air carrier in providing a cockpit checklist which will meet with such approval and will comply with the provisions of section 41.44 (b).

The checklist which follows has been prepared in general terms and is considered a normal checklist for compliance with section 41.44 except that those items not applicable to a particular aricraft may be deleted and the order of arrangement for the individual items may be changed at the discretion of the air carrier. The checklist provided by an air carrier should include all applicable items but should not necessarily be limited thereto.

PRIOR TO STARTING ENGINE

Fuel system:
- Quantity—checked.
- Proper tank selection—checked.
- Mixtures—as required.
- Fuel booster pumps—as required.
- Cross feeds—as required.

Hydraulic system:[7]
- Brakes—set.

Electrical system:
- Battery switch—proper position.

PRIOR TO TAKEOFF

Weight and balance:
- Pilot is aware of weights and takeoff limitations.

Fuel system:[7]
- Quantity—rechecked.
- Proper tank selection—rechecked.
- Mixtures—takeoff position.
- Fuel booster pumps—as required.
- Cross feeds—as required.

Hydraulic system:[7]
- Hydraulic pressures and quantity—checked.
- Brakes—checked.
- Hydraulic selector valves—checked.

Anti-icing and de-icing equipment.[7] Checked and set.

Electrical system:
- Battery switch—proper position.
- Inverters—as required.
- Ignition—checked.
- Generators—checked.
- Radio—checked.

Power plants and propellers:[7]
- Propellers—checked and set in takeoff position.
- All engines—checked for proper functioning and required power.
- Super chargers—checked and set in proper takeoff position.

Heaters. Checked and set.

Instruments—Engine:
- Oil—quantity, temperature and pressure—normal for takeoff.

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[7] Items thus marked will be doublechecked such as by challenge and response, or positively checked such as by a mechanical method.

Fuel pressure—normal for takeoff.
Carburetor—temperature—normal for takeoff.
Cylinder head—temperature—checked.
Instruments—flight:
Static and vacuum selectors—checked.
Directional gyro—set.
Altimeter—set.
Horizon—uncaged.
Turn and bank—checked.
Clock—set.
Pressurization.[7] Checked.
Flaps:[7]
Wing flaps—takeoff position.
Cowl flaps—takeoff position.
Controls:[7]
Auto pilot—off.
Trim tabs—set for takeoff.
Gust locks—off.
Free and tested for through full limit of travel.

PRIOR TO LANDING

Fuel system:[8]
Proper tank selection—checked.
Mixtures—landing position.
Fuel booster pumps—as required.
Cross feeds—as required.
Weight and balance:
Maximum landing gross weight—checked.
Hydraulic system:[8]
Hydraulic pressure—checked.
Brakes—checked and off.
Hydraulic selector valves—checked.
Anti-icing and de-icing equipment[8]—checked.
Power plants and propellers:
Propellers—as required.
Super chargers—as required.
Manual reverse pitch actuator or indicator[8]—checked.
Heaters[8]—checked.
Instruments:
Static and vacuum selectors—checked.
Altimeter—set.
Directional gyro—set.
Pressurization[8]—checked.
Controls:
Auto pilot—off.
Trim tabs—as desired.
Landing gear:[7]
Down and locked—checked.
Flaps:[8]
Wing flaps—as desired.
Cowl flaps—as desired.

POWERPLANT EMERGENCIES

Fuel system:
Mixtures—idle cutoff on dead engine—required position on all others.
Fuel selector valve—dead engine—off.
Fuel booster pumps—dead engine—off.
Cross feeds—as required.
Throttle—dead engine—closed.
Hydraulic system:
Hydraulic selector valve—set on proper engine.
Hydraulic pressures—checked.
Brakes—checked.
Ignition—off—dead engine.
Generators—off—dead engine.
Power plants and propellers:
Propellers—Low r.p.m. and feathered on dead engine—set as required on all live engines.
Engines—All live engines set for proper functioning and required power.
Superchargers—checked and set in proper position.
Heaters. Checked and set in safe operation position.
Instruments:
Engine—oil temperature and pressure checked.
Engine—fuel supply and pressure checked.
Carburetor—temperature checked.
Cylinder head—temperature checked.
Flight instruments. Checked and reset if necessary.
Pressurization. Checked.

(Published in 18 F.R. 6752, October 24, 1953, effective December 1, 1953.)

[7] Items thus marked will be doublechecked such as by challenge and response, or positively checked such as by a mechanical method.

[8] Items thus marked should be doublechecked as prescribed in footnote 7; except that when the aircraft requires a flight crew of only two pilots, one pilot should call out the item to be checked, either pilot should perform the operation, and the pilot not performing the operation should make a momentary visual check after the operation is completed.

41.45 *Airspeed indicators, limitations, and related information.*

(a) Air-speed limitations and related information contained in the Airplane Flight Manual and pertinent placards shall be expressed in the same units as used on the airspeed indicator.

(b) When more than one air-speed indicator is required, all such indicators shall be calibrated to read in the same units.

(c) When an air-speed indicator is calibrated in statute miles per hour, a readily usable means shall be provided for the flight crew to convert statute miles per hour to knots.

(d) On and after April 1, 1956, all air-speed indicators shall be calibrated in knots, and all air-speed limitations and related information contained in the Airplane Flight Manual and pertinent placards shall be expressed in knots.

41.45–1 *Airspeed limitations and related information contained in the Airplane Flight Manual (FAA policies which apply to sec. 41.45(d)).* The airspeeds shown in the Performance Information Section only, of an Airplane Flight Manual approved prior to April 1, 1956, may continue to be expressed in statute miles per hour, provided that a table converting statute miles to knots is incorporated therein, and a cautionary note is placed on each page and chart where airspeeds are denoted indicating that the statute miles shown must be converted to knots when determining performance information. A similar note should be placed in the Operations Limitations Section, indicating that airspeeds shown in the Performance Information Section are in statute miles and must be converted to knots when determining performance information.

(Published in 21 F.R. 4312, June 20, 1956, effective July 1, 1956.)

Airman Rules

Pilot

41.48 *Certificate.*

(a) Any pilot serving as pilot in command shall hold a valid airline transport pilot certificate and a rating for the aircraft in which he is to serve.

(b) Any pilot serving as second in command in an aircraft requiring two pilots shall hold at least a commercial pilot certificate and instrument rating and must have demonstrated to an air carrier inspector of the Administrator, or to an authorized check pilot of the air carrier, his ability to take off and land aircraft in which he is to serve.

(c) Any pilot serving as second in command in an aircraft requiring three or more pilots shall meet the requirements of paragraph (a) of this section.

(d) Any pilot serving in a pilot capacity other than as pilot in command or second in command shall meet the requirements of paragraph (b) of this section.

41.49 *Number of pilots required.* **The number of pilots required shall be sufficient to provide adequate safety. The type of aircraft used, the type of operation involved, and the duration of flights between points where flight crews are changed shall be the basis for making this determination.**

41.49–1 *Crew complement; number of pilots required (FAA rules which apply to secs. 41.49 and 41.65).* The number of pilots required on aircraft certificated in accordance with T-category requirements shall not be less than the pilot personnel specified in the minimum crew as set forth in the airplane flight manual of the particular aircraft. In the case of aircraft certificated in accordance with non T-category requirements, not less than two pilots shall be required when (a) the aircraft incorporates multiengine features combined with retractable landing gear or wing flaps, or (b) in the conduct of a flight, the duties of a pilot serving as pilot in command would be unduly interfered with through the necessity of performing other duties usually performed by the second in command.

(Published in 15 F.R. 9232, December 23, 1950, effective upon publication; amended in 18 F.R. 6753, October 24, 1953, effective December 1, 1953.)

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41.50 *Pilot route and airport qualification requirements.*

(a) An air carrier shall not utilize a pilot as pilot in command until he has been qualified for the route on which he is to serve in accordance with the provisions of this section and the appropriate instructor or check pilot has so certified.

(b) Each such pilot shall demonstrate adequate knowledge concerning the subjects listed below with respect to each route to be flown. Those portions of the demonstration pertaining to holding procedures and instrument approach procedures may be accomplished in a synthetic trainer which contains the radio equipment and instruments necessary to simulate the navigational and letdown procedures approved for use by the air carrier:

(1) Weather characteristics,

(2) Navigational facilities,

(3) Communication procedures,

(4) Type of en route terrain and obstruction hazards,

(5) Minimum safe flight levels,

(6) Position reporting points,

(7) Holding procedures,

(8) Pertinent traffic control procedures, and

(9) Congested areas, obstructions, physical layout, and all instrument approach procedures for each regular, provisional, and refueling airport approved for the route.

(c) Each such pilot shall make an entry as a member of the flight crew at each regular, provisional, and refueling airport into which he is scheduled to fly. Such entry shall include a landing and take-off. The qualifying pilot shall occupy a seat in the pilot compartment and he shall be accompanied by a pilot who is qualified at the airport.

(d) Such pilot shall not be required to meet the entry requirements of paragraph (c) of this section when:

(1) The initial entry is made under VFR weather conditions at the particular airport involved; or

(2) The air carrier shows that the pilot airport qualification can be accomplished by an approved pictorial means; or

(3) The air carrier notifies the Administrator that it intends to conduct operations at an airport in close proximity to an airport into which the pilot involved is presently qualified by entry, and the Administrator finds that such pilot is adequately qualified at the new airport. The Administrator, in making such finding, shall take into consideration at least the familiarity of the pilot with the layout, surrounding terrain, location of obstacles, and instrument approach and traffic control procedures at the new airport.

(e) On routes or route segments on which navigation must be accomplished by pilotage and on which flight is to be conducted at or below the level of the adjacent terrain which is within a horizontal distance of 25 miles on either side of the center line of the route to be flown, the pilot shall be familiarized with such route or route segments by not less than two one-way trips on the flight deck over the route or route segments under VFR weather conditions to permit the qualifying pilot to observe terrain along the route.

41.51 *Maintenance and re-establishment of pilot route and airport qualification for particular trips.*

(a) To maintain pilot route and airport qualifications, each pilot being utilized as pilot in command, within the preceding 12-month period, shall have made at least one trip as pilot or other member of the flight crew between terminals into which he is scheduled to fly and shall have complied with the provisions of section 41.50(e), if applicable.

(b) In order to re-establish pilot route and airport qualifications after absence from a route for a period in excess of 12 months, a pilot shall comply with the appropriate provisions of section 41.50.

41.52 *Initial pilot flight training and recent experience.*

(a) Flight training for each pilot shall include at least take-offs and landings, during day and night, and normal and emergency flight maneuvers in each type of airplane to be flown by him in scheduled operations, and flight under simulated instrument flight conditions.

(b) No air carrier shall schedule a pilot in command or second in command to serve as such in scheduled air transportation un-