Civil Aeronautics Manual 42

Irregular Air Carrier And Off-Route Rules

FEDERAL AVIATION AGENCY

February 15, 1959

Introductory Note

This manual contains in a consolidated form (1) Civil Air Regulations Part 42, Irregular Air Carrier and Off-Route Rules, dated December 15, 1954, 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. Civil Air Regulations Amendments 42–1 through 42–22 and 42–24 through 42–27 have been incorporated in the text. Amendment 42–23 which, except as provided in section 42.45g, does not become effective until January 1, 1961, has been included in appendix C.

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 42 dated August 1956, which was issued by the CAA as Volume VII of the Civil Aeronautics Manuals, and supplements 1 through 10 to that Volume. As amendments and other pertinent materials pertaining to Part 42 are issued, they will be included in this manual.

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Irregular Air Carrier and Off-Route Rules

General

42.0 *Applicability of this part.*

(a) The provisions of this part shall apply to irregular air carriers operating in interstate, overseas, or foreign air transportation, to Alaskan air carriers when authorized by the Administrator under the provisions of section 41.1 (a) of this subchapter, and to air carriers holding scheduled air carrier operating certificates when making charter trips or when performing other special services.

(b) An air carrier holding a scheduled air carrier operating certificate may elect to conduct charter flights or other special services, between points which it is authorized to serve under the terms of such certificate, under the provisions of Parts 40, 41 or 46 of this subchapter, as the case may be, and the scheduled air carrier operating certificate: *Provided,* That the certificate is amended to authorize such operation: *And provided further,* That charter or special services to other points shall be conducted under the provisions of this part, except that it shall not be necessary for the carrier to obtain an irregular air carrier operating certificate if its scheduled air carrier operating certificate is appropriately amended.

42.0–1 *Charter flights or other special services (FAA policies which apply to sec. 42.0(b)).*

(a) *General.* The policies provided in this section will be applied by the Federal Aviation Agency in amending a scheduled air carrier operating certificate to authorize charter flights or other special services.

(b) *Authority.* Upon application, a scheduled air carrier electing under section 42.0 (b) to conduct charter trips or other special services pursuant to the provisions of its scheduled air carrier operating certificate, may have such certificate amended to authorize such operations.

(c) *Application for amendment.* Application for this amendment will consist of submission of form ACA–1014, Operations Specifications, available at the local district office.[1] On the face (blank side) of the form, the air carrier will list all the operations for which authorization is desired, as outlined in paragraph (d) of this section. The air carrier will also complete the upper half of the back of the form, and submit the signed original and four copies to the local inspector.[2]

(d) *Operations specifications.* The amended scheduled air carrier operating certificate will include form ACA–1014, Operations Specifications, and an amendment to the scheduled air carrier operating certificate. The amendment will be issued by the FAA regional office having direct inspectional responsibility for the principal operations of the air carrier. The form ACA–1014 will be prepared by the applicant; and will be prefaced by the statement: "Charter Flights or Other Special Services are authorized in the following category and class aircraft under the conditions specified and within the areas of operation listed."; and will specify the category and class of aircraft authorized to be used (e. g., Airplane Multiengine Land); the flight conditions under which operations are authorized (e. g., VFR (Day), VFR (Night), IFR (Day), IFR (Night); whether the carriage of passengers, cargo, or both is authorized; and the areas of operation (e. g., continental United States, and specific United States territories or possessions and foreign countries or possessions).

(e) *Operation outside the United States, its territories or possessions.* When applying for an amendment to a scheduled air carrier operating certificate to include charter or other special services outside the United States, its territories or possessions, the following paragraph will also be included on the form ACA–1014:

When operating aircraft pursuant to the terms of this certificate and these operations

[1] "District office", unless otherwise specified means "Bureau of Flight Standards District Office."

[2] "Inspector", unless otherwise specified means "Bureau of Flight Standards Inspector."

specifications over or within any foreign country, the air carrier shall comply with the provisions of the air traffic rules of such country, including any special air traffic rules applicable to air carriers, except where any rule prescribed in the Civil Air Regulations is more restrictive and may be followed without violating the rules of such country.

(f) *Area of operation.*

(1) The air carrier should specify in the space provided under the section of the operations specifications entitled "Area of Operation Authorized" the proposed areas of operation.

(2) If the air carrier is able to show to the satisfaction of the assigned inspector that it is able to conduct charter flights or special services on a worldwide basis, the following phraseology should be used in filling out the section of the operations specifications pertaining to area of operation:

> "The air carrier is authorized to conduct charter flights or other special services within the United States and between any point within the United States and any point outside thereof."

(3) If the air carrier does not desire to conduct charter operations to the extent indicated in subparagraph (2) of this paragraph, the specific areas to and from which charter operations are contemplated should be listed in the operations specifications. Such listing should show the particular countries or possessions of such countries instead of continental areas. Operations within the United States should be shown as "Continental United States". When a country or possession is comprised of a number of islands, the island group rather than the individual islands should be listed.

(g) *Flight operations and maintenance manuals.* Prior to the conduct of operations off route, the Flight Operations and Maintenance Manuals will be revised to incorporate additional instructions to flight and ground personnel for the operation, servicing and handling of the aircraft used in this type of service.

(h) *Scheduled air carriers holding irregular air carrier operating certificates.* A scheduled air carrier holding an irregular air carrier operating certificate may conduct charter flights or other special services both on route and off route under the provisions of such certificate and this part without amending its scheduled air carrier operating certificate in accordance with the above. However, if a scheduled air carrier, holding an irregular operating certificate elects to amend its scheduled operating certificate to include charter flights or other special services, the irregular operating certificate will be surrendered to the Federal Aviation Agency for cancellation at the time the amendment to the scheduled operating certificate becomes effective.

(Published in 15 F. R. 3150, May 24, 1950, effective upon publication in the Federal Register; amended in 18 F. R. 1719, Mar. 27, 1953, effective Apr. 15, 1953; further amended in 21 F. R. 1697, Mar. 17, 1956, effective May 17, 1956; amended effective June 15, 1957.)

42.0–2 *Provisions of Part 42 which are applicable to air taxi operators (FAA interpretations which apply to sec. 42.0 and SR–395A).* See appendix B.

(Published in 19 F. R. 1601, Mar. 25, 1954, effective Apr. 1, 1954; amended effective June 15, 1957.)

42.0–3 *Operations for which an Air Taxi Operator Certificate is not required (FAA interpretations which apply to sec. 42.0 and SR–395A).* See appendix B.

(Published in 19 F. R. 1601, Mar. 25, 1954, effective Apr. 1, 1954; amended effective June 15, 1957.)

42.1 *Definitions.* As used in this part the words listed below shall be defined as follows:

***Accelerate-stop distance.* Accelerate-stop distance is the distance required to reach the critical point of takeoff and, assuming failure of the critical engine at that point, to bring the airplane to a stop using approved braking means. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such distance is determined.)**

***Air carrier.* Air carrier means any citizen of the United States who undertakes directly the carriage by aircraft of persons or property as a common carrier for compensation or hire, whether such carriage is wholly by aircraft or partly by aircraft and partly by other forms of transportation between any of the following places: A place in any State of the United States, or the District of Columbia, and a place in any other State of the United States, or the District of Columbia; places in the same State**

of the United States through the airspace over any place outside thereof; places in the same Territory or possession of the United States, or the District of Columbia; 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, and a place in any other Territory or possession of the United States; a place in the United States and any place outside thereof; or the carriage of mail by aircraft.

Alaskan air carrier. Alaskan air carrier includes any air carrier subject to the provisions of Part 292 [1] of this chapter as heretofore or hereafter amended.

[1] Part 292 currently provides that Alaskan air carriers shall include certificated and noncertificated air carriers engaging solely in air transportion within the State of Alaska.

Alternate airport. An alternate airport is one listed in the flight plan as a point to which a flight may be directed if, subsequent to departure, a landing at the point of intended destination becomes inadvisable.

Approach or takeoff area. The approach or takeoff area shall be an area symmetrical about a line coinciding with and prolonging the center line of the runway, or the most probable landing or takeoff path for instrument approaches where there is a multiplicity of parallel runways, or a large hard-surfaced area continuously available for landing or takeoff. This area shall be assumed to extend longitudinally in a straight line from the intersection of the obstruction clearance line with the runway to the most remote obstacle touched by the obstruction clearance line and in no case less than 1,500 feet. Thence, it shall be assumed to continue in a path consistent with the instrument approach or takeoff procedures for the runway in question or, where such procedures are not specified, consistent with turns of at least 4,000 feet in radius. It shall be further assumed to extend laterally at the point of intersection of the obstruction clearance line with the runway 200 feet on each side of such center line. This distance shall increase uniformly to 500 feet on each side of such center line at a longitudinal distance of 1,500 feet from such point of intersection. Thereafter, this distance shall be assumed to be 500 feet on each side of such center line.

Approved. Approved, when used either alone or as modifying other words such as "means," "method" "action," etc., shall mean approved by the Administrator.

Check pilot. Check pilot is a pilot authorized by the Administrator to check pilots of the air carrier for such items as familiarity with en route procedures and piloting technique.

Crew member. Crew member means any individual assigned by the air carrier for the performance of duty on the aircraft in flight.

Critical engine. The critical engine is the engine the failure of which gives the most adverse effect on the performance characteristics of the aircraft. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such engine is determined.)

Critical-engine-failure speed. The critical-engine-failure speed is a true indicated air speed, selected by the aircraft manufacturer, at which the takeoff may be safely continued even though the critical engine becomes suddenly inoperative. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such speed is determined.)

Critical point of takeoff. The critical point of takeoff is that point beyond which the aircraft cannot be brought to a safe stop in the event of failure of the critical engine. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such point is determined.)

Effective length of runway. The effective length of runway is the distance from the point where the obstruction clearance line intersects the runway to the far end thereof.

Exclusive use of aircraft. Exclusive use of an aircraft means that an air carrier has the sole possession, control, and use of an aircraft for flight arising from either (i) a lease or other agreement or arrangement under which the air carrier is to have the right to such possession, control, and use for a period of at least six consecutive months from the date of such lease or other agreement or arrangement,[2] or (ii) ownership of the aircraft.

[2] Attention is invited to the provisions of sec. 408 of the Federal Aviation Act of 1958, as amended (72 Stat. 767, 49 U.S.C. 1378) which, in certain cases, regulates sales, leases of, or contracts for use of aircraft between air carriers, or other persons engaged in any phase of aeronautics, and

which may require that prior Civil Aeronautics Board approval of such arrangements be obtained. Attention is further invited to the fact that aircraft leased from United States Government agencies may not ordinarily be subleased without prior approval of the lessor.

Extended overwater operation. An extended overwater operation shall be considered an operation over water conducted at a distance in excess of 50 miles from the nearest shore line.

Flight crew member. Flight crew member means a pilot, flight radio operator, flight engineer, or flight navigator assigned to flight duty on the aircraft.

Flight time. Flight time shall mean the total time from the moment the aircraft first moves under its own power for the purpose of flight until the moment it comes to rest at the end of the flight.

IFR. The symbol used to designate instrument flight rules.

Irregular air carrier. Irregular air carrier includes any air carrier subject to the provisions of Part 291 of this chapter as heretofore or hereafter amended.

Large aircraft. Aircraft of 12,500 pounds or more maximum certificated takeoff weight shall be considered large aircraft.

Maximum certificated takeoff weight. Maximum certificated takeoff weight shall mean the maximum takeoff weight authorized by the terms of the aircraft airworthiness certificate.[3]

[3] Note that the aircraft airworthiness certificate incorporates as a part thereof an airplane operating record or an airplane flight manual which contains the pertinent limitation.

Minimum control speed. The minimum control speed is the minimum speed at which the airplane can be maintained in straight flight after an engine suddenly becomes inoperative. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such speed is determined.)

Night. Night is the time between the ending of evening twilight and the beginning of morning twilight as published in the Nautical Almanac converted to local time for the locality concerned.[4]

[4] The Nautical Almanac containing the ending of evening twilight and the beginning of morning twilight tables may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Information is also available concerning such tables in FAA Airport Traffic Control Towers and Communications Stations or the United States Weather Bureau.

Obstruction clearance line. The obstruction clearance line is a line drawn tangent to or clearing all obstructions showing in a profile of the approach or takeoff area which has a slope to the horizontal of 1/20.

Passenger-carrying aircraft. An aircraft carrying any individual other than a flight crew or crew member, company employee, or an authorized Government representative shall be considered a passenger-carrying aircraft.

Pilot compartment. Pilot compartment means that part of the aircraft designed for the use of the flight crew.

Pilot in command. Pilot in command shall mean the pilot responsible for the operation and safety of the aircraft during the time defined as flight time.

Point-of-no-return. Point-of-no-return means the point beyond which the aircraft no longer has sufficient fuel, under existing conditions, to return to the point of departure or any alternate for that point.

Power-off stall speed. The power-off stall speed is the minimum steady flight speed at which the airplane with engines idling is controllable in the landing configuration. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such speed is determined.)

Rating. Rating is an authorization issued with a certificate, and forming a part thereof, stating special conditions, privileges, or limitations pertaining to such certificate.

Runway. A runway is a hard-surfaced area normally used for the landing or takeoff of airplanes. An unpaved area at the end of a paved area may be considered as part of a runway if it is smooth and firm enough to permit an airplane to traverse it safely.

Second pilot. Second pilot shall include any pilot other than the pilot in command assigned as a member of the flight crew.

Small aircraft. Aircraft of less than 12,500 pounds maximum certificated takeoff weight shall be considered small aircraft.

Transport category aircraft. Transport category aircraft are aircraft which have been certificated in accordance with the requirements of Part 4b of this subchapter, or under the transport category performance requirements of Part 4a of this subchapter.

Type. **Type shall mean all aircraft of the same basic design, including all modifications thereto except those modifications which result in a change in handling or flight characteristics.**

VFR. **The symbol used to designate visual flight rules.**

V_{s_0}. **V_{s_0} means the power-off true-indicated stalling speed of an aircraft. (See the airworthiness requirements under which the airplane was type certificated for the manner in which V_{s_0} is determined.)**

42.1–1 *Flight time (FAA interpretations which apply to sec. 42.1).* This is construed to mean from "block to block."

(Published in 14 F. R. 7032, Nov. 22, 1949, effective upon publication; amended effective June 15, 1957.)

42.1–2 *Twilight (FAA interpretations which apply to sec. 42.1).* The twilight referred to in this section is deemed to mean civil twilight. "The duration of civil twilight is the interval in the evening from sunset until the time when the center of the sun is 6 degrees below the horizon; or the corresponding interval in the morning between sunrise and the time at which the sun was still 6 degrees below the horizon." [3]

(Published in 14 F. R. 7032, Nov. 22, 1949, effective upon publication; amended effective June 15, 1957.)

42.2 *Deviation authority.*

(a) Contrary provisions of this part notwithstanding,

(1) The Administrator may, upon application by an appropriately certificated air carrier conducting, or intending to conduct, operations pursuant to a contract with the military services (primary contractor), or an appropriately certificated air carrier conducting operations for the military services pursuant to a subcontract with a primary contractor, authorize such air carrier to deviate from the applicable provisions of this part, subject to any terms and conditions that the Administrator shall find are necessary in the interest of safety: *Provided,* That the Department of Defense certifies to the Administrator that the subject operation is essential to the national defense and requires the requested deviation: *And provided further,* That the granting of a deviation shall not be based upon an economic advantage or convenience to either the air carrier or the government, or both.

(2) The Administrator may, upon application by an appropriately certificated air carrier, authorize an air carrier proposing to conduct operations under conditions of an emergency necessitating the transportation of persons or supplies for the protection of life or property, to deviate from any provision of this part to the extent that the Administrator finds that a deviation from this part is necessary for the expeditious conduct of such operations.

(b) Any deviation authority granted by the Administrator pursuant to this section shall be limited to those military contract operations certified by the Department of Defense as essential to the national defense, or operations conducted under conditions of an emergency as determined by the Administrator and shall not be applicable to any other type of operation.

(c) The Administrator shall, in any authorization granted pursuant to this section, specify the terms, conditions, and limitations of the authorization for the deviation and each air carrier shall, in the conduct of these operations, comply with such terms, conditions, and limitations.

(d) Grants of deviation authority issued pursuant to this section may be terminated at any time by the Administrator.

(e) Authorized deviations now in existence shall be continued in effect in accordance with their terms and conditions until 90 days after the effective date of this amendment, or upon their stated expiration date, whichever shall first occur, unless reissued pursuant to this section.

Certificate Rules

42.5 *Certificate issuance.*

(a) *General.* An air carrier operating certificate, describing the operations authorized and prescribing such operating specifications and limitations as may be reasonably required in the interest of safety, shall be issued by the Administrator to a properly qualified citizen of the United States possessing appropriate economic authority granted by the Board pursuant

[3] Tables of Sunrise, Sunset, and Twilight, supplement to the American Ephemeris, 1946, issued by the Nautical Almanac Office, United States Naval Observatory. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

to Title IV of the Federal Aviation Act of 1958, as amended, who is capable of conducting the proposed operations in accordance with the applicable requirements hereinafter specified. Application for a certificate, or application for amendment thereof, shall be made in a manner and contain information prescribed by the Administrator. No person subject to the provisions of this part shall operate in air transportation without, or in violation of the terms of, an air carrier operating certificate.

(b) ***Exceptions.*** **Whenever upon investigation the Administrator finds that the general standards of safety required for air carrier operations require or permit a deviation from any specific requirement of this part, he may issue an air carrier operating certificate or amendment providing for such deviation.**

42.5–1 *Appropriate economic authority (FAA interpretations which apply to sec. 42.5 (a)).* The term "appropriate economic authority" as used in section 42.5 (a) means economic authority from the Board to engage in the air carrier operations for which the air carrier operating certificate is issued.

(Published in 18 F. R. 1719, Mar. 27, 1953, effective Apr. 15, 1953.)

42.5–2 *Application for an Irregular Air Carrier Operating Certificate (FAA rules which apply to sec. 42.5).*

(a) Application for an irregular air carrier operating certificate will be made in triplicate on form ACA–1602, provided for this purpose by the Administrator. The application form may be obtained by contacting the local inspector. When the requirements, as prescribed in this part, have been met, the applicant should present his application to the local inspector and arrange for inspection of his flight equipment and all ground facilities.

(b) Where inspection of the applicant indicates that he is capable of conducting the proposed operation in accordance with applicable requirements, an irregular air carrier operating certificate will be issued, together with operations specifications, which become a part thereof, and will specify the carriage of passengers, cargo, or both; the category and class of aircraft (e. g. airplane single engine land); and the flight conditions under which operations are authorized (e. g. VFR (Day), VFR (Night), IFR (Day), IFR (Night)).

(Published in 14 F. R. 7032, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.5–3 *Application for amendment (FAA rules which apply to sec. 42.5).* Application for amendment of existing operations authorizations listed in the Operations Specifications shall be made on form ACA–1014, Operations Specifications, available at the local district office. On the face (blank side) of the form, the air carrier should list all the operations for which authorization is desired; i. e., show operations for which approval is requested and omit the operations no longer desired or for which he is no longer qualified. The air carrier should also complete the upper half of the back of the form and submit the signed original and four copies to the local inspector.

(Published in 14 F. R. 7033, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.5–4 *Application for overseas and international authorization (FAA rules which apply to sec. 42.5).* Application for overseas and international authorization shall be made to the local inspector in the following manner:

(a) An applicant desiring to engage in overseas and international air transportation shall so indicate in the space provided on form ACA–1602.

(b) The following information must be attached to the application:

(1) List of foreign areas for which operations specifications are desired.

(2) Points between which operations are contemplated.

(3) Type of activity; e. g., cargo, passengers, or a combination of both, etc.

(4) Statement to the effect that diplomatic clearances have been or will be obtained prior to departure either directly or through State Department channels for entry into, or flight over, all of the foreign countries involved. (Indicate which and duration.)

(5) Arrangements which the company has completed or contemplates for the servicing and maintenance of aircraft and equipment abroad.

(6) An outline of the method by which control will be exercised by company head-

quarters over operations outside the continental limits of the United States or its territories. (In lieu thereof, when a single aircraft and individual are involved, appropriate addresses in foreign countries through which the operator may be reached by normal communication channels.)

(c) An irregular air carrier possessing an irregular air carrier operating certificate, who desires to amend such certificate to include overseas and international operations authorization, shall make application on form ACA–1014 and submit it to the local inspector, together with the information required by paragraph (b) of this section.

(d) Any operator or pilot contemplating foreign flight should be well-acquainted with the airports of entry, fields to be visited, navigational facilities available, air laws, public health, customs, and any other requirements established by the country or countries into which operations are to be conducted.[4]

(Published in 14 F. R. 7033, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.5–5 *Application for an Air Taxi Operator Certificate (FAA rules which apply to sec. 42.5 and SR–395A).* See appendix B.

(Published in 19 F. R. 1602, Mar. 25, 1954, effective Apr. 1, 1954; amended effective June 15, 1957.

42.5–6 *Amendment and reissuance of Air Taxi Operator Certificates (FAA rules which apply to sec. 42.5).* See appendix B.

(Published in 19 F. R. 1602, Mar. 25, 1954, effective Apr. 1, 1954.)

42.5–7 *Application for worldwide operation (FAA policies which apply to sec. 42.5).* If the air carrier is able to show to the satisfaction of the assigned inspector that it is able to conduct operations on a worldwide basis, the following phraseology should be used by the air carrier in filling out the section of the operations specifications pertaining to area of operation:

> "The air carrier is authorized to conduct operations between any point within the United States and any point outside thereof."

If the air carrier does not desire to conduct operations on a worldwide basis or the assigned inspector finds that it is not able to do so, the specific areas to and from which operations are authorized should be listed in the operations specifications. Such listing should show the particular countries or possessions of such countries instead of continental areas. When a country or possession is comprised of a number of islands, the island group rather than the individual should be listed.

(Published in 21 F. R. 2586, Apr. 20, 1956, effective May 15, 1956; amended effective June 15, 1957.)

42.5–8 *International air taxi operations (FAA policies which apply to sec. 42.5 and SR–395A).* See appendix B.

(Published in 22 F. R., effective June 15, 1957.)

42.6 *Duration and renewal.*

(a) An air carrier operating certificate issued under this part, shall expire one year from date of issuance thereof, unless such certificate is renewed by the Administrator or such certificate has been sooner surrendered, suspended, or revoked.

(b) The Administrator shall renew an air carrier operating certificate if, upon inspection and examination, he finds that the air carrier meets the current requirements of the regulations in this subchapter for issuance of any such certificate. Evidence of renewal of air carrier operating certificates issued subsequent to July 1, 1950, shall be made a part of the air carrier operating certificate in such form and manner as the Administrator may prescribe.

(c) Application for renewal of an air carrier operating certificate shall be made no later than 60 days prior to the expiration thereof, and shall be made in the form and manner prescribed by the Administrator.

42.7 *Display.* The air carrier operating certificate shall be kept available at the carrier's principal operations office for inspection by any authorized representative of the Administrator or Board.

42.8 *Inspection.* Any authorized representative of the Administrator shall be permitted at any time and place to make inspections or examinations to determine the air carrier's compliance with the regulations in this subchapter.

[4] This information is normally contained in the International Flight Information Manual obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. (Price 50 cents.)

42.9 *Operations base, maintenance base, and/or office.* Each irregular air carrier shall give written notice to the Administrator of his principal business office, his principal operations base, and principal maintenance base. Thereafter the air carrier shall not change his principal operations or maintenance base without having secured prior approval of the Administrator of the new base or bases, nor shall the air carrier change his principal business office without advance notice thereof to the Administrator.

42.9–1 *Notice (FAA rules which apply to sec. 42.9).* Three copies of each notice, in letter form, shall be delivered by the air carrier to the district office of the Federal Aviation Agency serving the air carrier's principal business office, operations base, or maintenance base, whichever is appropriate, in order to give notice to the Administrator.

(Published in 14 F. R. 7033, Nov. 22, 1949, effective upon publication.)

Aircraft Requirements

42.11 *Aircraft required.* An air carrier shall have the exclusive use of at least one aircraft. All aircraft used in the carriage of persons or property for compensation or hire shall be certificated in accordance with standard airworthiness requirements. No air carrier shall operate a large aircraft for the carriage of goods or persons for compensation or hire unless (a) the air carrier has the exclusive use of such aircraft, (b) the Administrator has found such aircraft safe for the service to be offered and has listed such aircraft in the air carrier operating certificate, and (c) such aircraft is not listed in the air carrier operating certificate or commercial operator certificate of any other air carrier or commercial operator.

42.11–1 *Listing of aircraft (FAA rules which apply to sec. 42.11).* When an air carrier utilizes large aircraft, they shall be listed in the Operations Specifications—Aircraft Identification, form ACA–1014. When an aircraft is no longer regularly used in the air carrier's operation, it must be deleted from the Operations Specifications—Aircraft Identification, form ACA–1014. Prior to listing any aircraft in the operations specifications, the following standards shall be met:

(a) The aircraft must be properly registered and there shall be conspicuously displayed in the aircraft a current Airworthiness Certificate accompanied by an appropriate Operations Record or Airplane Flight Manual.

(b) The basic empty weight of the aircraft shall be provided and procedures effected to include the aircraft in the air carrier's weight control system.

(c) Proper application covering the maintenance of all the pertinent components of the aircraft in the maintenance manual must be submitted.

(d) The aircraft shall have the required equipment installed and shall show compliance with other requirements of applicable regulations in this subchapter (i. e., the Civil Air Regulations), the Air Carrier Operating Certificate, and operational or route requirements. Required equipment shall include an adequate number of emergency exits for rapid evacuation in the event of an emergency or crash landing. The installation, operation, and marking of required emergency exits must comply with the pertinent airworthiness regulations. Emergency exits of passenger-carrying aircraft shall be clearly marked with luminous paint. Such markings are to be located either on or immediately adjacent to the pertinent exit and readily visible to passengers. Location and method of operation of the handles shall be marked with luminous paint. In those instances where aircraft are, on occasion, utilized in combination cargo/passenger operation, the aircraft shall be so loaded that emergency exits will be readily accessible in direct proportion to available passenger seats.

(e) The aircraft, its components and accessories shall be in such condition initially that application of the maintenance time limitations listed in the maintenance manual covering overhaul and inspection periods will provide a continuous state of airworthiness.

(Published in 14 F. R. 7033, Nov. 22, 1949, effective upon publication; amended in 16 F. R. 926, Feb. 1, 1951, effective upon publication; amended in 18 F. R. 1719, Mar. 27, 1953, effective Apr. 15, 1953.)

42.11–2 *Listing of small aircraft (FAA interpretations which apply to sec. 42.11).* See appendix B.

(Published in 19 F. R. 1602, Mar. 25, 1954, effective Apr. 1, 1954.)

42.12 *Fire prevention requirements.* All airplanes used in passenger service, powered by engines rated at more than 600 horsepower each for maximum continuous operation shall comply with the applicable fire prevention requirements of Part 4b of this subchapter in effect on or after November 1, 1946, 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: *Provided,* That if the Administrator finds that in particular models of existing airplanes 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 these regulations.

42.13 *Engine rotation.* Multiengine aircraft having any engine rated at more than 480 h. p. for maximum continuous operation shall be so equipped that the rotation of each such engine can be stopped promptly in 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 aircraft.

42.14 *Minimum performance requirements for all aircraft.* Except as otherwise provided in this part, no air carrier shall use any aircraft unless it meets such operating limitations as the Administrator determines will provide a safe relation between the performance of the aircraft and the airports to be used and the areas to be traversed. 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.

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42.14–1 *Takeoff performance limitations for large aircraft (FAA rules which apply to sec. 42.14).* Whenever large aircraft are utilized in cargo operation, the following takeoff performance limitations shall apply:

(a) Transport category airplanes shall be operated in compliance with the provisions of sections 42.70 (b), 42.71 (b), and 42.72.

(b) Nontransport category airplanes shall be operated in compliance with the provisions of section 42.81 and shall meet the en route one-engine inoperative climb requirement of section 42.82 at an altitude of 1,000 feet above the airport from which the takeoff is being made. The pertinent performance limitations data published under sections 42.80–1, 42.80–2, 42.80–3, 42.80–4, 42.80–5, 42.80–7 and 42.80–8 shall be used in determining compliance with section 42.81.

(Published in 18 F. R. 766, Feb. 6, 1953, effective Feb. 15, 1953.)

42.15 *Airplane certification requirements for large airplanes used in passenger operations.*

(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 42.80, 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 sections 42.70 through 42.78: *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, shall be certificated as transport category airplanes and shall meet the requirements of section 42.70.

42.16 *Aircraft limitations for IFR and land aircraft overwater operations.* When passengers are carried, no air carrier shall use any aircraft under IFR weather conditions or

any land aircraft in overwater operations except as follows:

(a) *IFR operations.* Aircraft shall be multiengine with fully functioning dual controls and shall meet the appropriate en route operating limitations of section 42.74 or section 42.82.

(b) *Overwater operations.* Land aircraft shall be multiengine and shall meet the appropriate en route operating requirements of section 42.74 or section 42.82, unless the overwater operation consists only of takeoffs and landings or the aircraft is flown at such an altitude that it can reach land in the event of power failure.

42.16–1 *En route performance limitations (FAA policies which apply to sec. 42.16(b)).* Performance data applicable to this section are published under section 42.80.

(Published in 15 F. R. 83, Jan. 10, 1950, effective Jan. 1, 1950; amended in 18 F. R. 1719, Mar. 27, 1953, effective Apr. 15, 1953.)

Aircraft Equipment

42.21 *Basic required instruments and equipment for aircraft.* The following instruments and equipment acceptable to the Administrator for the type of operations specified shall be installed and in serviceable condition in all aircraft, except that the Administrator may permit or require different instrumentation or equipment for turbine-powered aircraft to provide equivalent safety:

(a) *VFR (day).* For day VFR flight the following is required:

(1) Air-speed indicator,

(2) Altimeter,

(3) Magnetic direction indicator,

(4) Tachometer for each engine,

(5) Oil pressure gauge for each engine using pressure system,

(6) Coolant temperature gauge for each liquid-cooled engine,

(7) Oil temperature gauge for each air-cooled engine,

(8) Manifold pressure gauge or equivalent when required for the proper operation of the engine,

(9) Fuel gauge indicating the quantity of fuel in each tank,

(10) Position indicators for retractable landing gear and flaps: *Provided,* That the Administrator may approve operation of aircraft of less than 12,500 pounds maximum certificated takeoff weight without a position indicator for flaps in the event he finds that the position of the flaps is readily determinable either by direct visual inspection from the cockpit or by other adequate means,

(11) An approved seat and an approved safety belt for each occupant. 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 the regulations in 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,

(12) In passenger service, a minimum of two approved hand-type fire extinguishers, one of which is installed in the pilot compartment, the other accessible to the passengers and ground personnel, unless the aircraft is so designed that the fire extinguisher in the pilot compartment is directly available to passengers and ground personnel, in which case only one fire extinguisher is required; in cargo service, fire extinguisher or extinguishers adequate for the aircraft,

(13) Source of electrical energy sufficient to operate all radio and electrical equipment installed,

(14) One spare set of fuses or 3 spare fuses of each magnitude,

(15) 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,

(b) *VFR (night).* For night VFR flight the following is required:

(1) Instruments and equipment specified in paragraph (a) of this section,

(2) Carburetor temperature gauge,

(3) Carburetor heating or de-icing equipment for each engine,

(4) Set of approved forward and rear position lights,

(5) At least one landing light,

(6) Approved landing flares as follows, if the aircraft is operated at night in extended over-water operations.

Maximum certificated takeoff weight of aircraft:		*Flares*
Less than 3,500 lbs	5	class–3, or 3 class–2.
3,500 lbs. to 5,000 lbs	4	class–2.
More than 5,000 lbs	2	class–1, or 3 class–2 and 1 class–1.

If desired, flare equipment specified for heavier aircraft may be used.

(7) Two-way radio communications system and navigational equipment appropriate to the ground facilities to be used,

(8) Generator of adequate capacity,

(9) One set of instrument lights.

(c) *IFR (day).* For day IFR flight the following is required:

(1) Instruments and equipment specified in paragraph (a) of this section,

(2) Two-way radio communications system and navigational equipment appropriate to the ground facilities to be used,

(3) Gyroscopic rate-of-turn indicator,

(4) Bank indicator,

(5) Rate-of-climb indicator,

(6) Artificial horizon indicator,

(7) Sensitive altimeter adjustable for changes in barometric pressure, in lieu of paragraph (a) (2) of this section,

(8) Clock with a sweep-second hand,

(9) One gryo direction indicator,

(10) Generator of adequate capacity,

(11) One outside air temperature gauge easily readable from the pilot's position,

(12) One carburetor temperature gauge or equivalent approved device,

(13) Power failure warning means or vacuum gauge on instrument panel connecting to lines leading to gyroscopic instruments,

(14) Carburetor heating or de-icing equipment for each engine,

(15) Heated pitot tube for each airspeed indicator,

(d) *IFR (night).* For night IFR flight the following is required:

(1) Instruments and equipment specified in paragraphs (a), (b), and (c) of this section: *Provided,* That when any requirements under paragraphs (a), (b), or (c) of this section are identical, such requirements need not be duplicated,

42.21–1 *Seats and safety belts (FAA rules which apply to sec. 42.21 (a) (11)).* The installation and use of an approved seat and approved individual seat belt for each person over 2 years of age is required. When a child under 2 years of age is held by an adult person, the safety belt shall be used only for the adult. In small aircraft, it will be permissible to carry persons in excess of the number specified in the pertinent aircraft specification; *Provided,* That the seat or seats occupied by such persons are adequate for side-by-side seating; and a safety belt is provided for each seat. Such belt shall not be used for more persons than the number for which it is approved. In any case, the maximum certificated takeoff weight, and allowable c. g. limits of the aircraft shall not be exceeded.

(Published in 14 F. R. 7034, Nov. 22, 1949, effective upon publication.)

42.21–2 *Fire extinguishers (FAA rules which apply to sec. 42.21 (a) (12)).*

(a) A portable fire extinguisher, which shall be of an approved type, shall have a minimum capacity, if carbon tetrachloride, of 1 quart, or, if carbon dioxide, of 2 pounds, or, if other, of equivalent effectiveness.

(b) On transport-type aircraft, fire extinguishers shall be installed so as to be accessible to the passengers and ground personnel. This may be done by securing the extinguisher near the main external cabin door. An extinguisher shall be readily available to the pilot and copilot.

(c) An approved type fire extinguisher is one that has been approved by the Underwriters Laboratories or by the Administrator.

(Published in 14 F. R. 7034, Nov. 22, 1949, effective upon publication.)

42.21–3 *Altimeter (FAA policies which apply to sec. 42.21 (b) (1)).* For VFR flight at night, the installation and use of a sensitive altimeter

adjustable for changes in barometric pressure is recommended.

(Published in 14 F. R. 7034, Nov. 22, 1949, effective upon publication.)

42.21–4 *Warning lights for reversible propellers (FAA policies which apply to sec. 42.21 (a) (15))*. 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.)

42.22 *Additional required instruments and equipment for large aircraft.* In addition to the basic instruments required by section 42.21, the following instruments and equipment for the type of operations specified shall be installed and in serviceable condition in large aircraft:

(a) *Day (VFR and IFR).* For flight during the day the following is required:

(1) Additional air-speed indicator,

(2) Additional sensitive altimeter,

(3) Alternate source of energy to supply gyroscopic instruments which shall be capable of carrying the required load. Engine-driven pumps, when used, shall be on separate engines and, in lieu of one such source of energy, an auxiliary power unit may be used. The installation shall be such that the failure of one source of energy will not interfere with the proper functioning of the instrument by means of the other source,

(4) In passenger service, in addition to fire-detecting and fire-extinguishing equipment necessitated as a result of compliance with section 42.12, such additional hand-type fire extinguishers as the Administrator finds necessary for compliance with section 42.21 (a) (12).

(b) *Night (VFR and IFR).* For flight during the night the following is required:

(1) Instruments and equipment specified in paragraph (a) of this section, and one additional landing light,

(2) After May 31, 1956, an approved anti-collision light; 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.

(c) *Flight recorders.* An approved flight recorder which records time, air speed, altitude, vertical acceleration, and heading shall be installed on all large airplanes which are certificated for operations above 25,000 feet altitude, and shall be operating continuously during flight time; except that, in the event of failure 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 60 days. For a particular 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.

42.22a *Air-speed indicators, limitations, and related information for large aircraft.*

(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 air-speed 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.

42.22a–1 *Airspeed limitations and related information contained in the Airplane Flight Manual (FAA policies which apply to sec. 42.22a (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.)

42.23 *Radio communications system and navigational equipment for large aircraft.* In lieu of the radio communications system and navigational equipment specified in section 42.21 (b) (7) and (c) (2), the following shall be required in large aircraft for the type of operations specified. The radio equipment required under paragraphs (a) and (b) of this section shall be of approved types:

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

(1) Transmit to at least one appropriate ground station from any point on the route and transmit to airport traffic control towers from a distance of not less than 25 miles.

(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.

(b) For day VFR operations over routes on which navigation cannot be accomplished by visual reference to landmarks, for night VFR, or for IFR operations, each aircraft shall be equipped as specified in paragraph (a) of this section, and in addition shall be equipped with at least one marker beacon receiver and with such radio equipment as is necessary to receive satisfactorily, by either of two independent means, radio navigational signals from any other radio aid to navigation intended to be used. For operations outside the United States each aircraft operated for long distances over water or uninhabited terrain shall be equipped with two independent means of transmitting to at least one appropriate ground station from any point on the route.

(c) If appropriate, one of the means provided for compliance with paragraph (a) (3) of this section may be employed for compliance with paragraph (a) (2) of this section, and the means provided for compliance with the requirements of paragraph (b) of this section may be employed for compliance with paragraph (a) (1) and (3) of this section.

42.23–1 *Approved types of radio equipment (FAA interpretations which apply to sec. 42.23).* Radio equipment is of an approved type when it is approved in accordance with the terms of a FAA type certificate or a technical standard order issued by the Administrator.

(Published in 20 F. R. 3067, May 6, 1955, effective May 31, 1955.)

42.23–2 *Independent means (FAA interpretations which apply to sec. 42.23).* Radio systems are independent where each such system is separate and complete, and the function of any part or the whole of one system is not dependent on the continued functioning of any component of the other, and in event of failure in one system, the other system is capable of continued independent operation: *Provided,* That where rigidly supported non-wire antenna or other antenna installations of equivalent reliability are used, only one such antenna need be provided.

(Published in 20 F. R. 3067, May 6, 1955, effective May 31, 1955.)

42.23–3 *Installation and use of non-approved radio communication equipment (FAA policies which apply to sec. 42.23).* All radio communication and navigation equipment required for compliance with section 42.23 must be of approved types. However, additional non-approved radio communication equipment may be installed in aircraft for test and evaluation purposes or for the performance of a non-operational function. The non-approved equipment must be constructed and installed so that it will not interfere with the proper functioning of any approved operational equipment or create an unsafe condition aboard the aircraft.

(Published in 20 F. R. 3067–8, May 6, 1955, effective May 31, 1955.)

42.24 *Emergency and safety equipment.* After May 31, 1957, the equipment required in sections 42.24a, 42.24b, and 42.24c shall be approved.

42.24–1 *First-aid and safety equipment (FAA policies which apply to sec. 42.24).*

In order to retain FAA approval of first-aid kits, flotation equipment, and other emergency gear, after receiving initial approval by the Administrator, such equipment should be regularly inspected to insure that the condition and quantity continues to meet the standards of the original approval.

(Published in 14 F. R. 7034, Nov. 22, 1949, effective upon publication; amended effective June 15, 1957.)

42.24a *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 operated over routes requiring flights for long distances over uninhabited terrain must carry such additional emergency equipment as appropriate for the particular operation involved.

42.24a–1 *First-aid kits and emergency equipment (FAA policies which apply to sec. 42.24a).* First-aid kits and emergency equipment which contain the materials and meet the standards prescribed below will be approved by the Administrator. To obtain approval to use first-aid kits not containing such materials or meeting such standards, application must be made through the local FAA inspector having certificate responsibility.

(a) Each first-aid kit should be dust and moisture proof, should contain only materials which meet Federal Specifications GGK 391, as revised, and should include at least the following items or their equivalent:

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

Adhesive bandage compress, 1 inch (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-inch bandage compress (4 per unit)	1
4-inch bandage compress (1 per unit)	1
Triangular bandage compressed, 40-inch (1 per unit)	1
Burn compound, one-eighth oz. (6 per unit)	1
Tourniquet, forceps, and scissors (1 each per double unit container)	1

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

Adhesive bandage compresses, 1-inch (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-inch bandage compresses (4 per unit)	2
4-inch bandage compresses (1 per unit)	2
Triangular bandage compressed, 40-inches (1 per unit)	1
Burn compound, one-eighth-ounce (6 per unit)	1
Tourniquet, forceps, and scissors (1 each per double unit container)	1
Eye dressing packet (3 each per unit) (ophthalmic ointment, one-eighth-ounce; eye pads; eye strips)	1

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

Adhesive bandage compresses, 1-inch (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-inch bandage compresses (4 per unit)	3
4-inch bandage compresses (1 per unit)	3
Triangular bandage compressed, 40-inches (1 per unit)	3
Burn compound, one-eighth-ounce (6 per unit)	2
Tourniquet, forceps, scissors (1 each per double unit container)	1
Eye dressing packet (3 each per unit) (ophthalmic ointment, one-eighth-ounce; eye pads; eye strips)	1

(b) *Emergency equipment for long-distance flights over uninhabited terrain.* When the type of operation requires more than one class of equipment, it will not be necessary to carry more than one supply of items duplicated in another list.

(1) *Tropical land areas:*

1 machete.
1 axe.
1 mosquito headnet for each person.

[5] Kit No. 2 in canvas may also be used on life rafts.

1 bottle insect repellent for each person.
1 pint drinking water for each person.
1 bottle chlorine tablets for water purification.
1 waterproof box of matches.
1 magnetic compass.
1 bottle quinine tablets.
1 signaling mirror.
1 pyrotechnic pistol and 6 cartridges.
1 small bore rifle and cartridges.
1 hunting knife.
1 fishing kit.
1 snake-bite kit.
1 book on jungle survival.

(2) *Frigid land areas:*

1 machete.
1 axe.
1 blanket for each person.
2 pairs snowshoes.
1 pair sunglasses for each person.
1 book on Arctic survival.
1 waterproof box of matches.
1 magnetic compass.
1 bottle of chlorine tablets for water.
1 signaling mirror.
1 pyrotechnic pistol and 6 cartridges.
1 small bore rifle and cartridges.
1 hunting knife.
2-day supply emergency food ration for each person.
1 mosquito headnet for each person.
1 bottle insect repellent for each person.
1 fishing kit.

(Published in 17 F. R. 2748, Mar. 29, 1952, effective upon publication; amended in 18 F. R. 1719, Mar. 7, 1953, effective Apr. 15, 1953; amended effective June 15, 1957.)

42.24b *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 requirements 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-bouyant 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 approved locations.

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

42.24b–1 *Survival kit for overwater operations (FAA policies which apply to sec. 42.24b).* Survival kits containing the materials listed below will be approved by the Administrator. To obtain approval to use survival kits which do not contain such materials, application must be made through the local FAA inspector having certificate responsibility.

(a) *General.* When the type of operation requires more than one class of equipment, it will not be necessary to carry more than one supply of items duplicated in another list.

1 canopy (for sail, sunshade, or for rain catcher).
1 liferaft repair kit.
1 bailing bucket.
1 signaling mirror.
1 police whistle.
1 raft knife.
1 CO_2 bottle for emergency inflation.
1 inflation pump.
2 oars.
1 75-foot retaining line.
1 magnetic compass.
1 pyrotechnic pistol and 6 cartridges.
2-day supply of emergency food ration for each person.
1 sea water desalting kit for each 2 persons the raft is authorized to carry, or 2 pints of water per person.

1 fishing kit.
1 book on survival appropriate for area.

(Published in 14 F. R. 7034, Nov. 22, 1949, effective upon publication; amended effective June 15, 1957.)

42.24c *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 of large aircraft, 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, for night operations, a source or sources of light, with an energy supply independent of the main lighting system, shall be installed in all large passenger-carrying aircraft 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 takeoff and landing.

42.25 *Cockpit check list.* The air carrier shall provide for each type of aircraft a cockpit check list adapted to each operation in which the aircraft is to be utilized. The check list shall be installed in a readily accessible location in the cockpit of each aircraft and shall be used by the flight crew.

42.25–1 *Cockpit checklist (FAA policies which apply to sec. 42.25).*

(a) The cockpit checklist shall be legible during hours of daylight and darkness under the light conditions of the cockpit.

(b) Checklists developed by the manufacturer, military services, or the operator will be considered satisfactory, providing the following steps are covered:

Prior to starting engines.
Prior to takeoff.
Cruising.
Prior to landing.
Powerplant emergencies.
After landing.
Stopping engines.

(c) It is recommended that in all multiengine equipment a one-engine inoperative checklist be available in cockpit for pilot reference after encountering difficulty which may cause one or more engines to become inoperative. It is further recommended that all aircraft having retractable gear and flaps also have checklists prepared for emergency use in event of failure.

(Published in 14 F. R. 7035, Nov. 22, 1949, effective upon publication.)

42.25–2 *Minimum standard cockpit checklist (FAA policies which apply to sec. 42.25).* The following checklist using general terms will be considered as the minimum standard check list for compliance with the foregoing requirements in irregular air carrier operations. Those items not applicable to the aircraft being operated may be deleted and the order of arrangement of the individual items is left to the air carrier. The checklist shall include all applicable items, but will 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.
Crossfeeds—as required.

Hydraulic system:[6]
Brakes—set.

Electrical system:
Battery switch—proper position.

PRIOR TO TAKEOFF

Weight and balance:
Pilot is aware of weight and takeoff limitations.

Fuel System:
Quantity—rechecked.
Proper tank selection—rechecked.
Mixtures—takeoff position.
Fuel booster pumps—as required.
Crossfeed—as required.

Hydraulic system:[6]
Hydraulic pressures and quantity—checked.
Brakes—checked.
Hydraulic selector valves—checked.

Anti-icing and de-icing equipment:[6]
Checked and set.

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

Powerplants and propellers:[6]
Propellers—checked and set in take-off position.
All engines—checked for proper functioning and required power.
Superchargers—checked and set in proper takeoff position.

Heaters:
Checked and set.

Instruments—engine:
Oil—quantity, temperature and pressure—normal for takeoff.
Fuel pressure—normal for takeoff.
Carburetor temperature—checked.
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:[6]
Checked.

Flaps:[6]
Wing flaps—takeoff position.
Cowl flaps—takeoff position.

Controls:[6]
Auto pilot—off.
Trim tabs—set for takeoff.
Gust locks—off.
Free and tested through full limit of travel.

PRIOR TO LANDING

Fuel system:[7]
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:[7]
Hydraulic pressure—checked.
Brakes—checked and off.
Hydraulic selector valves—checked.

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

Powerplants and propellers:[7]
Propellers—as required.
Superchargers—as required.
Manual reverse pitch actuator or indicator[7]—checked.

Heaters:[7]
Checked.

Instruments:
Static and vacuum selectors—checked.
Altimeter—set.
Directional gyro—set.

Pressurization:[7]
Checked.

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

[7] Items thus marked will be checked by one pilot calling out the item to be checked and then performing the operation with the other pilot observing the action or making a momentary visual check after the operation is completed.

Controls:
Autopilot—off.
Trim tabs—asdesired.
Landing gear: [8]
Down and locked—checked.
Flaps: [9]
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.
Electrical system:
Brakes—checked.
Ignition: off—dead engine.
Generators: off—dead engine.
Powerplants and propellers:
Propellers—Low revolutions per minute 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 14 F. R. 7035, Nov. 22, 1949, effective upon publication; amended in 17 F. R. 9132, Oct. 15, 1952, effective Oct. 31, 1952.)

[8] See footnote 6, page 17.
[9] See footnote 7, page 17.

42.26 *Supplemental oxygen; reciprocating-engine-powered airplanes.* Except where supplemental oxygen is provided in accordance with the requirements of section 42.27, supplemental oxygen shall be furnished and used as set forth in paragraphs (a) and (b) of this section. 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 each 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 standards:

(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.

42.26–1 *Supplemental oxygen for crew members (FAA interpretations which apply to sec. 42.26 (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; amended in 21 F. R. 5437, July 20, 1956, effective July 31, 1956.)

42.26–2 *Oxygen requirements for standby crew members (FAA interpretations which apply to sec. 42.26 (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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.26–3 *Operating instructions (FAA policies which apply to sec. 42.26).* 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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.26–4 *Oxygen requirements for jump-seat occupant (FAA policies which apply to sec. 42.26).* When the jump seat is occupied by a check pilot, a crew member, or a flight crew member, as defined by section 42.1 (a) (7), (8), and (13) respectively, oxygen should be provided in accordance with the requirements of section 42.26. 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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.26–5 *Oxygen requirements for infants in arms (FAA policies which apply to sec. 42.26 (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: (1) a disposable plastic mask which can be fitted to the face; (2) an infant size BLB oro-nasal mask and (3) 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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.26–6 *Oxygen requirements for clinical purposes (FAA policies which apply to sec. 42.26 (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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.26–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 42.26 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.

42.27 *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) *For 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 sec. 42.29 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) *For passengers.* When operating such airplanes at flight altitudes above 8,000 feet, the air carrier shall provide the following amounts of oxygen:

(1) When 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 flight altitudes above 15,000 feet, a supply sufficient to comply with sec. 42.26 (b) (3);

(ii) For the duration of the flight at flight altitudes above 14,000 feet to and including 15,000 feet, a supply sufficeint to comply with sec 42.26 (b) (2); and

(iii) For flight at flight 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) When an airplane is flown at a flight 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 sec. 42.26 (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 flight altitudes permitting safe flight with respect to terrain clearance.

42.27–1 *Computation of supply for crew members in pressurized cabin aircraft (FAA policies which apply to sec. 42.27 (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 42.27 (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. 42.27 (c).)

(2) The operator may use the supply furnished for protective breathing purposes (see sec. 42.29) for compliance with the 2-hour requirement for supplementary breathing oxygen. For example, the 300-liters 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 for crew members computed on the basis of the requirements of section 42.26 (a) should be provided.

(1) The oxygen supply required for protective breathing purposes, as defined in section 42.29, 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 two 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 42.27 (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 42.27 (a) except that the total supply for these other crew members need not exceed that provided on the basis of section 42.26 (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 42.26 (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 the 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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.27–2 *Computation of supply for passengers in pressurized cabin aircraft (FAA policies which apply to sec. 42.27(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 42.26 (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 42.27 (b) (1) and (2), no oxygen need be provided for the first four minutes following a cabin pressurization failure.

(b) *Cabin altitudes greater han 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 42.27 (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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.27–3 *Oxygen requirements for clinical purposes (FAA policies which apply to sec. 42.27 (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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.27–4 *Oxygen requirements for infants-in-arms (FAA policies which apply to sec. 42.26 (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 oro-nasal mask and (c) semirigid papercups, 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. 549, Feb. 2, 1954, effective Feb. 15, 1954.)

42.27–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 42.27, with the additional requirement that, when operating at flight altitudes above 25,000 feet, all flight crew members on flight deck 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 42.26–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 42.29 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 abover 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: *Provided,* That the one pilot need not wear a mask at or below 30,000 feet if all flight crew members are equipped with a quick-donning type of oxygen mask which is demonstrated to be satisfactory to a representative of the Administrator.

(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 42.26–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 42.28) 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.

42.28 *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 42.26 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 42.26–T and 42.27–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.

42.29 *Protective breathing equipment for the flight crew.*

(a) *Pressurized cabin airplanes.* Each required 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 supply of oxygen for each required flight crew member on flight deck duty shall be provided for this purpose.

(b) *Nonpressurized cabin airplanes.* The requirements 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.

42.29–1 *Protective breathing equipment and installation (FAA policies which apply to sec. 42.29).* Protective breathing equipment for the flight crew and its installation should comply with sections 4b.651–1 and 4b.651–2.

(Published in 15 F. R. 8924, Dec. 15, 1950, effective Jan. 1, 1951.)

42.29–2 *Requirement of protective breathing equipment in nonpressurized cabin airplanes (FAA rules which apply to sec. 42.29(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 will 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 at the flight crew stations has been determined in accordance with section 4b.484–1 of this subchapter (i. e. the Civil Air Regulations) and found to be less than 3 percent by volume (corrected to standard sea-level conditions).

(Published in 15 F. R. 8924, Dec. 15, 1950, effective Jan. 1, 1951.)

Maintenance Requirements

42.30 *General.* No person shall operate an aircraft which is not in an airworthy condition. All inspections, repairs, alterations, and maintenance shall be performed in accordance with Part 18 of this subchapter, and with the maintenance manual when required by sec. 42.32 (d).

42.30–1 *General (FAA policies which apply to sec. 42.30).*

(a) It is the operator's responsibility to maintain all aircraft in an airworthy condition at all times when operated in irregular air carrier operation.

(b) All maintenance, repairs, overhauls, and alterations shall be accomplished under the supervision of a certificated airman holding the appropriate mechanical rating for the work involved.

(c) All repairs, overhauls, and alterations shall be in accordance with materials, procedures, and standards set forth in Part 18 of this subchapter (i. e. the Civil Air Regulations) using proper equipment and tools for the type of work involved.

(d) FAA Airworthiness Directives and manufacturers' manuals, directives, bulletins, and notes shall be complied with as directed.

(e) Large aircraft must be maintained in accordance with the time limitations and maintenance schedules prescribed in the approved maintenance manual and the applicable regulations in this subchapter (i. e. the Civil Air Regulations).

(f) No engine or other major component which has not been maintained in accordance with the maintenance manual shall be installed in a large aircraft unless such engine or component is shown to be in an airworthy condition, and that it complies with current Airworthiness Directives. This may be accomplished by showing (1) that the engine or component is new and of current manufacture, (2) has been overhauled within the last 90 days by a certificated repair agency holding appropriate ratings, or (3) by disassembly to the extent necessary for the assigned agent to determine the airworthiness and extent of compliance with Airworthiness Directives and manufacturers' service bulletins.

(g) Small aircraft must be maintained in accordance with the provisions of the applicable regulations in this subchapter (i. e. the Civil Air Regulations) and the manufacturer's recommendations. No aircraft will be dispatched on any flight during which the aircraft may exceed any prescribed maintenance time limitations.

(Published in 14 F. R. 7035, Nov. 22, 1949, effective upon publication.)

42.31 *Inspections and maintenance.*

(a) Aircraft shall be given a preflight check to determine compliance with section 42.51 (e) and, in addition, shall meet the following requirements:

(1) Large aircraft shall be maintained and inspected in accordance with a continuous

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maintenance and inspection system as provided for in the maintenance manual.

(2) Small aircraft shall be inspected in accordance with the inspection provisions of Part 43 of this subchapter.

(b) A record shall be carried in the aircraft at all times showing that the latest inspections required by paragraph (a) of this section have been accomplished, except such record may be kept at the principal operations base when the aircraft is maintained and inspected as provided in paragraph (a) (1) of this section.

42.31–1 *Inspection and maintenance—large aircraft (FAA policies which apply to sec. 42.31 (a) (1)).* A continuous maintenance and inspection system is one in which a prescribed schedule of maintenance and inspection functions is set forth in the maintenance manual approved by the Administrator. The schedules of maintenance functions shall include the overhaul time limitations and inspection program including time limitations which are considered adequate by the Administrator to maintain the aircraft in a continuously airworthy condition.

(Published in 14 F. R. 7036, Nov. 22, 1949, effective upon publication.)

42.31–2 Deleted.

(Published in 21 F. R. 3183, May 15, 1956, effective July 17, 1956.)

42.31–3 Deleted.

(Published in 19 F. R. 6829, Oct. 23, 1954, effective upon publication.)

42.31–4 *Maintenance and inspection records (FAA policies which apply to sec. 42.31 (b)).* The record required in this paragraph may consist of the aircraft log book if it is so arranged as to provide full information on the maintenance work performed on the aircraft. In case the aircraft is maintained under a continuous maintenance and inspection system, the maintenance records which are utilized in such system may be considered as complying with this requirement; however, all such records shall be complete and shall properly identify the aircraft, aircraft time, and the extent of maintenance work or inspections performed. When maintenance or inspection functions are performed away from their principal maintenance base, a copy of the record of maintenance or inspections performed shall be retained in the aircraft and a copy promptly mailed to the principal maintenance base.

(Published in 14 F. R. 7036, Nov. 22, 1949, effective upon publication; amended in 15 F. R. 3151, May 25, 1950, effective upon publication.)

42.32 *Additional maintenance requirements for large aircraft.* The following requirements are applicable to operations conducted in large aircraft:

(a) *Facilities.* Facilities for the proper inspection, maintenance, overhaul, and repair of the types of aircraft used shall be maintained by the air carrier, unless arrangements acceptable to the Administrator are made with other persons possessing such facilities.

(b) *Maintenance personnel.* A staff of qualified mechanics, inspectors, and appropriate supervisory personnel shall be employed by the air carrier and kept available for performing the functions specified in section 42.30, except where the air carrier has obtained the approval of the Administrator for the performance of such functions by some other person. The air carrier shall permit maintenance to be performed only by an individual competent therefor.

(c) *Reporting of mechanical irregularities occurring in operation.* Each air carrier shall prescribe in its operations manual a procedure for the submission of written reports by the members of the flight crew for all mechanical irregularities occurring during the operation of the aircraft. The members of the flight crew designated by the air carrier shall submit a written report in accordance with such system to the person responsible for the maintenance of the aircraft. This report shall be submitted at the end of each through flight or sooner if the seriousness of the irregularity so warrants. Such report or copy thereof indicating the action taken shall be retained in the aircraft for the information of the next flight crew.[5]

[5] See section 42.96 for the requirements for reporting aircraft or component malfunctioning and defects.

(d) *Maintenance manual.*

(1) The air carrier shall prepare and maintain for the use and guidance of maintenance personnel a maintenance manual which contains full information pertaining to the maintenance, repair, and inspection of aircraft and

equipment and clearly outlines the duties and the responsibilities of maintenance personnel. The form and content shall be acceptable to the Administrator. It shall contain a copy of the approved time limitations for inspection and overhauling of aircraft, aircraft engines, propellers, and appliances. Copies and revisions shall be furnished to all persons designated by the Administrator. All copies in the hands of company personnel shall be kept up to date.

(2) A copy of those portions pertaining to the aircraft shall be carried therein.

(3) Any changes prescribed by the Administrator in the interest of safety shall be promptly incorporated in the manual. Other changes not inconsistent with any Federal regulation, the air carrier operating certificate, or safe operating practices may be made without prior approval of the Administrator.

(4) No maintenance, repair, or inspection of aircraft or equipment shall be made by the air carrier contrary to the provisions of the maintenance manual.

42.32–1 *Facilities for the proper inspection, maintenance, overhaul, and repair (FAA policies which apply to sec. 42.32).*

(a) The facilities required in section 42.32 (a) of this subchapter include housing, work space, equipment, supplies, materials, tools, parts, and aircraft components in sufficient quantity and quality to assure that the needed inspection, maintenance, overhaul, and repair of the air carrier's or commercial operator's aircraft (including airframes, powerplants, propellers, and appliances) can be satisfactorily performed at all times by either the air carrier, or commercial operator, or persons with whom arrangements have been made for the performance of such functions.

(b) Sections 52.21–1 through 52.21–3 and sections 52.30–1 through 52.36–1 of this subchapter, outline housing, facilities, equipment and materials which constitute criteria that may be used to determine the minimum facilities required by section 42.32 (a) insofar as applicable and appropriate to the air carrier's aircraft and maintenance system: Provided, That a work dock is used for the performance of airframe maintenance in lieu of a permanent hangar, if such work dock is appropriate for the proper performance of such maintenance under the climatic conditions which prevail at the particular maintenance location. When necessary, the entire airframe or portion thereof on which work is being performed should be enclosed so as to exclude rain, snow, dust, and provide reasonable protection to workers from the extremes of temperature which might impair the work being performed.

(c) When an air carrier contracts to perform inspection, maintenance, overhaul and repair on aircraft of other air carriers, the minimum facilities required by section 42.32 (a) are considered to be the same as required for a certificated repair station performing identical functions.

(Published in 20 F. R. 4184 on June 15, 1955, effective June 30, 1955.)

42.32–2 *Arrangements acceptable to the Administrator (FAA policies which apply to sec. 42.32 (a)).* The Administrator will determine the acceptability of arrangements made by the air carrier with other persons for the inspection, maintenance, overhaul, and repair of the types of aircraft used by the air carrier on the basis of the following criteria:

(a) Such arrangements conform to the approved continuous airworthiness, maintenance, and inspection program which the air carrier must perform in accordance with its maintenance manual.

(b) The inspection, maintenance, overhaul, and repair of the air carrier's aircraft, including airframes, powerplants, propellers, and appliances is performed, inspected, and/or approved by an appropriately rated certificated repair station, appropriately certificated air carrier, or manufacturer in accordance with section 18.10 (b), (d), or (e); section 18.11 (a) (2), (3), or (4); and section 18.11 (b) (2), (3) or (4): Provided, that maintenance, minor repairs, and minor alterations may be performed and/or approved by a certificated mechanic in accordance with section 18.10 (a) and section 18.11 (a) (1).

(c) Such arrangements provide that all replacement parts, components, and materials furnished directly or indirectly by such persons for use on the air carrier's aircraft conform to the type, quality, strength, and standards of

maintenance established in the air carrier's maintenance manual and as required by section 18.30.

(d) The air carrier's maintenance manual provides full, clear, and accurate information and instructions regarding the inspection, maintenance, overhaul, and repairs to be performed by such persons, and contains the names, location of facilities, and obligations of such persons to the carrier.

(e) The overhaul, major repair, and major inspection of aircraft and aircraft components are performed by or under the direct and immediate supervision of persons who are prime contractors and are conducted at the principal maintenance base of such persons or within the environs of such maintenance base.

(f) Such arrangements are made with qualified persons who provide competent personnel and possess adequate facilities and all other requisites appropriate to the type of aircraft or aircraft component on which any inspection, maintenance, or repair is to be performed for the air carrier.

(g) Such arrangements are reviewed by the Administrator prior to the accomplishment of any inspection, maintenance, or repairs; except that temporary arrangements may be made on an emergency basis without prior review by the Administrator provided that the air carrier gives written notice to the Administrator of each such arrangement not later than ten days after any inspection, maintenance, or repairs have been performed on such emergency basis and further provided that such temporary arrangements are limited to persons who are fully qualified and competent to perform such inspection, maintenance or repairs.

(Published in 18 F. R. 7537, Nov. 26, 1953, effective Dec. 15, 1953; amended in 20 F. R. 7645, Oct. 13, 1955, effective Nov. 1, 1955.)

42.32–3 *Maintenance personnel (FAA policies which apply to sec. 42.32 (b)).*

(a) The staff of maintenance personnel employed by the air carrier must be acceptable to the Administrator.

(*b*) When the air carrier desires approval for the performance of maintenance functions by another agency, the air carrier must provide at least one competent person who will be fully responsible for all maintenance functions performed by the other agency. All contacts between the Administrator and the air carrier pertaining to maintenance of aircraft will be conducted through such designated employee. This employee will be responsible for determining that maintenance or inspection functions are performed only by individuals or agencies competent therefor.

(Published in 14 F. R. 7036, November 22, 1949, effective upon publication; redesignated in 18 F. R. 7537, November 26, 1953, effective December 15, 1953).

42.32–4 *Reporting of mechanical irregularities in operation (FAA policies which apply to sec. 42.32 (c)).* All irregularities which are experienced and reported by the flight crews must be recorded under the established procedure including the aircraft identification, irregularity experienced, the corrective action taken as a result, and identification of the person making such corrections. This record may be included as a part of the aircraft log book if the log book provides for an extra copy of such data to be retained in the aircraft.

(Published in 14 F. R. 7036, November 22, 1949, effective upon publication redesignated in 18 F. R. 7537, November 26, 1953, effective December 15, 1953.)

42.32–5 *Maintenance manual (FAA policies which apply to sec. 42.32 (d) (1)).*

(a) *General.*

(1) The section of the maintenance manual which pertains to maintenance, repair, and inspection of aircraft shall include a detailed breakdown of the aircraft's component parts and emergency equipment (in accordance with the requirements of section 42.24–1) which are subjected to maintenance functions; such as, overhaul, repair, inspection, or testing. This listing of components shall indicate the time limitations at which such functions are conducted. This section of the manual shall also include an outline or description of the maintenance functions conducted at each of the scheduled maintenance operations. In many cases the inspection work sheets and work assignment forms may be used to accomplish this requirement if such forms contain sufficient information to fully describe the work done.

(2) The outline of duties and responsibilities of maintenance personnel is to be in such form that the line of authority can be clearly traced from the top management to the maintenance crews. An organization chart showing levels of responsibility and areas of authority will accomplish this purpose.

(3) The maintenance manual shall be loose leaf in form with letter-size pages, and shall be numbered and indexed in a manner to facilitate its use as reference material by the personnel concerned. Each page shall include space in which the date of last revision will be indicated. Existing manuals may be utilized if they are found to fulfill the requirements of this section and are considered acceptable by the local Aviation Safety Agent—Aircraft Maintenance.

(4) At any time when approval is granted for the amendment of time limitations, the pertinent pages for the manual must be promptly revised to indicate the new time limitations.

(b) *Maintenance—time limitations.* The approved time limitations for inspection and overhauling of aircraft, aircraft engines, propellers, and applicances must be those time limitations substantiated by, and approved for, the air carrier operator by the Administrator. Initial approval of the time limitations or approval of amendments to the time limitations will be accomplished by the regional office of the region in which the principal maintenance base is located. This approval will be based, to a large extent, on the recommendation of the Aviation Safety Agent—Aircraft Maintenance assigned to the operation. The inspection and overhaul time limitations applicable to airframes, powerplants, propellers, and appliances will be revised on the basis of service experience. 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. The procedures for amendment of such time limitations are as follows:

(1) *Notification of intent to amend time limitations.* An operator desiring to amend the currently approved time limitations should advise the Aviation Safety Agent—Aircraft Maintenance assigned to his operation at least 15 days prior to the submission of his intention to amend the time limitations indicating the components involved and the desired change.

(2) *Application for amendment.* The operator shall submit a written application in the form of a letter outlining the desired changes and attaching complete substantiating data. The letter shall include a statement to the effect that the operating, service, and overhaul records of the involved components for the past 90 days indicate that the changes requested will not adversely affect the continuous condition of airworthiness and safety of operation of the involved component. The substantiating data to be submitted with this letter will include a record of all mechanical irregularities, and malfunctions, and flight interruptions experienced during the preceding 90 days of operation. It will also include overhaul and inspection records pertaining to the most recent overhauls and inspections conducted on the involved components, under the currently approved time limitations.

(3) *Procedure for establishing initial 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.

(i) *Airframe—initial time limitations.* The initial time limitations for overhauls, inspections, or checks of airframes 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 mainte-

nance program must specify checks, inspections, and overhauls to be performed and times at which they will be performed.

(ii) *Appliances—initial time limitations.* Initial time limitations for inspections, bench checks, major inspections, or overhauls, as applicable, to the appliance involved, should 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, conservative 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.

(iii) *Powerplants—initial time limitations.*

(*a*) The initial overhaul time limitations for any engine used on multi-engine aircraft which has never been used in air carrier service will tentatively be established at 1,000 hours. However, a sample overhaul of a representative number of engines, but not less than three, will 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.

(*b*) 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, it will be required 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.

(*c*) The following procedures will be applicable in establishing initial overhaul time limitations for engines used in single-engine air carrier aircraft:

(*1*) Initial overhaul time limitations for single-engine aircraft powerplants will be established in accordance with the manufacturer's recommended periods for new air carrier operators using such equipment. Where the manufacturer does not recommend specific periods for overhaul of the engine, one of the two following conditions will be applicable.

(*i*) Operators who have previously operated and satisfactorily maintained the engine in question (as revealed by service and overhaul records) may have the initial overhaul time limitations for that engine established at a figure not to exceed 600 hours.

(*ii*) Operators who have not had the experience necessary to demonstrate the ability to operate and maintain the pertinent engine in accordance with (*i*) of this subdivision, may have initial overhaul time limitations established at a figure not to exceed 500 hours for the engine concerned.

(iv) *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.

(v) *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 1000-hour basic engine overhaul period will be considered on the basis of satisfactory service experience at the currently approved time limitations. The operator may make application to amend 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, in relation to the established operation schedules. 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 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 components, will be the same as used for the basic engine.

(vi) *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: (*a*) geographical area or areas of operation; (*b*) number of landings, long haul versus short haul; (*c*) maintenane organization and inspection procedures; (*d*) manufacturers' recommendations; (*e*) 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.

(vii) *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.

(c) *Weight control.* The maintenance manual must include complete information covering the methods and procedures for maintaining the aircraft weights and c. g. within the approved limits. The operator may elect to establish or use any system which fulfills the safety requirements of the applicable regulations of this subchapter (i. e. the Civil Air Regulations) and which is in accordance with the following provisions:

(1) Definitions of terms as specifically related to weight and balance control.

(i) *Approved weight control system.* A system of continuous recordation of weight changes on individual aircraft or fleet which will provide an accurate weight and c. g. location value for all aircraft at all times. Under an approved system the responsibility is delegated to the operator.

(ii) *Operating or basic weight.* The operating or basic weight is the takeoff gross weight excluding the following:

Drainable fuel.

Drainable oil (when the oil load is variable).

Crew and their baggage (when variable).
Payload (including nonrevenue load).
Food.
Other items of load or equipment that are variable from trip to trip.

Due to variations in drainable oil, crew and their baggage required for specific operations, the operating or basic weight may not be directly comparable for different air carriers.

(iii) *Operators' empty weight.* The operators' empty weight is the operating or basic weight excluding the following items:

Passenger service.
Emergency equipment (including portable fire extinguishers and emergency radio).
Navigation equipment.
Flight spares.
Washing and drinking water.
Crew.
Crew baggage.
Drainable oil.

This empty weight is corrected so that it will be comparable among the air carriers.

(iv) *Drainable fuel or oil.* That fuel or oil which, in normal ground attitude, drains with all drain cocks opened.

(2) *Operators' responsibility.*

(i) Not under an approved system.

(*a*) Each aircraft shall be weighed annually in the presence of an FAA representative [10] to determine the operators' empty weight and corresponding c. g. position.

(*b*) All weight and balance data (including loading schedules, overlays, equipment lists, etc.) shall be submitted for FAA approval and file.

(ii) *Under an approved system.*

(*a*) It is not necessary for the operator to submit weight and balance data for individual aircraft for FAA approval and file. He will be expected, however, to be prepared at any time to show that he is complying with the procedures for which he has obtained FAA approval, as well as with current regulations of this subchapter (i. e. with Civil Air Regulations). Weight manifests shall be retained in the operator's files for a period of at least 30 days.

(*b*) A continuous record should be kept for each aircraft, listing all changes affecting the weight, c. g. location, and equipment included in order that a computed weight and c. g. location may be established at any time.

(*c*) Each aircraft shall be weighed every 2 years, or at shorter intervals if the operator prefers, to determine the empty weight and the corresponding c. g. (if a fleet weight system is used, aircraft may be weighed on a fleet weight basis, established in accordance with the procedure outlined in this section).

(*d*) It is necessary to show the actual c. g. location on the weight manifest, except when a schedule has been prepared which insures that the c. g. will remain within approved limits under operating conditions, in which case it should be shown that the airplane is loaded in accordance with the proper schedule.

(*e*) The presence of an FAA representative will not be necessary during the routine weighing of aircraft.

(3) *Application for approval of weight control systems.*

(i) *General.* The air carrier should submit the application to the regional office of the region in which his principal maintenance base is located, through the assigned maintenance agent. The application should be submitted in letter form. A report (in quadruplicate) should be attached, outlining in detail the system employed to control the weight and balance of the aircraft. For the purpose of approving the system, actual operating data for specific aircraft need not be included. This report should include the following information where such information is necessary to properly substantiate the proposed system.

(*a*) Description of procedures established for reporting and recording changes affecting weight and balance, with copies of all printed forms and instructions to personnel.

(*b*) Description of loading devices used and instructions for their proper use.

When a mechanical computor is used for loading, the operating instructions should be furnished. It may be necessary for the operator to submit the computor for examination, in which case the computor will be returned to the operator upon completion of the examination.

[10] FAA representative may be defined as an FAA employee, air carrier employee, or designee, who is authorized by the Administrator to approve weight and balance of aircraft.

(*c*) Copies of all printed forms (including load manifests) and instructions to personnel with regard to the proper load distribution. This should include information pertaining to filling of fuel and oil tanks, passenger seating, restriction of passenger movement, distribution of cargo, etc.

(*d*) Description of procedures established to determine conformity with approved loading instructions to insure the operation of the aircraft within the approved c. g. range.

(*e*) Description of procedures established to inform the pilot of the loaded condition of the airplane.

(*f*) Information indicating the degree of responsibility of all ground and flight personnel (by title) and specific duties of each, relative to the various phases of the weight control system.

(ii) *Additional air carrier responsibilities.* Aircraft equipment lists must be prepared by the air carrier, but need not be submitted with the application. These are:

(*a*) List of fixed equipment standard for each model or type aircraft and included in the operating or basic weight.

(*b*) List of all removable equipment (including commissary, buffet equipment, meal services, etc.) and the weight and moment of each. It is satisfactory to establish an overall weight and c. g. location for each group or list.

Changes which alter the methods of the currently approved weight control system should be approved in the same manner as used for the original system. However, revisions which do not affect the method do not require approval.

EXAMPLE: A change from a tabular to an index type loading chart would require approval, but a revision to an index unit chart, already in use, would not require approval.

(4) *Passenger and crew weights.*

(i) *General.* These weights apply to operators with or without an approved weight control system. Consideration will be given to a different average of weights for crew and passengers, provided the operator can substantiate these weights based on an average of actual weights for each group.

(ii) *Passenger weights.* The actual passenger weights may be used in all computations and are preferable from the standpoint of accuracy. In addition, the use of average weights is approved as a means of expediting load manifest calculations. The use of average weights, however, does not relieve the operator of responsibility for compliance with the weight and c. g. location limitations as specified in the appropriate aircraft specification and the operating limitations prescribed in this part. In other words, if there is obvious evidence that the use of average weights will result in erroneous computations and possible violation of applicable regulations of this subchapter (i. e. the Civil Air Regulations), the total weight and c. g. location should be recomputed using actual weights. This condition is most likely to arise in cases where the major portion of a passenger load consists of a specialized group such as athletic teams or of a specific racial group which does not conform with the United States average. In all cases of such nonaverage groups actual weights must be used.

The approved averages are as follows:

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

(*b*) An average passenger weight (winter) of 165 pounds may be used during the calendar period of November 1 through April 30.

(*c*) An average passenger weight of 80 pounds may be used at any time for children between the ages of 3 and 12.

In all computations, either the actual or average weights indicated above will be used; in no case will a combination of average and actual weights be used. However, the above calendar periods may be varied where climatic conditions warrant, upon specific approval of the FAA.

(iii) *Crew weights.* Actual or average weights may be used in the case of crew members under conditions as set forth for passenger weights. The approved averages are as follows:

(*a*) Male cabin attendants 150 pounds; female cabin attendants 130 pounds.

(*b*) All other crew members 170 pounds.

(5) *Passenger and cabin attendant movement.*

(i) *General.* Consideration must be given to the effect of passenger and cabin attendant movement on the balance of the aircraft. The movement of a number of passengers and cabin attendants equal to the placarded capacity of the lounges and/or lavatories must be considered. If the capacity is one, the movement of either a passenger or a cabin attendant, whichever most adversely affects the c. g. condition shall be used. When the capacity of the lavatory and/or lounge is two or more, the movement of passengers and/or cabin attendants evenly distributed throughout the aircraft, equal to the placarded capacity of the lounge and/or lavatory, shall be considered. Where seats are blocked off, the movement of passengers and/or cabin attendants evenly distributed throughout the actual loaded section of the aircraft may be used. The extreme movements of the cabin attendants carrying out their assigned duties should be considered. The various conditions shall be combined so that the most adverse effect on the c. g. will be obtained and so accounted for in the development of the loading device to assure the aircraft of being loaded within the approved limits at all times.

(ii) *Fuel use and landing gear retraction* Consideration must be given to the effect on the balance of the aircraft of fuel used down to the FAA minimum of one-twelfth gallon per METO (or maximum continuous) hp. in addition to the unusable fuel and landing gear retraction. No consideration need be given to oil use.

(6) *Fleet weights.* An average operating or basic fleet weight may be utilized for a fleet, or group of aircraft, of the same model. When the basic or operating weights and c. g. positions remain within the limits established in subdivision (vii) of this paragraph. Such weights will be calculated on the following basis:

(i) The operator will determine the empty fleet weight by weighing aircraft according to the following table:

The first three aircraft must be weighed.

Fifty percent of the next six aircraft must be weighed.

Ten percent of the remaining aircraft must be weighed.

In choosing the aircraft to be weighed, a representative number should be picked from each age group of the fleet (the number of the same model delivered during each calendar year). This is to insure that the aircraft weighed as representative of the fleet will reflect the accuracy of the operator's weight records and expose any "service pickup" or unaccountable weights not shown in the weight ledger.

(ii) The operator will establish the empty weight and c. g. position for each aircraft that has been weighed.

(iii) The operator will establish the empty fleet weight and c. g. position for each fleet or group of the same model aircraft by averaging the operator's empty weights of the weighed aircraft in each fleet or group.

(iv) The operator will establish the empty weight and c. g. position by calculation for each aircraft in each group not weighed.

(v) The operator will establish the basic or operating fleet weight and c. g. position for each fleet by adding the following items to the empty fleet weight for each fleet: normally removable equipment, i. e., passenger service equipment, emergency equipment (including portable fire extinguishers), navigation equipment, flight spares, washing and drinking water, crew and crew baggage (when not variable), and drainable oil (when the oil load is not variable).

(vi) The operator will establish an operating or basic weight for each aircraft in each fleet by adding items designated in subdivision (v) of this subparagraph to the operator's empty weight of each aircraft.

(vii) If the basic or operating weight of any aircraft weighed or the calculated 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 basic or 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 average c. g. that airplane must be omitted from that group and operated on its actual or calculated basic or operating weight and c. g. position. If it falls within the limits of another

fleet or group, it may then become part of the basic or operating fleet weight of that fleet.

(viii) Reestablishment of the operator's empty fleet weight and the basic or operating fleet weight may be accomplished between weighing periods by calculation based on the current operator's empty weight and operating or basic weight of the aircraft previously weighed.

(ix) In cases where the basic or operating fleet weight does not vary more than the tolerance allowed, but the c. g. position varies in excess of the tolerance allowed, the aircraft may be operated utilizing a basic or operating fleet weight with individual c. g. positions.

If all aircraft are weighed, the same general procedure as outlined above shall be followed if a fleet weight is to be used.

Other methods of computing aircraft loading are permissible if it can be shown that the approved weight and c. g. limits are not exceeded.

(7) *Individual aircraft weights.*

(i) *General.* When the accumulated changes to the operating or basic weight and/or c. g. position exceed plus or minus one-half of one percent of the maximum landing weight or the MAC, respectively, the loading data must be revised accordingly.

(*a*) Fuel allowance for taxiing. A compensating weight allowance of 3 pounds of fuel for each 100 horsepower, METO (or maximum continuous), available to the aircraft from all of its engines may be added to the maximum weight of the aircraft.

(8) *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, shall prevail. Any nationally recognized scales may be used for weighing provided they are properly calibrated, zeroed, and used in accordance with the manufacturer's instructions. Each scale should have a calibration chart, either furnished by the manufacturer or by a civic Department of Weights and Measures. This calibration chart should not be more than 1 year old unless the particular scales have had insufficient use and have been properly stored and cared for, thereby warranting a longer period between calibrations. In case of necessity, the scales may be calibrated on the spot. In any case, the calibration of the scales and the weight precedure must be acceptable to the FAA[11] representative.

(d) *Deletion of irrelevant information.* The portion of the Maintenance Manual which requires approval by the Administrator shall not include information which does not have a direct bearing on safety of the aircraft. Such material as organization procedures, employee conduct, rates of compensation, working hours, etc., if included in the Maintenance Manual shall be confined within a separate section.

(Published in 14 F. R. 7036, Nov. 22, 1949, effective upon publication; amended in 16 F. R. 11415, Nov. 9, 1951, effective Dec. 9, 1951; amended in 18 F. R. 7527, Nov. 27, 1953; amended in 19 F. R. 6829, Oct. 23, 1954, effective upon publication.)

42.32–6 *Copy of maintenance manual in aircraft (FAA policies which apply to sec. 42.32 (d) (2)).* This manual shall contain such maintenance instructions as are necessary for the type of operations and aircraft concerned, and interpreting the air carrier's procedures to be followed in complying with the maintenance requirements of this part and the Operations Specifications. The foregoing shall not be construed as requiring an air carrier to carry in the aircraft complete maintenance and overhaul instructions for a particular type of aircraft. It is essential, however, that the manual contain such maintenance information as will provide adequate guidance for routine and emergency maintenance procedures, in addition to the air carrier's policy relative to their accomplishment.

(Published in 14 F. R. 7039, Nov. 22, 1949, effective upon publication; amended in 18 F. R. 7537, Nov. 26, 1953; amended in 19 F. R. 6829, Oct. 23, 1954, effective upon publication.)

42.32–7 *Mandatory revisions (FAA rules which apply to sec. 42.32 (d) (3)).* When the operator is instructed to incorporate changes in the manual by the Administrator or his properly authorized representatives, such changes shall

[11] FAA representative may be defined as an FAA employee, air carrier employee, or designee, who is authorized by the Administrator to approve weight and balance of aircraft

be made promptly in all copies of the manual in the hands of designated personnel.

(Published in 14 F. R. 7039, Nov. 22, 1949, effective upon publication; amended in 18 F. R. 7537, Nov. 26, 1953.)

Flight Crew Requirements

42.40 *Airman requirements.*

(a) No air carrier shall utilize an individual as an airman unless he has met the appropriate requirements of the Civil Air Regulations: *Provided,* That, in the case of an air carrier holding a scheduled air carrier operating certificate and conducting operations in accordance with section 42.0 (a) and (b) of this part, the provisions of sections 42.44(a) and 42.45 shall not be applicable to pilots who for the previous six months have been continuously in the employ and participating regularly in the training program and established pilot training and check procedures of such air carrier and who are otherwise qualified in accordance with the requirements of Part 40 or Part 41 of this chapter.

(b) Each air carrier operating large aircraft shall designate a chief pilot who shall be responsible for seeing that no individual is assigned as a pilot unless he has met the appropriate requirements of the Civil Air Regulations.

(c) No individual who has reached his 60th birthday shall be utilized or serve as a pilot on any large aircraft while engaged in air carrier operations.

NOTE: Paragraph (c) of this section does not become effective until March 16, 1960.

42.41 *Composition of flight crew.*

(a) No air carrier shall operate an aircraft with less than the minimum flight crew required for the particular operation and the type of aircraft, as determined by the Administrator in accordance with the standards prescribed in this section, and specified in the air carrier operations manual for the area in which operations are authorized.

(b) Where the provisions of this part require the performance of two or more functions for which an airman certificate is necessary, such requirement shall not be satisfied by the performance of multiple functions at the same time by any airman.

(c) *Second pilot.* A second pilot shall be required on large aircraft, or on other aircraft when passengers are carried on operations under IFR, or when the Administrator finds that a second pilot is otherwise required in the interest of safety.

(d) *Flight radio operator.* An airman holding a flight radio operator certificate shall be required for flight over any area over which the Administrator has determined that radiotelegraphy is necessary for communication with ground stations during flight.

(e) *Flight engineer.* An airman holding a flight engineer certificate shall be required on all aircraft of more than 80,000 lbs. maximum certificated takeoff weight, and on all other aircraft certificated for more than 30,000 lbs. maximum certificated takeoff weight where the Administrator finds that the design of the aircraft used or the type of operation is such as to require a flight engineer for the safe operation of the aircraft, or on other aircraft where required by the aircraft airworthiness certificate.

(f) *Flight navigator.* An airman holding a flight navigator certificate shall be required for flight over any area where the Administrator has determined that celestial navigation is necessary.

42.42 *Pilot qualification for small aircraft.*

(a) *Pilot in command.* Any pilot serving as pilot in command on small aircraft shall hold a valid commercial pilot certificate with an appropriate rating for the aircraft on which he is to serve, and for:

(1) *Day flight VFR.* He shall have had at least 50 hours of cross-country flight time as a pilot;

(2) *Night flight VFR.* He shall have had a total of at least 500 hours of flight time as a pilot, including 100 hours of cross-country flight time of which 25 hours shall have been at night;

(3) *IFR flight.* He must possess a currently effective instrument rating and have had a total of at least 500 hours of flight time as a pilot including 100 hours of cross-country flight.

(b) *Second pilot.* Any pilot serving as second pilot on small aircraft shall hold for:

(1) *VFR flight.* A valid commercial pilot certificate with the appropriate ratings;

(2) *IFR flight.* A currently effective instrument rating.

42.43 *Pilot qualifications for large aircraft.*

(a) *Pilot in command.* Any pilot serving as pilot in command on large aircraft shall possess a valid airline transport pilot rating with an appropriate rating for the aircraft on which he is to serve.

(b) *Second pilot.* Before a pilot shall serve as second pilot on large aircraft, he shall:

(1) Possess a valid commercial pilot rating and instrument rating, or a valid air line transport pilot rating, and

(2) Demonstrate to an authorized representative of the Administrator, or to a check pilot designated by the Administrator, his ability to take off and land each type of aircraft on which he is to serve by making at least three satisfactory takeoffs and landings in each type.

(c) *Three-pilot crew.* In a crew of three or more pilots at least two pilots shall meet the requirements of paragraph (a) of this section.

42.44 *Recent flight experience requirements for flight crew members.* No air carrier shall utilize an airman, nor shall any individual serve as an airman, unless he meets the appropriate experience requirements specified below:

(a) *Pilots.*

(1) Within the preceding 90 days a pilot shall have made at least 3 takeoffs and landings in an aircraft of the same type on which he is to serve. For night flight one of the takeoffs and landings required above shall have been made at night.

(2) Within the preceding 6 months a pilot on large aircraft shall have successfully accomplished an equipment check on aircraft of the type on which he is to serve. Such equipment check shall be given by an authorized representative of the Administrator or a check pilot of the air carrier.

(3) Within the preceding 6 months the pilot in command on any large aircraft, or on any aircraft under IFR conditions, shall have successfully accomplished an instrument check demonstrating his ability to pilot and navigate by instruments, to accomplish a standard instrument approach using radio range facilities, and to accomplish an instrument approach in accordance with ILS, GCA, or D/F procedures when such facilities are to be used. This instrument check shall be given by an authorized representative of the Administrator or a check pilot of the air carrier on an aircraft of, a type on which the pilot in command is to serve.

(4) Subsequent to the initial pilot equipment and instrument checks required by subparagraphs (2) and (3), respectively, of this paragraph, an approved course of training in an aircraft simulator, if satisfactorily completed, may be substituted at alternate 6-month intervals for the proficiency check required by subparagraphs (2) and (3). The air carrier shall show that the flight characteristics, performance, instrument reaction, and control loadings of the applicable aircraft are accurately simulated in the aircraft simulator through all ranges of normal and emergency operations in accordance with subdivisions (i) through (vii) of this subparagraph:

(i) The simulator shall represent a full-scale mockup of the cockpit interior, including normal flight crew stations and accommodations for the instructor or check airman.

(ii) The effect of changes on the basic forces and moments shall be introduced for all combinations of drag and thrust normally encountered in flight. The effect of changes in airplane attitude, power, drag, altitude, temperature, gross weight, center of gravity location, and configuration shall be included.

(iii) In response to control movement by a flight crew member, all instrument indications involved in the simulation of the applicable airplane shall be entirely automatic in character unless otherwise specified. The rate of change of simulator instrument readings and of control forces shall correspond to the rate of change which would occur on the applicable airplane under actual flight conditions, for any given change in the applied load on the controls, in the applied power or in aircraft configuration. Control forces and degree of actuating control travel shall correspond to that which would occur in the airplane under actual flight conditions.

42.48–2 *Scheduled type operations (FAA policies which apply to sec. 42.48).* An operator conducting a scheduled type operation (e. g., scheduled cargo-only service, regular flights between points pursuant to a military contract, etc.) may establish flight operations schedules for a particular route or route segment in order to determine compliance with the scheduling provisions of the flight time limitations.

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

42.49 *Assignment of emergency evacuation functions for each crew member.* **After May 31, 1956, each air carrier shall assign all necessary emergency functions for each crew member to perform in the event of circumstances requiring emergency evacuation. The air carrier shall show that functions so assigned are practicable of accomplishment. These functions shall be described in the air carrier manual.**

Flight Operation Rules

42.51 *Pilot responsibilities.*

(a) *Pilot in command.* **The pilot in command of the aircraft shall be designated by the air carrier.**

(b) *Preflight action.* **Prior to commencing a flight the pilot in command shall familiarize himself with the latest weather reports pertinent to the flight issued by the United States Weather Bureau or if unavailable, by the most reliable source, and with the information necessary for the safe operation of the aircraft en route, and on the airports or other landing areas to be used, and determine that the flight can be completed with safety.**

(c) *Charts and flight equipment.* **The pilot in command shall have in his possession in the cockpit proper flight and navigational facility charts, including instrument approach procedures when instrument flight is authorized, and such other flight equipment as may be necessary to properly conduct the particular flight proposed.**

(d) *Emergency decisions.*

(1) When required in the interest of safety, a pilot may make any immediate decision and follow any course of action which in his judgment appears necessary, regardless of prescribed methods or requirements. He shall, where practicable, keep the proper control station fully informed regarding the progress of the flight.[6]

[6] See section 42.94 for the report to be filed by the pilot where the authority granted by this section is exercised.

(2) In an emergency requiring either the dumping of fuel or a landing at a weight in excess of the authorized landing weight, a pilot may elect to follow whichever procedure he considers safer.

(e) *Serviceability of equipment.* **Prior to starting any flight, the pilot shall determine that the aircraft, all engines and propellers, appliances and required equipment, including all instruments, are in proper operating condition. If during the flight any such engine, propeller, appliance, or equipment malfunctions or becomes inoperative, the pilot in command shall determine whether the flight can be continued with safety. Unless he believes that flight can be continued safely, he shall hold or cancel it until satisfactory repairs or replacements are made.**

(f) *Admission to flight deck of aircraft having a separate pilot compartment.* **No persons, other than crew members, shall be admitted to the flight deck of an airplane having a separate pilot compartment except those authorized in subparagraphs (1) and (2) of this paragraph. For the purposes of this section, the Administrator shall determine what constitutes the flight deck.**

(1) FAA Flight Operations and Airworthiness Inspectors and authorized representatives of the Board while in the performance of official duties shall be admitted to the flight deck.

NOTE: Nothing contained in this paragraph shall be construed as limiting the emergency authority of the pilot in command to exclude any person from the flight deck in the interest of safety.

(2) The persons listed below may be admitted to the flight deck when authorized by the pilot in command:

(i) An employee of the Federal Government or of an air carrier or other aeronautical enterprise whose duties are such that his presence on the flight deck is necessary

heading during the takeoff run, his proficiency in using or directing the use of power, flaps, and gear operation, during the critical period between takeoff (off ground) and reaching 500 feet. If it becomes necessary for the pilot occupying the other control position to give other than routine assistance after becoming airborne, the maneuver should be considered as unsatisfactory.

(5) *Climbs and climbing turns.* Climbs and climbing turns should be performed in accordance with the airspeeds and power settings as prescribed by the air carrier or those set forth in the airplane flight manual. The use of proper climb speeds and designated rates of climb should be considered in determining the satisfactory performance of this phase of the equipment check flight.

(6) *Navigational facilities.* The pilot should be directed to use all en route navigational facilities in the proper sequence. Attention should be given to the pilot's ability to use all available airplane navigational equipment.

(7) *Loop orientation.* The pilot should be directed to obtain an en route position by the use of the radio compass. Attention should be given to the time involved in obtaining the fix and accuracy with which the airplane position is established on a proper chart.

(8) *Landing under regular approach conditions.* Landing under regular approach conditions should necessitate a path of flight around the landing area of not more than a 180° turn but not less than a 90° turn. The pilot should be judged on the basis of altitude and air-speed control and his ability to maneuver to a normal landing.

(9) *Judgment.* The pilot should demonstrate judgment commensurate with experience required of a co-pilot in air carrier aircraft.

(d) *Pilot records.* A record of the equipment check, including a report of any pilot deficiencies, should be maintained in the file of each pilot.

(1) The records of pilots, other than pilots in command, should include (i) the date, method used and grade received on the equipment examination set forth in paragraph (b) of this section and (ii) the date and grade received on the flight check set forth in paragraph (c) of this section.

(2) The records of pilots in command should include (i) the date, method used and grade received on the equipment examination set forth in paragraph (b) of this section and (ii) the date and grade received on the instrument checks prescribed in section 42.44–2.

(Published in 18 F. R. 1909, Apr. 7, 1953, effective Apr. 25, 1953.)

42.44–2 *Instrument checks (FAA policies which apply to sec. 42.44 (a) (3)).*

(a) *General.* A pilot in command on any large aircraft should successfully accomplish the instrument checks set forth in this section. Each pilot required under section 42.43 (c) to qualify as a pilot in command should successfully accomplish these instrument checks. The checks to be accomplished, and the observations to be made by the examining check pilot, are described as follows:

(b) *Taxiing, sailing, or docking.* Attention should be directed to (1) the manner in which the pilot in command conducts taxiing, sailing, or docking with reference to the taxi instruction as issued by airport traffic control or other traffic control agency, (2) any taxi instruction which may be published in the air carrier's operations manual, and (3) general regard for the safety of the air carrier's and other equipment which may be affected by taxiing, sailing, or docking operation.

(c) *Runup.* Attention to detail in the use of cockpit check list and cockpit procedure should be observed on all instrument check flights.

(d) *Takeoff.* Whenever practicable, the pilot being examined should execute a takeoff solely by reference to instruments, or at the option of the check pilot, a contact takeoff may be made following which instrument conditions should be simulated at or before reaching 100 feet with the subsequent climb conducted solely by reference to instruments. The check pilot should observe the pilot's ability to maintain a constant heading during the takeoff run, his proficiency in handling power, flap and gear operation during the critical period between takeoff (off ground) and reaching 500 feet. If it becomes necessary for the check pilot to give other than routine assistance after becoming airborne, the maneuver should be considered as unsatisfactory.

(e) *Climbs and climbing turns.* Climbs and climbing turns should be performed in accordance with the airspeeds and power settings as prescribed by the air carrier or those set forth in the Airplane Flight Manual. The use of proper climb speeds and designated rates of climb should be considered in determining the satisfactory performance of this phase of the instrument check flight.

(f) *Steep turns.* Except as provided hereinafter, steep turns should consist of at least 45° of bank. The turns should be at least 180° of duration but need not be more than 360°. Smooth control application, and ability to maneuver aircraft within prescribed limits, should be the primary basis for judging performance. When information is available on the relation of increase of stall speeds versus increase in angle of bank, such information should be reviewed and discussed. As a guide, the tolerances of 100 feet, plus or minus, a given altitude should be considered as acceptable deviation in the performance of steep turns. Consideration may be given to factors other than pilot proficiency which might make compliance with the above tolerances impractical. For example, where the range of vision from the safety observer's position is obstructed in certain types of aircraft while in a steep left turn, the degree of left bank in such instances may be reduced to not less than 30°.

(g) *Maneuvers (minimum speeds).* Maneuvers at minimum speed should be accomplished while using the prescribed flap settings as set forth in the Airplane Flight Manual. In addition, attention should be directed to airplane performance as related to use of flaps versus clean configuration while operating at minimum speeds. Attention should be directed toward the pilot's ability to recognize and hold minimum controllable airspeed, to maintain altitude and heading, and to avoid unintentional approaches to stalls.

(h) *Approach to stalls.* Approach to stalls should be demonstrated from straight flight and turns, with and without power. An approach to stall should be executed in landing or approach configuration. The extent to which the approach to stall will be carried and the method of recovery utilized should be dictated by the type of aircraft being flown, its reaction to stall conditions, and the limitation established by the air carrier. Performance should be judged on ability to recognize the approaching stall, prompt action in initiating recovery, and prompt execution of proper recovery procedure for the particular make and model of aircraft involved.

(i) *Propeller feathering.* Propeller feathering should be performed. Such propeller feathering should be accomplished in accordance with instructions set forth by the air carrier and be exercised at sufficient altitude to insure adequate safety for the performance of the operation. The pilot's ability to maintain altitude, directional control, and satisfactory airspeed should be demonstrated in accomplishing this maneuver. The manner in which the pilot manages his cockpit during propeller feathering should also be noted.

(j) *Maneuvers (one or more engines out).* When performing maneuvers (one or more engines out) the aircraft should be maneuvered with a loss of 50 percent of its power units, such loss to be concentrated on one side of the aircraft. The loss of these power units may be simulated either by retarding throttles or by following approved feathering procedures. The pilot in command should be required to maintain headings and altitude and to make moderate turns both toward and away from the dead engine or engines. Proficiency should be judged on the basis of the pilot's ability to maintain engine-out airspeed, heading and altitude; to trim the airplane; and to adjust necessary power settings.

(k) *Rapid descent and pull-out.* This maneuver should consist of the following steps: While the aircraft is under the normal approach configuration and being flown at a predetermined altitude, it will be assumed that the aircraft has arrived at a navigational fix and is cleared to descend immediately to a lower altitude. (The lower altitude should be one which permits a descent of at least 1,000 feet.) Upon reaching the lower altitude, the aircraft should be recovered from the rapid descent and flown on a predetermined heading and altitude for a predetermined period of time. At the end of the time interval, an emergency pullout should be executed which will involve a change in direction of at least 180°. Performance should

be judged on the basis of ability to establish a rapid descent at constant airspeed, stopping the descent at the minimum altitude specified without going below it, holding heading and altitude, and smooth pull-up and climb.

(l) *Ability to tune radio.*[12]

(m) *Orientation.*[12]

(n) *Beam bracketing.*[12]

(o) *Cone identification.*[12]

(p) *Loop orientation.*[12]

(q) *Approach procedures.* An approach procedure should be made in the aircraft on the letdown aid for which the lowest minimums are authorized and include, where possible, holding patterns and air traffic control instructions which might be used by the pilot in day-to-day operations. In case a particular air carrier is authorized its lowest landing minimums on a letdown aid which is not installed at locations where the air carrier's pilots are based, the air carrier should conduct the instrument check flights at locations where such an aid is installed. If at the time of the instrument check flight the letdown aid affording the lowest minimums is not in operation at the point the check is given, the landing aid which affords the next lowest minimums authorized should be used. In this case the approach on the aid affording the lowest minimums may be conducted in a simulator or other approved type trainer. All other approaches which a particular air carrier is authorized to use, such as ADF, LF/MR range, VOR, and VAR, may be conducted in a simulator or other approved type trainer. If these approaches (ADF, LF/MR range, VOR, and VAR) are not performed in a simulator or other approved type trainer, they should be accomplished during the instrument check flight. A record should be maintained in the pilot's file which will indicate the date that the approaches were performed and the grade received.

(r) *Missed approach procedures.* (See paragraph (s).)

(s) *Traffic-control procedures.* Missed approach procedures and traffic control procedures should be accomplished in a manner satisfactory to the examining check pilot. The degree of satisfactory or unsatisfactory performance should be predicated on the pilot's ability to maneuver the aircraft while performing these procedures, and to follow instructions either verbal or written which may be pertinent to the accomplishment of these procedures. Paragraphs (r) and (s) may be accomplished while performing paragraph (q).

(t) *Cross-wind landing.* A cross-wind landing should be performed when practicable. Traffic conditions and wind velocities will dictate whether a cross-wind landing is practicable. Performance should be judged on the technique used in correcting for drift on final approach, judgment in the use of flaps, and directional control during rollout.

(u) *Landing under regular approach conditions.* Landing under regular approach conditions should necessitate a path of flight around the landing area of not more than a 180° turn but not less than a 90° turn. The pilot should be judged on the basis of altitude and airspeed control and his ability to maneuver under the minimum ceiling and visibility conditions prescribed.

(v) *Takeoffs and landings (with engine(s) failures).* If it is consistent with safety, traffic patterns, local rules and laws, a simulated engine failure should be experienced during takeoff. The simulated failure should occur at any time after the aircraft has passed the V_1 speed pertinent to the particular takeoff and when practicable before reaching 300 feet. When performing the landing, the aircraft should be maneuvered to a landing while utilizing 50 percent of the available power units. The simulated loss of power should be concentrated on one side of the aircraft. The pilot's ability to satisfactorily perform this maneuver should be evaluated in the manner stated under paragraph (i).

(w) *Judgment.* The pilot should demonstrate judgment commensurate with experience required of a pilot-in-command of air carrier aircraft.

(x) *Emergency procedures.* The emergency procedures should be applicable to the type of aircraft being flown and in accordance with the emergency procedures prescribed by the air carrier. A record should be maintained in the

[12] Paragraphs (l), (m), (n), (o), and (p) may be accomplished during a routine line check, or in a simulated or synthetic trainer, or during the instrument check flight. A record should be maintained in the pilot's file which should indicate the date, method utilized, and grade received in the performance of these items.

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pilot's file which will list the emergency procedures accomplished, date performed, and grade received.

(Published in 18 F. R. 1911, Apr. 7, 1953, effective Apr. 25, 1953.)

42.44–3 *Aircraft used in instrument checks (FAA policies which apply to sec. 42.44 (a)(3)).* Where a pilot-in-command is scheduled to fly only one type of land aircraft or one type of seaplane, he should be given his instrument checks in that type of aircraft he is scheduled to fly.

Where a pilot-in-command is scheduled to fly more than one type of land aircraft and/or seaplane, his instrument competency should be checked in all types of aircraft he is scheduled to fly. However, the following exceptions should be allowed:

(a) If a pilot is scheduled to fly 2-engine, 3-engine, and 4-engine aircraft or any combination thereof, and/or more than one type of such aircraft, he should take his instrument checks in one of the larger and more complicated types of aircraft; or if only one of the smaller type aircraft is available, he should take his instrument checks immediately due in that aircraft, but his next instrument checks should be accomplished in one of the larger and more complicated type of aircraft.

(b) If a pilot is scheduled to fly both land aircraft and seaplanes, his instrument checks should include a demonstration of competency in both land aircraft and seaplane in accordance with paragraph (a).

(Published in 18 F. R. 1912, Apr. 7, 1953, effective Apr. 25, 1953.)

42.44–4 *Use of flight simulator in instrument checks (FAA policies which apply to sec. 42.44 (a) (3)).* An air carrier using a flight simulator in its pilot training program may be approved to utilize such a device for certain maneuvers in conducting instrument checks when (a) the training device accurately simulates the flight characteristics and the performance of the applicable aircraft through all ranges of normal and emergency operation, (b) a description of the maneuvers to be conducted in the simulator, other than those specifically authorized in paragraphs (1), (m), (n), (o), (p), and (q) of section 42.44–2, is submitted to the Washington office for approval by the region in which the headquarters of the air carrier is located, and (c) certain critical maneuvers which demonstrate the instrument proficiency of a pilot are executed in an aircraft of the type flown by the pilot in air carrier service. The proficiency flight in the aircraft should include at least maneuvers (minimum speed), approach procedures, handling under regular approach conditions, and takeoff and landings, with engine failures as outlined in section 42.44–2, paragraphs (g), (q), (u), and (v) respectively.

(Published in 18 F. R. 1912, Apr. 7, 1953, effective Apr. 25, 1953.)

42.44–5 *Persons from whom the equipment and instrument checks must be received (FAA interpretations which apply to sec. 42.44).*

(a) "An authorized representative of the Administrator" as used in this section means an FAA Flight Operations and Airworthiness Inspector.

(b) "A check pilot of the air carrier" as used in this section means a check pilot of the air carrier by which the pilot is presently employed. Therefore, checks given to a pilot by the check pilot of a previous employer within the preceding 6 months do not satisfy the experience requirements of subparagraphs (2) and (3) of section 42.44 (a).

(Published in 21 F. R. 450, Jan. 21, 1956, effective Jan. 21, 1956; amended effective June 15, 1957.)

42.44–6 *Flight engineer qualifications for duty (FAA interpretations which apply to sec. 42.44).* An airman assigned to flight-check other flight engineers must meet the recent experience requirements of this part before serving as a flight engineer in air transportation. However, the time spent in giving flight engineer checks may be applied toward the 50-hour recent experience requirement on a particular type of aircraft. Unless such experience has been obtained within the preceding 12-month period, a check by the air carrier or an authorized representative of the Administrator is required.

(Published in 21 F. R. 678, Jan. 31, 1956, effective Feb. 15, 1956; amended in 21 F. R. 2373, Apr. 12, 1956, effective upon publication.)

42.44–7 *Requirements for approved training course—aircraft simulator (FAA rules which apply to sec. 42.44 (a) (4)).*

(a) *Application for approval.* An applicant desiring approval of an aircraft simulator training course shall submit his application in triplicate to the local Air Carrier Safety Inspector. The application shall contain a training course, including a description of the equipment, facilities, and material to be used, together with a letter to the Administrator of the Federal Aviation Agency requesting approval [13] of the course. The application shall be prepared in looseleaf form, shall include a table of contents, time required for each phase of the course; and procedures for administering the following training course:

(1) *Training course.* Flight equipment used shall be identical to that used in actual flight operations and the course [14] shall incorporate at least the following subjects:

(i) All of the required maneuvers in section 40.282 (b) (1) of this subchapter and section 42.44–2 except the visual flight maneuvers performed around the airport.

(ii) A detailed description of the procedures to be employed in performing each of the required maneuvers applicable to the type aircraft being simulated.

(iii) Emergency procedures concerned with aircraft performance and also all emergency procedures outlined in the approved flight manual.

(b) *Revision of training course.* Requests for revisions of the approved training course, facilities, equipment, and material shall be accomplished in the manner established for securing approval of the original training course. Three copies of the revision shall be submitted in such form that entire pages of the approved course can be removed and replaced by the revision.

(c) *Satisfactory completion of course.* Determination of satisfactory completion of the approved aircraft simulator training course shall be made by an authorized representative of the Administrator or a check airman.

(d) *Cancellation of approval.* Failure to meet or maintain any of the standards established for the approval of a training course shall be considered sufficient reason for cancellation of approval.

(Published in 22 F. R. 8998, Nov. 9, 1957, effective Nov. 25, 1957.)

42.44–8 *Simulation requirements of aircraft simulators used in an approved training course (FAA policies which apply to sec. 42.44 (a)(4)).* The aircraft simulator should fully simulate the following systems or conditions:

All normal cockpit noises (adjustable volume is permissible).
All surface controls.
Gust locks.
Trim tabs.
Landing gear operation.
Wheel brakes.
Steering mechanism used on the ground.
Wing flaps.
Powerplants.
Propellers.
Fuel and oil systems (constant rate of depletion is permissible).
Cockpit and circuit breaker station (circuit breakers relating to nonessential flight equipment need not be operable).
Hydraulic system.
Interior cockpit lights.
Fire detection and extinguishing systems.
Pressurization system for aircraft intended to operate above 25,000 feet.
De-icing and anti-icing systems.
Oxygen system for flight crew.

(Published in 22 F. R. 8999, Nov. 9, 1957, effective Nov. 25, 1957.)

42.45 *Proficiency of crew members serving on large aircraft.* Each air carrier shall establish a training program sufficient to ensure that each crew member used by the air carrier is adequately trained and maintains adequate proficiency to perform the duties to which he is to be assigned.

(a) The training program shall consist of appropriate ground and flight training, including all subjects contained in the Operations Manual. Procedures for each crew function

[13] The Administrator will review the training course, and if it is found adequate, will return an approved copy of the application to the applicant.

[14] Any logical arrangement of the training course material will be acceptable, if all the required maneuvers are included, with appropriate description of techniques and procedures.

shall be standardized to the extent that each flight crew member will know the functions for which he is responsible.

(b) No air carrier shall initially assign an individual as a pilot unless he has satisfactorily accomplished a written examination by the carrier to ensure his familiarity with the contents of the Operations Manual and with all types of instrument approach and navigational facilities and procedures to be used. Thereafter, a pilot shall not be utilized by an air carrier unless during the preceding six months:

(1) He has satisfactorily accomplished such written examination, or

(2) He has been in the continuous employ of the air carrier and continuously participating in the training program of the air carrier.

(c) Each air carrier shall provide a sufficient number of check pilots to be able through its own personnel to give each pilot the checks necessary to comply with the requirements of section 42.44 (a). Check pilots shall make written reports of all pilot deficiencies disclosed by checks, and the carrier shall make provisions for such additional pilot training as may be required in each particular case.

42.45–1 *Training program (FAA policies which apply to sec. 42.45).*

(a) *Ground phase.* The ground phase of the air carrier's pilot training and instruction program shall include:

(1) A study of the regulations in this subchapter applicable to irregular air carrier operation and of the provisions of the air carrier's operating certificate, including methods and principles of determining weight limitations for landings and takeoffs;

(2) A study of the company's operations manual and procedures;

(3) Training in the duties and responsibilities of flight crew and crew members;

(4) Through familiarization with the aircraft to be flown including the engines and all major components, operation of cabin pressurization (if installed), oxygen system, standard operating procedures, a study of the *FAA* approved Airplane Flight Manual;

(5) A study of navigation, use of radio aids to navigation and such refresher courses necessary to keep airmen current in the application of any new developments;

(6) A study of meteorology sufficient to maintain a practical knowledge of the principles of icing, fog, thunderstorms and frontal systems, etc., and the best method of operating under these various conditions.

Training and instruction in synthetic-type training devices may be included in the ground phase of the training program. However, such training should be so planned that it will supplement the flight training phase and afford further training in specific instrument let-down procedures to be conducted by the pilot in irregular air carrier operations.

(b) *Flight phase.* The flight phase of the training program should be so planned as to insure adequate initial qualification of the pilot on the type aircraft on which he is to serve. It shall also provide for the continued maintenance of a high standard of pilot proficiency. This training shall include, but not be limited to:

(1) Takeoffs and landings under varying conditions of load, wind, low ceiling and visibility, inoperative engine, etc.;

(2) Flight with one or more engines inoperative, including flight with any one engine fully throttled at maximum authorized load, either at one-engine-inoperative service ceiling or at an altitude equivalent to 1,000 feet above the highest part of the terrain on the route or routes to be flown;

(3) Operating under normal and maximum limits of power and speed;

(4) Conduct instrument flight including navigation by low frequency radio ranges, VHF, and ADF, letting-down-through procedures utilizing radio range, ADF, ILS, GCA, etc., whichever is used by the air carrier in its normal operations.

(c) *Emergency procedures.* The training program shall include instruction in emergency procedures particularly with respect to engine failure, fire in the air or on the ground, evacuation of passengers, location and operation of all emergency equipment, power settings for maximum endurance and maximum range, etc.

(d) *Other.* Whenever flight engineers, flight radio operators, flight navigators, or cabin attendants are utilized, appropriate and ade-

quate training and instruction shall be included in the air carrier's training program.

(Published in 14 F. R. 7039, Nov. 22, 1949, effective upon publication.)

42.46 *Logging flight time.*

(a) A pilot in command may log his total flight time.

(b) A second pilot holding an airline transport pilot certificate and rating for the aircraft flown may log the total time during which he is on duty on the flight deck.

(c) A second pilot not holding an airline transport pilot certificate and rating for the aircraft flown may log 50 percent of the total flight time during which he is on duty on the flight deck.

(d) A pilot may log as instrument flight time only such time as he is actually manipulating the controls when the aircraft is being flown solely by reference to instruments.

42.47 *Grace period for airman periodic checks.* Whenever this part requires an airman check at stated intervals, such check may be given at any time during the month preceding or following the month in which it becomes due. The effective date of the check, if given within the preceding or following month, shall be the same as if given within the month in which it became due.

42.48 *Flight time limitations for pilots on large aircraft.* The following limitations shall be applicable to pilots serving on large aircraft.

(a) *Individual pilot limitations.*

(1) A pilot may be scheduled to fly 8 hours or less during any 24 consecutive hours without a rest period during such 8 hours.

(2) A pilot shall receive 24 hours of rest before being assigned further duty when he has flown in excess of 8 hours during any 24 consecutive hours.

(3) A pilot shall be relieved from all duty for not less than 24 consecutive hours at least once during any 7 consecutive days.

(4) A pilot shall not fly as a crew member in air carrier service more than 100 hours during any 30 consecutive days.

(5) A pilot shall not fly as a crew member in air carrier service more than 1,000 hours in any one calendar year.

(6) A pilot shall not do other commercial flying if his total flying time for any specified period will exceed the limits of that period.

(7) Time spent in any deadhead transportation shall in no case be considered as part of a required rest period.

(b) *Aircraft having a crew of two pilots.*

(1) A pilot shall not be scheduled to fly in excess of 8 hours during any 24-hour period unless he is given an intervening rest period at or before the termination of 8 scheduled hours of flight duty. Such rest period shall equal at least twice the number of hours flown since the last preceding rest period, and in no case shall such rest period be less than 8 hours. During such rest period the pilot shall be relieved of all duty with the air carrier.

(2) A pilot shall not be on duty for more than 16 hours during any 24 consecutive hours.

(c) *Aircraft having a crew of three pilots.*

(1) A pilot shall not be scheduled for duty on the flight deck in excess of 8 hours in any 24-hour period.

(2) A pilot shall not be scheduled to be aloft for more than 12 hours in any 24-hour period.

(3) A pilot shall not be on duty for more than 18 hours in any 24-hour period.

(d) *Aircraft having a crew of four pilots.*

(1) A pilot shall not be scheduled for duty on the flight deck in excess of 8 hours during any 24-hour period.

(2) A pilot shall not be scheduled to be aloft for more than 16 hours in any 24-hour period.

(3) A pilot shall not be on duty for more than 20 hours during any 24-hour period.

42.48–1 *"Scheduled to fly," "scheduled to be aloft," and "scheduled for duty on the flight deck" (FAA interpretations which apply to sec. 42.48).* The phrases "scheduled to fly" and "scheduled to be aloft," as used in this section, refer to the estimated "block-to-block time" for a particular flight under normal operating conditions. The phrase "scheduled for duty on the flight deck," as used in this section, refers to that portion of such "block to-block time" during which the airman is scheduled for flight duty on the aircraft.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.48–2 *Scheduled type operations (FAA policies which apply to sec. 42.48).* An operator conducting a scheduled type operation (e. g., scheduled cargo-only service, regular flights between points pursuant to a military contract, etc.) may establish flight operations schedules for a particular route or route segment in order to determine compliance with the scheduling provisions of the flight time limitations.

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

42.49 *Assignment of emergency evacuation functions for each crew member.* **After May 31, 1956, each air carrier shall assign all necessary emergency functions for each crew member to perform in the event of circumstances requiring emergency evacuation. The air carrier shall show that functions so assigned are practicable of accomplishment. These functions shall be described in the air carrier manual.**

Flight Operation Rules

42.51 *Pilot responsibilities.*

(a) *Pilot in command.* **The pilot in command of the aircraft shall be designated by the air carrier.**

(b) *Preflight action.* **Prior to commencing a flight the pilot in command shall familiarize himself with the latest weather reports pertinent to the flight issued by the United States Weather Bureau or if unavailable, by the most reliable source, and with the information necessary for the safe operation of the aircraft en route, and on the airports or other landing areas to be used, and determine that the flight can be completed with safety.**

(c) *Charts and flight equipment.* **The pilot in command shall have in his possession in the cockpit proper flight and navigational facility charts, including instrument approach procedures when instrument flight is authorized, and such other flight equipment as may be necessary to properly conduct the particular flight proposed.**

(d) *Emergency decisions.*

(1) When required in the interest of safety, a pilot may make any immediate decision and follow any course of action which in his judgment appears necessary, regardless of prescribed methods or requirements. He shall, where practicable, keep the proper control station fully informed regarding the progress of the flight.[6]

[6] See section 42.94 for the report to be filed by the pilot where the authority granted by this section is exercised.

(2) In an emergency requiring either the dumping of fuel or a landing at a weight in excess of the authorized landing weight, a pilot may elect to follow whichever procedure he considers safer.

(e) *Serviceability of equipment.* **Prior to starting any flight, the pilot shall determine that the aircraft, all engines and propellers, appliances and required equipment, including all instruments, are in proper operating condition. If during the flight any such engine, propeller, appliance, or equipment malfunctions or becomes inoperative, the pilot in command shall determine whether the flight can be continued with safety. Unless he believes that flight can be continued safely, he shall hold or cancel it until satisfactory repairs or replacements are made.**

(f) *Admission to flight deck of aircraft having a separate pilot compartment.* **No persons, other than crew members, shall be admitted to the flight deck of an airplane having a separate pilot compartment except those authorized in subparagraphs (1) and (2) of this paragraph. For the purposes of this section, the Administrator shall determine what constitutes the flight deck.**

(1) FAA Flight Operations and Airworthiness Inspectors and authorized representatives of the Board while in the performance of official duties shall be admitted to the flight deck.

NOTE: Nothing contained in this paragraph shall be construed as limiting the emergency authority of the pilot in command to exclude any person from the flight deck in the interest of safety.

(2) The persons listed below may be admitted to the flight deck when authorized by the pilot in command:

(i) An employee of the Federal Government or of an air carrier or other aeronautical enterprise whose duties are such that his presence on the flight deck is necessary

or advantageous to the conduct of safe air carrier operations, or

NOTE: Federal employees who deal responsibly with matters relating to air carrier safety and such air carrier employees as pilots, dispatchers, meteorologists, communication operators, and mechanics whose efficiency would be increased by familiarity with flight conditions may be considered eligible under this requirement. Employees of traffic, sales, and other air carrier departments not directly related to flight operations cannot be considered eligible unless authorized under subdivision (ii) of this subparagraph.

(ii) Any other person specifically authorized by the air carrier management and the Administrator.

(3) All persons admitted to the flight deck shall have seats available for their use in the passenger compartment except;

(i) FAA Flight Operations and Airworthiness Inspectors or other authorized representatives of the Federal Aviation Agency or the Civil Aeronautics Board engaged in checking flight operations;

(ii) Air traffic controllers who have been authorized by the Administrator to observe ATC procedures;

(iii) Certificated airmen of the air carrier whose duties with the carrier require an airman certificate;

(iv) Certificated airmen of another air carrier whose duties with such carrier require an airman certificate and who have been authorized by the air carrier concerned to make specific trips over the route;

(v) Employees of the air carrier, whose functions are directly related to the conduct or planning of flight operations or the in-flight monitoring of aircraft equipment or operating procedures, but only when their presence in the cockpit is required in the furtherance of such functions and when specifically authorized in writing by a responsible supervisor in the operations department of the air carrier, who is listed in the Operations Manual as having such authority; and

(vi) Technical representatives of the manufacturer of the airplane or its components whose functions are directly related to the in-flight monitoring of aircraft equipment or operating procedures, but only when their presence in the cockpit is required in the furtherance of such functions and only when specifically authorized in writing by the Administrator and by a responsible supervisor in the operations department of the air carrier, who is listed in the Operations Manual as having such authority.

42.51–1 *Preflight responsibilities (FAA interpretations which apply to sec. 42.51 (a) and (b)).* In complying with section 42.51 (a) and (b)—particularly that portion requiring the pilot in command to familiarize himself with "the information necessary for the safe operation of the aircraft en route and on the airports or other landing areas to be used"—the pilot in command must, prior to origination of each flight review the en route procedures, radio navigational facilities, holding patterns, approach procedures, and letdown procedures for the airport of destination and the alternate airports, if any, for the proposed flight.

Under the provisions of section 42.60–5, an air carrier using a large aircraft is required to establish a procedure in its operations manual whereby the pilot in command will under certain conditions certify on an appropriate form provided by the air carrier that the specified preflight action has been taken, and whereby such certification will be maintained as a part of its flight records.

(Published in 17 F. R. 5811, June 28, 1952, effective upon publication; amended in 18 F. R. 172, Jan. 9, 1953, effective Jan. 31, 1953.)

42.51–2 *Responsibilities of the pilot-in-command (FAA policies which apply to sec. 42.51).* In addition to the responsibilities prescribed in this section, the pilot-in-command is responsible for:

(a) Safe and efficient conduct of the flight to which assigned;

(b) Proper performance of duties by other assigned members of the crew;

(c) Conducting the flight in accordance with the provisions of the air carrier's irregular air carrier operating certificate and the applicable Civil Air Regulations;

(d) The exercise of good judgment in the planning of the flight;

(e) Proper loading of the aircraft, stowage of cargo, and adequacy of tie-down facilities;

(f) Determining that there are sufficient approved seats and safety belts for the number

of persons aboard the aircraft, and that safety belts are fastened when required;

(g) Proper servicing of the aircraft, including sufficient fuel, oil, and other items, such as de-icer fluid, etc., as may be necessary for the safety of the flight.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication; amended in 17 F. R. 5810, June 28, 1952, effective upon publication.)

42.51–3 *Time of reporting for duty (FAA policies which apply to sec. 42.51 (b)).* Each pilot should report in sufficient time prior to the start of the flight to permit reading of pilot's bulletins, current NOTAMS, studying of weather forecasts and reports, and other items pertinent to the proposed flight.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication; amended in 17 F. R. 5810, June 28, 1952, effective upon publication.)

42.51–4 *Flight equipment (FAA policies which apply to sec. 42.51 (c)).* Flight equipment shall include, but not be limited to, a navigation computer or calculator; current Airman's Guide; Flight Information Manual; International Flight Information Manual, if foreign flight is contemplated; and when night flight is contemplated, two satisfactory flashlights in good working order.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication; amended in 17 F. R. 5810, June 28, 1952, effective upon publication.)

42.51–5 *Serviceability of equipment (FAA policies which apply to sec. 42.51 (e)).*

(a) The pilot, as the authorized representative of the air carrier, is held responsible for the airworthiness of the aircraft and all its component parts or assemblies during its operation. Prior to starting any flight, the airworthiness of the aircraft will normally be determined through an inspection of the log book and maintenance records to make sure that all required maintenance functions and inspections have been accomplished and that the previously reported mechanical difficulties have been corrected. In addition, the pilot shall test the radio equipment and such instruments as may be ground checked for satisfactory operation. The pilot's responsibility also includes that of determining that refueling procedures and equipment are safe in all respects; such as, determination that water has been eliminated from the fuel, that sumps are drained on the aircraft, etc.

(b) When a malfunction or other difficulty is experienced with any component of the aircraft during the flight, the pilot should determine that a reasonable margin of safety will exist with those components which remain in good operating condition. If the situation exists where an additional failure would cause a hazardous condition the pilot should not continue flight, but should land at the nearest available landing area where a safe landing can be made.

(c) If any required instrument having functions which are not compensated for becomes inoperative during flight, a landing shall be made at the first airport where proper facilities to permit a safe landing are available.

(d) If unable to maintain two-way radio communications, the pilot in command shall:

(1) If operating under VFR conditions, proceed under VFR and land as soon as practicable, or

(2) Proceed according to the latest air traffic clearance to the radio facility serving the airport of intended landing, maintaining the minimum safe altitude or the last acknowledged assigned altitude, whichever is higher. Descent shall start at the expected approach time last authorized or, if not received and acknowledged at the estimated time of arrival indicated by the elapsed time specified in the flight plan.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication; amended in 17 F. R. 5810, June 28, 1952, effective upon publication.)

42.52 *Fuel supply.* The following minimum fuel requirements shall be applicable as specified:

(a) *United States.* Within the continental limits of the United States the following requirements shall be met unless the Administrator finds, after considering the character of the terrain being traversed, the available airports, and the category of aircraft being operated, that the safe conduct of the flight normally requires a greater quantity of fuel.

(1) No flight in small aircraft under VFR shall be started unless the aircraft carries sufficient fuel and oil, considering the wind and other weather conditions forecast, to fly to the point of intended landing, and thereafter

for a period of at least 30 minutes at normal cruising consumption.

(2) No flight in large aircraft under VFR shall be started unless, considering the factors enumerated in subparagraph (1) of this paragraph, the aircraft carries sufficient fuel and oil to fly to the point of intended landing, and thereafter for a period of at least 45 minutes at normal cruising consumption.

(3) No flight in large or small aircraft under IFR shall be started unless, considering the factors set forth in subparagraph (1) of this paragraph, sufficient fuel and oil are carried aboard the aircraft (i) to reach the point of intended landing, (ii) thereafter to fly to the alternate airport, and (iii) thereafter to fly for a period of 45 minutes at normal cruising consumption.

(b) *Outside the United States.* Outside the continental limits of the United States, the following requirements shall be met unless the Administrator finds, after considering the character of the terrain being traversed, the available airports, and the category and type of aircraft being operated, that the flight may be safely conducted with a lesser quantity of fuel.

(1) No flight shall be started unless, considering the wind and other weather conditions expected, the aircraft carries sufficient fuel and oil (i) to fly to the next point of landing specified in the flight plan, (ii) thereafter to fly to and land at the most distant alternate airport designated in the flight plan, and (iii) thereafter to fly for a period of at least 2 hours at normal cruising consumption.

(2) No flight shall be returned to the point of departure or to an alternate airport for that point unless the aircraft has sufficient fuel to return to such point and thereafter to fly for a period of at least 2 hours at normal cruising consumption.

(3) No flight shall be started to a destination for which there is no available alternate unless the aircraft carries sufficient fuel, considering wind and other weather conditions expected, to fly to that point and thereafter to fly for at least 3 hours at normal cruising consumption.

42.52–1 *Operations in the State of Alaska (FAA policies which apply to sec. 42.52(a)).* For operations in the State of Alaska, the minimum fuel requirements specified for operations within the continental limits of the United States shall apply, except as indicated in section 42.52–2.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.52–2 *Operations in the State of Alaska (FAA policies which apply to sec. 42.52 (b)).* The minimum fuel requirements specified for operations outside the continental limits of the United States shall apply to all off-airway overwater operation into or out of the State of Alaska, and to all instrument operation to or from points north of latitude 67° N. or to or from points in the Aleutian and Pribiloff Islands west of longitude 160° W.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.53 *Minimum flight altitude rules.* Except during takeoff and landing, the flight altitude rules prescribed in paragraphs (a) and (b) of this section, in addition to the applicable provisions of Section 60.17 of this subchapter, shall govern air carrier operations: *Provided,* That other altitudes may be established by the Administrator for any area where he finds, after considering the character of the terrain being traversed, the quality and quantity of meteorological service, the navigational facilities available, and other flight conditions, that the safe conduct of flight permits or requires such other altitudes.

(a) *Day VFR operations.* No aircraft shall be flown at an altitude less than 500 feet above the surface or less than 1,000 feet from any mountain, hill, or other obstruction to flight.

(b) *Night VFR or IFR operations.* No aircraft shall be flown at an altitude less than 1,000 feet above the highest obstacle located within a horizontal distance of 5 miles from the center of the course intended to be flown or, in mountainous terrain designated by the Administrator, 2,000 feet above the highest obstacle located within a horizontal distance of 5 miles from the center of the course intended to be flown: *Provided,* That in VFR operations at night in such mountainous terrain aircraft may be flown over a lighted civil airway at a minimum altitude of 1,000 feet above such obstacle.

42.54 *Flight into known icing conditions.* No aircraft shall be flown into known or probable heavy icing conditions. Aircraft may be flown into light or moderate icing conditions only if the aircraft is equipped with an approved means for de-icing the wings, propellers, and such other parts of the aircraft as are essential to safety.

42.54–1 *Other parts of the aircraft (FAA interpretations which apply to sec. 42.54).* The other parts of the aircraft referred to in this section include, but are not limited to, carburetors, windshields, pitot-static tubes, and empennage surfaces.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.55 *Weather minimums.* No flight shall be started unless the takeoff, en route operation, and landing at destination can be conducted in accordance with the weather requirements of Part 60 of this subchapter,[7] but in no case less than the minimums specified below:

[7] See Parts 609 and 610 of the Regulations of the Administrator, or refer to the Approach and Landing Charts and Radio Facility Charts of the Coast and Geodetic Survey, and to the Airman's Guide for specific en route, takeoff, and landing minimums for particular routes and airports.

(a) For VFR takeoff, en route operation, or landing, the weather minimums shall be a ceiling of 1,000 feet and visibility of 1 mile for day and 2 miles for night, unless otherwise authorized by an air traffic clearance obtained from air traffic control.

(b) For IFR operations the weather minimums, including alternate airport requirements, shall not be less than those specified in Parts 609 and 610 of the Regulations of the Administrator, or as otherwise specified or authorized by the Administrator. These weather minimums, including alternate airport requirements, also may be found in the Approach and Landing Charts and Radio Facility Charts of the Coast and Geodetic Survey and in the Airman's Guide.

42.55–1 Deleted.

(Published in 20 F. R. 4148, June 15, 1955, effective June 30, 1955.)

42.55–2 *Air traffic clearance (FAA interpretations which apply to sec. 42.55 (a)).* An air traffic clearance obtained from air traffic control is an approval for the flight, or portion thereof, only with regard to known traffic conditions and does not authorize a pilot to violate the Civil Air Regulations pertaining to weather minimums. Regardless of any air traffic clearance obtained from air traffic control, the minimum visibility shall be not less than 1 mile for day and 2 miles for night in control zones, and 3 miles in control areas.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.55–3 *IFR takeoff and landing minimums (FAA policies which apply to sec. 42.55).*

(a) The basic IFR takeoff minimums and landing minimums for each type of instrument approach procedure are prescribed in the operations specifications issued to an air carrier or commercial operator under the authority of this part. Frequently, these minimums are higher than those published in Part 609 of the Regulations of the Administrator. However, by application to the local inspector having certificate responsibility, minimums down to the lowest minimums prescribed in Part 609 for a particular airport may be authorized if such airport is regularly used by an air carrier or commercial operator (e. g., main operations base). To obtain such authorization, the air carrier or commercial operator will be required to demonstrate that its pilot training program and overall operating proficiency is adequate for the use of lower minimums. Such lower minimums, when approved, will be applicable only to those pilots-in-command who (1) have served as a pilot or as an observer member of the crew on the flight deck during operations conducted into the particular airport within the previous twelve months, (2) have been checked in accordance with section 42.44–2 of this subchapter on the type of facility for which the lower minimums are authorized, and (3) have been so certified by a company check pilot as being qualified to operate at the lower minimums.

(Published in 20 F. R. 4148, June 15, 1955, effective June 30, 1955; amended effective June 15, 1957.)

42.56 *Instrument approach.* No instrument approach procedure shall be executed or landing made at an airport when the latest United States Weather Bureau report for that airport indicates the ceiling or visibility to be less than that prescribed by the Administrator for landing at such airport: *Provided,* That, if

an instrument approach procedure is initiated when the current U. S. Weather Bureau report indicates that the prescribed ceiling and visibility minimums exist and a later weather report indicating below minimum conditions is received after the aircraft (a) is on an ILS final approach and has passed the outer marker, or (b) is on a final approach using a radio range station or comparable facility and has passed the appropriate facility and has reached the authorized landing minimum altitude, or (c) is on GCA final approach and has been turned over to the final approach controller, such approach may be continued and a landing may be made in the event weather conditions equal to or better than the prescribed minimums for the airport are found to exist by the pilot in command of the flight upon reaching the authorized landing minimum altitude.

42.56–1 *Standard instrument approach procedures (FAA rules which apply to sec. 42.56).* Standard instrument approach procedures prescribed by the Administrator are published in part 609 of this title (i. e. Regulations of the Administrator).

(Published in 16 F. R. 7351, July 27, 1951, effective upon publication.)

42.56–2 *Takeoff and landing weather minimums (FAA rules which apply to sec. 42.56).*

(a) *General.* The ceiling and visibility contained in the main body of the latest weather report furnished by the U. S. Weather Bureau or a source approved by the Weather Bureau shall be used for instrument approach and landing or takeoff for all runways of an airport except as provided in paragraph (b).

(b) *Runway visibility.* Whenever the latest weather report furnished by the U. S. Weather Bureau or a source approved by the Weather Bureau, including an aural report from the control tower, contains a visibility value specified as runway visibility for a particular runway of an airport, such visibility shall be used for a straight-in approach and landing or takeoff for that runway only.[15]

(Published in 20 F. R. 9039, Dec. 9, 1955, effective Dec. 15, 1955.)

[15] Information respecting the official runway visibility observations reported by the control tower operator may be obtained from the Office of the U. S. Weather Bureau for the airport concerned. Such office maintains a continuous graph recording of the runway visibility shown on the visibility meter in the control tower.

42.57 *Airport lighting for night operations.* No air carrier shall use an airport for the takeoff or landing of an aircraft at night unless such airport is adequately lighted.

42.57–1 *Minimum facilities (FAA policies which apply to sec. 42.57).* The minimum facilities and equipment for airport lighting where night operations are authorized and conducted shall include at least the following:

(a) Adequate boundary lights defining the boundaries of the usable area and/or adequate contact (runway marker) lights identifying the outer limits of the runways. Lights of the open-flame type (flare pots) are not considered adequate contact lights, except in an emergency. Range lights (aviation green) shall be installed and operating in conjunction with the boundary or contact (runway marker) lights.

(b) Floodlights, either of a permanent or portable type, shall be provided and operated to illuminate the ramp, apron, and passenger-loading area.

(c) Obstructions on and in the vicinity of the landing area should be obstruction lighted. The criteria for determining obstructions to air navigation and for the lighting of obstructions to air navigation are contained in Technical Standard Orders available from the Aeronautical Reference Branch, Attn: MS–126, Federal Aviation Agency, Washington 25, D.C.

(d) An illuminated wind direction indicator shall be provided and located so as to be clearly visible from the ground and the air.

(Published in 18 F. R. 1719, Mar. 27, 1943, effective Apr. 15, 1953; amended effective June 15, 1957.)

42.58 *Navigational aids for IFR flight.* IFR operations shall be conducted only over civil airways and at airports equipped with radio ranges or equivalent facilities, unless the Administrator has found that instrument navigation can be conducted by the use of radio direction finding equipment installed in the aircraft or by other specialized means and has approved or otherwise authorized such operation in the air carrier operating certificate.

42.58–1 *Off-airway instrument operation (FAA rules which apply to sec. 42.58).*

(a) Off-airway instrument operation may be authorized provided the aircraft is properly equipped, and the flight crew demonstrates they are capable of navigating along a predetermined

flight path over a proposed route without deviating more than 5 miles or 5 degrees on either side (whichever is the lesser) from a straight line drawn between the point of departure and the next point of arrival.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication; amended in 21 F. R. 4312, June 20, 1956, effective July 1, 1956.)

42.59 *Briefing of passengers.* After May 31, 1956, each air carrier engaged in extended overwater operations shall assure that all passengers are briefed orally concerning the location and method of operation of life vests and emergency exits and the location of life rafts. The procedure to be followed in presenting this briefing shall be described in the air carrier manual. Such a briefing shall include a demonstration of the method of donning and inflating a life vest. Where the airplane proceeds directly over water after takeoff, the briefing on location of the life vests and emergency exits shall be accomplished prior to takeoff, and the remainder of the briefing shall be accomplished as soon thereafter as practicable. Where the airplane does not proceed directly over water after takeoff, no part of the briefing need be accomplished prior to takeoff but the entire briefing shall be accomplished prior to reaching the overwater portion of the flight.

42.59–1 *Placement of established procedures (FAA policies which apply to sec. 42.59).* The procedures required by this section shall be contained in the air carrier's operations manual.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective upon publication.)

42.60 *Operations manual for large aircraft.*

(a) When operations are conducted in large aircraft the air carrier shall prepare and maintain for the use and guidance of operations personnel an operations manual which contains full information necessary to guide flight and ground personnel in the conduct of safe flight operations and to inform such personnel regarding their duties and responsibilities. The manual shall also contain a copy of the air carrier operating certificate. The form and content shall be acceptable to the Administrator. Copies and revisions shall be furnished to all persons designated by the Administrator. All copies in the hands of company personnel shall be kept up to date.

(b) A copy of the operations manual shall be kept at the principal operations base. Those portions of the manual pertinent to safe operation of the aircraft, including the copy of the air carrier operating certificate, shall be carried therein.

(c) Any changes prescribed by the Administrator in the interest of safety shall be promptly incorporated in the manual. Other changes not inconsistent with any Federal regulation, the air carrier operating certificate, or a safe operating practice may be made without the prior approval of the Administrator.

(d) No operation shall be conducted by the air carrier contrary to the safety provisions of the operations manual.

42.60–1 *Form of operations manual (FAA rules which apply to sec. 42.60).* The operations manual shall be loose leaf in form with letter-size pages, and shall be numbered and indexed in a manner to facilitate its use as reference material by the personnel concerned. Each page shall include a space in which the date of last revision will be indicated. Existing manuals may be utilized if they are found to fulfill the requirements of this section and are considered acceptable by the local inspector.

(Published in 14 F. R. 7040, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.60–2 *Content of operations manual (FAA rules which apply to sec. 42.60 (a)).*

(a) Table of contents. In preparing the manual the arrangement outlined below shall be followed.

TABLE OF CONTENTS

Chapter I.—General.
- Section 1—A copy of the air carrier's operating certificate and operations specifications, including the operations authorizations.
- Section 2—Part 42 of the Civil Air Regulations and CAM 42.
- Section 3—Instrument Approach Procedure Charts for all airports which the air carrier intends to utilize.
- Section 4—Other publications deemed necessary or applicable.

Chapter II.—Organization and Company Personnel.

Chapter III.—Operations Instructions. General policies for the guidance of operations personnel

Chapter IV.—Operating Procedures, including loading instructions and copies of cockpit check lists.

Chapter V.—Accident and Emergency Procedures, including list of emergency equipment.

Chapter VI.—Training Program.

Chapter VII.—Foreign Operations Instructions (if foreign operations are authorized).

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.60–3 Deleted.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication, deleted effective June 15, 1957.)

42.60–4 *Copy of operations manual in aircraft (FAA policies which apply to sec. 42.60 (b)).* In order that flight personnel of the air carrier may have more effectual use of the manual required by this section, the pilot in command shall have readily available in the cockpit a current copy of the manual required by this section, including a copy of the air carrier operating certificate and operations specifications. This manual shall contain such operations instructions as are necessary for the type of operations and aircraft concerned, and interpreting the air carrier's procedures to be followed in complying with the operations requirements of this part and the operations specifications.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.60–5 *Preflight certification (FAA rules which apply to sec. 42.60 (a) and (c)).* In the interest of safety, the air carrier shall establish in all operations manuals maintained for the use and guidance of operations personnel a procedure whereby the pilot in command, who has not flown over the route and into the airport of destination within the preceding 60 days, will certify on an appropriate form provided by the air carrier that he has taken the preflight actions specified in section 42.51–1. The manual shall also contain a procedure for maintaining such certification as part of the air carrier flight records.

(Published in 18 F. R. 172, Jan. 9, 1953, effective Jan. 31, 1953.)

42.60a *Airplane flight manual.*

(a) The air carrier shall keep current an approved Airplane Flight Manual for each type of transport category airplane which it operates.

(b) An approved Airplane Flight Manual or a manual complying with section 42.60 and containing information required for the Airplane Flight Manual shall be carried in each transport category airplane.

42.61 *Flight plan for large aircraft.* No large aircraft shall be taken off unless a VFR or IFR flight plan containing the appropriate information required by Part 60 of this subchapter is filed by the air carrier with the nearest FAA communications station or, when outside the United States, with the appropriate authority. In the event communications facilities are not readily available, such flight plan shall be filed as soon as practicable after becoming air-borne. An IFR or VFR flight plan must thereafter be in effect for all portions of the flight.

42.61–1 *IFR operation in control zone or control area (FAA policies which apply to sec. 42.61).* Prior to takeoff from a point within a control zone, or prior to entering a control area or control zone when operating under IFR conditions, an IFR flight plan shall be filed and an air traffic control clearance shall be obtained from air traffic control.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.62 *Flight manifest for large aircraft and passenger-carrying aircraft operating under IFR conditions.* For all large aircraft, or any aircraft carrying passengers under IFR conditions, a flight manifest form shall be prepared and signed for each flight by qualified personnel of the air carrier charged with the duty of supervising the loading of the aircraft and the preparation of the flight manifest form. The form and contents of this manifest shall be in accordance with the instructions contained in the air carrier's operations manual and shall include the names and addresses of the passengers carried, points of departure and destination, the weight of the cargo and passengers, and the distribution of such weight in the aircraft in accordance with the weight control system prescribed in the operations manual. The weight of the passengers may be

determined in accordance with a weight control system prescribed by the Administrator. In the event passengers are picked up at points other than the principal operations base or discharged at points other than as shown on the latest manifest, the pilot shall, before starting the flight, cause a duplicate copy of the revised manifest to be mailed to such base, unless other requirements are set forth in the carrier's operations manual.[8]

[8] See section 42.95 for record-keeping requirements for the flight manifest.

42.62–1 *Content of flight manifest (FAA policies which apply to sec. 42.62).* The flight manifest required by this section shall include at least the following information:

(a) Company or organization name.
(b) Date of flight.
(c) Flight or trip number.
(d) Point of departure.
(e) Destination (via route, etc.).
(f) Make, model, and registration number of aircraft.
(g) Names and addresses of passengers.
(h) Location and weight of crew, gasoline, oil, passengers, cargo, and ballast (if any).
(i) Empty, gross, and useful aircraft weights.
(j) Aircraft c. g. limits.
(k) C. g. of aircraft as loaded.
(l) Signature of pilot or authorized loading officer.

Extra manifest forms should be carried aboard the aircraft in order to meet the requirements in regard to discharging or picking up passengers or cargo at other than the principal operations base.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.62–2 *Weight control system (FAA interpretations which apply to sec. 42.62).* The weight control system as mentioned in this section includes the loading procedures as prescribed in the Operations Manual as well as the data derived from the weighing procedures or approved weight control system set forth in the Maintenance Manual.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.63 *Night VFR operations for large passenger-carrying aircraft; special rules.*

(a) Night VFR passenger operations in large aircraft shall be conducted only over civil airways or over off-airway routes for which the Administrator has established minimum en route instrument altitudes. Night VFR operations over such off-airway routes shall be conducted at or above such established altitudes. In addition, night VFR operations may be conducted only at airports equipped with satisfactory radio navigational facilities for which the Administrator has established approach procedures: *Provided,* That the Administrator may authorize operations at other airports upon finding that safe transition between the route and the airport may be made visually under weather minimums which he may establish, but which will in no case be lower than those provided in section 42.55 (a).

NOTE: Minimum en route instrument altitudes which have been established by the Administrator are published in the Flight Information Manual.

(b) During night VFR passenger operations in large aircraft the pilot-in-command of the aircraft shall ensure that a continuous watch is maintained on the appropriate radio frequencies and shall report by radio as soon as possible the time and altitude of passing each designated reporting point together with weather conditions and any other information which the pilot considers important to the safety of flight. In addition, in operations over off-airway routes the pilot-in-command shall report as soon as possible the time and altitude of passing over each check point specified in the flight plan.

42.64 *Flight crew members at controls.* All required flight crew members when on flight deck duty shall remain at their respective stations while the aircraft is taking off or landing, and while en route except when the absence of one such flight crew member is necessary for the performance of his duties in connection with the operation of the aircraft. All flight crew members shall keep their seat belts fastened when at their respective stations.

42.65 *Drinking and serving of alcoholic beverages.*

(a) No person shall drink any alcoholic beverage aboard an air carrier aircraft unless such beverage has been served to him by the air carrier operating the aircraft.

(b) No air carrier shall serve any alcoholic

beverage to any person aboard an air carrier aircraft if such person appears to be intoxicated.

NOTE: Section 42.65 does not become effective until March 10, 1960.

Operating Limitations for Large Passenger-Carrying Airplanes

42.70 *Operating limitations for transport category airplanes.*

(a) In operating any passenger-carrying transport category airplane the provisions of sections 42.71 through 42.78 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.

(b) For transport category aircraft the data contained in the Airplane Flight Manual shall be applied in determining compliance with these provisions. Where conditions differ from those for which specific tests were made, compliance shall be determined by interpolation or by computation of the effects of changes in the specific variables where such interpolations or computations will give results substantially equalling in accuracy the results of a direct test.

(c) 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 takeoff runway limitations of the transport category operating rules, after taking into account the temperature operating correction factors required by sections 4a.749a-T or 4b.117 of this subchapter, and set forth in the Airplane Flight Manual for the airplane.

42.70–1 *Deviations (FAA rules which apply to sec. 42.70 (a)).* An application for any deviation shall include all supporting data and shall be forwarded to the district office charged with the over-all inspection of the air carrier's operations.

(Published in 19 F. R. 2168, Apr. 15, 1954, effective Apr. 25, 1954; amended effective June 15, 1957.)

42.70–2 *Accuracy of data (FAA policies which apply to sec. 42.70 (b)).* The charts and data prepared by the air carrier for use of flight and operations personnel should be prepared with sufficient accuracy and clarity that the gross weight and runway length values for specific operating conditions can be reproduced within a tolerance of one-half of 1 percent by an independent recheck.

(Published in 19 F. R. 2168, Apr. 15, 1954, effective Apr. 25, 1954.)

42.70–3 *Temperature accountability (FAA policies which apply to sec. 42.70 (c)).* The maximum permissible weight for a given takeoff should be equal to the lowest of three values determined separately by consideration of (a) accelerate-stop, (b) takeoff and climb out to a 50-foot height and (c) the obstacle clearance condition. The established temperature accountability correction factors appearing in the Airplane Flight Manuals are applied to the takeoff weights determined by the accelerate-stop and climb out to a 50-foot height. These values may be used individually or in combination, i. e., if a runway is considerably longer than is required to meet the accelerate-stop and climb out to 50-foot requirements at standard temperature, then at temperatures higher than standard, takeoff weight need not be reduced as long as additional runway length is available. When the temperature reaches a value at which no additional runway length remains, then a reduction in weight would be necessary. These factors do not apply to weights determined by obstacle clearance considerations. If the takeoff weight at standard temperature is limited by obstruction clearance rather than by the climb out to 50 feet or by the accelerate-stop distance, a weight reduction need not be made for temperatures higher than standard until the temperatures reach a high enough value to use up the existing runway between that used for standard temperature (limited to less than the full runway because of obstacles) and the actual length.

(Published in 19 F. R. 2168, Apr. 15, 1954, effective Apr. 25, 1954.)

42.71 *Weight limitations.*

(a) No airplane shall be taken off from any airport located at an elevation outside of the altitude range for which maximum takeoff weights have been determined, and no airplane shall depart for an airport of intended destination, or have any airport specified as an alternate, which is located at an elevation outside of the altitude range for which maximum landing weights have been determined.

(b) The weight of the airplane at takeoff shall not exceed the authorized maximum takeoff weight for the elevation of the airport from which the takeoff is to be made.

(c) The weight at takeoff shall be such that, allowing for normal consumption of fuel and oil in flight to the airport of intended destination, the weight on arrival will not exceed the authorized maximum landing weight for the elevation of such airport.

42.71–1 *Weight limitations (FAA policies which apply to sec. 42.71).* The limitations imposed by section 42.71 take into account only one operating variable, i. e., the elevation of the airport to be used as it affects the weight of the aircraft during takeoff or landing. Other operating variables, such as runway length, gradient, wind and temperature, are considered in other sections of this part. Compliance with this section does not present a particular problem since the Airplane Flight Manual provides performance data for airports over a wide range of elevations. However, most manuals do not provide data for operations at airports below sea level. Section 42.71 should not be construed as prohibiting operations from airports below sea level, since sea level data in the Airplane Flight Manual, being conservative, may be applied to such airports.

(Published in 19 F. R. 2168, Apr. 15, 1954, effective Apr. 25, 1954.)

42.72 *Takeoff limitations to provide for engine failure.* No takeoff shall be made except under conditions which will permit compliance with the following requirements:

(a) It shall be possible, from any point on the takeoff up to the time of attaining the critical-engine-failure speed, to bring the airplane to a safe stop on the runway, as shown by the accelerate-stop distance data.

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

(1) In determining the allowable deviation of the flight path in order to avoid obstacles by at least the distances above set forth, it shall be assumed that the airplane is not banked before reaching a height of 50 feet, as shown by the takeoff path data, and that a 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 takeoff surface. To allow for wind effect, takeoff data based on still air may be corrected by not more than 50 percent of the reported wind component along the takeoff path if opposite to the direction of takeoff, and shall be corrected by not less than 150 percent of the reported wind component if in the direction of takeoff.

42.72–1 *Takeoff limitations to provide for engine failure (FAA policies which apply to sec. 42.72).*

(a) *Takeoff flight path.* Diagram 1 is a pictorial representation of the relationship required between the dimensions of an airport and its surroundings, and the performance of the airplane. It illustrates the takeoff flight path defined by the airworthiness requirements.

(b) *Airport data.* Complete data concerning the airport dimensions and characteristics, such as runway lengths, runway gradients, obstruction heights and location, airport elevation, and the nature and condition of airport areas other than paved runways from which takeoffs might be made, are necessary for the determination of permissible takeoff weights. The most nearly complete and satisfactory source of such data is the series of Airport Obstruction Plans prepared by the United States Department of Commerce Coast and Geodetic Survey. However, their Airport Obstruction Plan series does not yet completely cover the airports used by air carrier operators of Transport Category airplanes, and in addition, the Obstruction Plans do not present any data showing the nature or condition of runway surfaces or other airport areas suitable for use in takeoff and landing. Furthermore, the Obstruction Plans necessarily contain data which may be several months old and which may not completely conform to the existing obstructions. There-

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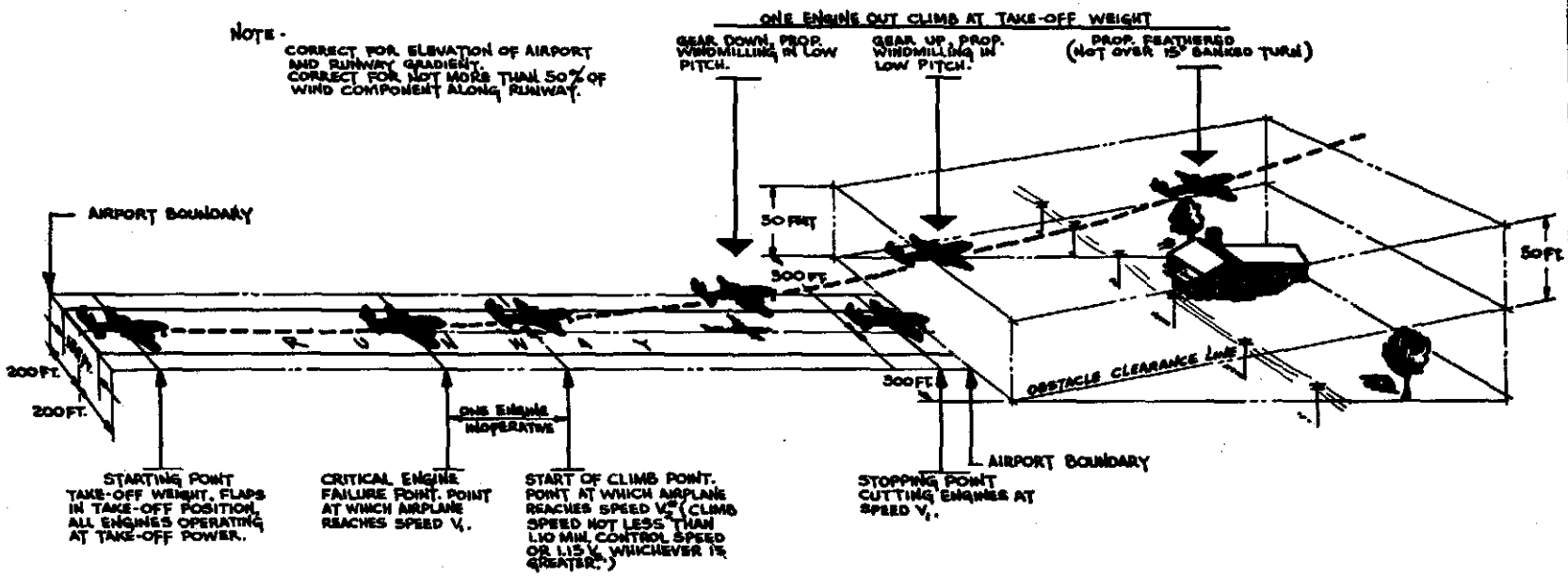
TAKE-OFF · AIRPORT LIMITATIONS



THE AIRPLANE SHALL RUN UP TO A SPECIFIED SPEED AND FROM THERE BE ABLE TO:

1. STOP WITHIN THE AIRPORT BOUNDARIES.
2. CONTINUE WITH ONE ENGINE INOPERATIVE AND CLEAR OBSTACLES AS SHOWN.

* $1.2V_s$ FOR AIRPLANES WITH TWO ENGINES
$1.15V_s$ FOR AIRPLANES WITH MORE THAN TWO ENGINES.
} V_s = STALL SPEED WITH TAKE-OFF CONFIGURATION.

Diagram 1

fore, it may be necessary, for the air carrier operator, to supplement its data with information obtained from other sources. However, gross weight data calculated on the basis of such data should be rechecked or recalculated as soon as appropriate data from the Coast and Geodetic Survey becomes available.

(c) *Runways.*

(1) Normally, only paved runways will be approved for use in takeoff. However, in some cases there may be a defined rectangular area hereinafter designated as a stopway at the end of a runway in the direction of takeoff, selected and approved as a suitable area, in which the aircraft can be stopped after an interrupted takeoff. The stopway should have the same width as the runway it augments. The stopway should be so prepared or constructed as to enable the aircraft to come to a stop on it without hazard at the operating speeds that might be expected in this area after an interrupted takeoff. If it is desired to use a stopway to meet the "climb to a 50-foot height" requirement, the stopway should be suitable for the aircraft to traverse it at takeoff speeds without hazard.

(2) In all cases the takeoff should be assumed to begin on the paved runway and not on an unpaved area. No allowance need be made for the length of the airplane in determining what should be considered to be the proper point for beginning the takeoff. Limitations established by the airport operator may make it necessary to stipulate that the beginning of the takeoff area be at some point down the runway from the actual end of the paving.

(d) *Turns to avoid obstructions.*

(1) Section 42.72 provides that after reaching a height of 50 feet, the aircraft may be turned with a bank not exceeding 15° to comply with the obstruction clearance criteria. Only one turn to a definite heading should be considered in detailing the takeoff path.

(2) The radius of turn resulting from a banked turn of 15° may be determined from the following formula:

Radius of turn $=V^2 \times 0.25$ feet where V=climb speed in mph, TAS

For example: at a climb speed of 120 mph., the radius of turn for a 15° banked turn would be,

$$120 \times 120 \times 0.25 = 3{,}600 \text{ feet.}$$

The effects of wind in altering a flight path need not be considered unless they are large (one-fourth climb speed) and the angle of turn is more than 45° from the runway heading.

(e) *Effects of runway gradient.*

(1) The gradient effect on the ground run may be calculated from the following formula:

$$S_G = S\left[\frac{1}{1-\left(\frac{2Sg \sin \alpha}{V_2^2}\right)}\right]$$

where S_G=length of ground run with gradient.
S=length of ground run without gradient.
g=acceleration of gravity=32.2 (ft./sec.^{2}).
V_2=climb out speed, feet per second, true air speed.
α=angle of grade with horizontal, uphill (+), downhill (−).

(2) The above formula is based on several simplifying assumptions, i. e., that a uniform grade exists, that the airplane is accelerated uniformly throughout the ground run, and that the speed V_2 may be used where the difference between V_1 and V_2 is not large. None of these assumptions may be exactly correct, but the errors introduced by making such assumptions are small provided the airplane acceleration and the actual point-to-point grade do not depart from the average values of those quantities by any great amount.

(3) The effect of gradient during the climb-out should be determined by comparing the airplane rate of climb with the change in runway elevation, to determine first the weight or wind condition at which the airplane clears the end of the runway and all obstacles by an actual 50 feet and second, that the airplane clears all points on the runway after takeoff.

(4) For purposes of simplification in calculating the effect of runway gradient on the takeoff flight path, an average gradient consisting of the difference in elevation of the two ends of the runway divided by the runway length may be used, provided that no intervening point on the runway lies more than 5 feet above or below a straight line joining the two ends of the runway. In this case, the gradient effects on the acceleration portion of the takeoff flight path and for the accelerate-stop portion

may be presented together in simple chart form without introducing excessive errors. However, the actual gradient should be used for the climbout segments of the flight path and in no case should the gradient be greater than the first segment climb.

(5) In those cases in which intermediate points on the runway depart more than 5 feet from the mean line, the gradient effects on the acceleration portions, the deceleration portion, and the climb portion of the flight path should be computed separately. An average gradient may be assumed for the ground run portion of the problem because the error resulting therefrom is so small that a more rigorous treatment is not justified, provided a truly representative gradient is chosen. Where there are no reversals or significant changes in the runway slope during the ground run, the average may be taken to be the difference in elevation between the starting point and the point of attaining takeoff climb speed, V_2, divided by the distance between the two points. However, if the gradient is not essentially constant, an average gradient should be assumed that more nearly parallels the high-speed portion of the acceleration run, since the gradient has a greater effect on the distance traversed at high speed. The average gradient selected in this way will usually serve for determining gradient effects on the acceleration distance in either the takeoff flight path or the accelerate-stop distance. An average gradient should be determined in the same way in determining the gradient effects on the stopping distance, while the actual gradient should be determined in checking the climb segment to the 50-foot point.

(6) The operator may take advantage of the favorable effect of a down-hill gradient on the takeoff flight path, if he wishes, but the unfavorable effect of such a gradient on the stopping distance should be accounted for in all cases.

(f) *Effects of wind.*

(1) Section 42.72 permits the use of 50 percent of the headwind component and requires consideration of 150 percent of any tailwind component.

The effect of wind on runway requirements can be determined by use of the following equation:

(i) For all headwind components, and tailwind components of 10 miles per hour or less.

$$S_w = S\left(\frac{V_2 - V_w}{V_2}\right)^{1.85}$$

where S_w=runway required with wind.
S=runway required, zero wind.
V_2=takeoff safety speed (miles per hour).
V_w=+(.5×headwind component) or, −(1.5×tailwind component).

(ii) If tailwind components in excess of 10 miles per hour are approved, the equation will be:

$$S_w = S\left(\frac{V_2 - V_w}{V_2}\right)^2$$

Alternately, the exponent can be that which is determined to be appropriate to the separation of deceleration characteristics of the airplane type, as applicable.

(2) For steady wind conditions, the wind velocity and direction will be used in computing the effective headwind and tailwind components and the maximum gust velocity and most unfavorable direction will be used in computing the crosswind component.

(Published in 19 F. R. 2169, Apr. 15, 1954, effective Apr. 25, 1954.)

42.73 *En route limitations; all engines operating.* 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 all engines operating, of at least $6V_{s_0}$ (when 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 of either side of the intended track. Transport category airplanes certificated under Part 4a of this subchapter are not required to comply with this section. For the purpose of this section it shall be assumed that the weight of the airplane as it proceeds along its intended track is progressively reduced by the anticipated consumption of fuel and oil.

42.74 *En route limitations; one engine inoperative.*

(a) 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 $V_{s_0}^2$.

(b) As an alternative to the provisions of paragraph (a) of this section, an aircarrier 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 42.78, 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, subparagraphs (1) through (6) shall be complied with:

(1) 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.

(2) 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 takeoff 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.

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

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

(5) 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.

(6) The alternate airport shall be specified in the dispatch release and shall meet the provisions of section 42.55.

(c) For the purposes of this section 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.

42.75 *En route limitations; two engines inoperative.* The provisions of this section 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 paragraph (a) or paragraph (b) of this section.

(a) 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 42.78, assuming all engines to be operating at cruising power.

(b) The takeoff 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 takeoff weight. In showing compliance with this prescribed rate of climb, the following shall apply:

(1) 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.

(2) 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 indicated by the performance information approved by the Administrator.

(3) 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 42.78 and to arrive there at an altitude of at least 1,000 feet directly over the landing area.

42.76 *En route limitations; where special air navigational facilities exist.* The 10-mile lateral distance specified in sections 42.73 through 42.76 may, for a distance of no more than 20 miles, be reduced to 5 miles: *Provided,* That special air navigational facilities provide a reliable and accurate identification of any high ground or obstruction located outside of such 5-mile lateral distance but within the 10-mile distance.

42.76–1 *En route limitations; where special air navigational facilities exist (FAA policies which apply to sec. 42.76).* No attempt is made to classify specific types of navigational facilities as acceptable or unacceptable for the purposes of section 42.76, but each case will be examined on its own merits. In general, however, the facility should be of a type that gives the pilot a continuous fix of his position with an error of not more than 2 miles, or a continuous on course indication with an error of not more than 2 miles, or a continuous indication of the bearing and distance of the obstacle from the airplane, with an accuracy adequate to allow the pilot to turn away from the obstacle with ample clearance. Any mechanical or electrical facilities that are to be acceptable should be thoroughly reliable regardless of weather or other operating conditions. Such considerations apply only for IFR operations.

(Published in 19 F. R. 2170, Apr. 15, 1954, effective Apr. 25, 1954.)

42.77 *Landing distance limitations; airport of destination.* No airplane shall be taken off at a weight in excess of that which, under the conditions stated in paragraphs (a) and (b) of this section, would permit the airplane to be brought to rest at the field of intended destination within 60 percent of the effective length of the runway from a point 50 feet directly above the intersection of the obstruction clearance line and the runway. For the purpose of this section it shall be assumed that the takeoff weight of the airplane is reduced by the weight of the fuel and oil expected to be consumed in flight to the field of intended destination.

(a) It shall be assumed that the aircraft is landed on the most favorable runway and direction without regard to wind.

(b) It shall be assumed, considering every probable wind velocity and direction, that the aircraft is landed on the most suitable runway, taking due account of the ground handling characteristics of the airplane and allowing for the effect on the landing path and roll of not more than 50 percent of the favorable wind component.

(c) If the airport of intended destination will not permit full compliance with paragraph (b) of this section, the aircraft may be taken off if an alternate airport is designated which permits compliance with section 42.78.

42.77–1 *Landing distance limitations; airport of destination (FAA policies which apply to sec. 42.77).*

(a) Section 42.77 establishes two major considerations in determining the permissible landing weight at the airport of destination. The first is that the aircraft weight will be

such on arrival that it can be landed within 60 percent of the effective landing length of the most favorable (normally the longest) runway in still air. This maximum weight for an airport/aircraft configuration, once established, remains constant and cannot be exceeded, regardless of wind conditions.

(b) The second is that consideration be given to the maximum weight that will be permitted due to the necessity of using another runway because of the probable wind condition, ground handling characteristics of the aircraft, landing aids, etc. This consideration may result in a lower gross weight than permitted in paragraph (a) of this section, in which case, dispatch must be based on this lesser weight.

(c) The probable wind referred to in paragraph (b) of this section, is the wind forecasted to exist at the time of arrival.

(d) If the forecast conditions are such that consideration of the requirements in section 42.77 (b) would preclude a landing at the intended destination, the aircraft may be dispatched if an alternate airport is designated which permits compliance with section 42.78.

(e) (1) If a flight has been properly dispatched, but arrives at the destination with a weight higher than anticipated due to unexpected wind conditions or fuel consumption, section 42.77 (b) should not be construed as prohibiting a landing at the overweight condition, provided the crosswind and/or tailwind operating limitations are not exceeded. (2) If conditions are such that the crosswind and/or tailwind limitations will be exceeded, the flight must proceed to its alternate, if one has been named to meet the requirements of section 42.77 (b). However, if an alternate was not provided, and upon arrival the wind conditions were such that the crosswind and/or tailwind limitations would be exceeded, the pilot should exercise the authority granted him in section 42.51 (d).

(f) For application of the wind components as allowed in section 42.77 (b), refer to section 42.72–1 (f).

(Published in 19 F. R. 2170, Apr. 15, 1954, effective Apr. 25, 1954.)

42.78 *Landing distance limitations; alternate airports.* No airport shall be designated as an alternate airport in a flight plan unless the aircraft at the weight at takeoff can comply with the requirements of section 42.77 (a) and (b) at such airport: *Provided,* That the aircraft can be brought to rest within 70 percent of the effective length of the runway.

42.80 *Operating limitations for aircraft not certificated in the transport category.* In operating any passenger-carrying, large, nontransport category airplanes after January 1, 1950, the provisions of sections 42.81 through 42.83 shall be complied with. Prior to that date, such aircraft shall be operated in accordance with such operating limitations as the Administrator determines will provide a safe relation between the performance of the aircraft and the airports to be used and the areas to be traversed. Performance data published by the Administrator for each such nontransport category type aircraft shall be used in determining compliance with such provisions.

42.80–1 *Performance data on Curtiss model C46 aircraft certificated for maximum weights of 45,000 pounds to 48,000 pounds (FAA rules which apply to sec. 42.80).* The following performance limitations data, applicable to the Curtiss model C46 aircraft shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1. (Distance to accelerate to 93 knots TIAS, and stop, with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds			
	39,000	42,000	45,000	[1] 48,000
	Distance in feet			
S. L.	4,110	4,295	4,570	4,950
1,000	4,250	4,450	4,725	5,130
2,000	4,400	4,600	4,880	5,300
3,000	4,650	4,890	5,190	5,680
4,000	4,910	5,170	5,500	6,050
5,000	5,165	5,450	5,810	6,430
6,000	5,420	5,730	6,120	6,805
7,000	5,685	6,000	6,440	[2]
8,000	5,940	6,280	6,750	[2]

[1] For use with Curtiss model C46 airplanes when approved for this weight.
[2] Limited by sec. 42.82.

(b) Actual length of runway required when "effective length", considering obstacles, is not determined (distance to accelerate to 93 knots TIAS, and stop divided by the factor 0.85.)

Standard altitude in feet	Airplane weight in pounds			
	39,000	42,000	45,000	[1] 48,000
	Distance in feet			
S. L.	4,835	5,050	5,375	5,825
1,000	5,000	5,235	5,555	6,035
2,000	5,175	5,410	5,740	6,235
3,000	5,470	5,750	6,105	6,680
4,000	5,775	6,080	6,470	7,120
5,000	6,075	6,410	6,830	7,565
6,000	6,375	6,740	7,200	8,005
7,000	6,690	7,060	7,575	[2]
8,000	6,990	7,390	7,940	[2]

[1] For use with Curtiss model C46 airplanes when approved for this weight.
[2] Limited by sec. 42.82.

TABLE 2.—*En route limitations*

(a) Curtiss model C–46 certificated for maximum weight of 45,000 pounds (based on a climb speed of 113 knots (TIAS)).

Weight (pounds)	Terrain clearance [1] (feet)	Blower setting
45,000	6,450	Low.
44,000	7,000	Do.
43,000	7,550	Do.
42,200	8,000	High.
41,000	9,600	Do.
40,000	11,000	Do.
39,000	12,300	Do.

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82

(b) Curtiss model C–46 certificated for maximum weight of 48,000 pounds or with engine installation approved for 2,550 revolutions per minute (1,700 brake horsepower). Maximum continuous power in low blower [1] (based on a climb speed of 113 knots (TIAS)).

Weight (pounds)	Terrain clearance [2] (feet)	Blower setting
48,000	5,850	Low.
47,000	6,300	Do.
46,000	6,700	Do.
45,000	7,200	Do.
44,500	7,450	Do.
44,250	8,000	High.
44,000	8,550	Do.
43,000	10,800	Do.
42,000	12,500	Do.
41,000	13,000	Do.

[1] Engine installations having P & W. R–2800–27, –43, –51, –71, –75, –79 engines can be approved for 1,700 brake horsepower in low blower. See engine specification chap. 19. p. 30.02 revised Oct. 10, 1949
[2] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42 82

TABLE 3.—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient. (1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	3,700	86.0	3,855	88.0	4,030	90.5	4,110	91.0
1,000	3,800	86.0	3,960	88.0	4,140	90.5	4,220	91.0
2,000	3,900	86.0	4,070	88.0	4,250	90.5	4,335	91.0
3,000	4,050	86.0	4,180	88.0	4,360	90.5	4,450	91.0
4,000	4,110	86.0	4,290	88.0	4,475	90.5	4,565	91.0
5,000	4,215	86.0	4,400	88.0	4,595	90.5	4,680	91.0
6,000	4,330	86.0	4,515	88.0	4,710	90.5	4,800	91.0
7,000	4,430	86.0	4,635	88.0	4,845	90.5	4,930	91.0
8,000	4,550	86.0	4,755	88.0	4,970	90.5	5,060	91.0

[1] Steady approach speed through 50 foot-height-knots TIAS denoted by symbol V_{50}.

(2) Curtiss model C–46 certificated for maximum weight of 48,000 pounds.[1]

Standard altitude in feet	Airplane weight in pounds and approach speeds [2] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	2,890	80.5	3,000	82.0	3,110	84.5	3,215	86.0
1,000	2,960	80.5	3,070	82.0	3,180	84.5	3,285	86.0
2,000	3,035	80.5	3,145	82.0	3,250	84.5	3,360	86.0
3,000	3,110	80.5	3,215	82.0	3,330	84.5	3,430	86.0
4,000	3,185	80.5	3,300	82.0	3,410	84.5	3,520	86.0
5,000	3,260	80.5	3,370	82.0	3,495	84.5	3,615	86.0
6,000	3,330	80.5	3,460	82.0	3,580	84.5	3,700	86.0
7,000	3,415	80.5	3,545	82.0	3,670	84.5	3,800	86.0
8,000	3,500	80.5	3,635	82.0	3,765	84.5	3,900	86.0

[1] For use with Curtiss model C–46 aircraft when approved for this weight.
[2] Steady approach speed through 50 foot-height-knots TIAS denoted by symbol V_{50}.

(Continued on page 65)

TABLE 3.—*Landing limitations*—Continued

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds.[1]

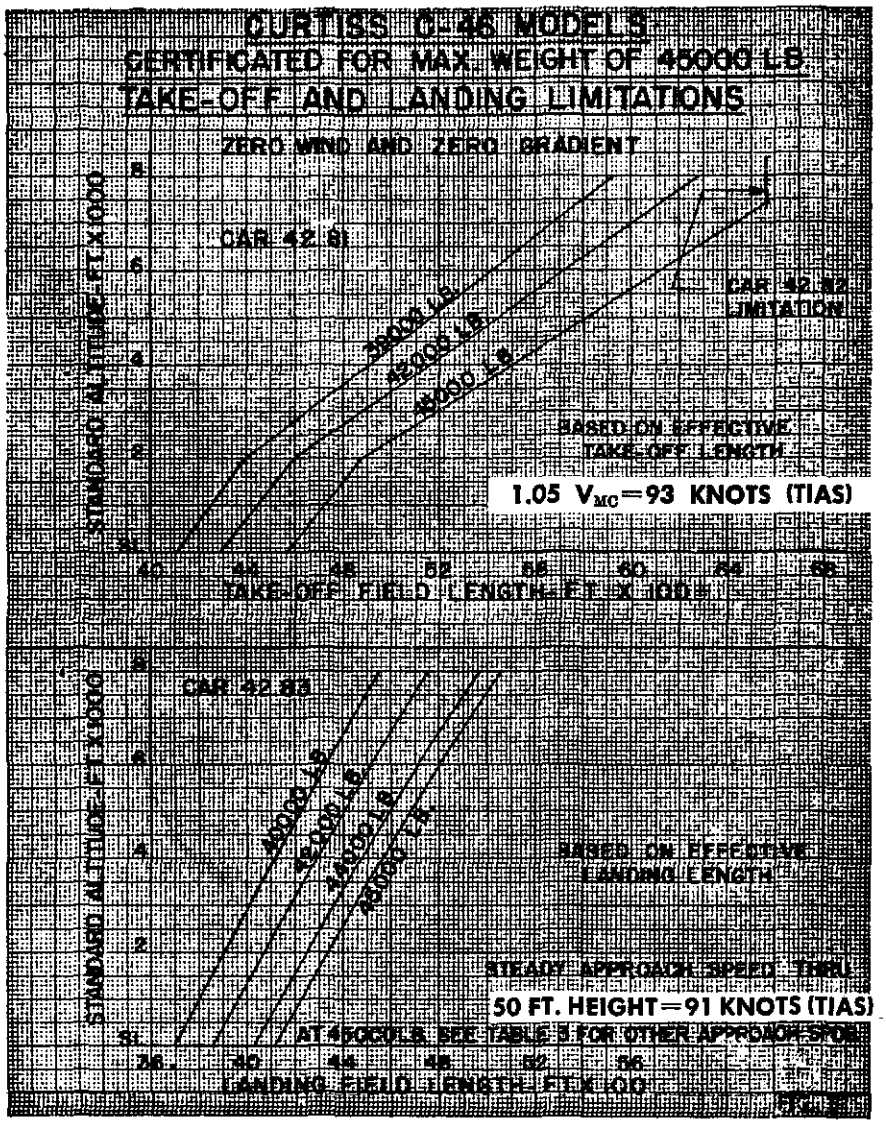
Standard altitude in feet	Airplane weight in pounds and approach speeds[2] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	4,710	86.0	4,910	88.0	5,130	90.5	5,230	91.0
1,000	4,835	86.0	5,050	88.0	5,270	90.5	5,370	91.0
2,000	4,965	86.0	5,180	88.0	5,410	90.5	5,520	91.0
3,000	5,155	86.0	5,320	88.0	5,550	90.5	5,665	91.0
4,000	5,230	86.0	5,560	88.0	5,695	90.5	5,810	91.0
5,000	5,365	86.0	5,600	88.0	5,850	90.5	5,955	91.0
6,000	5,510	86.0	5,745	88.0	5,995	90.5	6,110	91.0
7,000	5,640	86.0	5,900	88.0	6,165	90.5	6,275	91.0
8,000	5,790	86.0	6,050	88.0	6,325	90.5	6,550	91.0

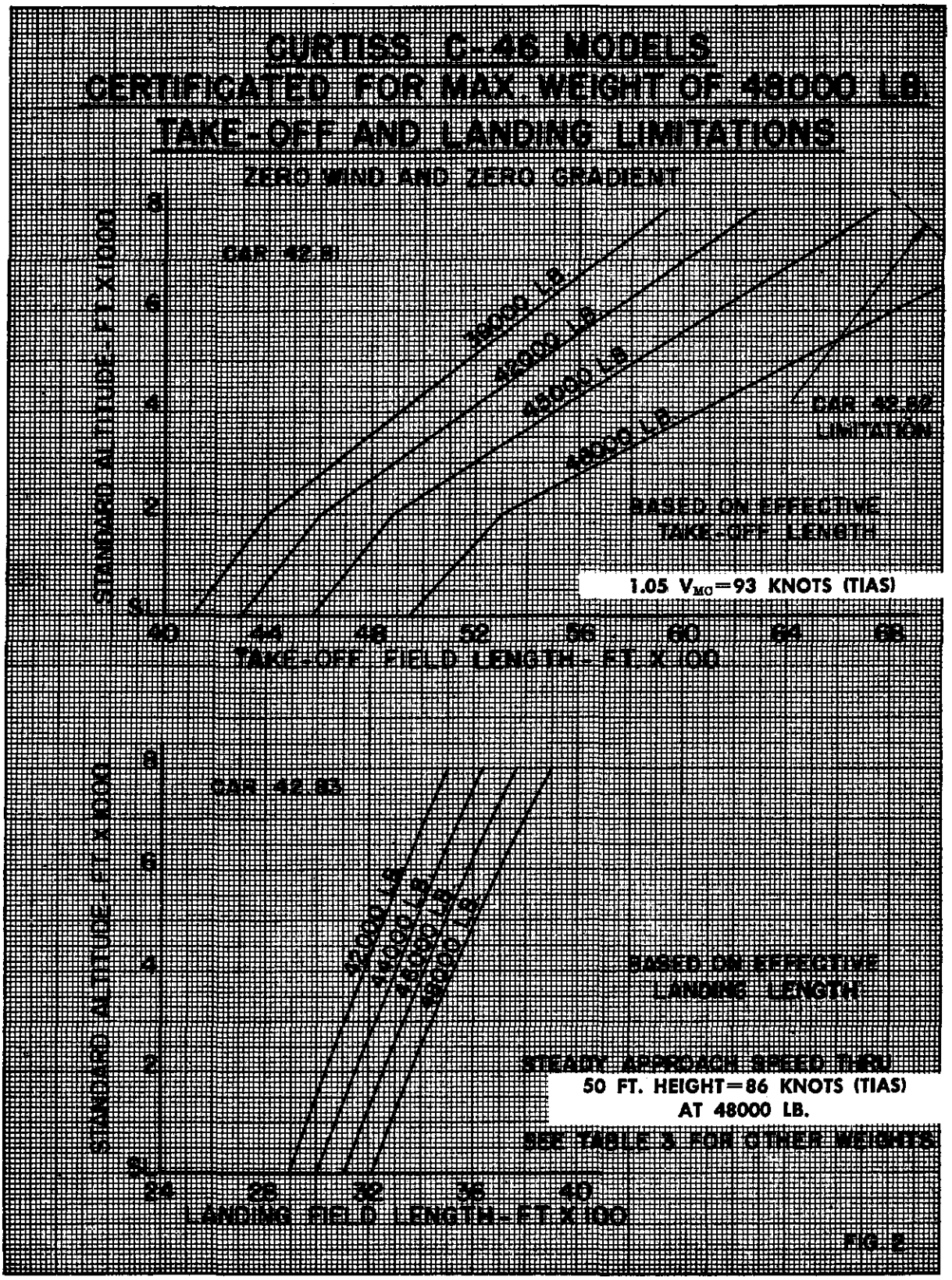
[1] Steady approach speed through 50 foot-height-knots TIAS denoted by symbol V_{50}.
[2] For use with Curtiss model C–46 aircraft when approved for this weight.

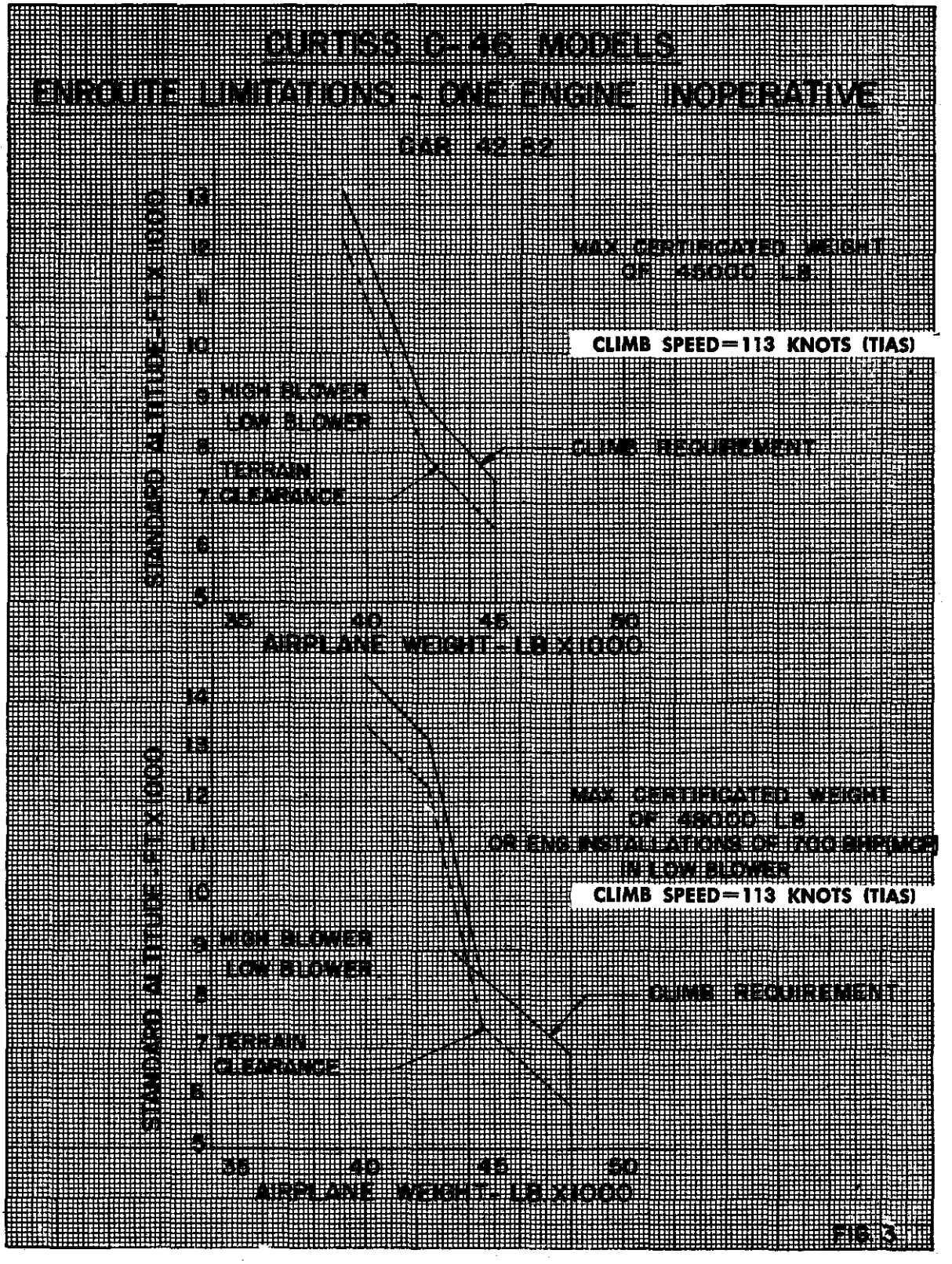
(2) Curtiss C–46 certificated for maximum weight of 48,000 pounds.[1]

Standard altitude in feet	Airplane weight in pounds and approach speeds[2] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	3,680	80.5	3,820	82.0	3,960	84.5	4,090	86.0
1,000	3,765	80.5	3,905	82.0	4,045	84.5	4,180	86.0
2,000	3,860	80.5	4,000	82.0	4,135	84.5	4,275	86.0
3,000	3,960	80.5	4,090	82.0	4,240	84.5	4,365	86.0
4,000	4,055	80.5	4,200	82.0	4,340	84.5	4,480	86.0
5,000	4,150	80.5	4,290	82.0	4,450	84.5	4,600	86.0
6,000	4,240	80.5	4,405	82.0	4,555	84.5	4,710	86.0
7,000	4,345	80.5	4,510	82.0	4,670	84.5	4,835	86.0
8,000	4,455	80.5	4,625	82.0	4,790	84.5	4,965	86.0

[1] For use with Curtiss model C–46 aircraft when approved for this weight.
[2] Steady approach speed through 50 foot-height-knots TIAS denoted by symbol V_{50}.


CURTISS C-46 MODELS
CERTIFICATED FOR MAX. WEIGHT OF 45000 LB.
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82 LIMITATION
39000 LB.
42000 LB.
45000 LB.
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=93 KNOTS (TIAS)
STANDARD ALTITUDE-FT X 1000
TAKE-OFF FIELD LENGTH-FT X 100
CAR 42.83
40000 LB.
42000 LB.
44000 LB.
45000 LB.
BASED ON EFFECTIVE LANDING LENGTH
STEADY APPROACH SPEED THRU
50 FT. HEIGHT=91 KNOTS (TIAS)
AT 45000 LB. SEE TABLE 3 FOR OTHER APPROACH SPDS.
LANDING FIELD LENGTH-FT X 100


CURTISS C-46 MODELS
CERTIFICATED FOR MAX WEIGHT OF 48000 LB.
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82 LIMITATION
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=93 KNOTS (TIAS)
TAKE-OFF FIELD LENGTH-FT. X 100
CAR 42.83
BASED ON EFFECTIVE LANDING LENGTH
STEADY APPROACH SPEED THRU 50 FT. HEIGHT=86 KNOTS (TIAS) AT 48000 LB.
SEE TABLE 3 FOR OTHER WEIGHTS
LANDING FIELD LENGTH-FT. X 100
FIG. 2



(42.80–1. Published in 15 F. R. 83, Jan. 10, 1950, effective Jan. 1, 1950; amended in 15 F. R. 6852, Oct. 12, 1950, effective upon publication; amended in 21 F. R. 2232, Apr. 16, 1956, effective Apr. 1, 1956.)

42.80–2 *Performance data on Douglas DC–3 aircraft (FAA rules which apply to section 42.80).* The following performance limitations data, applicable to all Douglas DC–3 aircraft with various engine models, shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section.

DOUGLAS DC–3 G102, AND C–47's, R4D's WITH COMPARABLE HORSEPOWER ENGINES

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with sec. 42.1. (Distance to accelerate to 80 knots TIAS, and stop with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds			
	22,000	23,000	24,000	25,200
	Distance in feet			
S. L.	3,325	3,395	3,460	3,545
1,000	3,425	3,495	3,560	3,645
2,000	3,610	3,685	3,760	3,840
3,000	3,800	3,880	3,960	4,050
4,000	3,990	4,080	4,170	4,270
5,000	4,200	4,290	4,390	4,500
6,000	4,415	4,520	4,630	4,760
7,000	4,650	4,770	4,895	5,050
8,000	4,900	5,040	5,190	(1)

[1] Limited by sec. 42.82.

(b) Actual length of runway required when "effective length," considering obstacles, is not determined. (Distance to accelerate to 80 knots TIAS, and stop, divided by factor 0.85.)

Standard altitude in feet	Airplane weight in pounds			
	22,000	23,000	24,000	25,200
	Distance in feet			
S. L.	3,910	3,990	4,070	4,170
1,000	4,030	4,110	4,185	4,285
2,000	4,245	4,335	4,420	4,515
3,000	4,470	4,565	4,655	4,765
4,000	4,690	4,800	4,905	5,020
5,000	4,940	5,045	5,160	5,290
6,000	5,190	5,315	5,445	5,600
7,000	5,470	5,610	5,755	5,940
8,000	5,760	5,925	6,105	(1)

[1] Limited by sec. 42.82.

DOUGLAS DC–3 G202A, S1C3G AND C47's, R4D's WITH COMPARABLE HORSEPOWER ENGINES

TABLE 2.—*Takeoff limitations*

(a) "Effective length" of runway required where effective length is determined in accordance with section 42.1. (Distance to accelerate to 80 knots TIAS, and stop, with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds					
	22,000	23,000	24,000	25,000	[1]26,000	[1]26,900
	Distance in feet					
S. L.	3,125	3,195	3,260	3,330	3,385	3,450
1,000	3,255	3,320	3,395	3,470	3,525	3,595
2,000	3,390	3,460	3,540	3,610	3,685	3,750
3,000	3,525	3,610	3,690	3,775	3,850	3,920
4,000	3,680	3,775	3,860	3,950	4,035	4,110
5,000	3,855	3,960	4,060	4,150	4,255	4,315
6,000	4,060	4,170	4,280	4,385	4,490	4,575
7,000	4,300	4,415	4,530	4,640	4,750	4,845
8,000	4,600	4,700	4,810	4,925	5,055	5,150

[1] Cargo operation only but not required under sec. 42.80.

(b) Actual length of runway required where "effective length," considering obstacles, is not determined. (Distance to accelerate to 80 knots TIAS, and stop, divided by factor 0.85.)

Standard altitude in feet	Airplane weight in pounds					
	22,000	23,000	24,000	25,000	[1]26,000	[1]26,900
	Distance in feet					
S. L.	3,675	3,755	3,835	3,915	3,980	4,055
1,000	3,830	3,905	3,990	4,080	4,145	4,230
2,000	3,985	4,070	4,165	4,245	4,335	4,410
3,000	4,145	4,245	4,340	4,440	4,530	4,610
4,000	4,330	4,440	4,540	4,645	4,745	4,835
5,000	4,535	4,655	4,775	4,880	5,005	5,075
6,000	4,775	4,905	5,035	5,155	5,280	5,380
7,000	5,055	5,190	5,325	5,455	5,585	5,700
8,000	5,410	5,525	5,655	5,790	5,945	6,055

[1] Cargo operation only but not required under sec. 42.80.

DOUGLAS DC–3 G102, G202A, S1C3G, C–47's, R4D's WITH COMPARABLE HORSEPOWER ENGINES

TABLE 3.—*En route limitations*

Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS					
	G102	V_e	G202A	V_e	S1C3G	V_e
25,200	6,400	95.5	7,500	95.0	10,600	92.5
24,000	7,550	94.0	8,700	93.5	12,100	90.0
23,000	8,500	92.0	9,750	91.0	13,450	88.0
22,000	9,500	90.5	10,750	89.5	14,750	86.5
21,000	10,500	89.0	11,750	87.5	16,100	85.5

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

DOUGLAS DC–3 G102, G202A S1C3G, AND C47's, R4D's WITH COMPARABLE HORSEPOWER ENGINES

TABLE 4—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

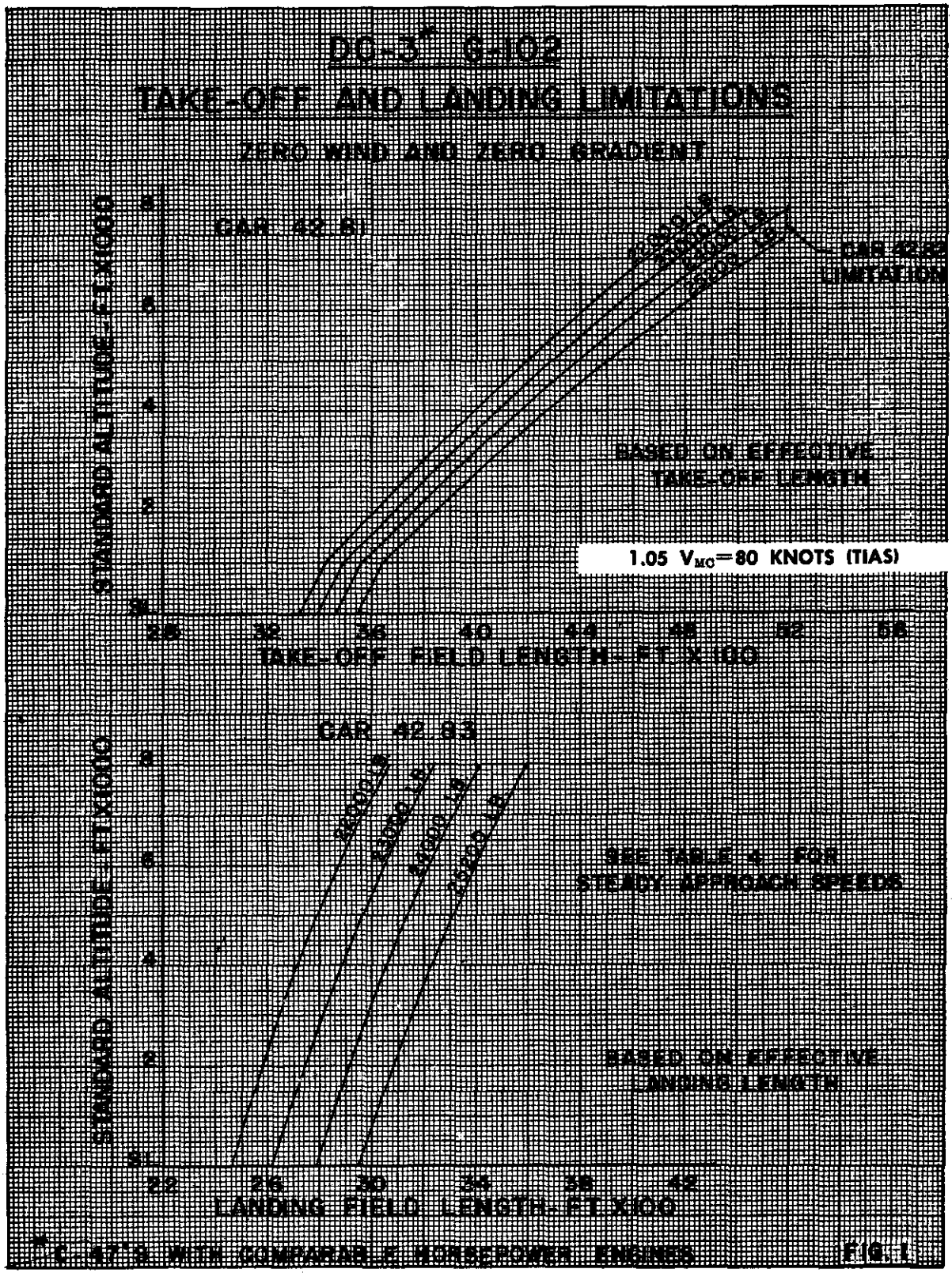
Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,200	V_{50}
	Distance in feet							
S. L.	2,460	74.5	2,620	76.5	2,790	78.0	2,950	80.0
1,000	2,520	74.5	2,680	76.5	2,850	78.0	3,015	80.0
2,000	2,580	74.5	2,745	76.5	2,915	78.0	3,080	80.0
3,000	2,645	74.5	2,815	76.5	2,980	78.0	3,155	80.0
4,000	2,710	74.5	2,885	76.5	3,060	78.0	3,230	80.0
5,000	2,790	74.5	2,965	76.5	3,135	78.0	3,310	80.0
6,000	2,870	74.5	3,050	76.5	3,220	78.0	3,400	80.0
7,000	2,965	74.5	3,140	76.5	3,315	78.0	3,490	80.0
8,000	3,045	74.5	3,240	76.5	3,420	78.0	3,595	80.0

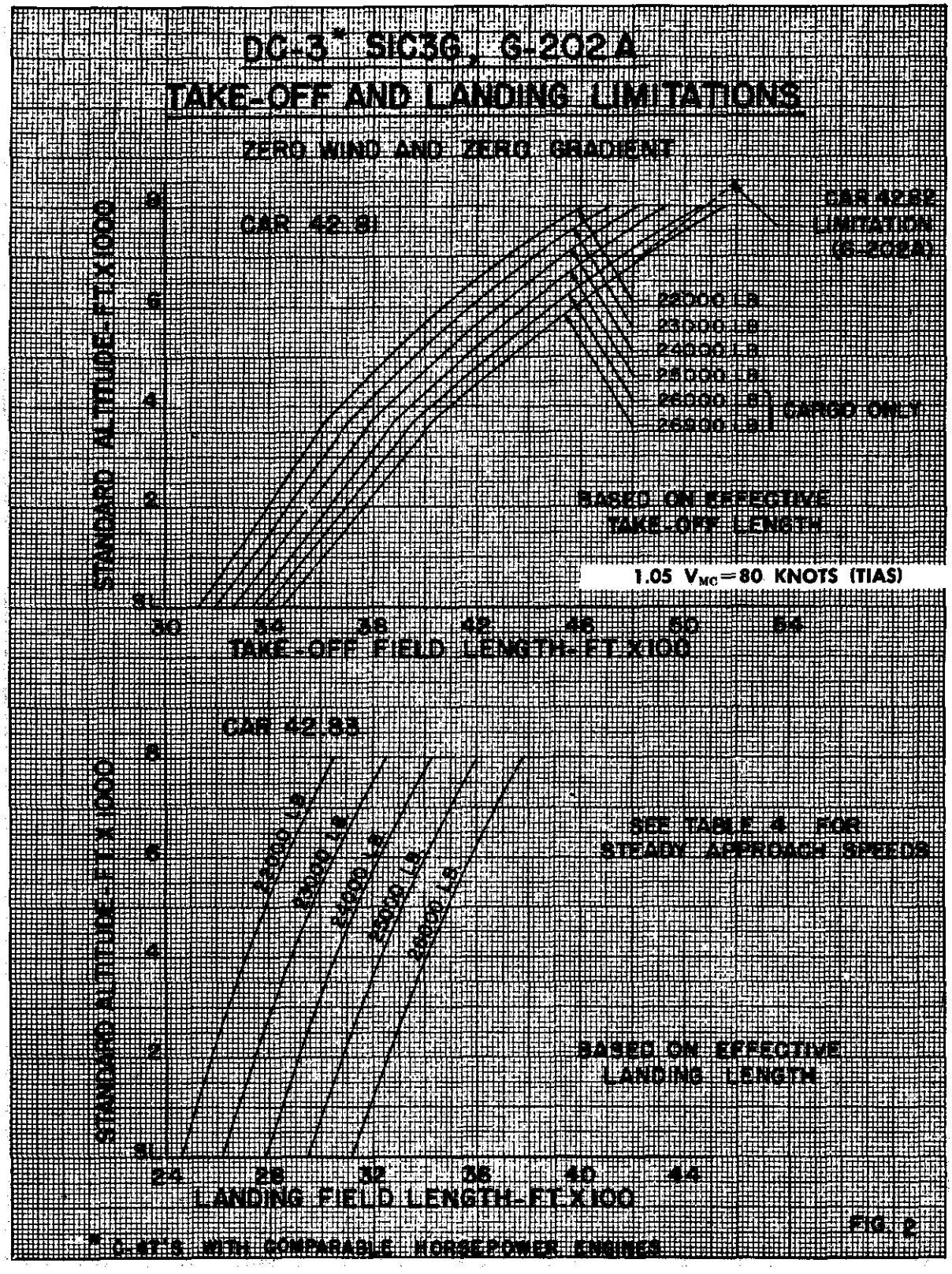
[1] Steady approach speed through 50 feet height-knots TIAS denoted by symbol V_{50}.

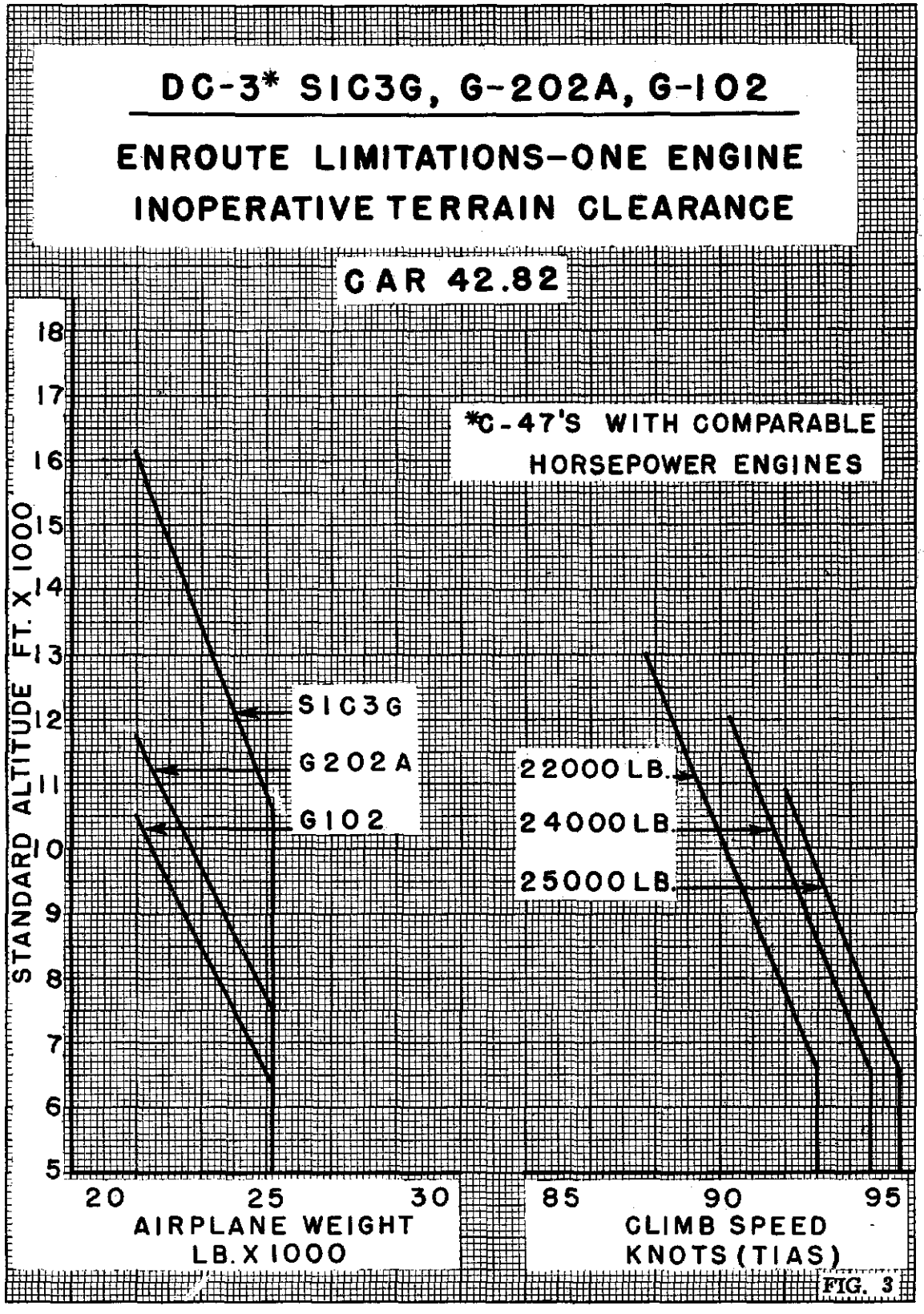
(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,200	V_{50}
	Distance in feet							
S. L.	3,125	74.5	3,325	76.5	3,545	78.0	3,745	80.0
1,000	3,200	74.5	3,390	76.5	3,620	78.0	3,830	80.0
2,000	3,275	74.5	3,485	76.5	3,700	78.0	3,910	80.0
3,000	3,360	74.5	3,575	76.5	3,785	78.0	4,005	80.0
4,000	3,440	74.5	3,665	76.5	3,885	78.0	4,100	80.0
5,000	3,545	74.5	3,765	76.5	3,980	78.0	4,205	80.0
6,000	3,645	74.5	3,875	76.5	4,090	78.0	4,320	80.0
7,000	3,765	74.5	3,990	76.5	4,210	78.0	4,430	80.0
8,000	3,865	74.5	4,115	76.5	4,345	78.0	4,565	80.0

[1] Steady approach speed through 50 feet height-knots TIAS denoted by symbol V_{50}.


DC-3* S-102
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82 LIMITATION
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=80 KNOTS (TIAS)
STANDARD ALTITUDE-FT X1000
TAKE-OFF FIELD LENGTH-FT X 100
CAR 42.83
SEE TABLE 4 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT X100
*C-47'S WITH COMPARABLE HORSEPOWER ENGINES
FIG. 1


DC-3* SIC3G, G-2O2A
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82
LIMITATION (G-2O2A)
22000 LB
23000 LB
24000 LB
25000 LB
26000 LB
26900 LB
CARGO ONLY
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=80 KNOTS (TIAS)
STANDARD ALTITUDE-FT.X1000
TAKE-OFF FIELD LENGTH-FT.X100
CAR 42.83
SEE TABLE 4 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT.X100
* C-47'S WITH COMPARABLE HORSEPOWER ENGINES
FIG 2



(42.80–2. Published in 15 F. R. 86, Jan. 10, 1950, effective Jan. 1, 1950; amended in 21 F. R. 2232, Apr. 6, 1956, effective Apr. 1, 1956.)

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42.80–3 *Performance data on Lockheed 18 G202A aircraft (FAA rules which apply to section 42.80).* The following performance limitations data, applicable to Lockheed 18 G202A aircraft shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1. (Distance to accelerate to 99.5 knots TIAS, and stop, with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds		
	17,500	18,000	18,500
	Distance in feet		
S. L.	5,470	5,670	5,830
1,000	5,725	5,925	6,100
2,000	5,980	6,185	6,380
3,000	6,250	6,460	6,670
4,000	6,520	6,740	6,950
5,000	6,800	7,030	7,250
6,000	7,100	7,330	7,570
7,000	7,405	7,650	7,890
8,000	7,750	8,000	8,240

(b) Actual length of runway required when "effective length," considering obstacles, is not determined. (Distance to accelerate to 99.5 knots TIAS, and stop, divided by the factor 0.85.)

Standard altitude in feet	Airplane weight in pounds		
	17,500	18,000	18,500
	Distance in feet		
S. L.	6,430	6,665	6,855
1,000	6,730	6,965	7,175
2,000	7,030	7,275	7,500
3,000	7,350	7,595	7,845
4,000	7,665	7,925	8,175
5,000	7,995	8,265	8,525
6,000	8,350	8,620	8,900
7,000	8,760	8,995	9,280
8,000	9,115	9,410	9,690

TABLE 2.—*En route limitations*

Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS	
	Feet	Knots
18,500	9,800	104.5
18,000	10,600	103.0
17,500	11,350	102.0
17,000	12,150	101.0
16,500	12,900	100.0
16,000	13,700	99.0

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

TABLE 3.—*Landing limitations (sod runway surfaces)*—Continued

(2) Curtiss C–46 certificated maximum weight of 48,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	4,230	80.5	4,395	82.0	4,555	84.5	4,705	86.0
1,000	4,330	80.5	4,490	82.0	4,650	84.5	4,805	86.0
2,000	4,440	80.5	4,600	82.0	4,755	84.5	4,915	86.0
3,000	4,555	80.5	4,705	82.0	4,875	84.5	5,020	86.0
4,000	4,665	80.5	4,830	82.0	4,990	84.5	5,150	86.0
5,000	4,775	80.5	4,935	82.0	5,120	84.5	5,290	86.0
6,000	4,875	80.5	5,065	82.0	5,240	84.5	5,415	86.0
7,000	4,995	80.5	5,185	82.0	5,370	84.5	5,560	86.0
8,000	5,125	80.5	5,320	82.0	5,510	84.5	5,710	86.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

CONVAIR MODEL 28–5ACF AND PBY–5A

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

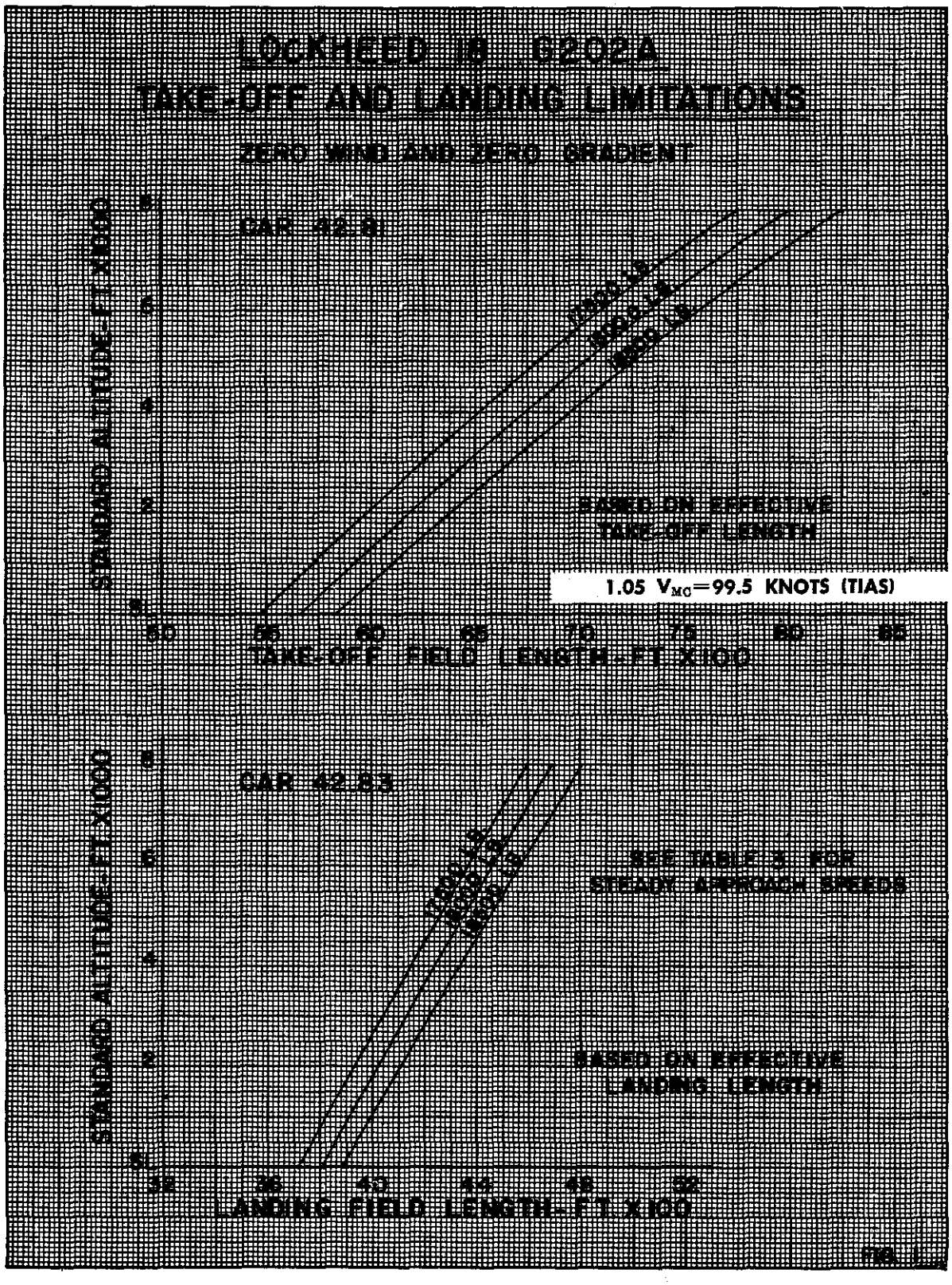
Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	3,935	74.5	4,105	76.5	4,245	78.0
1,000	4,040	74.5	4,215	76.5	4,370	78.0
2,000	4,145	74.5	4,330	76.5	4,485	78.0
3,000	4,255	74.5	4,370	76.5	4,610	78.0
4,000	4,360	74.5	4,585	76.5	4,725	78.0
5,000	4,470	74.5	4,665	76.5	4,845	78.0
6,000	4,570	74.5	4,775	76.5	4,970	78.0
7,000	4,680	74.5	4,880	76.5	5,090	78.0
8,000	4,785	74.5	4,990	76.5	5,205	78.0

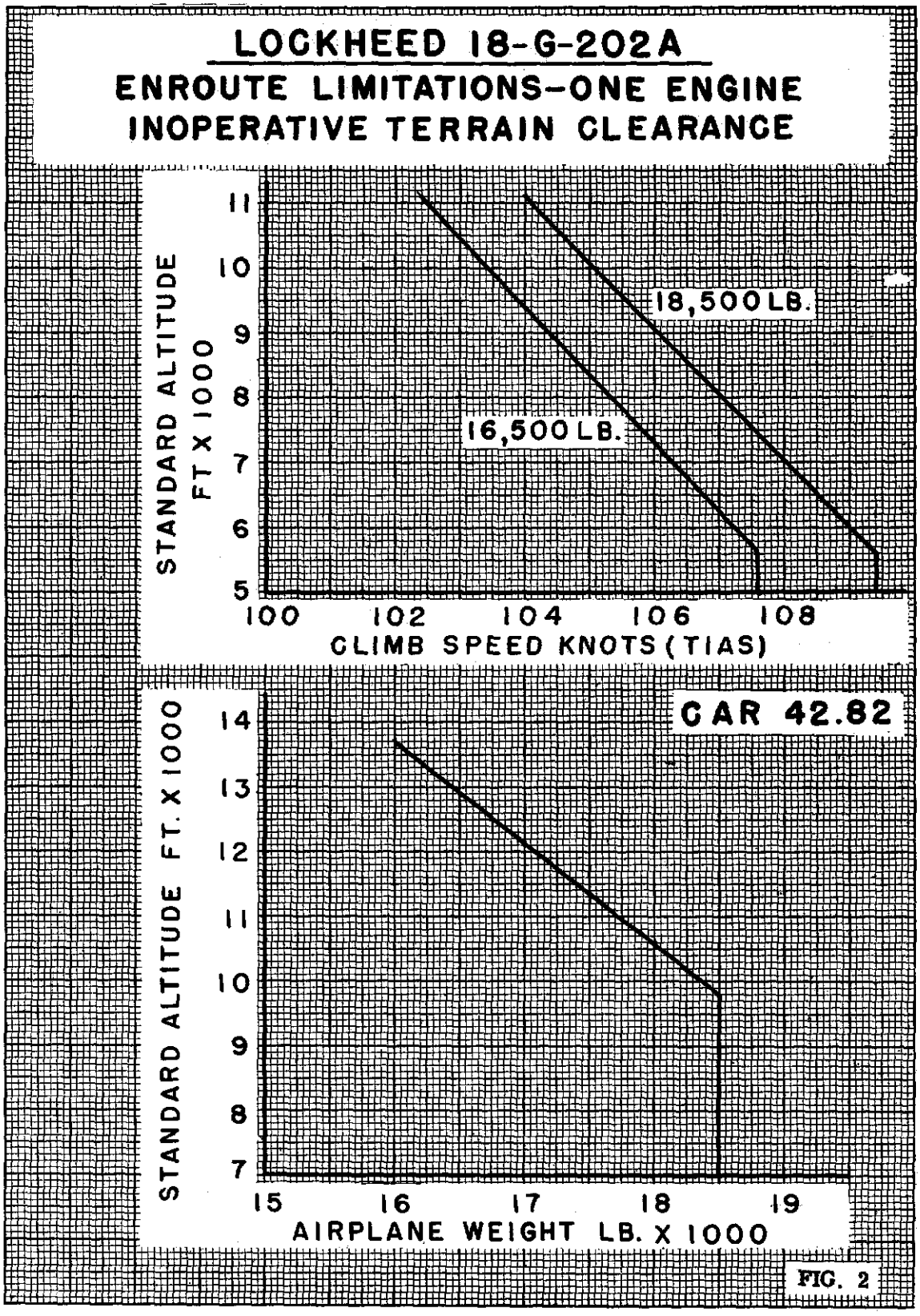
[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	5,005	74.5	5,225	76.5	5,400	78.0
1,000	5,145	74.5	5,365	76.5	5,560	78.0
2,000	5,275	74.5	5,510	76.5	5,710	78.0
3,000	5,415	74.5	5,650	76.5	5,870	78.0
4,000	5,550	74.5	5,790	76.5	6,015	78.0
5,000	5,685	74.5	5,935	76.5	6,170	78.0
6,000	5,820	74.5	6,075	76.5	6,325	78.0
7,000	5,955	74.5	6,215	76.5	6,475	78.0
8,000	6,090	74.5	6,355	76.5	6,625	78.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.


LOCKHEED 18 G202A
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=99.5 KNOTS (TIAS)
STANDARD ATMOSPHERE-FT X1000
TAKE-OFF FIELD LENGTH-FT X100
CAR 42.83
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT X100
FIG. 1



(42.80–3. Published in 15 F. R. 88 Jan. 10, 1950, effective Jan. 1, 1950; amended in 21 F. R. 2232, Apr. 6, 1956, effective Apr. 1, 1956.)

42.80–4 *Convair Model 28–5ACF and PBY–5A landplane aircraft (FAA rules which apply to sec. 42.80).* The following performance limitations data, applicable to Convair Model 28–5ACF and PBY–5A landplane aircraft shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1. (Distance to accelerate to 82.5 knots TIAS (28–5ACF), 79 knots TIAS (PBY–5A), and stop, with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds					
	23,000	24,000	25,000	26,000	[1]27,000	[2]28,000
	Distance in feet					
S. L.	3,240	3,400	3,565	3,725	3,880	4,050
1,000	3,370	3,540	3,720	3,885	4,055	4,225
2,000	3,500	3,680	3,875	4,045	4,230	4,400
3,000	3,635	3,830	4,025	4,200	4,400	4,580
4,000	3,860	4,070	4,280	4,485	4,700	4,900
5,000	4,095	4,315	4,540	4,770	5,000	5,215
6,000	4,330	4,565	4,810	5,060	5,305	5,545
7,000	4,580	4,830	5,090	5,360	5,610	5,880
8,000	4,830	5,095	5,380	5,660	5,940	6,240

[1] Maximum weight for PBY–5A landplane.
[2] Maximum weight for 28–5ACF.

(b) Actual length of runway required when "effective length," considering obstacles, is not determined. (Distance to accelerate to 82.5 knots TIAS (28–5ACF), 79 knots TIAS (PBY–5A), and stop, divided by the factor 0.85.)

Standard altitude in feet	Airplane weight in pounds					
	23,000	24,000	25,000	26,000	[1]27,000	[2]28,000
	Distance in feet					
S. L.	3,810	4,000	4,190	4,380	4,560	4,760
1,000	3,965	4,165	4,375	4,570	4,770	4,970
2,000	4,115	4,330	4,555	4,755	4,975	5,175
3,000	4,275	4,505	4,735	4,940	5,175	5,385
4,000	4,540	4,785	5,035	5,275	5,525	5,760
5,000	4,815	5,075	5,340	5,610	5,880	6,130
6,000	5,090	5,370	5,655	5,950	6,240	6,520
7,000	5,385	5,680	5,985	6,305	6,600	6,915
8,000	5,680	5,990	6,325	6,655	6,985	7,340

[1] Maximum weight for PBY–5A landplane.
[2] Maximum weight for 28–5ACF.

TABLE 2.—*En route limitations*

Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS			
	Model PBY–5A		Model 28–5ACF	
	Feet	Knots	Feet	Knots
28,000	--------	--------	7,500	90.5
27,500	--------	--------	8,000	89.5
27,000	7,200	81.0	8,500	88.5
26,500	7,700	80.5	9,050	87.5
26,000	8,200	79.5	9,600	87.0
25,500	8,700	78.5	10,100	86.0
25,000	9,200	77.5	10,650	84.5
24,500	9,700	76.5	11,150	84.0
24,000	10,200	75.5	11,700	82.5

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

TABLE 3.—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	3,420	74.5	3,570	76.5	3,690	78.0
1,000	3,515	74.5	3,665	76.5	3,800	78.0
2,000	3,605	74.5	3,765	76.5	3,900	78.0
3,000	3,700	74.5	3,860	76.5	4,010	78.0
4,000	3,790	74.5	3,955	76.5	4,110	78.0
5,000	3,885	74.5	4,055	76.5	4,215	78.0
6,000	3,975	74.5	4,150	76.5	4,320	78.0
7,000	4,070	74.5	4,245	76.5	4,425	78.0
8,000	4,160	74.5	4,340	76.5	4,525	78.0

[1] Steady approach speed through 50 feet height in knots. TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	4,350	74.5	4,544	76.5	4,696	78.0
1,000	4,475	74.5	4,664	76.5	4,836	78.0
2,000	4,588	74.5	4,792	76.5	4,964	78.0
3,000	4,709	74.5	4,913	76.5	5,104	78.0
4,000	4,824	74.5	5,034	76.5	5,231	78.0
5,000	4,944	74.5	5,161	76.5	5,364	78.0
6,000	5,059	74.5	5,282	76.5	5,498	78.0
7,000	5,180	74.5	5,403	76.5	5,632	78.0
8,000	5,294	74.5	5,524	76.5	5,759	78.0

[1] Steady approach speed through 50 feet height in knots. TIAS denoted by symbol V_{50}.

TABLE 4.—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	26,000	V_{50}	[2]27,000	V_{50}	[3]28,000	V_{50}
	Distance in feet					
S. L.	3,830	80.0	3,965	81.0	4,100	82.5
1,000	3,940	80.0	4,080	81.0	4,220	82.5
2,000	4,050	80.0	4,200	81.0	4,345	82.5
3,000	4,160	80.0	4,315	81.0	4,470	82.5
4,000	4,275	80.0	4,430	81.0	4,595	82.5
5,000	4,385	80.5	4,550	81.0	4,720	82.5
6,000	4,495	80.0	4,665	81.0	4,840	82.5
7,000	4,610	80.0	4,785	81.0	4,970	82.5
8,000	4,720	80.0	4,900	81.0	5,090	82.5

[1] Steady approach speed through 50 feet height in knots. TIAS denoted by symbol V_{50}.
[2] Maximum weight for PBY-5A landplane.
[3] Maximum weight for 28-5ACF.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	26,000	V_{50}	[2]27,000	V_{50}	[3]28,000	V_{50}
	Distance in feet					
S. L.	4,874	80.0	5,046	81.0	5,218	82.5
1,000	5,014	80.0	5,193	81.0	5,371	82.5
2,000	5,154	80.0	5,345	81.0	5,530	82.5
3,000	5,294	80.0	5,492	81.0	5,689	82.5
4,000	5,441	80.0	5,638	81.0	5,848	82.5
5,000	5,581	80.0	5,791	81.0	6,007	82.5
6,000	5,721	80.0	5,937	81.0	6,160	82.5
7,000	5,867	80.0	6,090	81.0	6,325	82.5
8,000	6,007	80.0	6,236	81.0	6,478	82.5

[1] Steady approach speed through 50 feet height in knots. TIAS denoted by symbol V_{50}.
[2] Maximum weight for PBY-5A landplane.
[3] Maximum weight for 28-5ACF

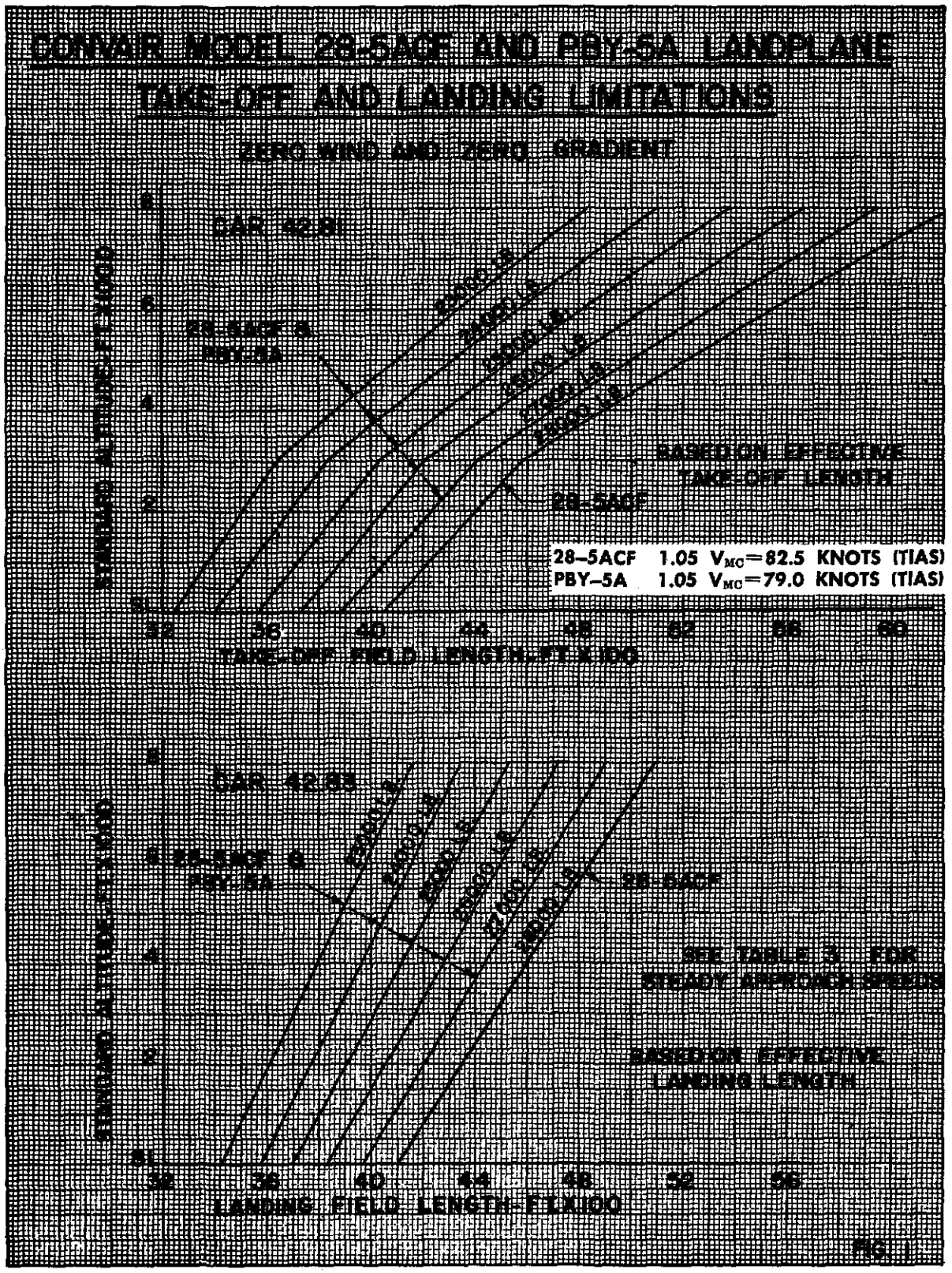
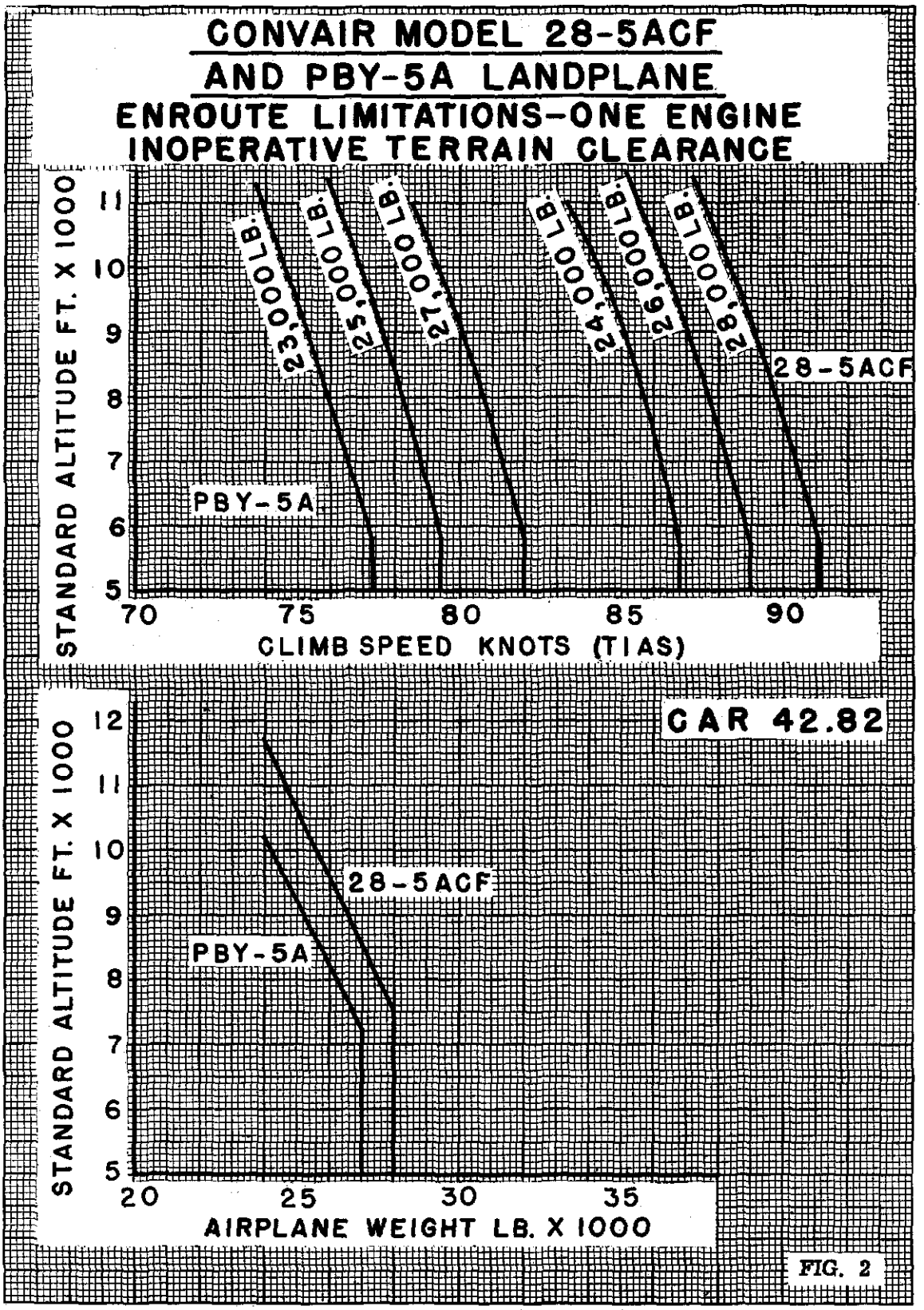

CONVAIR MODEL 28-5ACF AND PBY-5A LANDPLANE
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
28-5ACF & PBY-5A
28-5ACF
BASED ON EFFECTIVE TAKE-OFF LENGTH
28-5ACF 1.05 V_{MC}=82.5 KNOTS (TIAS)
PBY-5A 1.05 V_{MC}=79.0 KNOTS (TIAS)
STANDARD ALTITUDE-FT X 1000
TAKE-OFF FIELD LENGTH-FT X 100
CAR 42.83
28-5ACF & PBY-5A
28-5ACF
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT X 100

FIG. 1



(42.80–4. Published in 15 F. R. 90, Jan. 10, 1950, effective Jan. 1, 1950; amended in 20 F. R. 4184, June 15, 1955, effective June 30, 1955; amended in 21 F. R. Apr. 6, 1956, effective Apr. 1, 1956.)

42.80–5 *Performance data on Douglas B–18, RB–18A (R1820–53) aircraft (FAA rules which apply to section 42.80).* The following performance limitations data, applicable to the Douglas B–18, RB–18A aircraft shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section. As indicated by the en route limitation data for the Douglas model B–18 (table 2), operation is restricted to impractical operating weights. Therefore takeoff and landing limitations are not presented for this model.

TABLE 1.—*Takeoff limitations*

MODEL RB–18A

(a) "Effective length" of runway required when effective length is determined in accordance with 42.1. (Distance to accelerate to 81.5 knots TIAS, and stop, with zero wind and zero gradient.)

Standard altitude in feet	Airplane weight in pounds			
	19,000	20,000	21,000	21,300
	Distance in feet			
S. L.	3,605	3,695	3,790	3,820
1,000	3,710	3,815	3,920	3,950
2,000	3,835	3,945	4,045	4,085
2,500	3,890	4,000	4,110	4,150
3,000	4,015	4,130	4,230	4,275
4,000	4,240	4,355	4,475	4,525
5,000	4,475	4,595	4,720	----
6,000	4,710	4,835	----	----
7,000	4,935	5,065	[1]	[1]
8,000	5,170	5,300	----	----

[1] Limited by sec. 42.82.

(b) Actual length of runway required when "effective length", considering obstacles, is not determined. (Distance to accelerate to 81.5 knots TIAS, and stop, divided by the factor 0.85.)

Standard altitude in feet	Airplane weight in pounds			
	19,000	20,000	21,000	21,300
	Distance in feet			
S. L.	4,250	4,350	4,460	4,495
1,000	4,360	4,490	4,610	4,650
2,000	4,510	4,645	4,755	4,800
2,500	4,575	4,705	4,840	4,880
3,000	4,730	4,855	4,980	5,025
4,000	4,990	5,125	5,260	5,325
5,000	5,260	5,400	5,550	----
6,000	5,550	5,680	----	----
7,000	5,800	5,960	[1]	[1]
8,000	6,080	6,240	----	----

[1] Limited by sec. 42.82.

DOUGLAS B–18, RB18A (R–1820–53)

TABLE 2.—*En route limitations*

MODEL B–18

Weight in pounds:	*Terrain clearance[1] in feet*
13,500	4,100
13,000	4,600

Section 42.82 limitation critical for all practical operating weights.

MODEL RB–18A

Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS			
	Low blower		High blower	
	Feet	Knots	Feet	Knots
21,000	4,270	86.0	----	----
20,600	----	----	4,600	85.0
20,500	----	----	5,900	84.5
20,200	----	----	8,800	83.5
20,000	----	----	8,950	83.5
19,500	----	----	9,400	82.5

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

TABLE 3.—*Landing limitations*

MODEL RB-18A

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

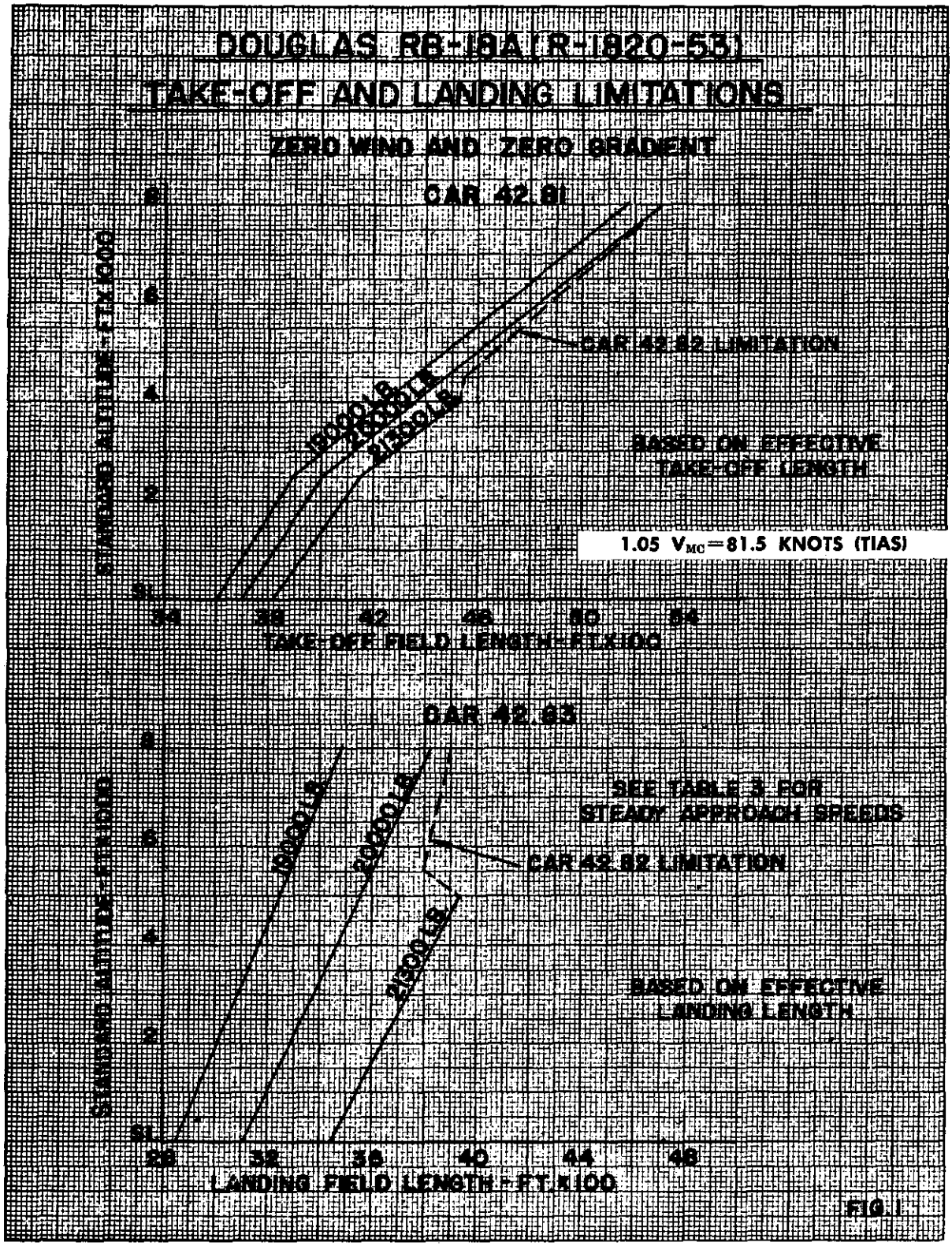
Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	2,850	74.5	3,110	77.0	3,370	78.5	3,445	79.0
1,000	2,930	74.5	3,200	77.0	3,470	78.5	3,545	79.0
2,000	3,010	74.5	3,290	77.0	3,565	78.5	3,640	79.0
3,000	3,085	74.5	3,380	77.0	3,660	78.5	3,740	79.0
4,000	3,165	74.5	3,470	77.0	3,755	78.5	3,835	79.0
5,000	3,245	74.5	3,560	77.0	3,850	78.5	3,935	79.0
6,000	3,325	74.5	3,650	77.0	----	----	----	----
7,000	3,405	74.5	3,735	77.0	[2]	[2]	[2]	[2]
8,000	3,485	74.5	3,825	77.0	----	----	----	----

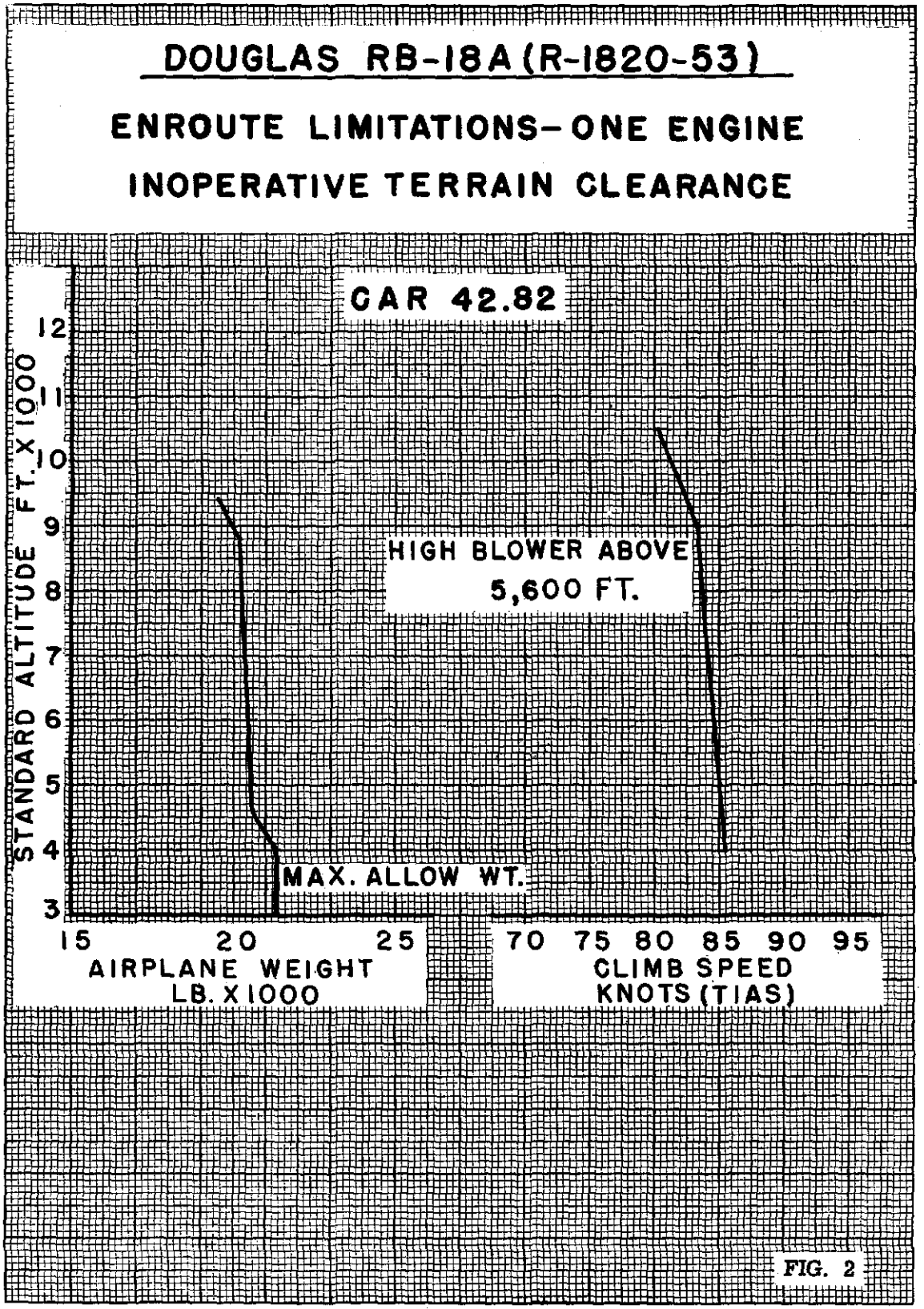
[1] Steady approach speed through 50 feet height knots TIAS denoted by symbol V_{50}.
[2] Limited by sec. 42.82.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	3,630	74.5	3,960	77.0	4,290	78.5	4,390	79.0
1,000	3,730	74.5	4,070	77.0	4,410	78.5	4,510	79.0
2,000	3,835	74.5	4,190	77.0	4,540	78.5	4,630	79.0
3,000	3,925	74.5	4,300	77.0	4,655	78.5	4,760	79.0
4,000	4,025	74.5	4,415	77.0	4,775	78.5	4,880	79.0
5,000	4,130	74.5	4,535	77.0	4,900	78.5	5,005	79.0
6,000	4,230	74.5	4,645	77.0	----	----	----	----
7,000	4,340	74.5	4,750	77.0	----	[2]	[2]	----
8,000	4,440	74.5	4,865	77.0	----	----	----	----

[1] Steady approach speed through 50 feet height knots TIAS denoted by symbol V_{50}.
[2] Limited by sec. 42.82.


DOUGLAS RB-18A (R-1820-53)
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82 LIMITATION
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC}=81.5 KNOTS (TIAS)
STANDARD PRESSURE ALTITUDE - FT. X 1000
TAKE-OFF FIELD LENGTH - FT. X 100
CAR 42.83
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
CAR 42.82 LIMITATION
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH - FT. X 100
FIG. 1



(42.80–5. Published in 15 F. R. 91, Jan. 10, 1950, effective Jan. 1, 1950; amended in 17 F. R. 2887, Apr. 3, 1952, effective upon publication; amended in 21 F. R. 2232, Apr. 6, 1956, effective Apr. 1, 1956.)

42.80–6 *En route limitations on multiengine aircraft with maximum allowable takeoff weight below 12,500 pounds (FAA rules which apply to sec. 42.80).* The following en route limitations data shall be used in determining compliance with section 42.80. These data are presented in tabular and graphic form by aircraft make and model. En route performance data on other aircraft weighing less than 12,500 pounds and operated under section 42.16 will be made available upon application to the Administrator.

(Published in 19 F. R. 5660, Sept. 8, 1954, effective Oct. 1, 1954; amended in 21 F. R. 8420, Nov. 3, 1956, effective Dec. 1, 1956.)

TABLE 1.—*En route limitations*

AERO COMMANDER 520

Weight in pounds [1]	Terrain clearance [2] in feet and climb speed in miles per hour (TIAS)	
	Feet [3]	Miles per hour
5,500	(3, 480)	94. 8
5,000	6, 820	93. 5
4,500	10, 130	92. 4

[1] The maximum permissible weight under secs. 42.16 and 42.82 is 5,420 pounds.
[2] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.
[3] The "terrain clearance" in parenthesis is not usable under secs. 42.16 and 42.82 because the minimum terrain altitude is 4,000 feet under sec. 42.82.

NOTE.—Inoperative propeller windmilling.

BEECH C–18S AND BEECH 18A

Airplane	Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
		Feet	Miles per hour
Beech C–18S	7, 850	6, 200	102. 5
	7, 500	7, 620	98. 7
	7, 000	9, 630	93. 3
Beech 18A	7, 200	4, 760	91. 7
	7, 000	5, 540	90. 8
	6, 500	7, 460	88. 9
	6, 000	9, 400	86. 9

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

BEECH AT–11

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
	Feet	Miles per hour
7,850	6, 200	102. 1
7,500	7, 800	100. 9
7,000	10, 170	99. 2
6,500	12, 500	97. 5

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

NOTE.—Inoperative propeller idling in high pitch. Cowl flaps are closed on inoperative engine. De-icers are not operating.

BEECH D–18C

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
	Feet	Miles per hour
9,000	6, 200	121. 0
8,500	7, 300	120. 0
8,000	8, 450	119. 5
7,500	9, 600	119. 0

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

NOTE.—Inoperative propeller feathered.

TABLE 1.—*En route limitations*—Continued

BEECH D–18S

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)			
	Propeller feathered		Propeller idling	
	Feet	Miles per hour	Feet	Miles per hour
8,750	7, 100	103. 5		
8,500	7, 600	103. 5	5, 600	104. 5
8,000	8, 800	102. 5	6, 700	104. 0
7,500	9, 900	102. 0	7, 900	103. 0

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

BEECH 50

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
	Feet	Miles per hour
5,500	4, 140	96. 4
5,000	7, 710	94. 6
4,500	11, 340	92. 7

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

NOTE.—Inoperative propeller windmilling.

CESSNA T–50

(WITH LYCOMING R–680–E3 ENGINES AND MAXIMUM GROSS WEIGHT OF 5,700 POUNDS)

Weight [3] in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)			
	6135A–15 propeller		6135A–9 propeller	
	Feet [2]	Miles per hour	Feet [2]	Miles per hour
5,700			(450)	87. 4
5,500	(920)	87. 2	(1, 540)	87. 0
5,250	(2, 280)	86. 6	(2, 890)	86. 4
5,000	(3, 740)	86. 0	4, 320	85. 7
4,750	5, 120	85. 3	5, 730	85. 2

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.
[2] The "terrain clearances" in parentheses are not usable under sec. 42.16 and sec. 42.82 because minimum terrain altitude is 4,000 feet under sec. 42.82.
[3] Maximum permissible weights under sec. 42.16 and sec. 42.82 are 4,950 pounds with 6135A–15 propeller; 5,050 pounds with 6135A–9 propeller.

NOTE.—Inoperative propeller windmilling. No leading edge de-icers installed.

GRUMMAN G–21

Weight in pounds [1]	Terrain clearance [2] in feet and climb speed in miles per hour (TIAS)	
	Feet [3]	Miles per hour
7,500	[3] (3, 620)	111. 5
7,000	4, 610	111. 1
6,500	5, 590	110. 6
6,000	6, 550	110. 1
5,500	7, 530	109. 6

[1] The maximum permissible weight under secs. 42.16 and 42.82 is 7,310 pounds.
[2] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.
[3] The "terrain clearance" in parenthesis is not usable under secs. 42.16 and 42.82 because the minimum terrain altitude is 4,000 feet under sec. 42.82.

NOTE.—Propeller idling in high pitch. Airplane is equipped with de-icers.

LOCKHEED 10A

Weight in pounds [1]	Terrain clearance [2] in feet and climb speed in miles per hour (TIAS)			
	Propeller feathered		Propeller idling	
	Feet [3]	Miles per hour	Feet [3]	Miles per hour
10,500	(3, 600)	93. 8		
10,100	4, 580	93. 6	(3, 120)	92. 9
10,000	4, 820	93. 5	(3, 350)	92. 8
9,500	6, 020	93. 1	4, 660	92. 5
9,000	7, 200	92. 8	5, 900	92. 1
8,500	8, 350	92. 4	7, 180	91. 7
8,000	9, 550	92. 0	8, 420	91. 4

[1] The maximum permissible weights under secs. 42.16 and 42.82 are 9,750 pounds with propeller idling, 10,340 pounds with propeller feathered.
[2] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.
[3] The "terrain clearances" in parenthesis are not usable under secs. 42.16 and 42.82 because the minimum terrain altitude is 4,000 feet under sec. 42.82.

TABLE 1.—*En route limitations*—Continued

LOCKHEED 10E

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)			
	Propeller feathered		Propeller idling	
	Feet	Miles per hour	Feet	Miles per hour
10,500	9,000	96	7,500	96.5
10,000	9,600	96	8,100	96.5
9,500	10,200	96	8,600	96.5
9,000	10,700	96	9,200	96.5
8,500	11,300	96	9,750	96.5
8,000	11,900	96	10,350	96.5

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

CESSNA MODEL 310

(WITH ORIGINAL PROPELLER DIAMETER LIMITS OF 82 INCHES TO 84 INCHES)

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
	Feet	Miles per hour
4,600	6,300	102.0
4,500	6,900	101.8
4,250	8,250	101.4
4,000	9,600	101.0
3,750	10,950	100.6

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

NOTE: Inoperative propeller feathered.

LOCKHEED 12A

Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)	
	Feet	Miles per hour
8,600	6,700	98.5
8,000	7,400	98.5
7,500	7,950	98.5
7,000	8,500	98.5
6,500	9,000	98.5

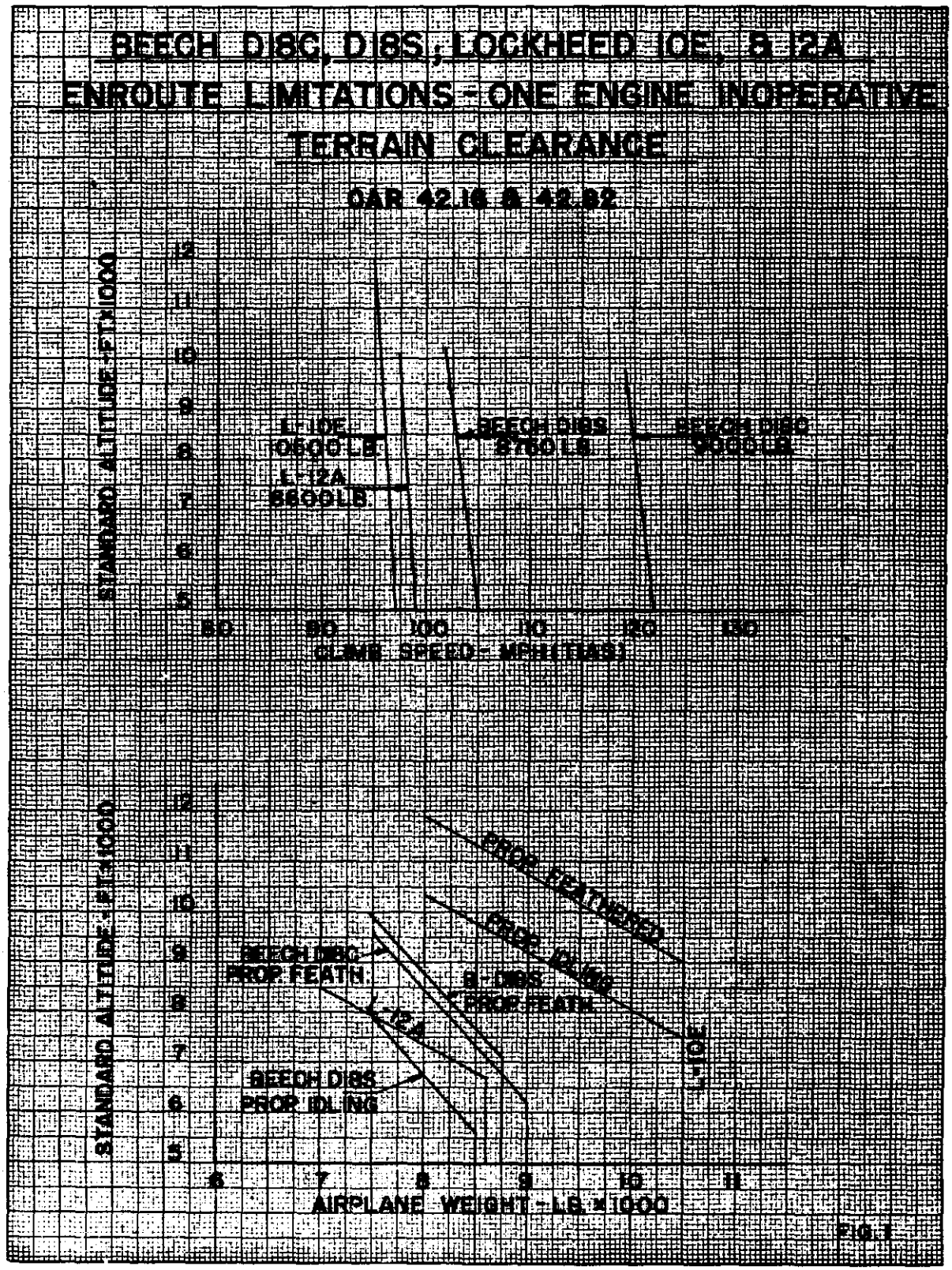
[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

DE HAVILLAND DOVE SERIES

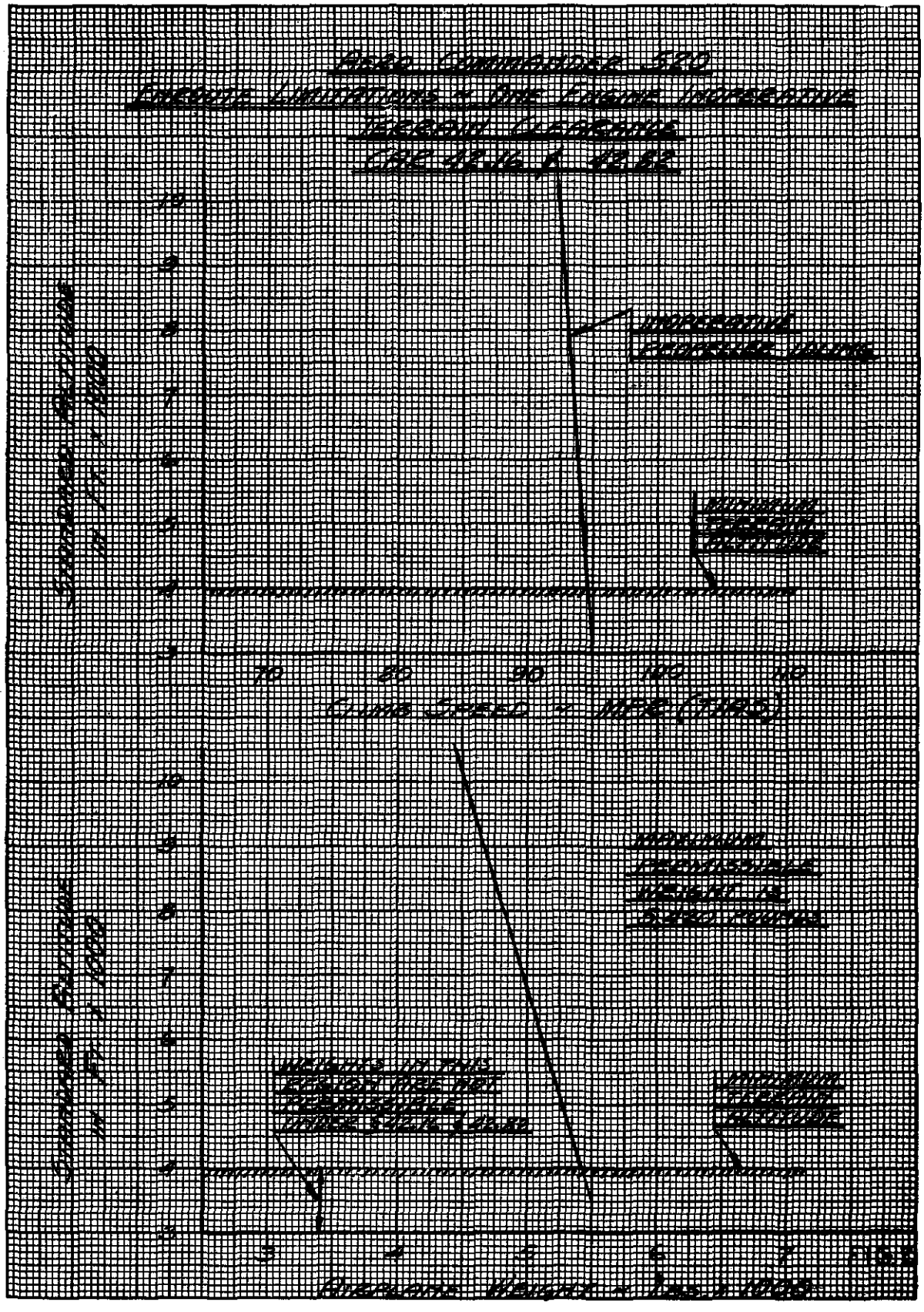
Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour (TIAS)		
	m. p. h.	Feet	
		1A and 2A Series	5A and 6A Series
8,800	110		5,600
8,500	108	6,600	6,600
8,000	105	8,300	8,300
7,500	102	9,900	9,900

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

NOTE: Inoperative propeller feathered.


BEECH D18C, D18S; LOCKHEED 10E, & 12A
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.32
STANDARD ALTITUDE - FT. X1000
L-10E 10600 LB
L-12A 8600 LB
BEECH D18S 8750 LB
BEECH D18C 9000 LB
CLIMB SPEED - MPH (TIAS)
PROP FEATHERED
BEECH D18C PROP FEATH.
L-12A
BEECH D18S PROP IDLING
L-10E
AIRPLANE WEIGHT - LBS. X 1000
FIG. 1

535996 O—60——7



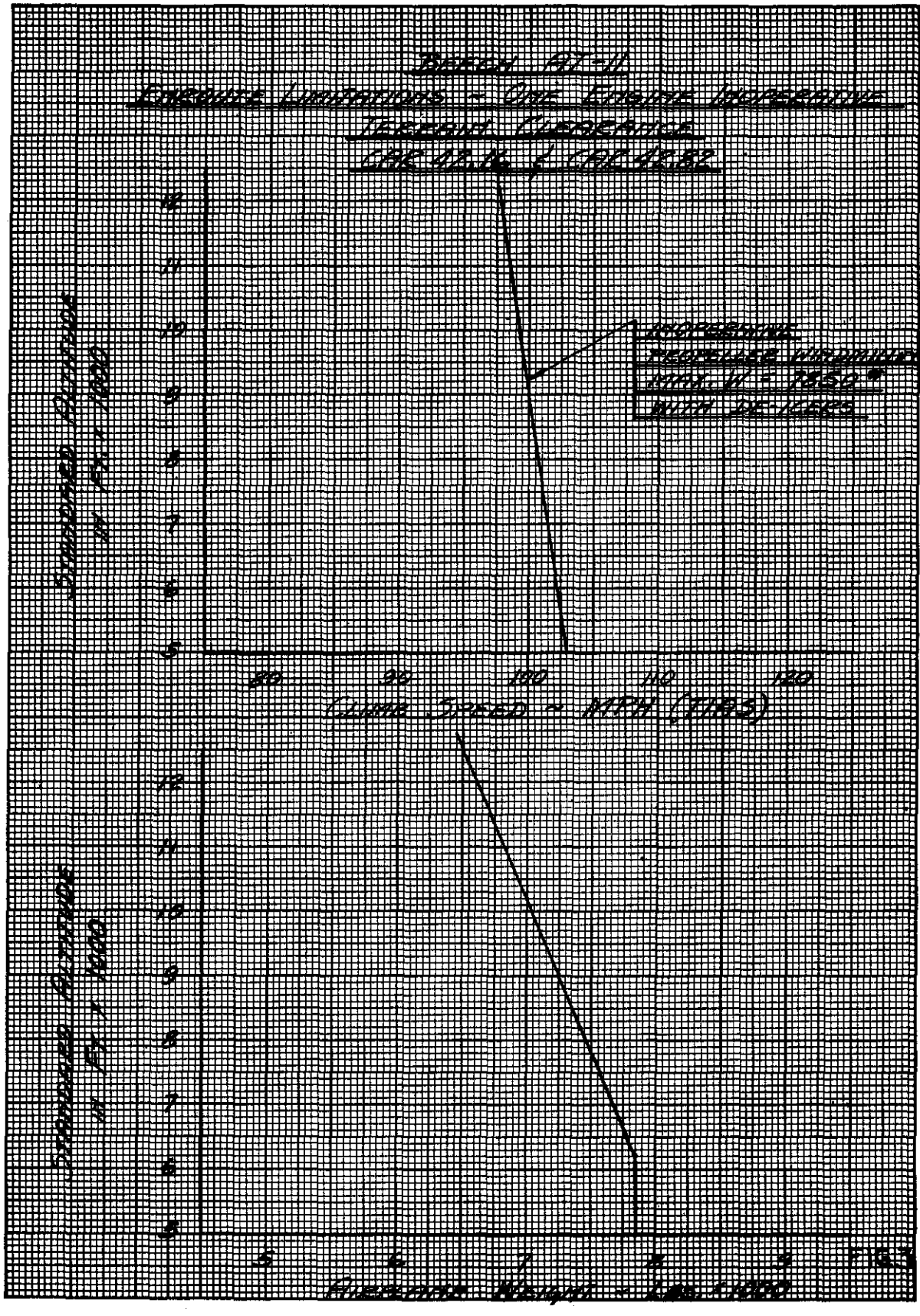

BEECH AT-11
ENROUTE LIMITATIONS ~ ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & CAR 42.82
INOPERATIVE
PROPELLER WINDMILLING
MAX. W = 7850#
WITH DE-ICERS
STANDARD ALTITUDE IN FT. x 1000
12
11
10
9
8
7
6
5
80
90
100
110
120
CLIMB SPEED ~ MPH (TIAS)
STANDARD ALTITUDE IN FT. x 1000
12
11
10
9
8
7
6
5
5
6
7
8
9
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 3

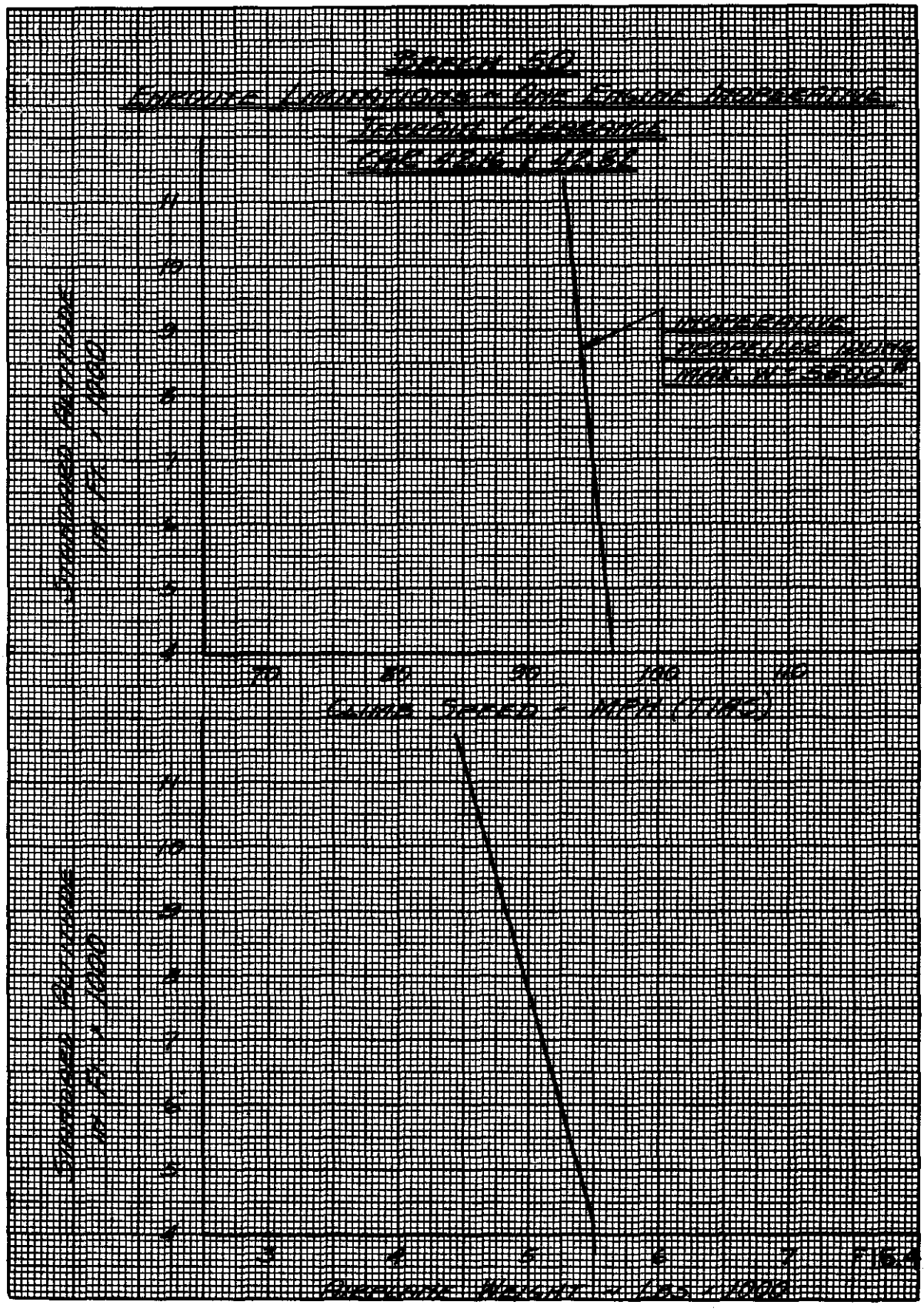
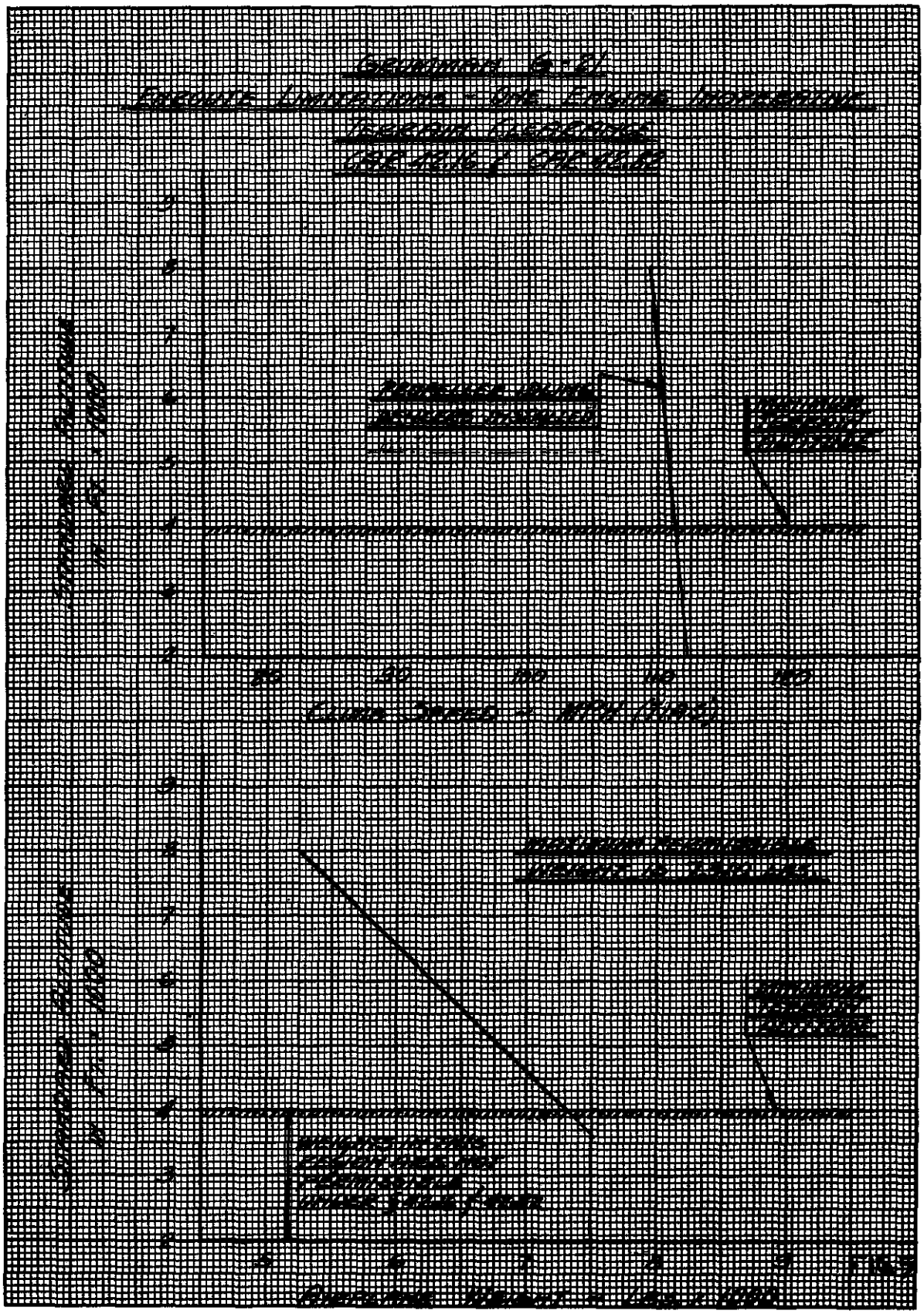


Chart No. 42
Increase in Direct Operating Cost Due to Increase in Block Speed
Case Mark I 12.5%



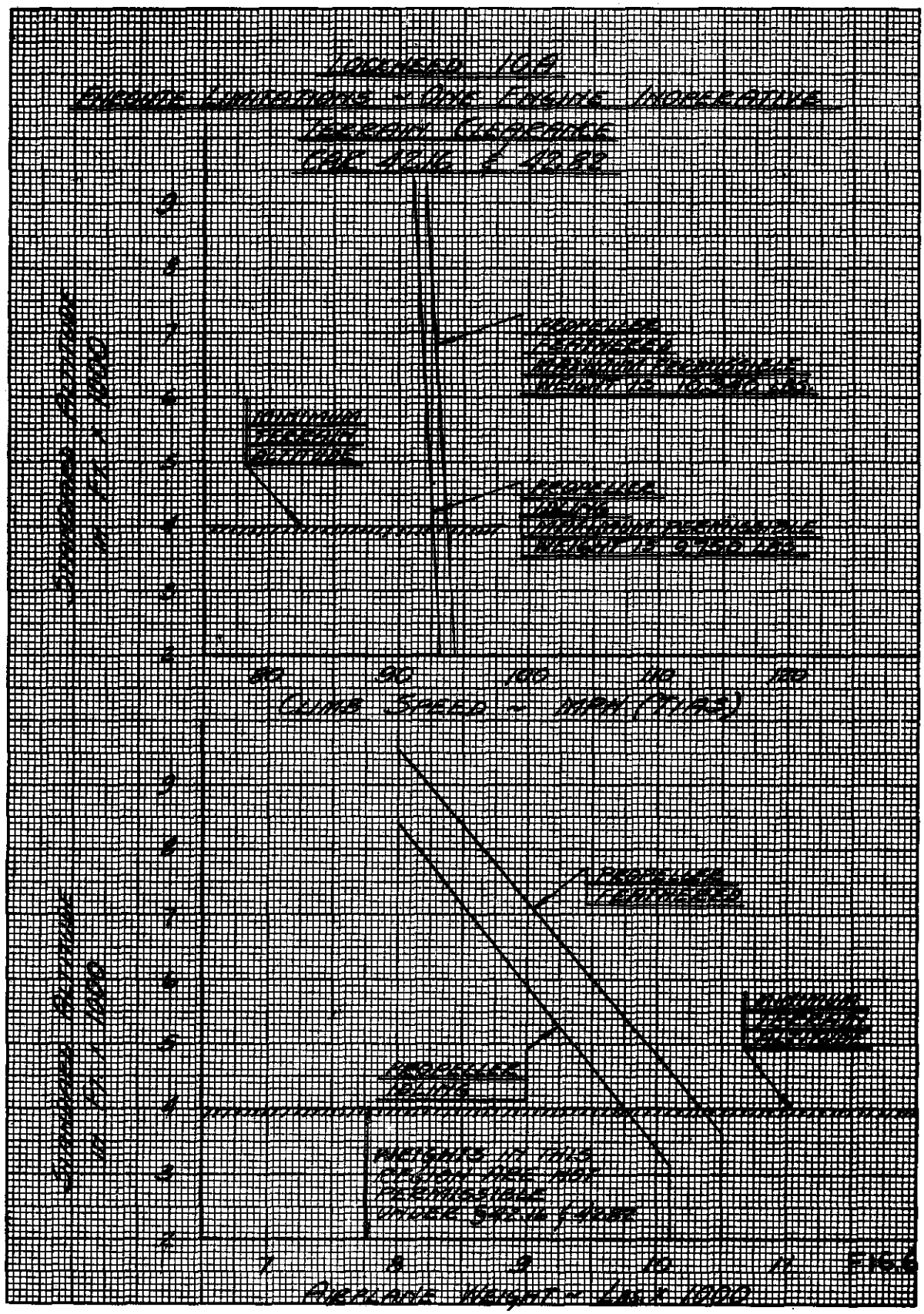

LOCKHEED 10A
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
STANDARD ALTITUDE IN FT. x 1000
PROPELLER FEATHERED
MAXIMUM PERMISSIBLE WEIGHT IS 10,340 LBS.
MINIMUM TERRAIN ALTITUDE
PROPELLER IDLING
MAXIMUM PERMISSIBLE WEIGHT IS 9,750 LBS.
80
90
100
110
120
CLIMB SPEED ~ MPH (TIAS)
PROPELLER FEATHERED
PROPELLER IDLING
WEIGHTS IN THIS REGION ARE NOT PERMISSIBLE UNDER §42.16 & 42.82
7
8
9
10
11
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 6

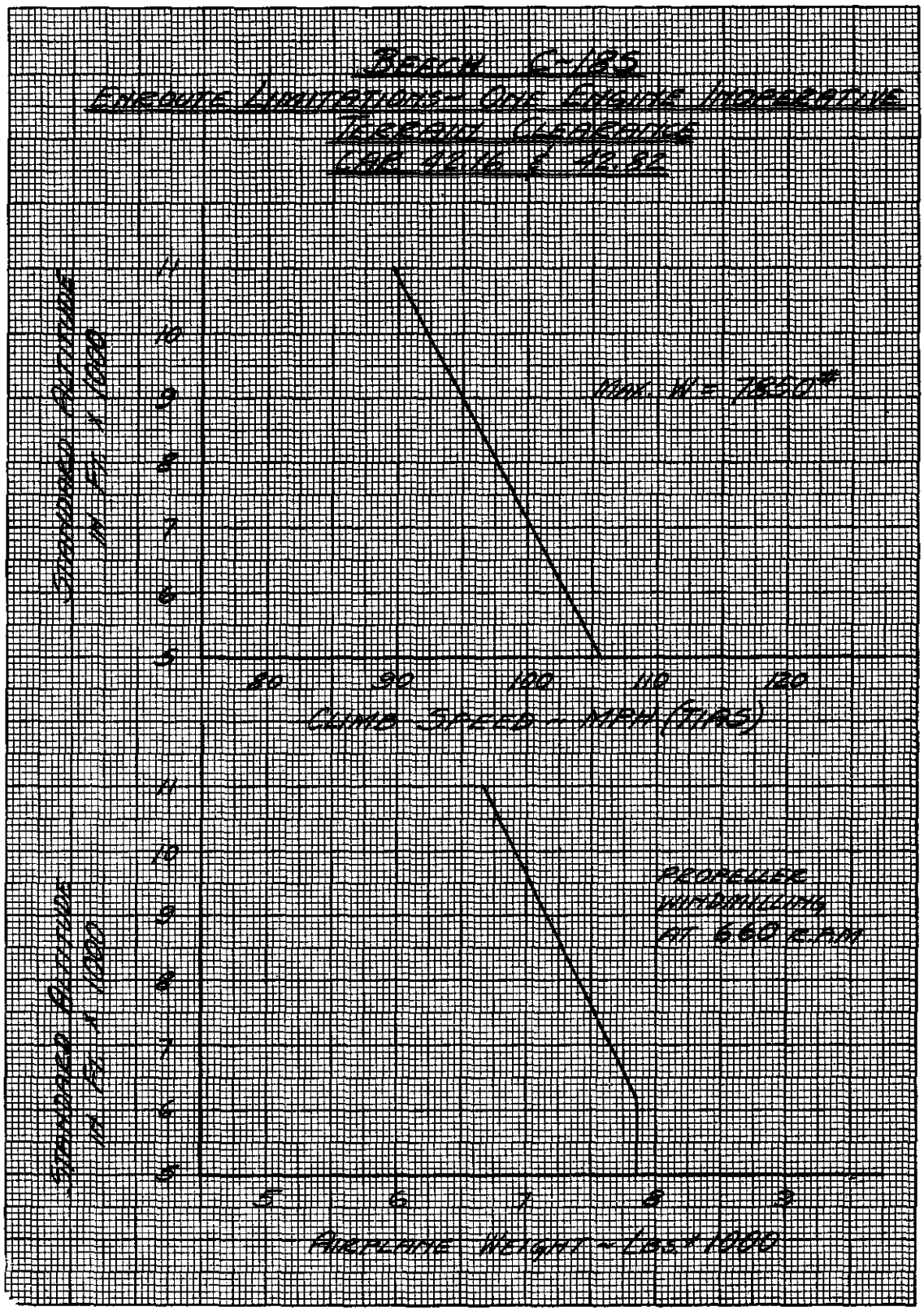

BEECH C-185
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
STANDARD ALTITUDE IN FT. X 1000
MAX. W = 7850#
CLIMB SPEED - MPH (TIAS)
PROPELLER WINDMILLING AT 660 R.P.M.
AIRPLANE WEIGHT - LBS X 1000

Figure 7.

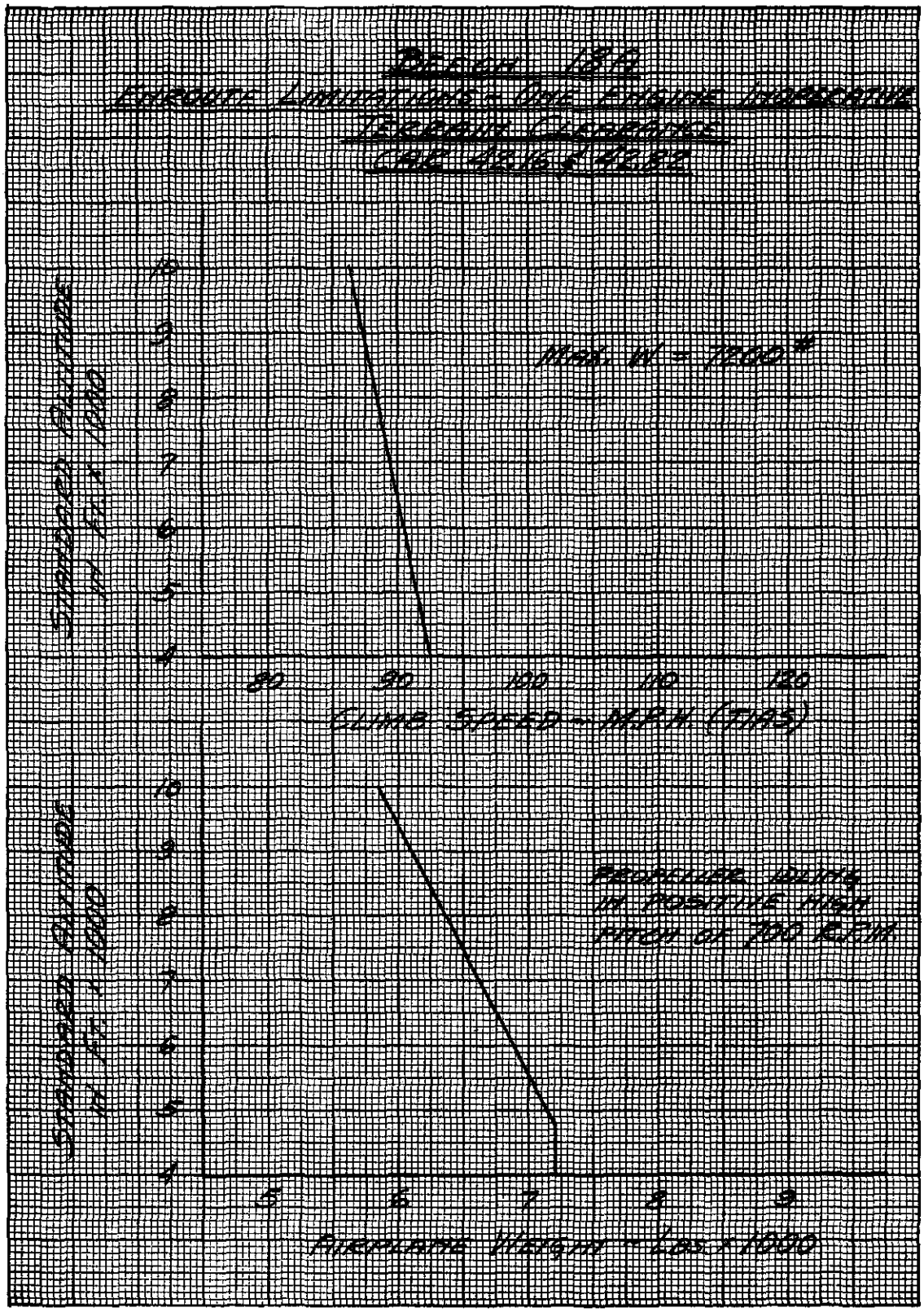


Figure 8.

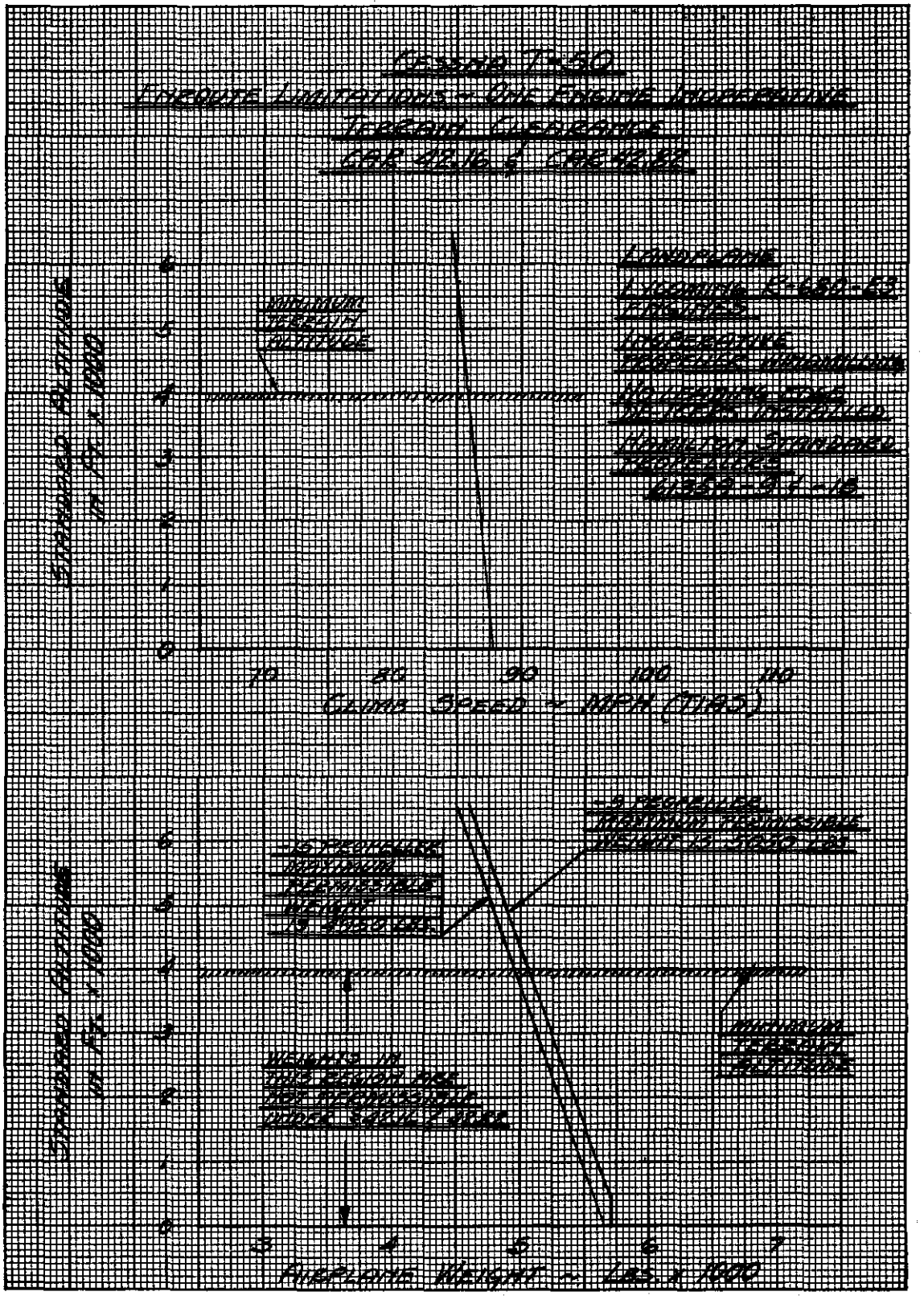


Figure 9.

(42.80–6. Published in 15 F. R. 93, Jan. 10, 1950, effective Jan. 1, 1950; amended in 19 F. R. 2054, Apr. 9, 1954, effective Apr. 24, 1954; amended in 19 F. R. 3564, June 17, 1954, effective July 15, 1954; amended in 19 F. R. 5660, Sept. 8, 1954, effective Oct. 1, 1954.)

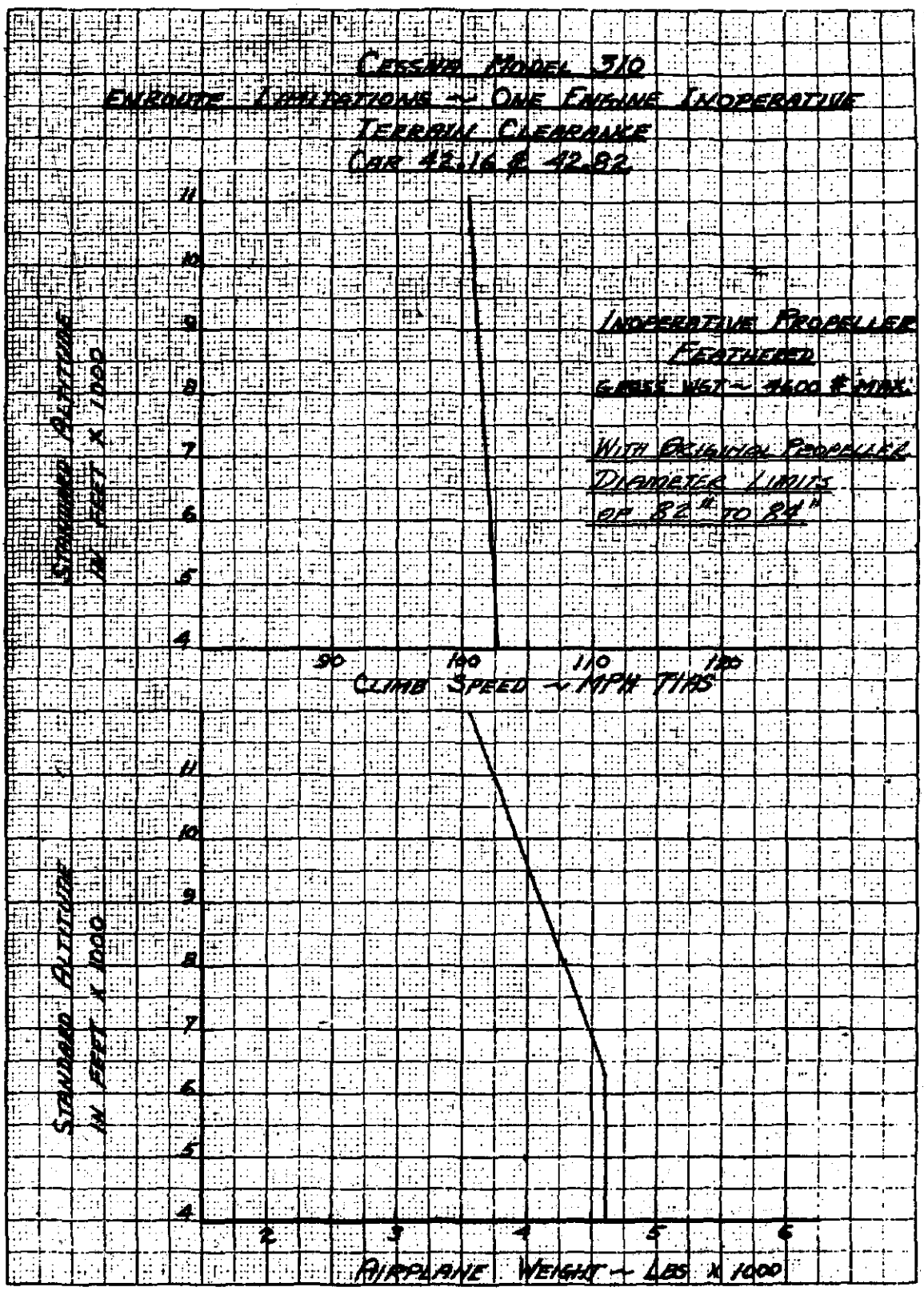


Figure 10.

(Published in 21 F. R. 8420, Nov. 3, 1956, effective Dec. 1, 1956.)

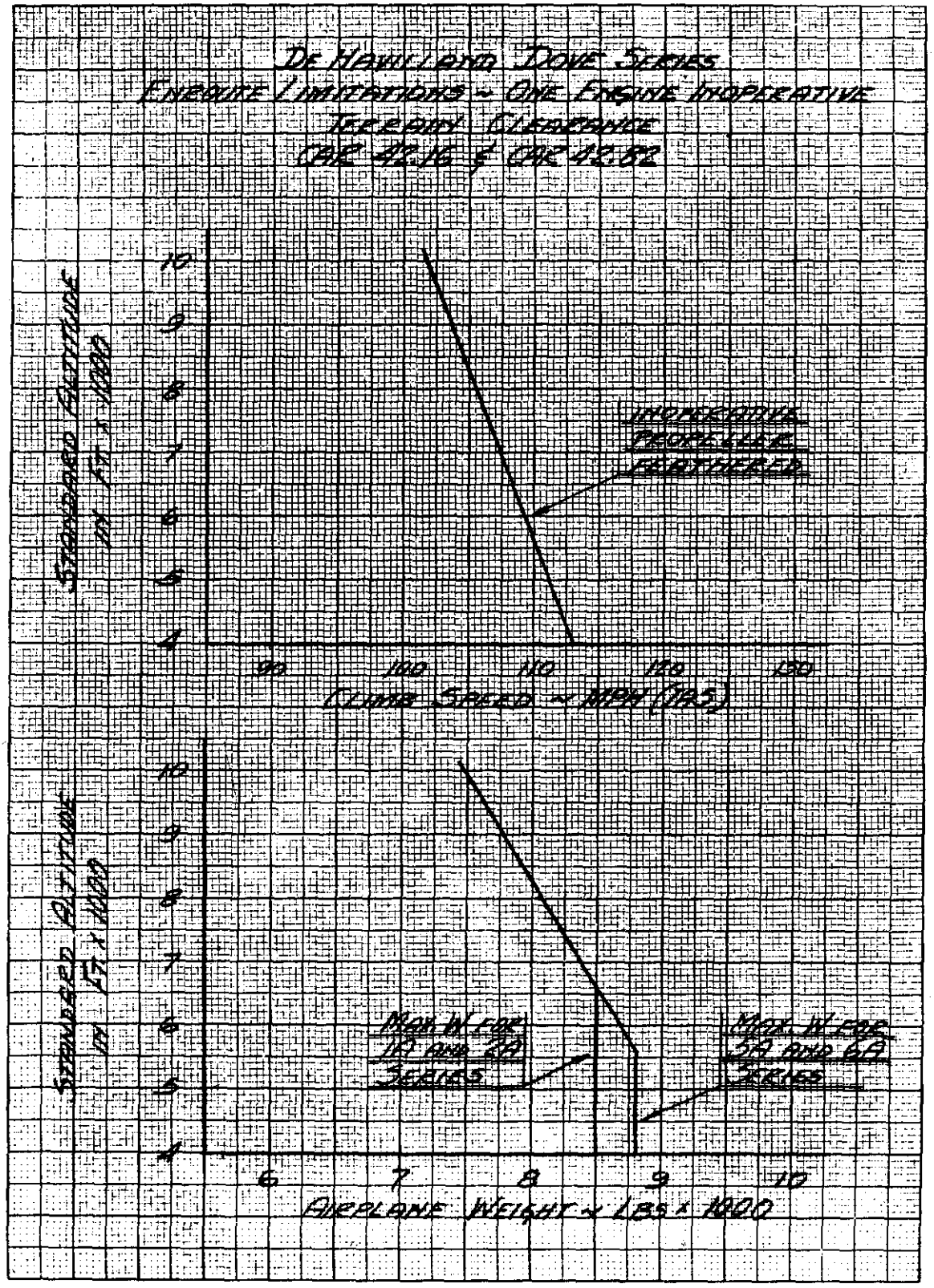


Figure 11.

(Published in 21 F. R. 8421, Nov. 3, 1956, effective Dec. 1, 1956.)

42.80–7 *Performance data on Boeing S–307 aircraft (FAA rules which apply to section 42.80).* The following performance limitations data, applicable to Boeing S–307 aircraft, shall be used in determining compliance with section 42.80. These data are presented in the tables and figures of this section.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 (distance to accelerate to 1.15 V_{s_1}=1.15 (85.4) $\sqrt{\text{Wgt.}/50{,}000}$ knots TIAS and stop, with zero wind and zero gradient).

Standard altitude in feet	Airplane weight in pounds and critical engine failure speeds in knots TIAS		
	46,000 V_1=94.0	48,000 V_1=96.5	50,000 V_1=98.0
	Distance in feet		
S. L.	3,730	4,010	4,260
1,000	3,900	4,190	4,460
2,000	4,120	4,430	4,720
3,000	4,350	4,680	4,990
4,000	4,600	4,950	5,280
5,000	4,860	5,250	5,600
6,000	5,140	5,550	5,940
7,000	5,460	5,910	6,320
8,000	5,820	6,330	6,770

(b) Actual length of runway required when "effective length," considering obstacles, is not determined (distance to accelerate to 1.15 (85.4) $\sqrt{\text{Wgt.}/50{,}000}$ knots TIAS, and stop, divided by the factor 0.85).

Standard altitude in feet	Airplane weight in pounds and critical engine failure speed (V_1) in knots TIAS		
	46,000 V_1=94.0	48,000 V_1=96.5	50,000 V_1=98.0
	Distance in feet		
S. L.	4,390	4,720	5,010
1,000	4,590	4,930	5,245
2,000	4,845	5,210	5,555
3,000	5,120	5,505	5,870
4,000	5,410	5,825	6,210
5,000	5,720	6,175	6,590
6,000	6,045	6,530	6,990
7,000	6,425	6,955	7,435
8,000	6,845	7,445	7,965

TABLE 2.—*En route limitations*

Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS		Weight in pounds	Terrain clearance [1] in feet and climb speed in knots TIAS	
	Feet	knots		Feet	knots
40,000	17,000	89.5	46,000	13,750	99.0
41,000	16,400	91.0	47,000	13,200	100.5
42,000	15,900	93.0	48,000	12,700	101.5
43,000	15,350	94.0	49,000	12,150	103.0
44,000	14,800	96.0	50,000	11,650	104.0
45,000	14,300	97.5			

[1] Highest altitude of terrain over which airplane may be operated in compliance with sec. 42.82.

TABLE 3.—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	3,065	81.0	3,445	86.5	3,815	91.0
1,000	3,145	81.0	3,540	86.5	3,915	91.0
2,000	3,225	81.0	3,630	86.5	4,015	91.0
3,000	3,310	81.0	3,725	86.5	4,120	91.0
4,000	3,390	81.0	3,820	86.5	4,225	91.0
5,000	3,480	81.0	3,925	86.5	4,340	91.0
6,000	3,575	81.0	4,035	86.5	4,460	91.0
7,000	3,670	81.0	4,140	86.5	4,580	91.0
8,000	3,770	81.0	4,260	86.5	4,715	91.0

[1] Steady approach speed through 50-foot height knots TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots TIAS					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	3,890	81.0	4,375	86.5	4,845	91.0
1,000	3,995	81.0	4,495	86.5	4,970	91.0
2,000	4,095	81.0	4,610	86.5	5,100	91.0
3,000	4,205	81.0	4,730	86.5	5,230	91.0
4,000	4,305	81.0	4,850	86.5	5,365	91.0
5,000	4,420	81.0	4,985	86.5	5,510	91.0
6,000	4,540	81.0	5,125	86.5	5,665	91.0
7,000	4,660	81.0	5,260	86.5	5,815	91.0
8,000	4,790	81.0	5,410	86.5	5,990	91.0

[1] Steady approach speed through 50-foot height knots TIAS denoted by symbol V_{50}.

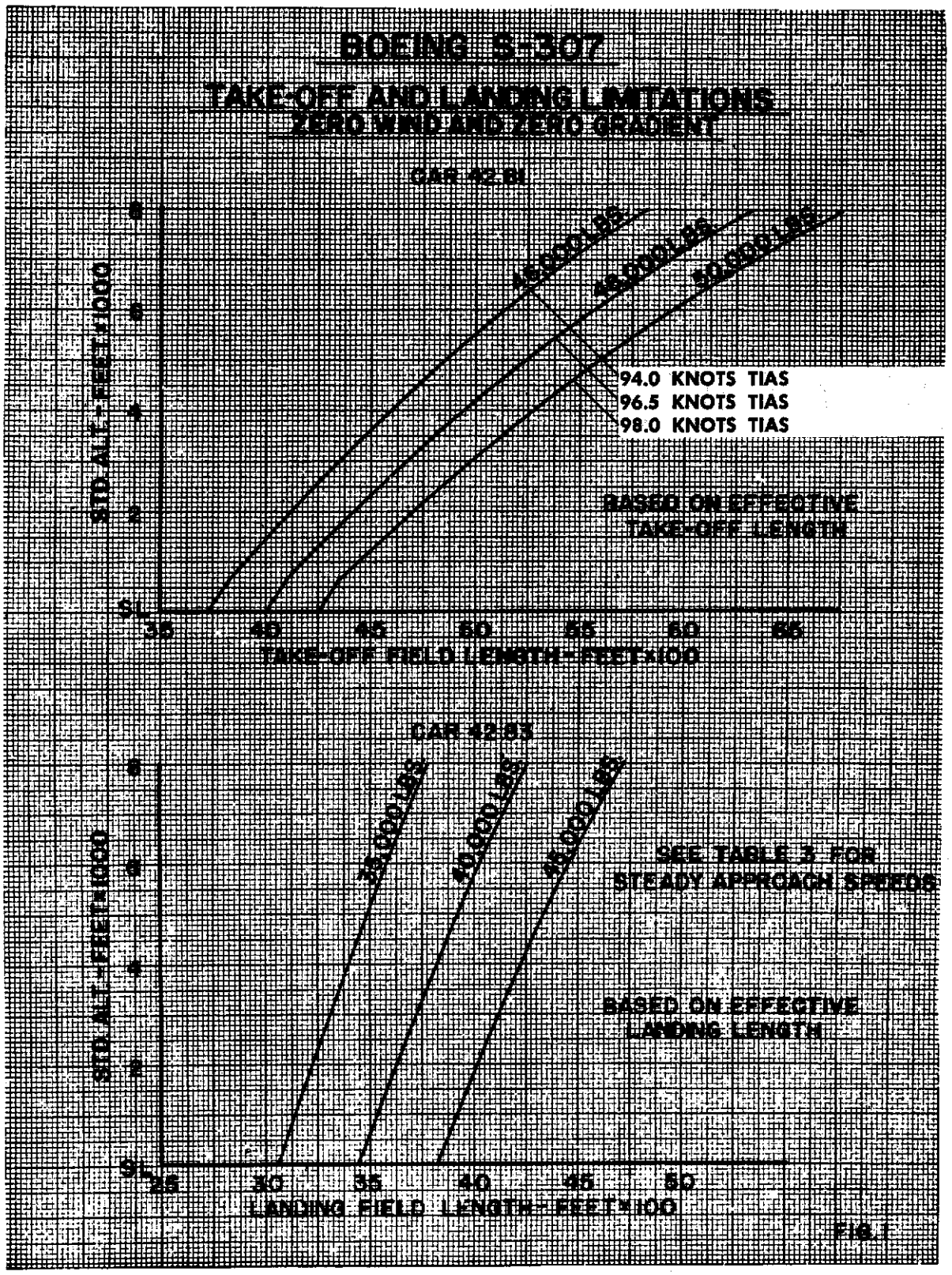
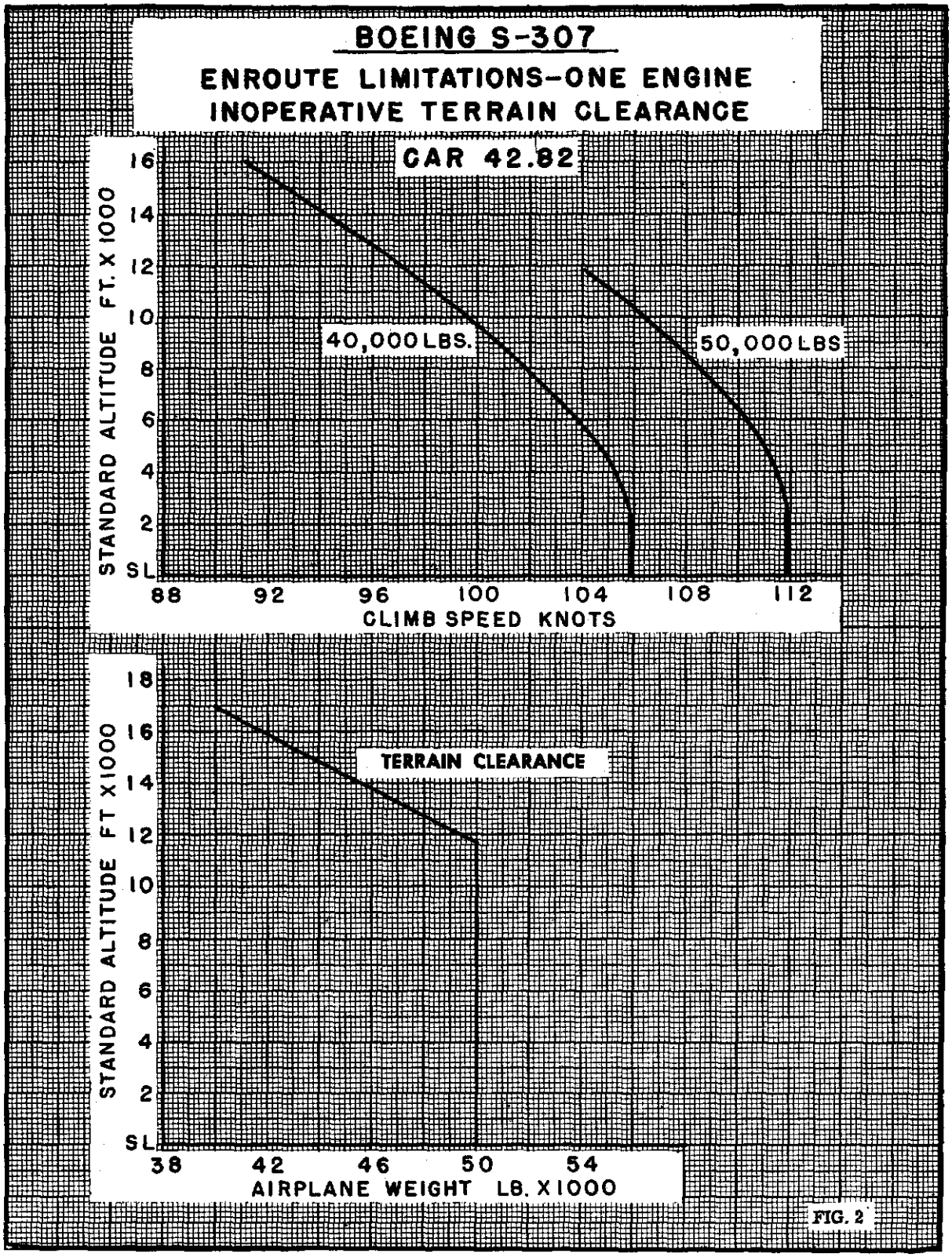

BOEING S-307
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STD. ALT.-FEET×1000
8
6
4
2
SL
35
40
45
50
55
60
65
TAKE-OFF FIELD LENGTH-FEET×100
50,000 LBS.
45,000 LBS.
40,000 LBS.
94.0 KNOTS TIAS
96.5 KNOTS TIAS
98.0 KNOTS TIAS
BASED ON EFFECTIVE TAKE-OFF LENGTH
CAR 42.83
STD. ALT.-FEET×1000
8
6
4
2
SL
25
30
35
40
45
50
LANDING FIELD LENGTH-FEET×100
45,000 LBS.
40,000 LBS.
35,000 LBS.
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH

FIG. 1



(42.80–7. Published in 16 F. R. 4486, May 15, 1951, effective May 15, 1951; amended in 21 F. R. 2232, Apr. 6, 1956, effective Apr. 1, 1956.)

42.80–8 *Performance data—operations from sod runway surfaces (FAA rules which apply to section 42.80.)*

(a) *General.* The performance limitation data and information contained herein, are adopted to provide a comparable level of safety between operations utilizing sod surfaced runways and those utilizing paved surfaced runways. There are, of course, numerous types of runway surfaces which are neither paved nor sod. Obviously, it is not feasible at this time to categorize all of the runway surfaces and to establish specific correction factors for operations from them. Therefore, all runways which are not paved shall be regarded as sod runways, and the limitations data herein shall be applied to such runways, except in those individual cases where the Administrator finds that a particular runway surface is such as to justify the use of a specific correction factor.

(b) *Takeoff limitation data.* In computing the maximum allowable takeoff weights for operations from sod runways, the takeoff weight tables contained in sections 42.80–1, 42.80–2, 42.80–3, 42.80–4, 42.80–5 or 42.80–7 shall be used in the following manner:

(1) Where the effective length of a sod runway has been established, the maximum allowable takeoff weight shall be the *lesser* gross weight as determined by application of the effective length to the appropriate takeoff table (a) and by application of the actual runway length to the corresponding takeoff table (b). Takeoff table (a) is used to determine the maximum allowable gross weight which will permit the aircraft to take off within the effective runway length, while table (b) is used to determine the maximum allowable gross weight which will permit the particular aircraft to be accelerated and brought to a full stop within the actual length of available runway.

(2) Where the effective length of a sod runway has not been established, the maximum allowable takeoff weight shall be determined by application of the actual runway length to the appropriate takeoff table (b). Tables (b) incorporate a correction factor (approximately 17.6 percent for an assumed obstruction height and/or a reduced coefficient of friction).

(c) *Landing limitations data.* In computing the maximum allowable landing weights for operations from sod runways, the landing weight tables contained in this section shall be used in the following manner:

(1) Where the effective length of a sod runway has been established, the maximum allowable landing weight shall be determined by application of the effective length to the appropriate landing weight table (a).

(2) Where the effective length of a sod runway has not been established, the maximum allowable landing weight shall be determined by application of the actual runway length to the appropriate landing weight table (b).

DOUGLAS DC–3 G102, C202A, S1C3G, AND C47's, R4D's WITH COMPARABLE HORSEPOWER ENGINES

TABLE 4.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,200	V_{50}
	Distance in feet							
S. L.	2, 830	74. 5	3, 015	76. 5	3, 210	78. 0	3, 390	80. 0
1,000	2, 900	74. 5	3, 080	76. 5	3, 275	78. 0	3, 465	80. 0
2,000	2, 965	74. 5	3, 155	76. 5	3, 350	78. 0	3, 540	80. 0
3,000	3, 040	74. 5	3, 235	76. 5	3, 425	78. 0	3, 630	80. 0
4,000	3, 115	74. 5	3, 320	76. 5	3, 520	78. 0	3, 715	80. 0
5,000	3, 210	74. 5	3, 410	76. 5	3, 605	78. 0	3, 805	80. 0
6,000	3, 300	74. 5	3, 505	76. 5	3, 705	78. 0	3, 910	80. 0
7,000	3, 410	74. 5	3, 610	76. 5	3, 810	78. 0	4, 015	80. 0
8,000	3, 500	74. 5	3, 725	76. 5	3, 935	78. 0	4, 135	80. 0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(Continued on page 105)

TABLE 4.—*Landing limitations (sod runway surfaces)*—Continued

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,200	V_{50}
	Distance in feet							
S. L	3,595	74.5	3,825	76.5	4,075	78.0	4,305	80.0
1,000	3,680	74.5	3,900	76.5	4,165	78.0	4,405	80.0
2,000	3,765	74.5	4,010	76.5	4,255	78.0	4,495	80.0
3,000	3,865	74.5	4,110	76.5	4,355	78.0	4,605	80.0
4,000	3,955	74.5	4,215	76.5	4,470	78.0	4,715	80.0
5,000	4,075	74.5	4,330	76.5	4,575	78.0	4,835	80.0
6,000	4,190	74.5	4,455	76.5	4,705	78.0	4,970	80.0
7,000	4,330	74.5	4,590	76.5	4,840	78.0	5,095	80.0
8,000	4,445	74.5	4,730	76.5	4,995	78.0	5,250	80.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

LOCKHEED 18 G202A AIRCRAFT

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L	4,270	83.5	4,380	84.0	4,470	86.0
1,000	4,400	83.5	4,495	84.0	4,595	86.0
2,000	4,520	83.5	4,625	84.0	4,720	86.0
3,000	4,645	83.5	4,750	84.0	4,855	86.0
4,000	4,770	83.5	4,875	84.0	4,985	86.0
5,000	4,875	83.5	5,000	84.0	5,115	86.0
6,000	5,025	83.5	5,130	84.0	5,255	86.0
7,000	5,150	83.5	5,260	84.0	5,395	86.0
8,000	5,285	83.5	5,395	84.0	5,530	86.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L	5,430	83.5	5,565	84.0	5,675	86.0
1,000	5,590	83.5	5,710	84.0	5,835	86.0
2,000	5,740	83.5	5,870	84.0	5,995	86.0
3,000	5,900	83.5	6,030	84.0	6,165	86.0
4,000	6,060	83.5	6,195	84.0	6,330	86.0
5,000	6,195	83.5	6,355	84.0	6,495	86.0
6,000	6,380	83.5	6,515	84.0	6,675	86.0
7,000	6,545	83.5	6,680	84.0	6,850	86.0
8,000	6,710	83.5	6,850	84.0	7,025	86.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

CURTIS MODEL C–46 AIRCRAFT

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	4,255	86.0	4,435	88.0	4,635	90.5	4,725	91.0
1,000	4,370	86.0	4,555	88.0	4,760	90.5	4,855	91.0
2,000	4,485	86.0	4,680	88.0	4,890	90.5	4,985	91.0
3,000	4,660	86.0	4,805	88.0	5,015	90.5	5,120	91.0
4,000	4,730	86.0	4,935	88.0	5,145	90.5	5,250	91.0
5,000	4,845	86.0	5,060	88.0	5,285	90.5	5,380	91.0
6,000	4,980	86.0	5,190	88.0	5,415	90.5	5,520	91.0
7,000	5,095	86.0	5,330	88.0	5,570	90.5	5,670	91.0
8,000	5,235	86.0	5,470	88.0	5,715	90.5	5,820	91.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(2) Curtiss model C–46 certificated for maximum weight of 48,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	3,325	80.5	3,450	82.0	3,575	84.5	3,695	86.0
1,000	3,405	80.5	3,530	82.0	3,655	84.5	3,780	86.0
2,000	3,490	80.5	3,615	82.0	3,740	84.5	3,865	86.0
3,000	3,575	80.5	3,695	82.0	3,830	84.5	3,945	86.0
4,000	3,675	80.5	3,795	82.0	3,920	84.5	4,050	86.0
5,000	3,750	80.5	3,875	82.0	4,020	84.5	4,155	86.0
6,000	3,830	80.5	3,980	82.0	4,115	84.5	4,255	86.0
7,000	3,925	80.5	4,075	82.0	4,220	84.5	4,370	86.0
8,000	4,025	80.5	4,180	82.0	4,330	84.5	4,485	86.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 41.1.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	5,415	86.0	5,645	88.0	5,900	90.5	6,015	91.0
1,000	5,560	86.0	5,795	88.0	6,060	90.5	6,175	91.0
2,000	5,710	86.0	5,955	88.0	6,220	90.5	6,350	91.0
3,000	5,930	86.0	6,120	88.0	6,385	90.5	6,515	91.0
4,000	6,015	86.0	6,280	88.0	6,550	90.5	6,680	91.0
5,000	6,170	86.0	6,440	88.0	6,730	90.5	6,850	91.0
6,000	6,335	86.0	6,605	88.0	6,895	90.5	7,025	91.0
7,000	6,485	86.0	6,785	88.0	7,090	90.5	7,215	91.0
8,000	6,650	86.0	6,960	88.0	7,275	90.5	7,405	91.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(Continued on page 107)

TABLE 3.—*Landing limitations (sod runway surfaces)*—Continued

(2) Curtiss C–46 certificated maximum weight of 48,000 pounds.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	4,230	80.5	4,395	82.0	4,555	84.5	4,705	86.0
1,000	4,330	80.5	4,490	82.0	4,650	84.5	4,805	86.0
2,000	4,440	80.5	4,600	82.0	4,755	84.5	4,915	86.0
3,000	4,555	80.5	4,705	82.0	4,875	84.5	5,020	86.0
4,000	4,665	80.5	4,830	82.0	4,990	84.5	5,150	86.0
5,000	4,775	80.5	4,935	82.0	5,120	84.5	5,290	86.0
6,000	4,875	80.5	5,065	82.0	5,240	84.5	5,415	86.0
7,000	4,995	80.5	5,185	82.0	5,370	84.5	5,560	86.0
8,000	5,125	80.5	5,320	82.0	5,510	84.5	5,710	86.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

CONVAIR MODEL 28–5ACF AND PBY–5A

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	3,935	74.5	4,105	76.5	4,245	78.0
1,000	4,040	74.5	4,215	76.5	4,370	78.0
2,000	4,145	74.5	4,330	76.5	4,485	78.0
3,000	4,255	74.5	4,370	76.5	4,610	78.0
4,000	4,360	74.5	4,585	76.5	4,725	78.0
5,000	4,470	74.5	4,665	76.5	4,845	78.0
6,000	4,570	74.5	4,775	76.5	4,970	78.0
7,000	4,680	74.5	4,880	76.5	5,090	78.0
8,000	4,785	74.5	4,990	76.5	5,205	78.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	5,005	74.5	5,225	76.5	5,400	78.0
1,000	5,145	74.5	5,365	76.5	5,560	78.0
2,000	5,275	74.5	5,510	76.5	5,710	78.0
3,000	5,415	74.5	5,650	76.5	5,870	78.0
4,000	5,550	74.5	5,790	76.5	6,015	78.0
5,000	5,685	74.5	5,935	76.5	6,170	78.0
6,000	5,820	74.5	6,075	76.5	6,325	78.0
7,000	5,955	74.5	6,215	76.5	6,475	78.0
8,000	6,090	74.5	6,355	76.5	6,625	78.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

CONVAIR MODEL 28-5ACF AND PBY-5A

TABLE 4.—*Landing limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	26,000	V_{50}	[2] 27,000	V_{50}	[3] 28,000	V_{50}
	Distance in feet					
S. L.	4,405	80.0	4,560	81.0	4,715	82.5
1,000	4,530	80.0	4,690	81.0	4,855	82.5
2,000	4,660	80.0	4,830	81.0	4,995	82.5
3,000	4,785	80.0	4,960	81.0	5,140	82.5
4,000	4,915	80.0	5,095	81.0	5,285	82.5
5,000	5,045	80.0	5,235	81.0	5,430	82.5
6,000	5,170	80.0	5,365	81.0	5,565	82.5
7,000	5,300	80.0	5,505	81.0	5,715	82.5
8,000	5,430	80.0	5,635	81.0	5,855	82.5

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.
[2] Maximum weight for PBY-5A landplane.
[3] Maximum weight for 28-5ACF.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	26,000	V_{50}	[2] 27,000	V_{50}	[3] 28,000	V_{50}
	Distance in feet					
S. L.	5,605	80.0	5,805	81.0	6,000	82.5
1,000	5,765	80.0	5,970	81.0	6,175	82.5
2,000	5,925	80.0	6,145	81.0	6,360	82.5
3,000	6,090	80.0	6,315	81.0	6,540	82.5
4,000	6,255	80.0	6,485	81.0	6,725	82.5
5,000	6,420	80.0	6,660	81.0	6,910	82.5
6,000	6,580	80.0	6,830	81.0	7,085	82.5
7,000	6,745	80.0	7,005	81.0	7,275	82.5
8,000	6,910	80.0	7,170	81.0	7,450	82.5

[1] Steady approach speed through 50 feet height— knots TIAS denoted by symbol V_{50}.
[2] Maximum weight for PBY-5A landplane.
[3] Maximum weight for 28-5ACF

DOUGLAS, RB-18A AIRCRAFT

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	3,280	74.5	3,575	77.0	3,875	78.5	3,960	79.0
1,000	3,370	74.5	3,680	77.0	3,990	78.5	4,075	79.0
2,000	3,460	74.5	3,785	77.0	4,100	78.5	4,185	79.0
3,000	3,550	74.5	3,885	77.0	4,210	78.5	4,300	79.0
4,000	3,640	74.5	3,990	77.0	4,320	78.5	4,410	79.0
5,000	3,730	74.5	4,095	77.0	4,430	78.5	4,525	79.0
6,000	3,825	74.5	4,200	77.0				
7,000	3,915	74.5	4,295	77.0	[2]	[2]	[2]	[2]
8,000	4,010	74.5	4,400	77.0				

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}
[2] Limited by CAR 42.82.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	4,175	74.5	4,555	77.0	4,935	78.5	5,050	79.0
1,000	4,290	74.5	4,680	77.0	5,070	78.5	5,185	79.0
2,000	4,410	74.5	4,820	77.0	5,220	78.5	5,325	79.0
3,000	4,515	74.5	4,945	77.0	5,355	78.5	5,475	79.0
4,000	4,630	74.5	5,075	77.0	5,490	78.5	5,610	79.0
5,000	4,750	74.5	5,215	77.0	5,635	78.5	5,755	79.0
6,000	4,865	74.5	5,340	77.0				
7,000	4,990	74.5	5,465	77.0	[2]	[2]	[2]	[2]
8,000	5,105	74.5	5,590	77.0				

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.
[2] Limited by CAR 42.82.

BOEING MODEL S–307 AIRCRAFT

TABLE 3.—*Landing limitations (sod runway surfaces)*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	3,525	81.0	3,960	86.5	4,385	91.0
1,000	3,615	81.0	4,070	86.5	4,500	91.0
2,000	3,710	81.0	4,175	86.5	4,615	91.0
3,000	3,805	81.0	4,285	86.5	4,740	91.0
4,000	3,900	81.0	4,395	86.5	4,860	91.0
5,000	4,000	81.0	4,515	86.5	4,990	91.0
6,000	4,110	81.0	4,640	86.5	5,130	91.0
7,000	4,220	81.0	4,760	86.5	5,265	91.0
8,000	4,335	81.0	4,900	86.5	5,420	91.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(b) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.1.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	4,475	81.0	5,040	86.5	5,570	91.0
1,000	4,595	81.0	5,170	86.5	5,715	91.0
2,000	4,710	81.0	5,300	86.5	5,865	91.0
3,000	4,835	81.0	5,440	86.5	6,015	91.0
4,000	4,950	81.0	5,580	86.5	6,170	91.0
5,000	5,085	81.0	5,735	86.5	6,335	91.0
6,000	5,220	81.0	5,895	86.5	6,515	91.0
7,000	5,360	81.0	6,050	86.5	6,685	91.0
8,000	5,510	81.0	6,220	86.5	6,890	91.0

[1] Steady approach speed through 50 feet height—knots TIAS denoted by symbol V_{50}.

(42.80–8. Published in 18 F. R. 173, Jan. 9, 1953, effective Jan. 31, 1953; amended in 21 F. R. 2232, Apr. 6, 1956, effective Apr. 1, 1956.)

42.81 *Takeoff limitations.* No takeoff shall be made except under conditions which will permit the airplane to be brought to a safe stop within the effective length of the runway from any point on takeoff up to the time of attaining, with all engines operating at normal takeoff power, 105 percent of the minimum control speed or 115 percent of the power-off stall speed in the takeoff configuration, whichever is greater, as shown by the accelerate-stop distance data.

(a) In applying this requirement, takeoff data shall be based upon still-air conditions, and no correction shall be made for any uphill gradient of 1 percent or less when such percentage is measured as the difference between elevation at the end points of the runway divided by the total length. For all uphill gradients greater than 1 percent, the effective takeoff length of the runway shall be reduced 20 percent for each 1 percent grade.

42.82 *En route limitations; one engine inoperative.* No airplane shall be taken off at a weight in excess of that which, with the critical engine inoperative, would permit a rate of climb of at least 50 feet per minute at an altitude of at least 1,000 feet above the elevation of the highest ground or obstruction within 10 miles of either side of the intended track or at an altitude of 5,000 feet, whichever is higher. For the purpose of this section it shall be assumed that the weight of the airplane as it proceeds along its intended track is progressively reduced by the anticipated consumption of fuel and oil; that the propeller of the inoperative engine is in the minimum drag position; that the wing flaps and landing gear are in the most favorable positions; and that the remaining engine or engines are operating at the maximum continuous power available. The 10-mile lateral distance specified herein may, for a distance of no more than 20 miles, be reduced to 5 miles, provided that special air navigational facilities provide a reliable and accurate identification of any high ground or obstruction located outside of such 5-mile lateral distance but within the 10-mile distance.

42.83 *Landing distance limitations; airport of destination.* No airplane shall be taken off at a weight in excess of that which, under the conditions stated in paragraphs (a) and (b) of this section, would permit the airplane to be brought to rest at the field of intended destination within 70 percent of the effective length of the runway from a point 50 feet directly above the intersection of the obstruction clearance line and the runway. For the purpose of this section it shall be assumed that the takeoff weight of the airplane is reduced by the weight of the fuel and oil expected to be consumed in flight to the field of intended destination.

(a) It shall be assumed that the aircraft is landed on the most favorable runway and direction without regard to wind.

(b) It shall be assumed, considering every probable wind velocity and direction, that the airplane is landed on the most suitable runway, taking due account of the ground handling characteristics of the airplane type involved and other conditions (e. g., landing aids, terrain, etc.) and allowing for the effect on the 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 airport of intended destination will not permit full compliance with paragraph (b) of this section, the aircraft may be taken off if an alternate airport is designated which permits compliance with paragraphs (a) and (b) of this section.

Required Records and Reports

42.91 *Maintenance records.*

(a) Each air carrier shall, except as provided in paragraph (b) of this section, keep at its principal operations base the following current records with respect to all aircraft, aircraft engines, propellers, and, where practicable, appliances used in air transportation: (1) Total time and service, (2) time since last overhaul, (3) time since last inspection, and (4) mechanical failures.

(b) 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 manufac-

turer'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.

42.91–1 *Content of maintenance records (FAA policies which apply to sec. 42.91).* The basic requirement of the above records is to provide a means for determining that overhaul, inspection, and check of the various units or components is performed within the prescribed time limitations. In the case of appliances, any method which will accomplish this result, other than keeping of individual time records on the units themselves, will be satisfactory.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.91–2 *Principal maintenance base (FAA policies which apply to sec. 42.91).* When the principal maintenance base is at a location other than the principal operations base, the term "Principal operations base," when applied to maintenance matters, shall be considered to mean the principal maintenance base. Copies of the necessary records shall also be maintained at the principal operations base if it is in a region other than the one in which the principal maintenance base is located.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.91–3 *Retention of records (FAA policies which apply to sec. 42.91).* The records required by this section shall be preserved and retained by the air carrier for a period of 2 years. For additional requirements pertaining to preservation of records, see Part 249 of this chapter (i. e. the Economic Regulations).

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.92 *Airman records.* An air carrier shall maintain at its principal operations base, or at such other location used by the air carrier as the Administrator may designate, current records of every airman utilized as a member of a flight crew. These records shall contain such information concerning the qualifications of each airman as is necessary to show compliance with the appropriate requirements prescribed by the regulations in this subchapter. No air carrier shall utilize any airman as a flight crew member unless records are maintained for such airman as required in this section.

42.92–1 *Content of airman records (FAA policies which apply to sec. 42.92).*

(a) *General.* The following pertinent information is considered the minimum necessary in the airman records required by this section:

(1) Name (in full);

(2) Current duties and date of assignment (pilot, engineer, navigator, etc.);

(3) Airman certificates (type, number, and ratings);

(4) Date, result, and class of last physical examination;

(5) Date and result of last 6-month instrument competency flight check for each pilot in command;

(6) Record of each pilot's flight time including trip time, instrument, night flight time, and flight time in the make and model of aircraft on which he is currently qualified;

(7) Records of company training for all crewmen, including actual flight, synthetic flight, and maintenance of proficiency training;

(8) Any check pilot authorization.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.92–2 *Availability of records (FAA policies which apply to sec. 42.92).* The above information shall be made available at any time for inspection by an authorized representative of the Administrator or Board.

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.92–3 *Retention of records (FAA policies which apply to sec. 42.92).* The disposition of any flight crew member released from the employ of the air carrier, or who becomes physically or professionally disqualified must be so indicated in these records and such records shall be retained by the company for at least 1 year. For additional requirements pertaining to preservation of records see Part 249 of this chapter (i. e. the Economic Regulations).

(Published in 14 F. R. 7041, Nov. 22, 1949, effective upon publication.)

42.93 *Emergency flight reports.* In the case of emergencies necessitating the transportation of persons or medical supplies for the protection of life or property, the rules contained herein regarding type of aircraft, equipment, and weather minimums to be observed will not be applicable: *Provided,* That within 48 hours after any such flight returns to its base the air carrier shall file a report with the Administrator setting forth the conditions under which the flight was made, the necessity therefor, and the names and addresses of the crew and passengers.

42.93–1 *Submission of emergency flight reports (FAA policies which apply to sec. 42.93).* The report referred to in this section shall be submitted in duplicate to the local inspector, and a copy shall be retained by the air carrier for at least 1 year.

(Published in 14 F. R. 7042, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.94 *Pilot's emergency deviation report.* Where pursuant to authority granted in section 42.51 (d) a pilot has deviated from established methods or requirements, he shall, within 7 days after completion of the trip, file with the Administrator a report thereof giving a brief statement concerning the circumstances of the emergency and the nature of the deviation.

42.94–1 *Submission of pilot's emergency deviation report (FAA policies which apply to sec. 42.94).* The report referred to in this section shall be submitted in duplicate to the local inspector, and a copy shall be retained by the air carrier for at least 1 year.

(Published in 14 F. R. 7042, Nov. 22, 1949, effective Nov. 22, 1949; amended effective June 15, 1957.)

42.95 *Flight manifest record.* A signed copy and any revision of the flight manifest required by section 42.62 shall be retained in the personal possession of the pilot for the duration of the flight, and a duplicate copy thereof shall be retained by the air carrier at its principal operations base, or at such other location used by the air carrier as the Administrator may designate, for at least 1 year after completion of the flight.

42.96 *Reporting of malfunctioning and defects.* An air carrier shall report in a manner prescribed by the Administrator all malfunctioning and defects occurring during operation or discovered during inspection which cause or may be reasonably expected by the air carrier to cause an unsafe condition in any aircraft, engine, propeller, or appliance. The corrective action taken by the air carrier to prevent recurrence of the malfunctioning or defect shall be indicated.

42.96–1 *Mechanical hazard and difficulty reports (FAA rules which apply to sec. 42.96).*

(a) *General.* The following reporting procedure will apply to all certificated irregular air carriers which operate large aircraft and eliminates the necessity for submission of form ACA–1226 by these operators.

(b) *Daily mechanical reports.*

(1) *Submission of reports.* Whenever a failure, malfunction, or other defect[16] is detected in flight or on the ground in an aircraft or aircraft component, which may reasonably be expected by the air carrier to cause a serious hazard in the operation of any aircraft, notice thereof is to be transmitted to the nearest district or regional office in the area in which the aircraft is being operated.

(2) *Times of submission.* Such daily reports should be submitted only where mechanical hazards have been detected; should be submitted within the 24-hour period from midnight to midnight of the day of occurrence; and should be transmitted to the nearest district office before noon of the following working day when possible, except for reports for Fridays, Saturdays, and Sundays should be submitted not later than noon of the following Monday. When it is impossible to furnish the report before noon due to scheduling, it should be reported as early as possible, but in no case later than 24 hours after the period for which the report is submitted. It is not necessary that the operator's personnel personally appear

[16] Failures, malfunctions, or other defects not covered by Part 320 of the Civil Aeronautics Board's Safety Investigation Regulations, titled "Notification and Reporting of Aircraft Accidents and Overdue Aircraft," which are to be reported under these rules, comprise generally the following basic items: Fire hazards, structural hazards, serious system or component malfunctions or failures, unsafe procedures or conditions, and defects in design or quality of parts and materials found installed on aircraft or intended for such installation.

at the district office since such reports may be transmitted by telephone, wire, or other rapid means of communication.

(3) *Method of transmission.* Such reports may be transmitted in a manner or on a form convenient to the air carrier's system of communications and procedures.

(i) *Suggested form for transmission.* Whenever practicable, the following guide for each aircraft type should be used by the air carrier in submission of the daily reports:

(*a*) Type, FAA identification number of aircraft, air carrier, and date;

(*b*) Emergency procedure effected (unscheduled landing, dumping fuel, etc.);

(*c*) Nature of condition (fire, structural failure, etc.);

(*d*) Identification of part and system involved, including the model designation of the major component (e. g., P & WR–2800–34);

(*e*) Apparent cause of trouble (wear, cracks, design, personnel error, etc.):

(*f*) Disposition (repaired, replaced, aircraft grounded, etc.):

(*g*) Brief narrative summary to supply any other pertinent data required for more complete identification, determination of seriousness, corrective action, etc.

(4) *Supplementary information.* The daily reports should not be withheld pending presentation of all specific details pertaining to such items of information. As soon as the additional information is obtained, it is to be submitted in an expedited supplement to the original report, making reference to the date and place of submission of the first report.

(c) *Monthly report of chronic mechanical difficulties.* As soon as practicable after the end of each calendar month, each certificated irregular air carrier operating large aircraft shall submit three copies of a report covering the mechanical difficulties experienced during the preceding month which they consider chronic or otherwise particularly significant from a safety standpoint. The report is to fully identify all components (manufacturer, model, type, etc.) and contain sufficient information so as to enable a determination of the trend of failures and defects and to provide information on which to base corrective action. The detailed information from which such reports are prepared shall be kept current and available for examination at the air carrrier's main headquarters by any authorized representative of the Administrator or Board.

The reports shall be submitted to the office of the assigned inspector.

(Published in 14 F. R. 7042, Nov. 22, 1949, effective upon publication; amended in 18 F. R. 1719, Mar. 27, 1953, effective Apr. 15, 1953; amended effective June 15, 1957.)

42.97 *Change in exclusive use of large aircraft.* When, for any reason whatsoever, an air carrier shall cease to have the exclusive use of any large aircraft, an immediate report of such fact shall be filed with the Administrator in such form and manner and containing such information as the Administrator may prescribe.

Appendix A

Special Civil Air Regulations
Which Affect Part 42

SPECIAL CIVIL AIR REGULATION NO. SR-364

Effective: June 26, 1951
Adopted: June 26, 1951

Operation by Transocean Air Lines of Certain Aircraft in the Trust Territory of the Pacific Islands

On July 1, 1951, the Department of the Interior will assume the duty of administering the Trust Territory of the Pacific Islands, including the islands of Saipan, Yap, Koror, Truk, Ponape, Kwajalein, and Majuro. At the present time the administration of these islands is in the Department of the Navy, which has maintained air transport communications with Naval aircraft among the various islands and between these islands and Guam. As a part of the transfer of the civil administration, the Departments of the Navy and Interior are desirous of establishing on or before the date of transfer a civilian operation which will replace the airlift heretofore furnished by the Navy in government aircraft. To this end the Department of the Navy has entered into a contract with Transocean Air Lines, the principal provisions of which include the transfer to Transocean of four PBY-5A aircraft, the undertaking by Transocean Air Lines to furnish service thereunder by the carriage of passengers, property and mail as may be directed by the High Commissioner of the Trust Territory and the payment to Transocean on an aircraft mile basis.

The four PBY Amphibians turned over to Transocean Air Lines pursuant to this contract are eligible for airworthiness certificates issued pursuant to Part 3 of the Civil Air Regulations with a maximum allowable gross weight of 28,000 pounds. The Department of the Navy, joined by representatives of the Department of the Interior, has now requested that this gross weight limitation be raised from 28,000 to 30,000 pounds, because of the fact that a gross weight of 28,000 pounds would permit little or no pay-load over the longest over-water leg of the proposed operation. In addition to this waiver of the Civil Air Regulations concerning gross weight limits, the Department of the Navy and the Director of the Office of Territories in the Department of the Interior have requested that certain operating rules relative to the conduct of operations of these aircraft be modified in certain respects.

The Board believes that the importance of maintaining air communications to and within the Trust Territory of the Pacific Islands, the fact that no other type of aircraft appears to be practicable in conducting the operations, the fact that the operation is basically governmental in nature and will not be open to members of the general public, and the fact that most of the landing areas utilized will be sea level airports or sea-dromes, with few enroute obstructions are all factors which indicate that a relaxation of otherwise applicable safety rules would be reasonable and in the public interest.

Because Transocean Air Lines is the only carrier affected by this Special Civil Air Regulation and because it has requested the relief herein granted, public notice and procedure hereon are unnecessary, and since it relieves the said carrier from restriction the Board finds that good cause exists to make this regulation effective immediately.

In consideration of the foregoing the Civil Aeronautics Board hereby makes and promulgates a Special Civil Air Regulation effective immediately to read as follows:

1. Notwithstanding any provision of the Civil Air Regulations to the contrary, but subject to the conditions hereinafter set forth, the airworthiness certificates of four certain PBY Amphibian Flying Boats transferred to Transocean Air Lines pursuant to contract with United States Navy (No. N600s-d-12210) may be amended, or new airworthiness certificates may be issued in their stead, such new or amended certificates to provide for an allowable gross weight of 30,000 pounds for each aircraft; and the air carrier operating certificate of the said carrier may likewise be amended to the extent necessary to permit it to operate such aircraft between

Guam	—Saipan
Guam	—Yap
Yap	—Koror
Truk	—Guam
Truk	—Ponape
Majuro	—Kwajalein
Kwajalein	—Ponape
Ponape	—Majuro

(a) The airworthiness certificates referred to herein may be amended, or other certificates issued, only if full compliance with the provisions of Part 3 of the Civil Air Regulations is shown on the basis of 28,000 pounds maximum take-off weight.

(b) Each such amended airworthiness certificate or new airworthiness certificate shall bear the following legend—"This certificate is issued (or amended) pursuant to the provisions of Special Civil Air Regulation SR-364. To the extent it authorizes a maximum take-off weight in excess of 28,000 pounds, it is valid only for non-common carrier operations conducted by Transocean Air Lines between points in the Trust Territory of the Pacific Islands and between such islands and Guam."

(c) The air carrier operating certificate shall be amended only to the extent necessary to permit the use of the said PBY-5a aircraft in operations conducted pursuant to the said contract between Transocean Air Lines and the Department of the Navy.

(d) In conducting the operations specified above, Transocean Air Lines shall do so in accordance with the provisions of Part 42 of the Civil Air Regulations; *Provided,* That any provision of such part which would require any alteration or addition to the structure or component of the said PBY-5a aircraft certificated in accordance with this Special Civil Air Regulation or which would materially hinder Transocean Air Lines in performing its obligations under the said contract is hereby expressly waived.

SPECIAL CIVIL AIR REGULATION NO. SR-364A

Effective: July 18, 1952
Adopted: July 18, 1952

Operation by Transocean Air Lines of Certain Aircraft in the Trust Territory of the Pacific Islands

Special Civil Air Regulation SR-364 precently provides authorization to Transocean Air Lines for certification and operation of four PBY-5A aircraft between various islands in the Trust Territory of the Pacific Islands and the island of Guam. Such operations have been conducted pursuant to a certain contract between Transocean Air Lines and the Department of the Navy, which contract was subsequently assigned by the Department of the Navy to the Department of the Interior. The aforementioned contract expires on July 30, 1952, and Transocean Air Lines and the Department of the Interior have agreed to enter into a new or extended contract covering the same operations with the same aircraft.

Paragraph 1(c) of Special Regulation SR-364 predicates the amendment of Transocean's air carrier operating certificate on the terms of the contract between Transocean and the Department of the Navy. Since operations under the proposed new contract between Transocean Air Lines and the Department of the Interior would technically not be authorized by Special Regulation SR-364, the Board considers that paragraph 1(c) should be amended to provide authorization for identical operations under any such contract or extension thereof entered into between Transocean Air Lines and the Department of the Interior.

Because Transocean Air Lines is the only carrier affected by this amendment and has requested the relief herein granted and because this amendment is minor in nature, notice and public procedure hereon are unnecessary, and since it relieves the said carrier from restriction, the Board finds that good cause exists to make this regulation effective immediately.

In consideration of the foregoing the Civil Aeronautics Board hereby amends paragraph 1(c) of Special Civil Air Regulation SR-364, effective immediately, as follows:

By substituting a comma for the period at the end of paragraph 1(c) and by adding the following language: or pursuant to any contract or extension thereof subsequently entered into between Transocean Air Lines and the Department of the Interior but only with respect to the points specified in section 1.

SPECIAL CIVIL AIR REGULATION NO. 368B

Effective August 1, 1957
Adopted: July 31, 1957

Authorization for Scheduled Air Transportation of Cargo Outside the Continental Limits of the United States Under the Provisions of Part 42 of the Civil Air Regulations

Special Civil Air Regulation No. SR–368A currently authorizes air carriers, appropriately authorized by the Board to engage in scheduled cargo-only operations outside the continental limits of the United States, to conduct such operations under the provisions of Part 42 of the Civil Air Regulations. This authorization terminates July 31, 1957.

At the time the Board promulgated SR–368A, it indicated that the regulation was a temporary measure pending the development of adequate certification and operation rules for scheduled air transportation of cargo outside the continental limits of the United States. Although certain proposals in this matter have been circulated to interested persons for comment, the Board has not acted on these rules as yet; hence it is considered desirable to continue the authorization currently in effect.

Civil Air Regulations Draft Release No. 56–17, "Proposed Revision of Part 41 of the Civil Air Regulations—Certification and Operation Rules for Scheduled Air Carrier Operations Outside the Continental Limits of the United States," proposes that scheduled cargo-only operations be conducted under Part 42 when authorized by the Administrator. This was also proposed in the published notice of rule making on this special regulation and no adverse comment was received on this point. For this reason and because it is anticipated that revised Part 41, following publication in accordance with public rule making procedures, will contain a requirement that authorization be obtained from the Administrator prior to conducting such cargo operations, such a requirement has been incorporated in this special regulation.

Interested persons have been afforded an opportunity to participate in the making of this regulation (22 F.R. 4239), and due consideration has been given to all relevant matter presented. Since it imposes no additional burden on any person, this regulation may be made effective without prior notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation effective August 1, 1957.

Any air carrier authorized by the Board pursuant to Title IV of the Civil Aeronautics Act of 1938, as amended, to engage in scheduled air transportation of cargo outside the continental limits of the United States may, upon authorization by the Administrator, conduct such trans-

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portation under the air carrier certification and operation rules prescribed in Part 42 of the Civil Air Regulations.

This regulation supersedes Special Civil Air Regulation No. SR–368A and shall remain in effect until such time as new certification and operation rules become effective for cargo operations outside the continental limits of the United States, unless sooner terminated or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION NO. SR-389B

Effective: January 30, 1959
Adopted: December 24, 1958

Emergency Exits for Airplanes Carrying Passengers for Hire

Special Civil Air Regulation No. SR-389A, effective September 13, 1957, superseded Special Civil Air Regulation No. SR-389. All of the provisions of SR-389 were retained in SR-389A. However, the latter special regulation as amended on October 17, 1957, contained an addition to the occupant/exit table which permitted the Viscount 700 series airplanes to carry 53 occupants when 7 exits were provided.

Special Civil Air Regulation No. SR-389, effective October 27, 1952, superseded Special Civil Air Regulation No. SR-387. Except for correcting some minor errors with respect to the number of exits authorized by the Civil Aeronautics Administration, there was no difference between the two special regulations.

Special Civil Air Regulation No. SR-387, effective October 27, 1952, was adopted in order to make applicable to the then operating transport airplanes more stringent rules regarding the number of occupants permitted per exit. SR-387 required, among other things, that all large airplanes (more than 12,500 pounds maximum certificated takeoff weight) comply with either section 4b.362 (a), (b), and (c) of Part 4b of the Civil Air Regulations as amended by Amendment 4b-4 effective December 20, 1951, or with the specific requirements set up in SR-387. Subsequently, the provisions of section 4b.362 (a), (b), and (c) of Part 4b were revised by Amendment 4b-5, effective April 9, 1957.

Special Civil Air Regulation No. SR-389A permits the airplanes listed in the occupant/exit table to carry additional occupants if additional exits are provided, except that in no case shall more than 8 additional occupants be carried for any one additional exit. The preamble to Civil Air Regulations Draft Release No. 58-11 stated that the intent of this provision was that no more than 8 additional occupants could be authorized if the most effective exit for emergency evacuation were provided, which, by reference to the rule proposed in the draft release, is seen to be one comparable to a Type I exit as prescribed in section 4b.362. As herein set forth, it is intended that as many as 8 additional occupants may be authorized with the addition of an exit of reasonably high effectiveness and that a lesser number of occupants would be authorized with the addition of a less effective exit. For the purpose of this regulation, it has been established that the addition of an exit, approximating a Type II or IV exit as prescribed in section 4b.362, would possibly permit the addition of 8 occupants. This relaxation over the rule proposed in Draft Release 58-11 was prompted by comments received to the draft release and the fact that a number of airplanes had already received approval to carry 8 additional occupants with the addition of an exit com-

parable to a Type IV based on the Administrator's interpretation of SR-389A. Justification for the relaxation is based upon the current requirements of section 4b.362(c) wherein it may be seen that for the addition of a Type IV exit on each side, an increase of 30 passengers is permitted. While such a ratio is not advocated for airplanes covered by this special regulation because of other factors considered in establishing these values for section 4b.362, permitting 8 occupants to be added for a Type IV exit represents a more reasonable and realistic view than that proposed in Draft Release 58-11. Therefore, it is expressly provided herein that since the effectiveness of the exit varies with the type, size, and location, 8 additional occupants shall be authorized only when an exit comparable to a Type II or a Type IV exit as prescribed in section 4b.362 is provided.

Special Civil Air Regulation No. SR-389A does not contain provisions regarding the required reduction in occupancy when the number of exits is reduced. In order to cover such cases, it is provided herein that upon removal of any exit the maximum number of occupants shall be reduced by at least 8.

The occupant/exit table has been modified by listing the "L-1049 Series" in lieu of the "L-1049," and the "CV-340 and CV-440" in lieu of the "CV-340."

Interested persons have been afforded an opportunity to participate in the making of this regulation (23 F.R. 3275), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective January 30, 1959.

1. Contrary provisions of the Civil Air Regulations notwithstanding, no large airplane (more than 12,500 pounds maximum certificated take-off weight) while carrying passengers for hire shall be operated with occupants in excess of the number permitted by applying the provisions of section 4b.362 (a), (b), and (c) of Part 4b of the Civil Air Regulations as amended by Amendment 4b-5, effective April 9, 1957, except that airplane types listed in the following table may be operated with the listed maximum number of occupants (including all crew members) and the listed corresponding number of exits (including emergency exits and doors) heretofore approved by the Administrator for emergency egress of passengers.

2. Additional occupants above the values listed in the table may be carried if additional exits are provided, except that in no case shall more than 8 additional occupants be carried for any one additional exit. For the addition of exits comparable to at least a Type II or Type IV exit as prescribed in section 4b.362, a maximum of 8 additional occupants may be authorized and for exits not comparable to at least a Type II or Type IV exit, the Administrator after consideration, among other factors, of the type, size, and location of the exit, may authorize a lesser number of additional occupants.

3. For airplanes which have a ratio (as computed from the table in this special regulation) of maximum number of occupants to number of exits greater than 14:1 and for airplanes which do not have installed at least one full-size door-type exit in the side of the fuselage in the

rearward portion of the cabin, the first additional exit approved by the Administrator for increased occupancy shall be a floor-level exit not less than 24 inches wide by 48 inches high located in the side of the fuselage in the rearward portion of the cabin. In no case shall an occupancy greater than 115 be allowed unless there is such an exit on each side of the fuselage.

4. The maximum number of occupants authorized (listed in the table) shall be reduced where the number of approved exits is less than that shown in the table. The reduction in the maximum number of occupants for each exit eliminated shall be determined by the Administrator taking due account of the effectiveness of the remaining exits for emergency evacuation, except that the maximum number of occupants shall be reduced by at least 8 for each eliminated exit. In no case, when exits are deleted, shall the resulting ratio of occupants to exits be greater than 14:1, and there shall be at least one exit on each side of the fuselage irrespective of the number of occupants.

Airplane type	Maximum number of occupants including all crew members	Corresponding number of exits authorized for passenger use
B–307	61	4
B–377	96	9
C–46	67	4
CV–240	53	6
CV–340 and CV–440	53	6
DC–3	35	4
DC–3 (Super)	39	5
DC–4	86	5
DC–6	87	7
DC–6B*	112	11
L–18	17	3
L–049, L–649, L–749	87	7
L–1049 series	96	9
M–202	53	6
M–404	53	7
Viscount 700 series	53	7

*The DC–6A, if converted to a passenger transport configuration, will be governed by the maximum number applicable to the DC–6B.

This regulation supersedes Special Civil Air Regulation No. SR–389A as amended by Amendment No. 1 and shall remain effective until superseded or rescinded by the Board or the Administrator of the Federal Aviation Agency, as appropriate.

AMENDMENT I TO SPECIAL CIVIL AIR REGULATION NO. SR-389B

Effective: September 11, 1959
Adopted: September 11, 1959

Emergency Exits for Airplanes Carrying Passengers for Hire

Special Civil Air Regulation No. SR-389B, adopted by the Civil Aeronautics Board on December 24, 1958, and effective January 30, 1959, specified in part that no large airplane while carrying passengers for hire shall be operated with occupants in excess of the number permitted by applying the provisions of section 4b.362 (a), (b), and (c) of Part 4b of the Civil Air Regulations as amended by Amendment 4b-5 effective April 9, 1957, except for those airplanes listed in the table in SR-389B. Special Civil Air Regulations SR-389A, which preceded SR-389B, contained a similar provision but referred to Amendment 4b-4 effective December 20, 1951. The effect of SR-389B was to apply the current Part 4b exit requirements referenced in SR-389A.

A review of the history of the development of SR-389B indicates that such retroactive application of current Part 4b requirements was included inadvertently and that it would impose an unnecessary burden on the operators of certain airplanes. SR-389B is therefore being amended to eliminate this retroactive provision.

Since this amendment imposes no additional burden on any person, notice and public procedure hereon are unnecessary, and the amendment is made effective immediately.

In consideration of the foregoing, Paragraph 1 of Special Civil Air Regulation No. SR-389B is hereby amended to read as follows, effective September 11, 1959.

1. Contrary provisions of the Civil Air Regulations notwithstanding, no large airplane (more than 12,500 pounds maximum certificated take-off weight) type certificated under Civil Air Regulations effective prior to April 9, 1957, while carrying passengers for hire, shall be operated with occupants in excess of the number permitted by applying the provisions of section 4b.362 (a), (b), and (c) of Part 4b of Civil Air Regulations as amended by Amendment 4b-4 effective December 20, 1951, except that airplane types listed in the following table may be operated with the listed maximum number of occupants (including all crew members) and the listed corresponding number of exits (including emergency exits and doors) heretofore approved by the Administrator for the emergency egress of passengers.

SPECIAL CIVIL AIR REGULATION NO. SR-392B

Effective: February 25, 1957
Adopted: February 25, 1957

Facilitation of Experiments With Exterior Lighting Systems

Special Civil Air Regulation No. SR-392A adopted June 29, 1955, permits air carriers, subject to the approval of the Administrator, to install and use experimentally, on a limited number of their airplanes, exterior lighting systems which do not conform to the specifications contained in Part 4b of the Civil Air Regulations. The purpose of SR-392A was to permit experimentation on large airplanes while retaining their standard airworthiness certification. Prior to that time such experimentation was conducted either on Government-owned aircraft or on private aircraft limited in operations to the conditions of an experimental certificate.

SR-392A does not extend the permission for experimentation with exterior lights to non-air-carrier aircraft because at the time of its adoption only air carrier operators indicated interest in this activity. Recently, however, new experimental developments in anti-collision light systems have aroused the interest of private and corporate operators to the extent that some of the operators apparently wish to install the new systems on their aircraft for purposes of experimentation. The Board sees no valid reason why operators other than air carriers should not be permitted to participate, if they wish, in experiments intended to improve the effectiveness of aircraft exterior lighting, provided that the number of such aircraft is reasonably limited.

Since future experimentation is to be conducted more widely and by private individuals, the Board believes that conditions should be imposed which will assure that the experimental exterior lights are in fact installed for purposes of bona fide experimentation and that the results of such experimentation become available to the Government and to all other interested persons.

Interested persons have been afforded an opportunity to participate in the making of this regulation (21 F.R. 3388), and due consideration has been given to all relevant matter presented. Since this regulation imposes no additional burden on any person, it may be made effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective February 25, 1957.

Contrary provisions of the Civil Air Regulations notwithstanding, experimental exterior lighting equipment which does not comply with the relevant specifications contained in the Civil Air Regulations may, sub-

ject to the approval of the Administrator, be installed and used on aircraft for the purpose of experimentation intended to improve exterior lighting for a period not to exceed six months: *Provided,* That

(1) The Administrator may grant approval for additional periods if he finds that the experiments can be reasonably expected to contribute to improvements in exterior lighting;

(2) Not more than 15 aircraft possessing a U.S. certificate of airworthiness may have installed at any one time experimental exterior lighting equipment of one basic type;

(3) The Administrator shall prescribe such conditions and limitations as may be necessary to insure safety and avoid confusion in air navigation;

(4) The person engaged in the operation of the aircraft shall disclose publicly the deviations of the exterior lighting from the relevant specifications contained in the Civil Air Regulations at times and in a manner prescribed by the Administrator; and

(5) Upon application for approval to conduct experimentation with exterior lighting, the applicant shall advise the Administrator of the specific purpose of the experiments to be conducted; and at the conclusion of the approved period of experimentation, he shall advise the Administrator of the detailed results thereof.

This regulation supersedes Special Civil Air Regulation No. SR–392A and shall terminate February 25, 1962, unless sooner superseded or rescinded.

SPECIAL CIVIL AIR REGULATION NO. SR-395A

Effective: February 20, 1955
Adopted: February 17, 1955

Authorization for Air Taxi Operators to Conduct Operations Under the Provisions of Part 42 of the Civil Air Regulations—Extension of Expiration Date for Air Taxi Operator Certificates

On January 11, 1952, the Board adopted Special Civil Air Regulation SR-378, which provided that air taxi operators as defined in section 298.1 (a)(2) of Part 298 of the Board's Economic Regulations, shall be certificated and shall conduct operations in accordance with the applicable provisions of Part 42 of the Civil Air Regulations. Subsequently, on June 1, 1953, the Board adopted currently effective Special Civil Air Regulation SR-395, which superseded SR-378 and provided that air taxi operator certificates should continue in effect until the termination of the economic exemption authority contained in Part 298, namely, until February 20, 1955. On December 21, 1954, the Board issued a notice of proposed rulemaking (Economic Regulations Draft Release No. 71), which proposed to delete the economic exemption authority termination date of February 20, 1955, which existed in Part 298. This proposal would have put the exemption authority granted to air taxi operators on a permanent basis.

The Board concurrently with the issuance of this Special Civil Air Regulation is extending the exemption authority contained in Part 298 pending a final determination as to the proper economic limitations which should be imposed on air taxi operators. It appears certain, however, that some form of economic exemption authority for air taxi operators will be continued on a permanent basis. It therefore is desirable to extend Special Civil Air Regulation SR-395 to provide for such operations.

Part 42 of the Civil Air Regulations is presently undergoing revision. This proposed revision would make Part 42 applicable solely to large aircraft; and it would be necessary to prepare a new Part for the certification and operation of small aircraft (air taxi operators). Revised Part 42 and proposed regulations to cover air taxi operations are presently being prepared in draft release form, and it is estimated that they will be adopted by the Board for circulation as a notice of proposed rule-making in the near future. For this reason, Special Civil Air Regulation SR-395 is being extended until such time as a new permanent Part, covering the certification and operation of small aircraft, becomes effective. Notice of this extension was published in the Federal Register on January 19, 1955 at 20 F.R. 422.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all relevant matter presented. Since this regulation imposes no additional burden on any person, it may be made effective without prior notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective February 20, 1955:

Notwithstanding the provisions of Parts 40 and 41 of the Civil Air Regulations, any air taxi operator as defined in section 298.1(a)(2) of Part 298 of the Board's Economic Regulations shall be certificated and shall conduct operations in air transportation in accordance with the provisions of Part 42 of the Civil Air Regulations: *Provided,* That any air carrier operating certificate issued for air taxi operations which is in effect on, or issued after, the effective date of this regulation shall remain in effect until the expiration of this special regulation, unless such certificate is sooner surrendered, suspended, or revoked.

This regulation supersedes Special Civil Air Regulation SR–395 and shall remain in effect until such time as new air taxi certification and operation rules become effective, unless sooner terminated or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION NO. SR-399B

Effective: May 28, 1959*
Issued: May 21, 1959

Provisional Maximum Certificated Weights for Certain Airplanes Operated by Alaskan Air Carriers, Alaskan Air Taxi Operators, and the Department of the Interior

Special Civil Air Regulations Nos. SR-399 and SR-399A, (18 F.R. 6799 and 20 F.R. 8091) authorized the Administrator to establish increased maximum authorized weights for certain airplanes of 12,500 pounds or less operated entirely within Alaska by Alaskan air carriers as designated by Part 292 of the Board's Economic Regulations or by the United States Department of the Interior. Effective February 3, 1959, the Civil Aeronautics Board amended Part 292 to eliminate Alaskan pilot-owners from the provisions of that Part (24 F.R. 437) and concurrently adopted new Part 293 (24 F.R. 127) redesignating such air carriers as Alaskan air taxi operators. Accordingly, in order to permit this new class of air carriers to continue operating airplanes under the increased maximum weights authorized by SR-399A, such regulations are revised to specifically include Alaskan air taxi operators. However, Alaskan air taxi operators will remain subject to the 7,900 pound weight limitation imposed by Part 293.

This special regulation does not impose any additional burden upon any person and is purely technical in nature. For these reasons, the Administrator finds that compliance with the notice, public participation and effective date provisions of section 4 of the Administrative Procedure Act is unnecessary. In consideration of the foregoing, I hereby adopt a Special Civil Air Regulation, effective immediately on the date of its publication in the Federal Register, to read as follows:

1. Notwithstanding any contrary provisions of the Civil Air Regulations, the Director, Bureau of Flight Standards and any employee of such administrative unit as he shall designate may increase the maximum certificated weight for airplanes which are:

(a) Operated entirely within the State of Alaska by an Alaskan air carrier or an Alaskan air taxi operator pursuant to Parts 292 and 293, respectively, of the Civil Aeronautics Board's Economic Regulations, or by the United States Department of the Interior in the conduct of its game and fish law enforcement activities and its management, fire detection, and fire suppression activities concerning public lands; and

*Date of publication in the Federal Register.

(b) Type certificated under the provisions of Aeronautical Bulletin No. 7 of the Aeronautics Branch of the United States Department of Commerce dated January 1, 1939, as amended, or under the normal category of Part 4a of the Civil Air Regulations.

2. The maximum certificated weight herein referred to shall not exceed any of the following:

(a) 12,500 pounds,

(b) 115 percent of the maximum weight listed in the FAA Aircraft Specification,

(c) The weight at which the airplane meets the positive maneuvering load factor requirement for the normal category specified in sec. 3.186 of the Civil Air Regulations, or

(d) The weight at which the airplane meets the climb performance requirements under which it was type certificated.

3. In determining the maximum certificated weight the structural soundness of the airplane and the terrain to be traversed in the operation will be considered.

4. The maximum certificated weight so determined will be added to the airplane's operation limitations and identified as the maximum weight authorized for operations within the State of Alaska.

This regulation supersedes Special Civil Air Regulation No. SR–399A, and shall terminate on October 25, 1960, unless sooner superseded or rescinded.

SPECIAL CIVIL AIR REGULATION NO. SR-402

Effective: June 2, 1954
Adopted: March 4, 1954

Certification and Operation Rules For Star Route Air Carriers

When the nature of the terrain in particular sections of the country is such as to make surface transportation impracticable, the Postmaster General has authority under the Experimental Air Mail Act of 1938, as amended, to award contracts for the transportation of all classes of mail by airplane. The routes for which these contracts are awarded are known as "star routes" and are generally in isolated areas and of comparatively short distance. In a few instances these routes are located completely within a state.

An "air carrier" under the Civil Aeronautics Act of 1938, as amended, is defined as anyone who engages in air transportation. "Air transportation" is defined as interstate, overseas, and foreign air transportation or the transportation of mail by aircraft. Thus, a "star route" operator, including one otherwise engaged exclusively in intrastate air transportation, is an "air carrier" within the meaning of the Act.

While "star route" air carriers are exempted from certain areas of the Board's economic jurisdiction, they are subject to the Board's safety jurisdiction over air carriers. However, presently effective Parts 40 and 42 of the Civil Air Regulations apply to air carriers when engaged in interstate air transportation, but are not applicable to "star route" air carriers who are engaged only in intrastate transportation of mail. In view of the fact that the Civil Aeronautics Act requires each air carrier to have an air carrier operating certificate, it is necessary to make provision in the Civil Air Regulations for the issuance of this certificate to these "star route" air carriers.

This Special Civil Air Regulation provides air carrier certification and operation rules for all carriers engaged in carriage of mail pursuant to "star route" contracts. In view of the fact that these air carriers generally operate small planes and carry out relatively small operations, it appears desirable that they be certificated and comply with the provisions of Part 42 which are also applicable to air taxi operators. Thus, under this regulation, these air carriers are required to be certificated in accordance with Part 42 and to comply with the provisions of Part 42. Since it will require a certain amount of time to accomplish this certification, this regulation will become effective in ninety days.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all the relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective June 2, 1954:

Persons engaged in the carriage of mail by aircraft pursuant to "star route" contracts awarded under the Experimental Air Mail Act of 1938, as amended, shall, for such operations, be certificated in accordance with and comply with the provisions of Part 42 of the Civil Air Regulations.

SPECIAL CIVIL AIR REGULATION NO. SR–403

Effective: March 31, 1954
Adopted: March 31, 1954

Certification and Operation of Certain Airplanes for the Department of the Interior in the Trust Territory of the Pacific Islands

Special Civil Air Regulations SR–364 and SR–364A now permit Transocean Air Lines to operate PBY–5A airplanes in the Trust Territory of the Pacific Islands, pursuant to a contract with the Department of the Interior, at a maximum allowable weight of 30,000 pounds. This weight was permitted because of the unique operation being conducted, and the fact that all take-offs and landings are at sea level airports or seadromes and over routes which have few, if any, physical obstructions.

As a result of two and one-half years of continuous use and recurrent landings in salt water, the PBY's now require a major and extensive overhaul if they are to be continued in active service. In order to avoid the time and expense involved in such a program, the Department of the Interior has obtained three Grumman SA–16A airplanes from the Air Force as replacements for the PBY's. SA–16A airplanes are of more modern design and construction than the PBY–5A's presently operated and appear to afford an overall increase in the safety of this operation.

The Department of the Interior proposes that these airplanes be certificated in general in accordance with Part 4b and operated in accordance with Part 42 of the Civil Air Regulations. The Department has also stated that it is not practical to operate these airplanes at less than 29,000 pounds maximum allowable take-off weight and has requested the Board to waive certain provisions of the regulations to permit this. These airplanes were manufactured to military specifications without consideration of civil requirements, and strict compliance with the applicable regulations would prevent their use as desired. Therefore, as in the case of the PBY–5A's, it is necessary to waive certain portions of the certification and operation rules if the proposed use is to be approved. The armed services in operating these airplanes have achieved a satisfactory safety record at weights equal to and above the weight requested by the Department of the Interior. It is understood, however, that in order to comply as fully as practicable with the certification requirements of Part 4b, a number of modifications will be made to these airplanes.

In view of the foregoing and mindful that the factors which prompted the promulgation of Special Civil Air Regulations SR–364 and SR–364A continue to exist, the Board finds that it is in the public interest to grant the request of the Department of the Interior. This regulation provides that the airplanes be operated by Transocean Air Lines under contractual agreement with the Department of the Interior.

Since the use to which these airplanes is to be put is a matter relating to agency management and contract, public notice and procedure hereon

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are unnecessary. Since this regulation imposes no additional burden on any person, it may be made effective without prior notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates a Special Civil Air Regulation, effective immediately, to read as follows:

1. Contrary provisions of the Civil Air Regulations notwithstanding, the following provisions of Part 4b of the Civil Air Regulations are hereby waived to permit the certification thereunder of three Grumman SA–16A airplanes, owned or controlled by the Department of the Interior, for operation by Transocean Air Lines within the Trust Territory of the Pacific Islands and between these islands and the island of Guam.

a. Sections 4b.120(a) and 4b.120(b) to the extent that the maximum certificated take-off weight with respect to performance cannot be met at weights of 29,000 pounds or less.

b. Section 4b.120(c).

c. Sections 4b.115, 4b.116, 4b.117, 4b.122, 4b.123, 4b.124, 4b.324(a), 4b.337(a)(1), 4b.337(a)(2), 4b.441(b)(1), 4b.474(c), 4b.484(a)(2), 4b.485(c), 4b.604(d), b.604(f), 4b.604(h), and 4b.622(c) to the extent that the airplane cannot comply with the provisions of these sections: *Provided,* That the Military Flight Manual, placards, or similar means shall be provided which shall contain the appropriate procedures and warnings necessary to overcome or explain the deficiencies resulting from the waiver of these sections.

d. Sections 4b.226(b), 4b.352(b), 4b.356(b), 4b.383(b)(2), 4b.612(d), 4b.612(f), and 4b.624(b) to the extent that the airplane cannot comply with the provisions of these sections.

e. Section 4b.443 to the extent that it requires the oil tank to be located outside a fire zone unless it is constructed of fire-proof materials.

f. Sections 4b.740 through 4b.743: *Provided,* That the Military Flight Manual be used as supplemented by such limitations and procedural data as found necessary by the Administration, or are required by this regulation.

2. The airworthiness certificate for each airplane certificated hereunder, shall bear the following legend: "This certificate is issued pursuant to Special Civil Air Regulation SR–403 and is valid only for operation by Transocean Air Lines under contract with the Department of the Interior within the Trust Territory of the Pacific Islands and between these islands and the island of Guam."

3. The operations referred to herein shall be conducted in accordance with Part 42 with the exception of those provisions which are inconsistent with the requirements of Part 4b hereby waived: *Provided,* That the Administrator shall establish operating limitations consistent with the standards established herein.

4. The air carrier operating certificate of Transocean Air Lines shall be amended to the extent necessary to permit the use of said Grumman SA–16A airplanes in such operations conducted pursuant to a contract between Transocean Air Lines and the Department of the Interior.

SPECIAL CIVIL AIR REGULATION NO. SR–406C

Effective: July 1, 1956
Adopted: June 28, 1956

Application of Transport Category Requirements to C–46-Type Airplanes

On June 30, 1954, the Civil Aeronautics Board adopted Special Civil Air Regulation No. SR–406, effective July 1, 1954, which provided for the modification and operation of C–46 type airplanes in passenger service. On June 7, 1955, the Board adopted Special Civil Air Regulation No. SR–406A, effective June 7, 1955, which added certain substantive and clarifying amendments to SR–406. On March 30, 1956, the Board adopted Special Civil Air Regulation No. SR–406B, effective April 1, 1956, which extended the date for modification of C–46 airplanes in passenger service from April 1, 1956, to July 1, 1956. The preamble material of these three Special Civil Air Regulations is incorporated herein by reference.

SR–406B provided only temporary relief from those provisions of Special Civil Air Regulation No. SR–406A which prevented the use of C–46 airplanes in passenger operations under Part 42 of the Civil Air Regulations on and after April 1, 1956, unless recertificated in accordance with the regulation. In SR–406B, the Board indicated that subject to persuasive reasons for failing, type certification had to be accomplished before July 1, 1956, and that, within the effective period of the regulation, the Board would determine a later end effective date by which recertification of these airplanes in the transport category must be completed. It was expressly stated that the later end effective date for recertification would depend on a bona fide showing of meeting the type certification requirements.

Since the adoption of Special Civil Air Regulation No. SR–406B, two type certificates have been issued under its provisions and one application for a type certificate has been received although complete data have not been submitted to the Civil Aeronautics Administration as of the date of adoption of this regulation, SR–406C.

In adopting SR–406B, the Board anticipated obtaining a schedule of modification of C–46 airplanes from the applicants for type certification. In its attempt to obtain this information, not only has the Board not received such a schedule, but has been advised that only a comparatively few operators have actual contractual agreements with holders of type certificates to accomplish the required modification.

The Board has previously stated that a final compliance date for modification would depend on a bona fide showing that the aircraft certification requirements will be met in the reasonably near future. However, in the absence of such a showing by more than a few operators, the Board must establish an end compliance date without the benefit of any complete and detailed modification schedules. In the only formal request for an extension of the effective date of these regulations which the Board has received, it is indicated that required modifications are

expected to be completed by January 1, 1957. No other information available to the Board indicates that this is not a reasonable end effective date; therefore, January 1, 1957, is hereby established as the date when recertification is required.

Since October 1, 1955, the Administrator has been authorized to permit the continued operation of C–46 aircraft in passenger service on a showing by operators that "genuine and diligent efforts" have been made to accomplish the required modifications. In the light of the fact that there now exist at least two persons possessing type certificates on the basis of which such modifications may be made, there no longer appears to be any reason for not requiring the showing of a firm contract between the operator and the holder of such a type certificate indicating that the required modifications will be completed prior to January 1, 1957, prior to such operations. Accordingly, this Special Civil Air Regulation contains a requirement that before the Administrator is authorized to continue to permit operation of C–46 airplanes in passenger service, between July 1, 1956, and January 1, 1957, there must be a showing by the operator that he has a firm contract with the holder of a type certificate to complete modifications prior to January 1, 1957, except that the Administrator may authorize during the period July 1, 1956, through July 15, 1956, such operations without a showing of such firm contract where the Administrator has previously permitted such operations based on genuine and diligent efforts to complete the required modifications. In other words, the Administrator may authorize continued operations of C–46 airplanes in passenger service from July 1, 1956, to July 16, 1956, where he has previously given such authority. However, on and after July 16, 1956, the Administrator may authorize such continued operations only upon a showing by the operator that he has a firm contract with the holder of a type certificate to complete modifications prior to January 1, 1957.

As stated hereinbefore, all the preamble material pertinent to the application of transport category requirements to C–46 type airplanes appearing in SR–406, SR–406A, and SR–406B is incorporated herein by reference. However, in order to obviate any possible confusion as to which specific regulations are presently applicable to accomplish the recertification of the C–46 in passenger service, all such regulations are included in this Special Civil Air Regulation.

Since this regulation continues in effect the same rules as are presently applicable to C–46 type airplanes, with the exception of the compliance date listed herein, without diminution in safety standards, and since it would be in the public interest to prescribe rules to become effective on July 1, 1956, to permit the continuation of operation of C–46 type airplanes in passenger service, the Board finds that omission of notice and public procedure is not contrary to public interest and that good cause exists for making this regulation effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective July 1, 1956:

1. Contrary provisions of the Civil Air Regulations notwithstanding (in particular the provisions of section 42.15(b) of Part 42), C–46 airplanes may be used in passenger operations conducted under Part 42 of the Civil Air Regulations. Such airplanes shall be operated in accord-

ance with section 42.15(a) of Part 42 and the provisions of this special regulation.

2. C–46 type airplanes, when used in passenger operations in accordance with paragraph 4 of this regulation, shall not be operated at weights exceeding those which are demonstrated to the Administrator will allow compliance with the performance requirements of Part 4b, except that in determining the maximum take-off weight, such weight shall be limited only to a value at which the airplane has a rate of climb equal to 0.035 V_{s1}^2 in the take-off configuration at sea level with the landing gear retracted but with the propeller of the inoperative engine feathered rather than windmilling.

3. Provisionally, pending a determination by the Administrator of the weights at which C–46 airplanes will meet the standards prescribed by paragraph 2 of this regulation, the maximum take-off weight of such airplanes, when used in the manner herein referred to, shall not exceed 44,300 pounds: *Provided,* That in the case of C–46 airplanes equipped with Hamilton Standard propellers with blades Model Number 6419A–9 or approved equivalent which have been clipped in accordance with specifications approved by the Administrator, such provisional maximum weight shall be increased by 1,000 pounds until such time as the Administrator shall have determined by suitable tests another value to correspond to the additional efficiency obtainable by the use of such propellers, and thereafter by such other value.

4. The Administrator of Civil Aeronautics may authorize continued operation of C–46 airplanes in passenger service in accordance with paragraphs 2 and 3 of this regulation until January 1, 1957, if he finds that the applicant for such authorization has a bona fide, firm contract with the holder of a type certificate indicating that the required modifications will be completed prior to January 1, 1957, except that the Administrator may authorize during the period July 1, 1956, through July 15, 1956, such continued operation without a showing of such firm contract where the Administrator has previously permitted such operations based on genuine and diligent efforts to complete the required modifications. Such type certificate shall indicate that it meets the transport category requirements of Part 4b of the Civil Air Regulations in effect on July 20, 1950, with the exceptions authorized in SR–406A.

5. On and after July 1, 1956, (except as provided in paragraph 4) C–46 airplanes in passenger service shall comply with the provisions of Part 4b as in effect on July 20, 1950, except as otherwise provided hereinafter:

a. The provisions of sections 4b.0 through 4b.19 of Part 4b, effective May 18, 1954, shall be complied with.

b. The provisions of sections 4b.100 through 4b.190 need not be complied with.

c. The birdproof windshield requirements of section 4b.352 need not be complied with.

d. The provision of sections 4b.480 through 4b.490 effective May 16, 1953, shall be complied with in lieu of sections 4b.480 through 4b.489 effective July 20, 1950, with the exception of subparagraph 4b.484(a)(1) which shall be applicable as effective July 20, 1950, and paragraph 4b.487(e) which has no counterpart in the 1950 regulations.

6. On and after January 1, 1957, C–46 airplanes in passenger service shall be recertificated in the transport category in accordance with paragraph 5 of this regulation, and shall comply with the provisions of sections 4b.100 through 4b.190 with the following exception: In determining the take-off path in accordance with section 4b.116 and the one-engine-inoperative climb in accordance with section 4b.120 (a) and (b), the propeller of the inoperative engine may be assumed to be feathered if there is installed either an approved means for automatically indicating when the particular engine has failed or an approved means for automatically feathering the propeller of the inoperative engine.

7. In applying the provisions of paragraphs 5 and 6 of this regulation, where literal compliance with the requirements of sections 4b.130 through 4b.190 of Subpart B and Subparts C, D, E, and F of Part 4b is extremely difficult to accomplish, and where the Administrator finds that service experience with the C–46 type airplane so justifies, the Administrator may authorize deviations from specific details of these requirements, taking into account the effect of design changes.

8. On or after January 1, 1957, C–46 airplanes in passenger service shall be operated in accordance with the performance operating limitations applicable to transport category airplanes.

9. C–46 airplanes which comply with the provisions of paragraphs 5 and 6 of this regulation may be used in passenger operations conducted under the provisions of Parts 40 and 41 provided they are operated in accordance with paragraph 8.

10. This Special Civil Air Regulation supersedes Special Civil Air Regulation SR–406B.

SPECIAL CIVIL AIR REGULATION NO. SR–410

Effective: April 18, 1955
Adopted: April 18, 1955

Flight Time Limitations for Transcontinental Nonstop Irregular Air Carrier Interstate Operations

On June 14, 1954, the Board adopted Special Civil Air Regulation No. SR–405 which permitted air carriers in the conduct of scheduled transcontinental nonstop flights to schedule flight crew members for more than eight but not more than ten hours of continuous duty aloft on flights conducted in pressurized airplanes carrying at least two pilots and a flight engineer. Special Civil Air Regulation No. SR–405 will terminate with the effective date of any final action taken by the Board in respect of Draft Release No. 54–16, which was circulated to the public on May 28, 1954.

Subsequently a request was made to the Board by an irregular air carrier to provide that Part 42 operators may make nonstop flights on the same basis extended to the scheduled operators under SR–405.

The Board believes that the nonstop flight time limitations should be extended to irregular air carriers on substantially the same basis as they are currently applied to scheduled air carriers. The scheduled air-carrier operating rules of Part 40 contain requirements for dispatch and company communications systems not currently required under the irregular air carrier operating rules of Part 42. In order to insure equivalent safety, therefore, the Board believes it necessary to add certain provisions concerning dispatch and company communications systems for the operations herein contemplated. The petitioner has advised the Board that it considers these provisions reasonable. Therefore, by this Special Civil Air Regulation the Board applies to irregular air carriers the provisions of SR–405 provided that the air carrier is able to show an independent air/ground communications service and a dispatch organization serving terminal points which are essentially similar to those required of scheduled air carriers.

It should be noted that the independent air/ground communications system specified by this rule is required to be approved by the Administrator as adequate to serve terminal points. This requirement is intended to provide an operational control system which insures reliable and rapid communications either direct or via acceptable point-to-point circuits between the pilot and the dispatcher under normal operating conditions. While the Board is not in this instance establishing firm criteria with respect to the geographic coverage of such a communications system, we envisage that it will normally permit communication between the pilot and the dispatcher at least during the last hour of the flight.

As is the case in scheduled air carrier operations, the Board contemplates that the dispatcher will be responsible for monitoring the

progress of each flight and issuing instructions and information necessary for the continued safety of the flight within the area of communications provided under this rule. It is expected that the dispatch office will be so located with respect to the terminal point and so equipped with necessary communications facilities as to insure that the dispatcher will be in possession of necessary information to determine the flight may be terminated safely and to communicate such information to the pilot.

The Board anticipates that the air carrier shall determine that prior to serving in operations conducted under this rule, an aircraft dispatcher shall be familiar with all essential operating procedures and with the equipment and facilities to be used.

The Board contemplates that at the termination of SR–405 this regulation will have been reexamined and necessary action will then be taken with regard to flight time limitations for irregular long-range nonstop interstate operations.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all relevant matter presented. Since this regulation is in the nature of relieving from a restriction, it may be made effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective April 18, 1955:

Notwithstanding the requirements of section 42.48 of the Civil Air Regulations, air carriers in the conduct of interstate transcontinental nonstop flights, in accordance with Part 42, may schedule flight crew members for more than eight but not more than ten hours of continuous duty aloft without an intervening rest period: *Provided,* That the flight is conducted in pressurized airplanes with a flight crew of at least two pilots and a flight engineer: *And provided further,* That the carrier utilize in the conduct of such operations an air/ground communication service independent of systems operated by the Federal Government, and a dispatch organization, both of which have been approved by the Administrator as adequate to serve the terminal points concerned. This regulation shall terminate with the effective termination of SR–405.

SPECIAL CIVIL AIR REGULATION NO. SR–411A

Effective: July 1, 1957
Adopted: June 28, 1957

Trial Operation of Transport Category Airplanes in Cargo Service at Increased Zero Fuel and Landing Weights

On June 30, 1955, the Civil Aeronautics Board adopted Special Civil Air Regulation No. SR–411 authorizing for a period of 2 years' trial operations of transport category airplanes in cargo service at weights in excess of those permitted in passenger service. The weights involved are the zero fuel weight (maximum weight of the airplane with no disposable fuel and oil) and the structural landing weight. The use of the higher weights is made contingent upon certain findings by the Administrator and upon certain conditions of operation and inspection.

Prior to the adoption of SR–411, trial operations of Douglas DC–6A airplanes at higher weights were authorized in orders issued by the Board to individual carriers. The first of such orders was issued on July 21, 1954. Authorization of the trial operations was predicated on the premise that such operations could eventually lead to the establishment of a sound basis for differentiating between standards for passenger and cargo air carrier operations. The success of the trial operations under the Board's orders led to the promulgation of SR–411 which permits any number of any type of transport category airplane to be operated at increased weights in cargo service. The basic intent of SR–411 was to obtain a more extensive background of operating experience to assure that the conditions governing the trial operations do in fact provide a sound basis for establishing possible future standards for airplanes in cargo operations.

Prior to the effective date of SR–411, there were a total of 6 DC–6A airplanes being used by 3 operators under waivers at higher weights. As of December 30, 1956, such operations encompassed 23 DC–6A airplanes and 5 operators. More recently Lockheed L1049–H airplanes have been introduced in cargo service at increased weights. Results of inspections submitted thus far to the Board have revealed no serious structural defects which could be attributed to operation at the increased weights.

In the preamble to SR–411, the Board indicated that it expected to have interested persons submit their evaluation of the trial operations and recommendations with respect to future regulatory action. In this regard, industry segments directly related to the trial operations under SR–411 recommended that the authorization for trial operations be continued on the basis that such operations have not resulted in any indications of structural distress and on the basis of the economic importance of such trial operations to the promotion and success of cargo service. Based on the foregoing and on the evaluation of the inspection and operational reports submitted by the air carriers, the Board finds that there is sufficient justification to permit the continuation of trial operations beyond June 30, 1957, the termination date of Special Civil Air Regulation No. SR–411. From the operational data submitted by the operators, the scope of operations under SR–411 has been such that substantiation of the conditions for these operations for inclusion in the regulations

on a permanent basis will entail a long range program. Consequently, the termination date of this regulation is being established to permit trial operations for an additional five-year period.

In connection with the rulemaking procedures effected on this matter, it was suggested that the Board extend the trial operations for a period no longer than one or two years on the premise that the shorter time extension would permit closer control of these operations. The Board fails to find any relationship between the extension period and the quality of control exerted over the trial operations inasmuch as the Board intends to continue its evaluation of the inspection reports submitted by the operators at regular intervals and envisions that the industry and the Administrator will do likewise.

Suggestions were also received to the effect that the trial operations should not be limited only to the older type airplanes, as proposed in the notice of proposed rulemaking; i.e., to airplanes certificated prior to March 13, 1956. In this regard, the Board considers that in view of the new concept of structural design requirements as well as other related changes in these requirements which were introduced on the aforementioned date into Part 4b of the Civil Air Regulations along with the new concept of structural design, it is advisable that some experience be gained with airplanes certificated under those provisions at the normal transport category weights before permitting such airplanes to operate at the higher weight. Accordingly, this special regulation extends the authorization to operate at higher weights only to airplanes certificated in accordance with the transport category requirements in effect prior to March 13, 1956.

It should be noted that, as indicated in the preamble to SR–411, the Board envisions that most of the airplanes taking advantage of this regulation will continue to be used in cargo service solely. However, if any of the airplanes operated under the provisions of this regulation are to be made eligible at any later time for passenger service, the provisions of this regulation require accomplishment of a special inspection and an evaluation of the fatigue limitations. It is suggested that, if it is contemplated to return the airplane to passenger service, the establishment of special inspections and the evaluation of the fatigue limitations be accomplished prior to increasing the airplane weight for cargo service. It is not the intent of this regulation to permit intermittent operations in passenger and cargo service.

The provisions of this regulation differ from the provisions of Special Civil Air Regulation No. SR–411 in that they are made applicable only to airplanes certificated in accordance with the transport category structural requirements effective prior to March 13, 1956; they require inspection and flight data records to be kept available for no longer than one year; and they require flight records (as distinguished from inspection records) to be made only with respect to those flights involving increased weights, rather than for all flights regardless of whether or not they are made at the increased weights.

Interested persons have been afforded an opportunity to participate in the making of this regulation (22 F.R. 3416), and due consideration has been given to all relevant matter presented. Since this regulation

imposes no additional burden on any persons, it may be made effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective July 1, 1957.

Notwithstanding the applicable structural provisions of the Civil Air Regulations, any air carrier may operate in cargo service transport category airplanes which were certificated under the provisions of Part 4a or Part 4b, effective prior to March 13, 1956, subject to the conditions hereinafter set forth:

(1) The air carrier shall submit an application to the Administrator indicating its desire to operate its airplane(s) under the provisions of this special regulation, and indicating which airplane(s) would be involved.

(2) The air carrier shall furnish a statement from each manufacturer for each type of airplane involved indicating in each case that the airplane manufacturer approves the operation of such type of airplane under the provisions of this regulation and that the airplane manufacturer will establish the inspection procedure prescribed in paragraph (4) of this Special Civil Air Regulation and will supervise such inspection as necessary.

(3) The zero fuel weight (maximum weight of the airplane with no disposable fuel and oil) and the structural landing weight may be increased beyond the maxima approved in full compliance with the applicable Civil Air Regulations: *Provided,* That the Administrator of Civil Aeronautics finds that the increase in either such weight is not likely to reduce seriously the structural strength, that the probability of sudden fatigue failure is not noticeably increased, and that the flutter, deformation, and vibration characteristics do not fall below those required by the Civil Air Regulations: *And provided further,* That any increase in the zero fuel weight approved shall not exceed 5 percent and that the increase in the structural landing weight shall not exceed the amount, in pounds, of the increase in the zero fuel weight.

(4) Airplanes for which the increased weights become effective shall be subject to inspections in addition to those normally performed, such inspections to be established by the manufacturer of the type airplane concerned, subject to the approval of the Administrator of Civil Aeronautics and to be supervised as found necessary by that manufacturer, to safeguard against possible structural distress resulting from the higher operating stress levels. The air carrier shall keep for a period of at least one year, and make available upon request to the Civil Aeronautics Board, the Administrator of Civil Aeronautics, or the manufacturer of the type of airplane concerned, the records of such inspections.

(5) Airplanes for which the increased weights become effective shall be operated in accordance with the transport category performance operating limitations prescribed in Part 40, 41, or 42 of the Civil Air Regulations, whichever is applicable.

(6) The air carrier shall keep for a period of at least one year and make available upon request to the Civil Aeronautics Board, the

Administrator of Civil Aeronautics, or the manufacturer of the type airplane concerned, records of all flights conducted at increased weights with airplanes for which the increased weights become effective, such records to include the actual takeoff, zero fuel, and landing weights.

(7) The Airplane Flight Manual of each airplane operating under the provisions of this special regulation shall be appropriately revised so as to include the necessary operating limitations and operating information.

(8) An airplane which has been operated at increased weights under the provisions of this regulation shall not be used for the carriage of passengers, except under the following conditions:

(a) Special inspections established by the manufacturer and approved by the Administrator of Civil Aeronautics shall have been accomplished.

(b) The effects of the operations at increased weights on structural fatigue shall have been evaluated by the airplane manufacturer and taken into account in any fatigue limitations established for the airplane.

This regulation shall terminate on June 30, 1962, unless sooner superseded or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION NO. SR-415

Effective: January 1, 1956
Adopted: December 29, 1955

Supplemental Air Carrier Certification and Operation Rules

The Board opinion which was made a part of Order No. E-9744, adopted November 15, 1955, effective January 1, 1956, explains that as a matter of new policy the Board established a new class of noncertificated air carriers designated "supplemental" air carriers who would be granted enlarged operating authority.

Accordingly, in Order No. E-9744 the Board issued a temporary exemption to all applicants named therein who held operating authority either as irregular air carriers or as irregular air transport carriers to operate within the scope of the new policy, pending final disposition of each air carrier's application for continued authorization to conduct operations as a supplemental air carrier.

At the present time, the Civil Air Regulations do not prescribe any rules to govern the operations of supplemental air carriers. The applicants named in Order No. E-9744 are conducting their operations as large irregular air carriers pursuant to the provisions of Part 42 of the Civil Air Regulations, and the Board believes that until operating experience reveals that further or different rules are necessary, supplemental air carriers should be allowed to continue their operations pursuant to Part 42.

This regulation is necessary to give effect to Order No. E-9744 and the opinion made a part thereof. Since this regulation is ancillary to said order and opinion; since it continues in effect the same rules as are presently applicable to the operators named in said order without diminution in safety standards; and since it would be contrary to the public interest not to prescribe rules to become effective on January 1, 1956, to govern the operations of such air carriers, the Board finds that notice and public procedure are impracticable and that good cause exists for making this regulation effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective January 1, 1956:

Contrary provisions of the Civil Air Regulations notwithstanding, any air carrier holding valid authority issued by the Board to perform air transportation as a supplemental air carrier in charter services and individual services, as defined in Appendix A attached to Board Order No. E-9744, shall be certificated and shall conduct such operations in accordance with the provisions of Part 42 of the Civil Air Regulations. An air carrier operating certificate presently issued by the Civil Aeronautics Administration to a large irregular air carrier shall, until its

stated expiration date, be valid as a supplemental air carrier operating certificate for supplemental air carrier operations, unless sooner surrendered, suspended, or revoked. Such certificate may be renewed as an air carrier operating certificate for supplemental air carrier operations.

This regulation shall remain in effect until such time as new supplemental air carrier certification and operation rules become effective, unless sooner superseded or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION NO. SR-419

Effective: January 17, 1957
Adopted: January 17, 1957

Authority to Deviate From Certain Provisions of the Civil Air Regulations in the Conduct of Military Contract Operations

By petition dated October 8, 1956, AAXICO Airlines, Inc., Capitol Airways, Inc., and Riddle Airlines, Inc., requested the Board to permit them to carry certain passengers in aircraft in the performance of certain military contract operations without compliance with the passenger-carrying rules prescribed in Part 42 of the Civil Air Regulations and Special Civil Air Regulation No. SR-406C. The petitioners informed the Board that they have entered into contracts with the United States Air Force to provide scheduled cargo service for the Air Force among numerous domestic military installations utilizing a fleet of over forty Curtiss C-46 aircraft. This contract operation is commonly known as the Air Force Logistical Airlift, or "LOGAIR" Service. They state further that the continued efficient operation of LOGAIR is in the interest of national defense and essential for the domestic airlift requirements of the Air Force. The petitioners have advised the Board that it is essential in the performance of these contracts that government couriers traveling with classified information or for the purpose of maintaining security requirements with respect to certain classified cargo be carried. They have also advised that the occasional transportation (deadheading) by one LOGAIR contractor of crew members of another LOGAIR contractor is essential for the efficient operation of LOGAIR.

Petitioners advise that the LOGAIR operation is under the complete operational control of the Air Force; that flight operations are conducted only between Air Force bases; and that all loading, servicing, and scheduling matters are handled by the Air Force.

By letter dated October 12, 1956, the Department of the Air Force officially confirmed the essential information submitted by the petitioners and requested that the Board give favorable consideration to the petitioners' request. In justification of petitioners' request, the Air Force stated in part that LOGAIR is necessary to execute successfully the Air Force mission. In addition the Air Force stated that part of LOGAIR's value to the Air Force is due to the fact that it can carry classified cargo with a maximum of speed and with a minimum of special handling. As the various missile programs develop and other new weapons come into the Air Force inventory, the requirement for this type of transportation will continue to increase. Couriers must be carried on LOGAIR aircraft to effect the safe handling and expeditious delivery of this classified cargo. The Air Force also stated that it was necessary to provide deadhead transportation of LOGAIR flight crew members on aircraft of other

LOGAIR contractors because restricting their movement to their own company's aircraft or to commercial carriers that neither originate nor terminate at military installations often results in lengthy delays in LOGAIR schedules that reduce the value of this service as a means of fast and economical transportation.

In addition to the couriers and the deadheading crew members which were the subject of the petitioners' request, the Air Force has requested that authority also be provided to permit the carriage of Air Force route supervisors. The mission of these supervisors is to work out liaison with contractor crews and Air Force personnel from the Air Materiel Command, the Air Defense Command, and the Strategic Air Command. Their areas of responsibility, in addition to normal air terminal operation inspections, include checking weight and balance procedures and adequacy of tie-down techniques, as well as observing the adequacy of the temperature control provided for the cargo compartment during actual flight operations. The route supervisors also evaluate the control tower communications furnished at Air Force bases by Air Force personnel, the adequacy of follow-me vehicles, fire guards, and ramp alert personnel. Most of these activities either directly or indirectly affect the safety of the operation of LOGAIR. These checks on LOGAIR, both on the ground and in the air, are considered by the Air Force to be necessary in assuring a safe, efficient, and dependable airline operation. The Air Force has also stated that the cost resulting from placing passenger-carrying weight limitations on the C–46 aircraft in the LOGAIR operations would be prohibitive.

Section 42.2 (Deviation authority) of Part 42 authorizes the Administrator to permit air carriers conducting operations pursuant to contracts with the military service to deviate from the applicable provisions of Part 42 only, subject to any terms and conditions that the Administrator finds are necessary in the interest of safety. This authority is limited to those operations which the Department of Defense has certified to the Administrator are essential to the national defense and require the requested deviation. It was anticipated by the Board that petitions similar to the one herein discussed would normally have been handled by the Administrator under this deviation authority. However, this authority is not broad enough to permit the Administrator to grant the relief requested in this instance since the petitioners request relief from the provisions of Special Civil Air Regulation No. SR–406C in addition to certain provisions of Part 42. SR–406C contains no deviation authority comparable to that contained in Part 42.

The Board has considered the information submitted by the petitioners and the Air Force in support of the relief requested and finds that a sufficient showing has been made to justify granting such relief through the promulgation of a Special Civil Air Regulation. The Board considers that the carriage of the various categories of personnel as requested would not affect the public interest adversely. The carriage of these persons would, on the contrary, constitute a contribution to the efficiency and safety of essential national defense operations, and, therefore, would be in the public interest.

The provisions of this Special Civil Air Regulation authorize the carriage of military couriers, LOGAIR crew members, and LOGAIR route

supervisors in aircraft without compliance with the passenger-carrying rules prescribed in Part 42 and SR–406C.

Prior to engaging in operations pursuant to this Special Civil Air Regulation each operator will be required to give notice to the administrator of the type and registration number of the aircraft to be used and satisfactory evidence that it is a bona fide contractor acting pursuant to a LOGAIR contract.

Since this Special Civil Air Regulation will neither affect adversely the safety of the public nor impose any additional burden on any person, and because the Board has been advised by the Department of the Air Force that the authority granted by this regulation with respect to LOGAIR operations is necessary to the successful execution of the Air Force mission, the Board finds that omission of notice and public procedure is not contrary to the public interest and that good cause exists for making this regulation effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation effective January 17, 1957.

Subject to conditions hereinafter set forth, the operators listed in Appendix A, and any other operator authorized by the Administrator to be added to such list pursuant to this regulation, may, while conducting operations under an Air Force contract known as LOGAIR, carry the persons listed in subparagraph 1 in aircraft without complying with the passenger-carrying rules prescribed in Part 42 of the Civil Air Regulations and Special Civil Air Regulation No. SR–406C, subject to such terms and conditions as the Administrator may find are necessary in the interest of safety.

1. Military couriers, route supervisors, and LOGAIR flight crew members of other LOGAIR contractors.

2. Each operator shall furnish the Administrator, prior to the carriage of such persons, with a list showing the type aircraft, registration number, and an authorization from the Air Force for the transportation of such persons.

3. The operator shall be responsible for the issuance of appropriate instructions to insure that the persons authorized to be carried will not create any interference with the control of the aircraft.

4. Upon notification by any other bona fide contractors acting pursuant to the above specified LOGAIR contracts, the Administrator of Civil Aeronautics is authorized to add to the list in Appendix A any such operator who he determines meets the requirements of this Special Civil Air Regulation.

This Special Civil Air Regulation shall remain in effect until superseded or rescinded by the Board.

APPENDIX A TO SPECIAL CIVIL AIR REGULATION NO. SR–419

Operator

Aaxico Airlines, Inc.
Capitol Airways, Inc.
Riddle Airlines, Inc.

535996 O—60——11

SPECIAL CIVIL AIR REGULATION NO. SR–420

Effective: May 21, 1957
Adopted: May 21, 1957

Emergency Evacuation Equipment for DC–3-Type Airplanes

Sections 40.173, 41.23d, and 42.24c effective November 28, 1955, require in part that after May 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. This requirement was adopted on the basis of experience which had shown that in certain instances, it is essential that some means be provided to assist passengers in evacuating airplanes on the ground.

The application of this emergency evacuation requirement to the DC–3 airplane, however, would impose an economic burden on the operators of this airplane without a commensurate increase in safety. The rear window emergency exit of this airplane is just over 6 feet from the ground, with the landing gear extended, and accordingly would require the installation of a means to assist descent. However, the main passenger door and 2 window emergency exits which are located over the wings require no special means to assist descent and they afford an excellent means of emergency evacuation. Furthermore, a study of DC–3 airplane accidents from 1938 through 1955 does not disclose any incident in which the absence of a means to assist the descent of occupants from the rear window emergency exit adversely affected the emergency evacuation of passengers. This record can be attributed in great part to the fact that the DC–3 airplane does not utilize a nose-wheel type landing gear and the probability of the rear window emergency exit being raised above its normal height from the ground, such as can occur when a nose-wheel gear collapses, is extremely remote.

Accordingly, the Board is of the view that it is not necessary in the interest of safety to require that means be provided to assist occupants in descending from the rear window emergency exit of a DC–3 airplane. It should be noted, however, that a DC–3 operator would not be prevented from installing a means to assist descent should he so desire.

Interested persons have been afforded an opportunity to participate in the making of this regulation (22 F.R. 2663), and due consideration has been given to all relevant matter presented Since this regulation imposes no additional burden on any person, it may be made effective without prior notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective May 21, 1957.

Contrary provisions of sections 40.173(e), 41.23d(a), and 42.24c(a) of Parts 40, 41, and 42, respectively, of the Civil Air Regulations notwith-

standing, after May 31, 1957, means need not be provided to assist the occupants of a passenger-carrying DC–3 airplane in descending from the airplane by way of the rear window emergency exit: *Provided,* That the authority contained herein shall not apply to DC–3 airplanes which are operated with an occupancy greater than that specified in Special Civil Air Regulation No. SR–389 for DC–3 airplanes with 4 exits authorized for passenger use.

SPECIAL CIVIL AIR REGULATION NO. SR–422

Effective: August 27, 1957
Adopted: July 23, 1957

Turbine-Powered Transport Category Airplanes of Current Design

Part 4b of the Civil Air Regulations contains rules governing the design of transport category airplanes. For a number of years, this part has established airworthiness requirements for this category of airplanes by prescribing detailed provisions to be met for the issuance of a type certificate. However, the advent of turbine-powered airplanes (jets, turboprops, etc.) has brought about operations at considerably higher speeds and altitudes than those involving reciprocating engine airplanes. These higher speeds and altitudes as well as certain inherent characteristics of turbine engines have introduced numerous new technical and design problems and have necessitated re-evaluation and amendment of many provisions in Part 4b.

In recent years the Board has amended Part 4b by introducing numerous technical provisions more specifically applicable to turbine-powered airplanes. These were included in amendments pertaining to structural, flight characteristic, powerplant installation, and other provisions. It is believed that Part 4b as now written is applicable to turbine-powered airplanes with but one exception; namely, airplane performance. In the future, further amendments to this part, other than those relating to performance, will be comparatively minor in nature mainly reflecting the latest experience in the certification and operation of these airplanes.

The performance requirements presently in Part 4b were first promulgated almost twelve years ago. They are now considered by the Board to be in a form not suitable for direct application to turbine-powered airplanes.

The administrator of Civil Aeronautics is in receipt of a large number of applications for type certification of turbine-powered airplanes. However, the so-called "non-retroactive"clause of section 4b.11(a) of Part 4b does not make applicable to a particular airplane type any amendment which is adopted after an application is filed by the manufacturer for type certification of that airplane. Thus, most of these airplanes are not now required to meet some of the latest effective provisions of Part 4b unless the Board prescribes otherwise. With so many applications for type certificates pending, it is essential that the Board establish adequate requirements which will effectively apply to the type certification of turbine-powered transport category airplanes. This Special Civil Air Regulation is being promulgated for that purpose.

This Special Civil Air Regulation is being made effective with respect to all turbine-powered transport category airplanes not yet certificated. In essence, it prescribes a revised set of performance requirements for turbine-powered airplanes and incorporates such of the recent amend-

ments to Part 4b as the Administrator finds necessary to insure that the level of safety of turbine-powered airplanes is equivalent to that generally intended by Part 4b.

The performance requirements contained herein include not only the performance requirements necessary for the certification of an airplane, but also the complementary performance operating limitations as applicable under Parts 40, 41, and 42 of the Civil Air Regulations. In promulgating this new performance code, the Board intends that the resulting level of safety will be generally similar to the level of safety established by the performance code as expressed by the provisions now contained in Parts 4b and 40 (or 41 or 42 as appropriate) for reciprocating engine airplanes. To attain this, many of the performance provisions have been modified for better applicability to turbine-powered airplanes, some in the direction of liberalization, others in the direction of improvement in the required performance.

A significant change being made is the introduction of full temperature accountability in all stages of performance, except the landing distances required. The introduction of full temperature accountability will insure that the airplane's performance is satisfactory irrespective of the existing atmospheric temperature. The performance requirements heretofore applicable did not give sufficient assurance in this respect.

The reason for omitting the direct application of temperature accountability in the requirement for landing distances is that this stage of performance always has been treated in a highly empirical fashion whereby temperature effects are taken into account indirectly together with the effects of other operational factors. Long range studies on rationalization of airplane performance so far have not yielded a satisfactory solution to the landing stage of performance. The Board hopes, however, that continued studies will result in a solution of this problem in the near future.

The introduction of full temperature accountability has necessitated a complete re-evaluation of the minimum climb requirements. Since the prescribed climb must now be met at all temperatures rather than to be associated with standard temperature, the specific values of climb have been altered. In each instance, the change has been in the downward direction because, although the previous values were related to standard temperature, a satisfactory resultant climb performance was attained at temperatures substantially above standard. While values of minimum climb performance specified in the new code will tend to increase the maximum certificated weights of the airplane for the lower range of temperatures, they will limit these weights for the upper range of temperatures, giving adequate assurance of satisfactory climb performance at all temperatures.

In considering the various stages of flight where minimum values of climb have been heretofore established, the Board finds that in two of the stages (all-engines-operating en route and one-engine-inoperative en route) the establishment of minimum values of climb is unnecessary because, in the case of the all-engines-operating stage, it has been found not to be critical and the case of the one-engine-inoperative stage is now more effectively covered by the en route performance operating limitations.

Considering that the minimum climbs being prescribed affect mainly the maximum certificated weights of the airplane but not the maximum operating weights, the Board, in adopting the new performance code, places considerable emphasis on the ability of the airplane to clear obstacles on take-off and during flight. To this end, criteria for the take-off path, the en route flight paths, and the transition from take-off to the en route stage of flight have been prescribed to reflect realistic operating procedures. Temperature is fully accounted for in establishing all flight paths and an expanding clearance between the take-off path and the terrain or obstacles is required until the en route stage of flight is reached.

In order to insure that the objectives of the prescribed performance are in fact realized in actual operations, the manufacturer is required to establish procedures to be followed in the operation of the airplane in the various conditions specified in the regulation. These procedures, each designed for a specific airplane, will permit the operator to utilize the full performance capabilities of the airplane more readily than if the regulations prescribed all-inclusive procedures. The use of these procedures in determining compliance with the requirements governing take-off, en route, and landing stages, will also add considerable flexibility to the regulation.

The new performance requirements established more clearly than heretofore which of the performance limitations are conditions on the airworthiness certificate of the airplane. In addition to the maximum certificated take-off and landing weights, there are included limitations on the take-off distances and on the use of the airplane within the ranges of operational variables, such as altitude, temperature, and wind. Since these limitations are in the airworthiness certificate, they are applicable to all type operations conducted with the airplane.

The new performance code contains values for minimum climb expressed as gradients of climb, in percent, rather than as rates of climb, in feet per minute, as has been the case heretofore. The Board believes that the gradient of climb is more direct in expressing the performance margins of the airplane. Use of the gradient eliminates the influence of the stalling speed on the required climb. Heretofore, higher rates of climb were required for airplanes with higher stalling speeds. The only differentiation in the new code with respect to the required climb is between two and four-engine airplanes. This type of differentiation is of long standing in the regulations, being applicable to the one-engine-inoperative stage of flight. It is now being expanded to the take-off and approach stages.

The new performance requirements contained herein are based on the best information presently available to the Board. It is realized, however, that due to the present limited operating experience with turbine-powered transport airplanes, improvement in the requirements can be expected as a result of the direct application of the code to specific designs of new airplanes. There are certain areas in the new requirements where additional refinement of details might be advisable. This is so particularly in the case of the requirements pertaining to the landing stage of flight. It is anticipated that, after further study of the regulation and especially after its application in the design, certification, and operation of forthcoming turbine-powered airplanes, the desirability of changes

may become more apparent. It is the intent of the Board to consider without delay such changes as might be found necessary. Only after the provisions of this Special Civil Air Regulation are reasonably verified by practical application will the Board consider incorporating them on a more permanent basis into Parts 4b, 40, 41, and 42 of the Civil Air Regulations.

This Special Civil Air Regulation is not intended to compromise the authority of the Administrator under section 4b.10 to impose such special conditions as he finds necessary in any particular case to avoid unsafe design features and otherwise to insure equivalent safety.

Interested persons have been afforded an opportunity to participate in the making of this regulation (21 F.R. 6091), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective August 27, 1957.

Contrary provisions of the Civil Air Regulations notwithstanding, all turbine-powered transport category airplanes for which a type certificate is issued after the effective date of this Special Civil Air Regulation shall comply with the following:

1. The provisions of Part 4b of the Civil Air Regulations, effective on the date of application for type certificate; and such of the provisions of all subsequent amendments to Part 4b, in effect prior to the effective date of this special regulation, as the Administrator finds necessary to insure that the level of safety of turbine-powered airplanes is equivalent to that generally intended by Part 4b.

2. In lieu of sections 4b.110 through 4b.125, and 4b.743 of Part 4b of the Civil Air Regulations, the following shall be applicable:

PERFORMANCE

4T.110 *General.*

(a) The performance of the airplane shall be determined and scheduled in accordance with, and shall meet the minima prescribed by, the provisions of sections 4T.110 through 4T.123. The performance limitations, information, and other data shall be given in accordance with section 4T.743.

(b) Unless otherwise specifically prescribed, the performance shall correspond with ambient atmospheric conditions and still air. Humidity shall be accounted for as specified in paragraph (c) of this section.

(c) The performance as affected by engine power and/or thrust shall be based on a relative humidity of 80 percent at and below standard temperatures and on 34 percent at and above standard temperatures plus 50° F. Between these two temperatures the relative humidity shall vary linearly.

(d) The performance shall correspond with the propulsive thrust available under the particular ambient atmospheric conditions, the particular flight conditions, and the relative humidity specified in paragraph (c) of this section. The available propulsive thrust shall correspond with engine power and/or thrust not exceeding the approved power and/or thrust less the installational losses and less the power and/or

equivalent thrust absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

4T.111 *Airplane configuration, speed, power, and/or thrust; general.*

(a) The airplane configuration (setting of wing and cowl flaps, air brakes, landing gear, propeller, etc.), denoted respectively as the take-off, en route, approach, and landing configurations, shall be selected by the applicant except as otherwise prescribed.

(b) It shall be acceptable to make the airplane configurations variable with weight, altitude, and temperature, to an extent found by the Administrator to be compatible with operating procedures required in accordance with paragraph (c) of this section.

(c) In determining the accelerate-stop distances, take-off flight paths, take-off distances, and landing distances, changes in the airplane's configuration and speed, and in the power and/or thrust shall be in accordance with procedures established by the applicant for the operation of the airplane in service, except as otherwise prescribed. The procedures shall comply with the provisions of subparagraphs (1) through (3) of this paragraph.

(1) The Administrator shall find that the procedures can be consistently executed in service by crews of average skill.

(2) The procedures shall not involve methods or the use of devices which have not been proven to be safe and reliable.

(3) Allowance shall be made for such time delays in the execution of the procedures as may be reasonably expected to occur during service.

4T.112 *Stalling speeds.*

(a) The speed V_{s_0} shall denote the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in knots, with:

(1) Zero thrust at the stalling speed, or engines idling and throttles closed if it is shown that the resultant thrust has no appreciable effect on the stalling speed;

(2) If applicable, propeller pitch controls in the position necessary for compliance with subparagraph (1) of this paragraph;

(3) The airplane in the landing configuration;

(4) The center of gravity in the most unfavorable position within the allowable landing range;

(5) The weight of the airplane equal to the weight in connection with which V_s is being used to determine compliance with a particular requirement.

(b) The speed V_{s_1} shall denote the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in knots, with:

(1) Zero thrust at the stalling speed, or engines idling and throttles closed if it is shown that the resultant thrust has no appreciable effect on the stalling speed;

(2) If applicable, propeller pitch controls in the position necessary for compliance with subparagraph (1) of this paragraph; the air-

plane in all other respects (flaps, landing gear, etc.) in the particular configuration corresponding with that in connection with which V_{s_1} is being used;

(3) The weight of the airplane equal to the weight in connection with which V_{s_1} is being used to determine compliance with a particular requirement.

(c) The stall speeds defined in this section shall be the minimum speeds obtained in flight tests conducted in accordance with the procedure of subparagraphs (1) and (2) of this paragraph.

(1) With the airplane trimmed for straight flight at a speed of 1.4 V_s and from a speed sufficiently above the stalling speed to insure steady conditions, the elevator control shall be applied at a rate such that the airplane speed reduction does not exceed one knot per second.

(2) During the test prescribed in subparagraph (1) of this paragraph, the flight characteristics provisions of section 4b.160 of Part 4b of the Civil Air Regulations shall be complied with.

4T.113 *Take-off; general.*

(a) The take-off data in sections 4T.114 through 4T.117 shall be determined under the conditions of subparagraphs (1) and (2) of this paragraph.

(1) At all weights, altitudes, and ambient temperatures within the operational limits established by the applicant for the airplane.

(2) In the configuration for take-off (see sec. 4T.111).

(b) Take-off data shall be based on a smooth, dry, hard-surfaced runway, and shall be determined in such a manner that reproduction of the performance does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the take-off surface shall be smooth water, while for skiplanes it shall be smooth dry snow. In addition, the take-off data shall be corrected in accordance with subparagraphs (1) and (2) of this paragraph for wind and for runway gradients within the operational limits established by the applicant for the airplane.

(1) Not more than 50 percent of nominal wind components along the take-off path opposite to the direction of take-off, and not less than 150 percent of nominal wind components along the take-off path in the direction of take-off.

(2) Effective runway gradients.

4T.114 *Take-off speeds.*

(a) The critical-engine-failure speed V_1, in terms of calibrated air speed, shall be selected by the applicant, but shall not be less than the minimum speed at which controllability by primary aerodynamic controls alone is demonstrated during the take-off run to be adequate to permit proceeding safely with the take-off using average piloting skill, when the critical engine is suddenly made inoperative.

(b) The minimum take-off safety speed V_2, in terms of calibrated air speed, shall be selected by the applicant so as to permit the gradient of climb required in section 4T.120 (a) and (b), but it shall not be less than:

(1) 1.2 V_{s_1} for two-engine propeller-driven airplanes and for airplanes without propellers which have no provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed.

(2) 1.15 V_{s_1} for propeller-driven airplanes having more than two engines and for airplanes without propellers which have provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed;

(3) 1.10 times the minimum control speed V_{MC}, established in accordance with section 4b.133 of Part 4b of the Civil Air Regulations.

(c) If engine failure is assumed to occur at or after the attainment of V_2, the demonstration in which the take-off run is continued to include the take-off climb, as provided in paragraph (a) of this section, shall not be required.

4T.115 *Accelerate-stop distance.*

(a) The accelerate-stop distance shall be the sum of the following:

(1) The distance required to accelerate the airplane from a standing start to the speed V_1;

(2) Assuming the critical engine to fail at the speed V_1, the distance required to bring the airplane to a full stop from the point corresponding with the speed V_1.

(b) In addition to, or in lieu of, wheel brakes, the use of other braking means shall be acceptable in determining the accelerate-stop distance, provided that such braking means shall have been proven to be safe and reliable, that the manner of their employment is such that consistent results can be expected in service, and that exceptional skill is not required to control the airplane.

(c) The landing gear shall remain extended throughout the accelerate-stop distance.

4T.116 *Take-off path.* The take-off path shall be considered to extend from the standing start to a point in the take-off where a height of 1,000 feet above the take-off surface is reached or to a point in the take-off where the transition from the take-off to the en route configuration is completed and a speed is reached at which compliance with section 4T.120(c) is shown, whichever point is at a higher altitude. The conditions of paragraphs (a) through (i) of this section shall apply in determining the take-off path.

(a) The take-off path shall be based upon procedures prescribed in accordance with section 4T.111(c).

(b) The airplane shall be accelerated on or near the ground to the speed V_2 during which time the critical engine shall be made inoperative at speed V_1 and shall remain inoperative during the remainder of the take-off.

(c) Landing gear retraction shall not be initiated prior to reaching the speed V_2.

(d) The slope of the airborne portion of the take-off path shall be positive at all points.

(e) After the V_2 speed is reached, the speed throughout the take-off path shall not be less than V_2 and shall be constant from the point where the landing gear is completely retracted until a height of 400 feet above the take-off surface is reached.

(f) Except for gear retraction and propeller feathering, the airplane configuration shall not be changed before reaching a height of 400 feet above the take-off surface.

(g) At all points along the take-off path starting at the point where the airplane first reaches a height of 400 feet above the take-off surface, the available gradient of climb shall not be less than 1.4 percent for two-engine airplanes and 1.8 percent for four-engine airplanes.

(h) The take-off path shall be determined either by a continuous demonstration take-off, or alternatively, by synthesizing from segments the complete take-off path.

(i) If the take-off path is determined by the segmental method, the provisions of subparagraphs (1) through (4) of this paragraph shall be specifically applicable.

(1) The segments of a segmental take-off path shall be clearly defined and shall be related to the distinct changes in the configuration of the airplane, in power and/or thrust, and in speed.

(2) The weight of the airplane, the configuration, and the power and/or thrust shall be constant throughout each segment and shall correspond with the most critical condition prevailing in the particular segment.

(3) The segmental flight path shall be based on the airplane's performance without ground effect.

(4) Segmental take-off path data shall be checked by continuous demonstrated take-offs to insure that the segmental path is conservative relative to the continuous path.

4T.117 *Take-off distance.* The take-off distance shall be the horizontal distance along the take-off path from the start of the take-off to the point where the airplane attains a height of 35 feet above the take-off surface as determined in accordance with 4T.116.

4T.118 *Climb; general.* Compliance shall be shown with the climb requirements of sections 4T.119 and 4T.120 at all weights, altitudes, and ambient temperatures, within the operational limits established by the applicant for the airplane. The airplane's center of gravity shall be in the most unfavorable position corresponding with the applicable configuration.

4T.119 *All-engine-operating landing climb.* In the landing configuration, the steady gradient of climb shall not be less than 4.0 per cent, with:

(a) All engines operating at the available take-off power and/or thrust;

(b) A climb speed not in excess of 1.4 V_{s_0}.

4T.120 *One-engine-inoperative climb.*

(a) *Take-off; landing gear extended.* In the take-off configuration at the point of the flight path where the airplane's speed first reaches V_2, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall be positive with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available take-off power and/or thrust existing in accordance with section 4T.116 at the time the airplane's landing gear is fully retracted;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time retraction of the airplane's landing gear is initiated;

(3) The speed equal to the speed V_2.

(b) *Take-off; landing gear retracted.* In the take-off configuration at the point of the flight path where the airplane's landing gear is fully retracted, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall not be less than 2.5 percent for two-engine airplanes and not less than 3.0 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the take-off power and/or thrust available at a height of 400 feet above the take-off surface and existing in accordance with section 4T.116;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time the airplane's landing gear is fully retracted;

(3) The speed equal to the speed V_2.

(c) *Final take-off.* In the en route configuration, the steady gradient of climb shall not be less than 1.4 percent for two-engine airplanes and not less than 1.8 percent for four-engine airplanes, at the end of the take-off path as determined by section 4T.116, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time retraction of the airplane's flaps is initiated;

(3) The speed equal to not less than 1.25 V_{s_1}.

(d) *Approach.* In the approach configuration such that V_{s_1} does not exceed 1.10 V_{s_0}, the steady gradient of climb shall not be less than 2.2 percent for two-engine airplanes and not less than 2.8 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available take-off power and/or thrust;

(2) The weight equal to the maximum landing weight;

(3) A climb speed in excess of 1.5 V_{s_1};

4T.121 *En route flight paths.* With the airplane in the en route configuration, the flight paths prescribed in paragraphs (a) and (b) of this section shall be determined at all weights, altitudes, and ambient temperatures within the limits established by the applicant for the airplane.

(a) *One engine inoperative.* The one-engine-inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 1.4 percent for two-engine airplanes and 1.8 percent for four-engine airplanes. It shall be acceptable to include in these data the variation of the airplane's weight along the flight path to take into account the progressive consumption of fuel and oil by the operating engine(s).

(b) *Two engines inoperative.* For airplanes with four engines, the two-engine–inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 0.6 percent. It shall be acceptable to include in these data the variation of the airplane's weight

along the flight path to take into account the progressive consumption of fuel and oil by the operating engines.

(c) *Conditions.* In determining the flight paths prescribed in paragraphs (a) and (b) of this section, the conditions of subparagraphs (1) through (4) of this paragraph shall apply.

(1) The airplane's center of gravity shall be in the most unfavorable position.

(2) The critical engine(s) shall be inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust.

(3) Means for controlling the engine cooling air supply shall be in the position which provides adequate cooling in the hot-day condition.

(4) The speed shall be selected by the applicant.

4T.122 *Landing distance.* The landing distance shall be the horizontal distance required to land and to come to a complete stop (to a speed of approximately 3 knots in the case of seaplanes or float planes) from a point at a height of 50 feet above the landing surface. Landing distances shall be determined for standard temperatures at all weights, altitudes, and winds within the operational limits established by the applicant for the airplane. The conditions of paragraphs (a) through (f) of this section shall apply.

(a) The airplane shall be in the landing configuration. During the landing, changes in the airplane's configuration, in power and/or thrust, and in speed shall be in accordance with procedures established by the applicant for the operation of the airplane in service. The procedures shall comply with the provisions of section 4T.111(c).

(b) The landing shall be preceded by a steady gliding approach down to the 50-foot height with a calibrated air speed of not less than 1.3 V_{s_0}.

(c) The landing distance shall be based on a smooth, dry, hard-surfaced runway, and shall be determined in such a manner that reproduction does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the landing surface shall be smooth water, while for skiplanes it shall be smooth dry snow. During landing, the airplane shall not exhibit excessive vertical acceleration, a tendency to bounce, nose over, ground loop, porpoise, or water loop.

(d) The landing distance shall be corrected for not more than 50 percent of nominal wind components along the landing path opposite to the direction of landing and not less than 150 percent of nominal wind components along the landing path in the direction of landing.

(e) During landing, the operating pressures on the wheel braking system shall not be in excess of those approved by the manufacturer of the brakes, and the wheel brakes shall not be used in such a manner as to produce excessive wear of brakes and tires.

(f) If the Administrator finds that a device on the airplane other than wheel brakes has a noticeable effect on the landing distance and if the device depends upon the operation of the engine and the effect of such a device is not compensated for by other devices in the event of engine failure, the landing distance shall be determined by assuming the critical engine to be inoperative.

4T.123 *Limitations and information.*

(a) *Limitations.* The performance limitations on the operation of the airplane shall be established in accordance with subparagraphs (1) through (4) of this paragraph. (See also sec. 4T.743.)

(1) *Take-off weights.* The maximum take-off weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with section 4T.120 (a), (b), and (c) for altitudes and ambient temperatures within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(2) *Landing weights.* The maximum landing weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with sections 4T.119 and 4T.120(d) for altitudes and ambient temperatures within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(3) *Take-off and accelerate-stop distances.* The minimum distances required for takeoff shall be established at which compliance is shown with the generally applicable provisions of this regulation and with sections 4T.115 and 4T.117 for weights, altitudes, temperatures, wind components, and runway gradients, within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(4) *Operational limits.* The operational limits of the airplane shall be established by the applicant for all variable factors required in showing compliance with this regulation (weight, altitude, temperature, etc.). (See secs. 4T.113(a) (1) and (b), 4T.118, 4T.121, and 4T.122.)

(b) *Information.* The performance information on the operation of the airplane shall be scheduled in compliance with the generally applicable provisions of this regulation and with sections 4T.116, 4T.121, and 4T.122 for weights, altitudes, temperatures, wind components, and runway gradients, as these may be applicable, within the operational limits of the airplane (see subparagraph (a)(4) of this section). In addition, the performance information specified in subparagraphs (1) through (3) of this paragraph shall be determined by extrapolation and scheduled for the ranges of weights between the maximum landing and maximum take-off weights established in accordance with subparagraphs (a)(1) and (a)(2) of this section. (See also sec. 4T.743.)

(1) Climb in the landing configuration (see sec. 4T.119);

(2) Climb in the approach configuration (see sec. 4T.120(d));

(3) Landing distance (see sec. 4T.122).

AIRPLANE FLIGHT MANUAL

4T.743 *Performance limitations, information, and other data.*

(a) *Limitations.* The airplanes' performance limitations shall be given in accordance with section 4T.123(a).

(b) *Information.* The performance information prescribed in section 4T.123(b) for the application of the operating rules of this regulation shall be given together with descriptions of the conditions, air speeds, etc., under which the data were determined.

(c) *Procedures.* For all stages of flight, procedures shall be given with respect to airplane configurations, power and/or thrust settings, and indicated air speeds, to the extent such procedures are related

to the limitations and information set forth in accordance with paragraphs (a) and (b) of this section.

(d) *Miscellaneous.* An explanation shall be given of significant or unusual flight or ground handling characteristics of the airplane.

3. In lieu of sections 40.70 through 40.78, 41.27 through 41.36(d), and 42.70 through 42.83, of Parts 40, 41, and 42 of the Civil Air Regulations, respectively, the following shall be applicable:

OPERATING RULES

40T.80 *Transport category airplane operating limitations.*

(a) In operating any passenger-carrying transport category airplane certificated in accordance with the performance requirements of this regulation, the provisions of sections 40T.80 through 40T.84 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.

(b) The performance data in the Airplane Flight Manual shall be applied in determining compliance with the provisions of sections 40T.81 through 40T.84. Where conditions differ from those for which specific tests were made compliance shall be determined by approved interpolation or computation of the effects of changes in the specific variables if such interpolations or computations give results substantially equalling in accuracy the results of a direct test.

40T.81 *Airplane's certificate limitations.*

(a) No airplane shall be taken off at a weight which exceeds the take-off weight specified in the Airplane Flight Manual for the elevation of the airport and for the ambient temperature existing at the time of the take-off. (See secs. 4T.123(a)(1) and 4T.743(a).)

(b) No airplane shall be taken off at a weight such that, allowing for normal consumption of fuel and oil in flight to the airport of destination, the weight on arrival will exceed the landing weight specified in the Airplane Flight Manual for the elevation of the airport of destination and for the ambient temperature anticipated there at the time of landing. (See secs. 4T.123(a)(2) and 4T.743(a).)

(c) No airplane shall be taken off at a weight which exceeds the weight shown in the Airplane Flight Manual to correspond with the minimum distance required for take-off on the runway to be used. The take-off distance shall correspond with the elevation of the airport, the effective runway gradient, and the ambient temperature and wind component existing at the time of take-off. (See secs. 4T.123(a)(3) and 4T.743 (a).)

(d) No airplane shall be operated outside the operational limits specified in the Airplane Flight Manual. (See secs. 4T.123(a)(4) and 4T.743(a).)

40T.82 *Take-off obstacle clearance limitations.* No airplane shall be taken off at a weight in excess of that shown in the Airplane Flight Manual to correspond with a take-off path which clears all obstacles either by at least a height equal to (35+0.01D) feet vertically, where D is the distance out along the intended flight path from the end of the runway in feet, or by at least 200 feet horizontally within the airport boundaries and by at

least 300 feet horizontally after passing beyond the boundaries. In determining the allowable deviation of the flight path in order to avoid obstacles by at least the distances prescribed, it shall be assumed that the airplane is not banked before reaching a height of 50 feet as shown by the take-off path data in the Airplane Flight Manual, and that a maximum bank thereafter does not exceed 15 degrees. The take-off path considered shall be for the elevation of the airport, the effective runway gradient, and for the ambient temperature and wind component existing at the time of take-off. (See secs. 4T.123(b) and 4T.743(b).)

40T. 83 *En route limitations.*

(a) *One engine inoperative.* No airplane shall be taken off at a weight in excess of that which, according to the one-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit compliance with either subparagraph (1) or subparagraph (2) of this paragraph at all points along the route. The net flight path used shall be for the ambient temperatures anticipated along the route. (See secs. 4T.123(b) and 4T.743(b).)

(1) The slope of the net flight path shall be positive at an altitude of at least 1,000 feet above all terrain and obstructions along the route within 5 miles on either side of the intended track.

(2) The net flight path shall be such as to permit the airplane to continue flight from the cruising altitude to an alternate airport where a landing can be made in accordance with the provisions of section 40T.84 (b), the net flight path clearing vertically by at least 2,000 feet all terrain and obstructions along the route within 5 miles on either side of the intended track. The provisions of subdivisions (i) through (vii) of this paragraph shall apply.

(i) The engine shall be assumed to fail at the most critical point along the route.

(ii) The airplanes 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, except that the Administrator may authorize a procedure established on a different basis where adequate operational safeguards are found to exist.

(iii) The net flight path shall have a positive slope at 1,000 feet above the airport used as the alternate.

(iv) An approved method shall be used to account for winds which would otherwise adversely affect the flight path.

(v) Fuel jettisoning shall be permitted if the Administrator finds that the operator 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 prescribed weather minima.

(vii) The consumption of fuel and oil after the engine becomes inoperative shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

(b) *Two engines inoperative.* No airplane shall be flown along an intended route except in compliance with either subparagraph (1) or subparagraph (2) of this paragraph.

(1) No place along the intended track shall be more than 90

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minutes away from an airport at which a landing can be made in accordance with the provisions of section 40T.84(b), assuming all engines to be operating at cruising power.

(2) No airplane shall be taken off at a weight in excess of that which, according to the two-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit the airplane to continue flight from the point where two engines are assumed to fail simultaneously to an airport where a landing can be made in accordance with the provisions of section 40T.84(b), the net flight path having a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions along the route within 5 miles on either side of the intended track or at an altitude of 5,000 feet, whichever is higher. The net flight path considered shall be for the ambient temperatures anticipated along the route. The provisions of subdivision (i) through (iii) of this subparagraph shall apply. (See secs. 4T.123(b) and 4T.743(b).)

(i) The two engines shall be assumed to fail at the most critical point along the route.

(ii) 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 the airport and to arrive there at an altitude of at least 1,000 feet directly over the landing area.

(iii) The consumption of fuel and oil after the engines become inoperative shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

40T.84 *Landing limitations.*

(a) *Airport of destination.* No airplane shall be taken off at a weight in excess of that which, in accordance with the landing distances shown in the Airplane Flight Manual for the elevation of the airport of intended destination and for the wind conditions anticipated there at the time of landing, would permit the airplane to be brought to rest at the airport of intended destination within 60 percent of the effective length of the runway from a point 50 feet directly above the intersection of the obstruction clearance plane and the runway. The weight of the airplane shall be assumed to be reduced by the weight of the fuel and oil expected to be consumed in flight to the airport of intended destination. Compliance shall be shown with the conditions of subparagraphs (1) and (2) of this paragraph. (See secs. 4T.123(b) and 4T.743(b).)

(1) It shall be assumed that the airplane is landed on the most favorable runway and direction in still air.

(2) It shall be assumed that the airplane is landed on the most suitable runway considering the probable wind velocity and direction and taking due account of the ground handling characteristics of the airplane and of other conditions (i.e., landing aids, terrain, etc.). If full compliance with the provisions of this subparagraph is not shown, the airplane may be taken off if an alternate airport is designated which permits compliance with paragraph (b) of this section.

(b) *Alternate airport.* 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 provisions of paragraph (a) of this section, provided that the airplane can be brought to rest within 70 percent of the effective length of the runway.

SPECIAL CIVIL AIR REGULATION NO. SR-422A

Adopted: July 2, 1958
Effective: July 2, 1958

Turbine-Powered Transport Category Airplanes of Current Design

On July 23, 1957, the Board adopted Special Civil Air Regulation No. SR-422 which sets forth airworthiness requirements applicable to the type certification and operation of turbine-powered transport category airplanes for which a type certificate is issued after August 27, 1957. Included in that regulation was a new set of performance requirements, with respect to which the Board indicated that consideration would be given to any changes found necessary as a result of further study and experience. The preamble to SR-422 contains the relevant considerations leading to its promulgation and is considered to provide the basic background for this regulation.

Since the adoption of SR-422, considerable study has been devoted to the new performance requirements by all interested parties. As a result of these studies and of further experience gained in the design, certification, and operation of turbine-powered airplanes, certain issues with respect to SR-422 require re-evaluation. This regulation reflects the resolution of most of the outstanding issues in the light of the best information presently available to the Board.

The following provisions of this regulation differ from, or are additional to, the provisions of SR-422; Introductory paragraph; item 1; sections 4T.111(c); 4T.112; 4T.114 (b), (b)(1), (b)(4), and (c); introductory paragraph of 4T.116; 4T.116 (b), (c), (e), and (g); 4T.117; 4T.117a; 4T.119; 4T.120 (a), (a)(1), (b), (b)(1), (c), (c)(2), (c)(3), (d), and (d)(3); 4T.121 (a) and (b); introductory paragraph of 4T.122; 4T.122 (b), (f), and (g); 4T.123 (a)(1), (a)(2), (a)(3), and (b); 4T.743(c); 40T.81 (b) and (c); 40T.82; 40T.83 (a)(2)(iii), (b)(2), and (b)(2)(ii); item 4; and item 5. Of these provisions, the following differ from those proposed in Civil Air Regulations Draft Release No. 58-6: sections 4T.111(c); 4T.112(a)(4); 4T.114 (b)(4), (c), (c)(2), (c)(3), and (c)(4); 4T.116 (c) and (e); 4T.117 (b)(1) and (b)(2); 4T.119(a); 4T.120(a); 40T.81(c) and 43T.11(c).

With respect to the applicability of this regulation, experience with certification under SR-422 indicates that a lead time of about two months between the date of adoption of the regulation and the date of issuance of the type certificate should provide a reasonable period of time within which to show compliance with this regulation. In view of this, and in the interest of having uniform regulations applicable to most of the turbine-powered airplanes, it is considered advisable to have this regulation apply to all such airplanes for which a type certificate is issued after September 30, 1958. Turbine-powered transport category airplanes for which a type certificate is issued on or prior to September 30, 1958, may comply with the provisions of this regulation in lieu of SR-422. If

this option is exercised, it is intended that compliance be shown with all the provisions of this regulation and it is not intended to permit a showing of compliance with portions of this regulation and portions of SR–422.

The provisions of this regulation involve the following technical issues:

A substantive change is made by introducing an all-engines-operating take-off in establishing the take-off distance. Presently, the take-off distance is based only on a one-engine-out take-off. To insure that an adequate margin of safety will exist for day-in and day-out operations, the minimum take-off distance is being related to both the one-engine-inoperative distance now prescribed and to the distance with all engines operating, with a factor of 1.15 being applied to the latter.

There are also included important changes with respect to the speeds applicable to the take-off path. The provisions of SR–422 prescribe that the airplane shall be accelerated on or near the ground to the speed V_2. This provision has been subject to varying interpretations having a marked difference in effect on the resultant level of performance. The issue in this matter is whether or not the airplane should be permitted to lift off the runway at some speed below V_2. Because of the increased acceleration of turbine-powered airplanes, the tendency to overshoot the lift-off speed will be greater than on piston-engine airplanes and this tendency increases with the reduction in weight of the airplane. To restrict lift-off to the minimum take-off safety speed V_2 would unduly extend the take-off distance in cases where such overshooting of speed occurs. Such a restriction would be unnecessarily conservative and would not reflect realistic take-off procedures. For these reasons this regulation permits the airplane to lift off the ground at a speed lower than the V_2 speed, but prescribes certain limiting conditions. The lift-off speed is related to a rotational speed V_R which must not be less than 95 percent of the minimum V_2 speed and must be 10 percent greater than a speed at which no hazardous characteristics are displayed by the airplane, such as a relatively high drag condition or a ground stall. The V_2 speed has been re-defined to take into account the increment in speed arising from overshoot tendencies. Under the new definition, the minimum V_2 speed corresponds with the minimum take-off safety speed as now defined in SR–422. With respect to the take-off path, the V_2 speed is required to be attained prior to reaching a height of 35 feet above the take-off surface and thus is related to the selection of the rotational speed. Further, there is a revision which requires V_2 to be maintained as close as practicable at a constant value from the 35-foot point to a height of 400 feet above the take-off surface. This speed is the speed at which the prescribed minimum take-off gradients must be met.

There is introduced in this regulation the concept of unbalanced take-off field lengths. SR–422 does not preclude unbalancing of field lengths, provided that the unbalancing is within the length of the runway. Other countries have employed unbalancing with respect to so-called "stopways" and "clearways." It appears that United States operators ultimately will find it advantageous to resort to the use of unbalancing, but probably not to the same extent as practiced in other countries. On the premise that only clearways will be utilized, the amendments have been formulated accordingly. Clearways, as defined herein, are areas not suitable

for stopping the airplane in the event of an aborted take-off, but adequate to provide additional take-off distance for climb-out. To safeguard operations utilizing clearways, there is introduced the concept of a take-off run which operationally relates to the determination of the minimum runway length required. The take-off run is defined as the greater of the horizontal distances along the take-off path to a given point with one engine inoperative or with all engines operating, with a margin of 15 percent being added to the latter. The take-off run is measured from the beginning of take-off to a point equidistant between the point where the airplane lifts off and the point where a height of 35 feet is reached. The required runway length must not be less than the take-off run nor less than the accelerate stop distance.

According to the definition given, a clearway is subjected to the control of the airport authorities. It is not intended, however, that there be ownership by the airport authorities of the area in which the clearway lies. The objective for requiring control by the airport authorities is to insure that no flight will be initiated using a clearway unless it is determined with certainty that no movable obstacle will exist within the clearway when the airplane flies over.

It is anticipated that the introduction of clearways will offer further possibilities of increasing the utility of existing airport facilities in this country. When such areas can be integrated into existing facilities, economical benefits will accrue to the community and the operators. In addition, since clearways are presently available at some of the airports in other countries, United States operators will have the opportunity of taking advantage of such facilities.

There are included changes with respect to the prescribed minimum altitude of 1,000 feet relative to the take-off path and to the one-engine-inoperative and two-engine-inoperative requirements applicable to the vicinity of the airport. Heretofore, the Civil Air Regulations have incorporated the reference altitude of 1,000 feet in respect of performance criteria over the airport. Obscure as is the significance of this altitude operationally, the altitude of 1,500 feet has worldwide precedent of being used as the altitude above the airport at which, generally, IFR approaches are initiated and go-around procedures executed. For this reason, the changes made extend the take-off path to a minimum altitude of 1,500 feet and make this altitude applicable to the prescribed performance criteria above the airport for the one- and two-engine-inoperative en route requirements. It is not anticipated that these changes will create any problems with respect to the en route stages of flight; however, it is realized that a further extension of the take-off path might add to the problem of obtaining accurate data on obstacles relatively distant from the airport. The Board finds that the extension of the flight path to 1,500 feet is warranted in light of the operational significance of this altitude and because the extended flight paths will provide more fully for adequate terrain clearance at the end of the take-off path.

There is included a change with respect to the take-off path whereby the take-off flight path is established as starting from a 35-foot height at the end of the take-off distance and a net take-off flight is prescribed for operational use. This latter change is for consistency with the specification of net flight paths for the en route stages of flight and to simplify

determination of obstacle clearances operationally. The net flight path is specified to be the actual flight path diminished by a gradient of 1.0 percent. It is intended that the net flight path be obtained from the gross flight path by simple geometric means.

The change in the altitude from 1,000 to 1,500 feet previously mentioned, as well as a re-evaluation in other respects of some of the climb gradients in SR-422, justify certain changes. The gradients of 1.4 and 1.8 applicable to the take-off path and the final take-off climb are being reduced to 1.2 and 1.7 for two-engine and four-engine airplanes, respectively. In addition, the gradients of 1.4 and 1.8 in the one-engine-inoperative en route case are being reduced to 1.1 and 1.6, respectively.

Changes are made with respect to the one-engine-inoperative take-off climb by interrelating more realistically the prescribed airplane configuration, weight, and power. These changes, in effect, permit meeting the prescribed gradients of climb at slightly higher airplane weights than would be possible under the presently effective provisions.

There is included a change to the provisions applicable to the one-engine-inoperative take-off climb with landing gear extended which increases the prescribed minimum gradient from substantially zero to 0.5 percent for four-engine airplanes. This change is made to attain consistency in the difference between gradients applicable to twins and fours.

Changes are incorporated in connection with the two-engine-inoperative en route requirement. Representations have been made that the gradient of 0.6 percent now prescribed is unduly conservative. On the other hand, it has been pointed out that the fuel requirements for this case are not realistically covered. Both of these contentions warrant consideration and changes are included which reduce the margin gradient from 0.6 to 0.5 percent, reduce the prescribed altitude from 5,000 to 2,000 feet, and require scheduling the flight so that there is sufficient fuel on board to reach the airport and subsequently to fly for 15 minutes at cruise power or thrust.

Changes are also made relative to the approach and landing stages of flight. There is a new provision which requires the establishment of procedures for the execution of missed approaches and balked landings. A question has been raised as to whether the speed limitation of 1.5 V_s applicable to the approach condition is realistically related to the normal day-in and day-out landing procedures. To insure that it will be so related, it is required that the speed used for demonstrating the approach climb be established consistent with the landing procedures, but that it not exceed 1.5 V_s. In addition, the approach gradient of 2.8 percent prescribed for four-engine airplanes is being reduced to 2.7 percent to obtain consistency in the differences between gradients applicable to twins and fours.

A change is made to the "all-engines-operating landing climb" provisions which now require a 4.0 percent gradient of climb in the landing configuration. On the premise that requiring the landing configuration during the climb after a balk is unduly conservative, consideration was given to a proposal to permit showing of compliance with the 4.0 percent gradient of climb in the configuration which would exist 5 seconds after the initiation of the climb. Further study of this proposal indicated that such a rule would tend to introduce complications in design and lead to

less favorable operating procedures which ultimately would not contribute to safety. One of the most important factors in connection with this configuration is the response of the engines to throttle movement. Therefore, there is a provision which requires that the power used in showing compliance with the climb gradient be that power or thrust attained 8 seconds after initiation of movement of the power controls to the take-off position from the minimum flight idle position. In addition, for consistency with the procedures used for determining the landing distance, the speed limitation of 1.4 V_s is reduced to 1.3 V_s. Concern has been indicated to the effect that any reduction in the prescribed gradient of 4.0 percent might not insure in all cases the ability of the airplane to continue a safe climb after a balk. To provide a further safeguard, the take-off weight-altitude-temperature limitations (WAT limitations stemming from the application of the one-engine-inoperative take-off climb requirements) are being made applicable to the maximum landing weight at the airport of landing. In the past, the landing weight limitations were applicable to the airport of destination but not to the weather alternates. This regulation makes both the take-off weight and landing weight limitations equally applicable to the airport of destination and the weather alternates. In view of the aforementioned changes, a reduction of the required climb gradient from 4.0 to 3.2 percent is justified and included in this regulation.

In addition to the substantive changes which have been discussed, there are three significant changes of a clarifying nature. The first deals with the determination of the landing distance as affected by devices or means other than wheel brakes. There is included a provision similar to the one applicable to the accelerate-stop distance for application to the landing distance. This provision permits the use of means other than wheel brakes in the determination of the landing distance. Additionally, there is a change to the provision which requires in some cases the determination of the landing distance with one engine inoperative. It is believed that the new requirement expresses the intent more clearly. One of the more obvious applications of this provision is in respect of turbopropeller airplanes. Such airplanes usually are landed with the propellers in a relatively high drag position. If one of the engines becomes inoperative, its propeller would be expected to be in a relativly low drag position with the consequence of a longer landing distance than with all engines operating. In such a case it is required that the landing distance be determined with one engine inoperative unless use could be made by the crew of other means (e.g., reverse thrust not otherwise considered in determining the landing distance) which would reduce the landing distance at least to that determined for all-engine operation.

The second clarification being included deals with the provision setting forth the procedures which must be included in the Airplane Flight Manual. This provision in SR–422 does not make clear what procedures are involved and whether the procedures are considered to be limitations on the operation of the airplane. The clarification in language specifies that the procedures which are included with the performance limitations shall be considered only as guidance material.

The third clarification concerns the applicability of the performance limitations prescribed in SR–422. These consist of the "certificate limita-

tions" and the "operating limitations." The former relate to maximum take-off and landing weights, minimum take-off distances, accelerate-stop distances, and the operational limits imposed upon the airplane. These limitations, being part of the conditions of the type and airworthiness certificates, must be complied with at all times irrespective of the type of operation being conducted (e.g., air carrier, private, cargo). The "operating limitations," distinct from the "certificate limitations," are only applicable when required by the operating parts of the regulations (Parts 40, 41, and 42 require compliance for passenger operations). Although it appeared that previous Board pronouncements regarding this general principle as well as the explanation contained in the preamble to SR-422 would make the issue quite clear, it has come to the Board's attention that there is still some misunderstanding of this matter. Apparently this misunderstanding stems from the fact that SR-422 prescribes operating rules for air carrier operations which contain both the "certificate limitations" and the "operating limitations" while no prescription is given to non-air-carrier operations; thus giving an impression that not even the "certificate limitations" are applicable to non-air-carriers. The inclusion of "certificate limitations" for air carrier operations with the "operating limitations" was meant only to provide the operators with the convenience of having together the complete prescription of the applicable performance limitations, notwithstanding that such an inclusion, in fact, duplicates the general requirement of compliance with the "certificate limitations" contained in the Airplane Flight Manual. In view of the possible misunderstanding which might exist from the aforementioned inclusion, there are included in this regulation the same "certificate limitations" for application to all operations under the provisions of Part 43 of the Civil Air Regulations.

In addition, other changes of a minor nature are included herein, the most significant of which is the generalization of the stall speed V_s, eliminating reference to V_{s_0} and V_{s_1}.

Of the changes to SR-422 made in this regulation, there are a number which might require further consideration as studies continue and as additional experience is gained with the application of these new rules. Several of these involve new concepts with which U.S. operators have had little or no experience. These entail the requirements relative to unbalanced field lengths with respect to clearways, to the rotational speed, and to the all-engine take-off distance. Strong representation has been made to the Board to the effect that the numerical factors applicable to the aforementioned rules are too high and should be reduced pending further experience. The Board considers that it would not be in the public interest to reduce any of these factors until such time as further experience indicates that they are in fact overly conservative. Realizing, however, that these issues are of considerable importance in prescribing a practicable level of performance, the Board stands ready to reconsider the relevant provisions of this regulation at such time as substantiating information is received.

There are areas other than those previously mentioned where additional refinement of details may be advisable. This is so particularly in the case of the requirements pertaining to the landing stage of flight, to the take-off lateral clearances, and to the two-engine-inoperative en route

gradient margin. It is anticipated that, after further study of the regulation and especially after its application in the design, certification, and operation of forthcoming turbine-powered airplanes, the desirability of changes may become more apparent. It is the intent of the Board to consider without delay such changes as might be found necessary. Only after the provisions of this Special Civil Air Regulation are reasonably verified by practical application will the Board consider incorporating them on a more permanent basis into Parts 4b, 40, 41, 42, and 43 of the Civil Air Regulations.

This Special Civil Air Regulation is not intended to compromise the authority of the Administrator under section 4b.10 to impose such special conditions as he finds necessary in any particular case to avoid unsafe design features and otherwise to insure equivalent safety.

Interested persons have been afforded an opportunity to participate in the making of this regulation (23 F.R. 2139), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective July 2, 1958:

Contrary provisions of the Civil Air Regulations notwithstanding, all turbine-powered transport category airplanes for which a type certificate is issued after August 27, 1957, shall comply with Special Civil Air Regulation No. SR–422 or, alternatively, with the following provisions, except that those airplanes for which a type certificate is issued after September 30, 1958, shall comply with the following provisions:

1. The provisions of Part 4b of the Civil Air Regulations, effective on the date of application for type certificate; and such of the provisions of all subsequent amendments to Part 4b, in effect prior to August 27, 1957, as the Administrator finds necessary to insure that the level of safety of turbine-powered airplanes is equivalent to that generally intended by Part 4b.

2. In lieu of sections 4b.110 through 4b.125, and 4b.743 of Part 4b of the Civil Air Regulations, the following shall be applicable:

PERFORMANCE

4T.110 *General.*

(a) The performance of the airplane shall be determined and scheduled in accordance with, and shall meet the minima prescribed by, the provisions of sections 4T.110 through 4T.123. The performance limitations, information, and other data shall be given in accordance with section 4T.743.

(b) Unless otherwise specifically prescribed, the performance shall correspond with ambient atmospheric conditions and still air. Humidity shall be accounted for as specified in paragraph (c) of this section.

(c) The performance as affected by engine power and/or thrust shall be based on a relative humidity of 80 percent at and below standard temperatures and on 34 percent at and above standard temperatures plus 50° F. Between these two temperatures the relative humidity shall vary linearly.

(d) The performance shall correspond with the propulsive thrust available under the particular ambient atmospheric conditions, the particular flight condition, and the relative humidity specified in paragraph (c) of this section. The available propulsive thrust shall correspond with engine power and/or thrust not exceeding the approved power and/or thrust less the installational losses and less the power and/or equivalent thrust absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

4T.111 *Airplane configuration, speed, power, and/or thrust; general.*

(a) The airplane configuration (setting of wing and cowl flaps, air brakes, landing gear, propeller, etc.), denoted respectively as the take-off, en route, approach, and landing configurations, shall be selected by the applicant except as otherwise prescribed.

(b) It shall be acceptable to make the airplane configurations variable with weight, altitude, and temperature, to an extent found by the Administrator to be compatible with operating procedures required in accordance with paragraph (c) of this section.

(c) In determining the accelerate-stop distances, take-off flight paths, take-off distances, and landing distances, changes in the airplane's configuration and speed, and in the power and/or thrust shall be in accordance with procedures established by the applicant for the operation of the airplane in service, except as otherwise prescribed. In addition, procedures shall be established for the execution of balked landings and missed approaches associated with the conditions prescribed in sections 4T.119 and 4T.120(d), respectively. All procedures shall comply with the provisions of subparagraphs (1) through (3) of this paragraph.

(1) The Administrator shall find that the procedures can be consistently executed in service by crews of average skill.

(2) The procedures shall not involve methods or the use of devices which have not been proven to be safe and reliable.

(3) Allowance shall be made for such time delays in the execution of the procedures as may be reasonably expected to occur during service.

4T.112 *Stalling speeds.*

(a) The speed V_s shall denote the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in knots, with:

(1) Zero thrust at the stalling speed, or engines idling and throttles closed if it is shown that the resultant thrust has no appreciable effect on the stalling speed;

(2) If applicable, propeller pitch controls in the position necessary for compliance with subparagraph (1) of this paragraph; the airplane in all other respects (flaps, landing gear, etc.) in the particular configuration corresponding with that in connection with which V_s is being used;

(3) The weight of the airplane equal to the weight in connection with which V_s is being used to determine compliance with a particular requirement;

(4) The center of gravity in the most unfavorable position within the allowable range.

(b) The stall speed defined in this section shall be the minimum speed obtained in flight tests conducted in accordance with the procedure of subparagraphs (1) and (2) of this paragraph.

(1) With the airplane trimmed for straight flight at a speed of 1.4 V_s and from a speed sufficiently above the stalling speed to insure steady conditions, the elevator control shall be applied at a rate such that the airplane speed reduction does not exceed one knot per second.

(2) During the test prescribed in subparagraph (1) of this paragraph, the flight characteristics provisions of section 4b.160 of Part 4b of the Civil Air Regulations shall be complied with.

4T.113 *Take-off; general.*

(a) The take-off data in sections 4T.114 through 4T.117 shall be determined under the conditions of subparagraphs (1) and (2) of this paragraph.

(1) At all weights, altitudes, and ambient temperatures within the operational limits established by the applicant for the airplane.

(2) In the configuration for take-off (see sec. 4T.111).

(b) Take-off data shall be based on a smooth, dry, hard-surfaced runway and shall be determined in such a manner that reproduction of the performance does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the take-off surface shall be smooth water, while for skiplane it shall be smooth dry snow. In addition, the take-off data shall be corrected in accordance with subparagraphs (1) and (2) of this paragraph for wind and for runway gradients within the operational limits established by the applicant for the airplane.

(1) Not more than 50 percent of nominal wind components along the take-off path opposite to the direction of take-off, and not less than 150 percent of nominal wind components along the take-off path in the direction of take-off.

(2) Effective runway gradients.

4T.114 *Take-off speeds.*

(a) The critical-engine-failure speed V_1, in terms of calibrated air speed, shall be selected by the applicant, but shall not be less than the minimum speed at which controllability by primary aerodynamic controls alone is demonstrated during the take-off run to be adequate to permit proceeding safely with the take-off using average piloting skill, when the critical engine is suddenly made inoperative.

(b) The take-off safety speed V_2, in terms of calibrated air speed, shall be selected by the applicant so as to permit the gradient of climb required in section 4T.120 (a) and (b), but it shall not be less than:

(1) 1.2 V_s for two-engine propeller-driven airplanes and for airplanes without propellers which have no provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed;

(2) 1.15 V_s for propeller-driven airplanes having more than two engines and for airplanes without propellers which have provisions for obtaining a significant reduction in the one-engine-inoperatve power-on stalling speed;

(3) 1.10 times the minimum control speed V_{MC}, established in accordance with section 4b.133 of Part 4b of the Civil Air Regulations;

(4) The rotation speed V_R plus the increment in speed attained in compliance with section 4T.116(e).

(c) The minimum rotation speed V_R, in terms of calibrated air speed, shall be selected by the applicant, except that it shall not be less than:

(1) The speed V_1;

(2) A speed equal to 95 percent of the highest speed obtained in compliance with subparagraph (1) or (2), whichever is applicable, and with subparagraph (3) of paragraph (b) of this section;

(3) A speed which permits the attainment of the Speed V_2 prior to reaching a height of 35 feet above the take-off surface as determined in accordance with section 4T.116(e);

(4) A speed equal to 110 percent of the minimum speed above which the airplane, with all engines operating, can be made to lift off the ground and to continue the take-off without displaying any hazardous characteristics.

4T.115 *Accelerate-stop distance.*

(a) The accelerate-stop distance shall be the sum of the following:

(1) The distance required to accelerate the airplane from a standing start to the speed V_1;

(2) Assuming the critical engine to fail at the speed V_1, the distance required to bring the airplane to a full stop from the point corresponding with the speed V_1.

(b) In addition to, or in lieu of, wheel brakes, the use of other braking means shall be acceptable in determining the accelerate-stop distance, provided that such braking means shall have been proven to be safe and reliable, that the manner of their employment is such that consistent results can be expected in service, and that exceptional skill is not required to control the airplane.

(c) The landing gear shall remain extended throughout the accelerate-stop distance.

4T.116 *Take-off path.* The take-off path shall be considered to extend from the standing start to a point in the take-off where a height of 1,500 feet above the take-off surface is reached or to a point in the take-off where the transition from the take-off to the en route configuration is completed and a speed is reached at which compliance with section 4T.120(c) is shown, whichever point is at a higher altitude. The conditions of paragraphs (a) through (i) of this section shall apply in determining the take-off path.

(a) The take-off path shall be based upon procedures prescribed in accordance with section 4T.111(c).

(b) The airplane shall be accelerated on the ground to the speed V_1 at which point the critical engine shall be made inoperative and shall remain inoperative during the remainder of the take-off. Subsequent to attaining speed V_1, the airplane shall be accelerated to speed V_2 during which time it shall be permissible to initiate raising the nose gear off the ground at a speed not less than the rotation speed V_R.

(c) Landing gear retraction shall not be initiated until the airplane becomes airborne.

(d) The slope of the airborne portion of the take-off path shall be positive at all points.

(e) The airplane shall attain the speed V_2 prior to reaching a height of 35 feet above the take-off surface and shall continue at a speed as close as practical to, but not less than, V_2 until a height of 400 feet above the take-off surface is reached.

(f) Except for gear retraction and propeller feathering, the airplane configuration shall not be changed before reaching a height of 400 feet above the take-off surface.

(g) At all points along the take-off path starting at the point where the airplane first reaches a height of 400 feet above the take-off surface, the available gradient of climb shall not be less than 1.2 percent for two-engine airplanes and 1.7 percent for four-engine airplanes.

(h) The take-off path shall be determined either by a continuous demonstrated take-off, or alternatively, by synthesizing from segments the complete take-off path.

(i) If the take-off path is determined by the segmental method, the provisions of subparagraphs (1) through (4) of this paragraph shall be specifically applicable.

(1) The segments of a segmental take-off path shall be clearly defined and shall be related to the distinct changes in the configuration of the airplane, in power and/or thrust, and in speed.

(2) The weight of the airplane, the configuration, and the power and/or thrust shall be constant throughout each segment and shall correspond with the most critical condition prevailing in the particular segment.

(3) The segmental flight path shall be based on the airplane's performance without ground effect.

(4) Segmental take-off path data shall be checked by continuous demonstrated take-offs to insure that the segmental path is conservative relative to the continuous path.

4T.117 *Take-off distance and take-off run.*

(a) *Take-off distance.* The take-off distance shall be the greater of the distances established in accordance with subparagraphs (1) and (2) of this paragraph.

(1) The horizontal distance along the take-off path from the start of the take-off to the point where the airplane attains a height of 35 feet above the take-off surface, as determined in accordance with section 4T.116.

(2) A distance equal to 115 percent of the horizontal distance along the take-off path, with all engines operating, from the start of the take-off to the point where the airplane attains a height of 35 feet above the take-off surface, as determined by a procedure consistent with that established in accordance with section 4T.116.

(b) *Take-off run.* If the take-off distance is intended to include a clearway (see item 5 of this regulation), the take-off run shall be determined and shall be the greater of the distances established in accordance with subparagraphs (1) and (2) of this paragraph.

(1) The horizontal distance along the take-off path from the start of the take-off to a point equidistant between the point where the airplane first becomes airborne and the point where it attains a height of 35 feet above the take-off surface, as determined in accordance with section 4T.116.

(2) A distance equal to 115 percent of the horizontal distance along the take-off path, with all engines operating, from the start of the take-off to a point equidistant between the point where the airplane first becomes airborne and the point where it attains a height of 35 feet above the take-off surface, as determined by a procedure consistent with that established in accordance with section 4T.116.

4T.117a *Take-off flight path.*

(a) The take-off flight path shall be considered to begin at a height of 35 feet above the take-off surface at the end of the take-off distance as determined in accordance with section 4T.117(a).

(b) The net take-off flight path data shall be determined in such a manner that they represent the airplane's actual take-off flight paths, determined in accordance with paragraph (a) of this section, diminished by a gradient of climb equal to 1.0 percent.

4T.118 *Climb; general.* Compliance shall be shown with the climb requirements of sections 4T.119 and 4T.120 at all weights, altitudes, and ambient temperatures, within the operational limits established by the applicant for the airplane. The airplane's center of gravity shall be in the most unfavorable position corresponding with the applicable configuration.

4T.119 *All-engine-operating landing climb.* In the landing configuration the steady gradient of climb shall not be less than 3.2 percent, with:

(a) All engines operating at the power and/or thrust which is available 8 seconds after initiation of movement of the power and/or thrust controls from the minimum flight idle to the take-off position;

(b) A climb speed not in excess of 1.3 V_s.

4T.120 *One-engine-inoperative climb.*

(a) *Take-off; landing gear extended.* In the take-off configuration existing at the point of the flight path where the airplane first becomes airborne, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall be positive for two-engine airplanes and shall not be less than 0.5 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available take-off power and/or thrust existing in accordance with section 4T.116 at the time retraction of the airplane's landing gear is initiated, unless subsequently a more critical power operating condition exists along the flight path prior to the point where the landing gear is fully retracted;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time retraction of the airplane's landing gear is initiated;

(3) The speed equal to the speed V_2.

(b) *Take-off; landing gear retracted.* In the take-off configuration existing at the point of the flight path where the airplane's landing gear is fully retracted, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall not be less than 2.5 percent for two-engine airplanes and not less than 3.0 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available take-off power and/or thrust existing in accordance with section 4T.116 at the time the landing gear is fully retracted, unless subsequently a more critical power operating condition exists along the flight path prior to the point where a height of 400 feet above the take-off surface is reached;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time the airplane's landing gear is fully retracted;

(3) The speed equal to the speed V_2.

(c) *Final take-off.* In the en route configuration, the steady gradient of climb shall not be less than 1.2 percent for two-engine airplanes and not less than 1.7 percent for four-engine airplanes, at the end of the take-off path as determined by section 4T.116, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the end of the take-off path;

(3) The speed equal to not less than 1.25 V_s.

(d) *Approach.* In the approach configuration such that the corresponding V_s for this configuration does not exceed 110 percent of the V_s corresponding with the related landing configuration, the steady gradient of climb shall not be less than 2.2 percent for two-engine airplanes and not less than 2.7 percent for four-engine airplanes with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available take-off power and/or thrust;

(2) The weight equal to the maximum landing weight;

(3) A climb speed established by the applicant in connection with normal landing procedures, except that it shall not exceed 1.5 V_s (see sec. 4T.111(c)).

4T.121 *En route flight paths.* With the airplane in the en route configuration, the flight paths prescribed in paragraphs (a) and (b) of this section shall be determined at all weights, altitudes, and ambient temperatures within the limits established by the applicant for the airplane.

(a) *One engine inoperative.* The one-engine-inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 1.1 percent for two-engine airplanes and 1.6 percent for four-engine airplanes. It shall be acceptable to include in these data the varia-

tion of the airplane's weight along the flight path to take into account the progressive consumption of fuel and oil by the operating engine(s).

(b) *Two engines inoperative.* For airplanes with four engines, the two-engine-inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 0.5 percent. It shall be acceptable to include in these data the variation of the airplane's weight along the flight path to take into account the progressive consumption of fuel and oil by the operating engines.

(c) *Conditions.* In determining the flight paths prescribed in paragraphs (a) and (b) of this section, the conditions of subparagraphs (1) through (4) of this paragraph shall apply.

(1) The airplane's center of gravity shall be in the most unfavorable position.

(2) The critical engine(s) shall be inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust.

(3) Means for controlling the engine cooling air supply shall be in the position which provides adequate cooling in the hot-day condition.

(4) The speed shall be selected by the applicant.

4T.122 *Landing distance.* The landing distance shall be the horizontal distance required to land and to come to a complete stop (to a speed of approximately 3 knots in the case of seaplanes or float planes) from a point at a height of 50 feet above the landing surface. Landing distances shall be determined for standard temperatures at all weights, altitudes, and winds within the operational limits established by the applicant for the airplane. The conditions of paragraphs (a) through (g) of this section shall apply.

(a) The airplane shall be in the landing configuration. During the landing, changes in the airplane's configuration, in power and/or thrust, and in speed shall be in accordance with procedures established by the applicant for the operation of the airplane in service. The procedures shall comply with the provisions of section 4T.111(c).

(b) The landing shall be preceded by a steady gliding approach down to the 50-foot height with a calibrated air speed of not less than 1.3 V_s.

(c) The landing distance shall be based on a smooth, dry, hard-surfaced runway, and shall be determined in such a manner that reproduction does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the landing surface shall be smooth water, while for skiplanes it shall be smooth dry snow. During landing, the airplane shall not exhibit excessive vertical acceleration, a tendency to bounce, nose over, ground loop, porpoise, or water loop.

(d) The landing distance shall be corrected for not more than 50 percent of nominal wind components along the landing path opposite to the direction of landing and not less than 150 percent of nominal wind components along the landing path in the direction of landing.

(e) During landing, the operating pressures on the wheel brak-

ing system shall not be in excess of those approved by the manufacturer of the brakes, and the wheel brakes shall not be used in such a manner as to produce excessive wear of brakes and tires.

(f) In addition to, or in lieu of, wheel brakes, the use of other braking means shall be acceptable in determining the landing distance, provided such braking means shall have been proven to be safe and reliable, that the manner of their employment is such that consistent results can be expected in service, and that exceptional skill is not required to control the airplane.

(g) If the characteristics of a device (e.g., the propellers) dependent upon the operation of any of the engines noticeably increase the landing distance when the landing is made with the engine inoperative, the landing distance shall be determined with the critical engine inoperative unless the Administrator finds that the use of compensating means will result in a landing distance not greater than that attained with all engines operating.

4T.123 *Limitations and information.*

(a) *Limitations.* The performance limitations on the operation of the airplane shall be established in accordance with subparagraphs (1) through (4) of this paragraph. (See also sec. 4T.743.)

(1) *Take-off weights.* The maximum take-off weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with the take-off climb provisions prescribed in section 4T.120 (a), (b), and (c) for altitudes and ambient temperatures within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(2) *Landing weights.* The maximum landing weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with the landing and take-off climb provisions prescribed in sections 4T.119 and 4T.120 for altitudes and ambient temperatures within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(3) *Accelerate-stop distance, take-off distance, and take-off run.* The minimum distances required for take-off shall be established at which compliance is shown with the generally applicable provisions of this regulation and with sections 4T.115 and 4T.117(a), and with 4T.117(b) if the take-off distance is intended to include a clearway, for weights, altitudes, temperatures, wind components, and runway gradients, within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(4) *Operational limits.* The operational limits of the airplane shall be established by the applicant for all variable factors required in showing compliance with this regulation (weight, altitude, temperature, etc.). (See secs. 4T.113 (a)(1) and (b), 4T.118, 4T.121, and 4T.122.)

(b) *Information.* The performance information on the operation of the airplane shall be scheduled in compliance with the generally applicable provisions of this regulation and with sections 4T.117a(b), 4T.121, and 4T.122 for weights, altitudes, temperatures, wind components, and runway gradients, as these may be applicable, within the operational limits of the airplane (see subparagraph (a)(4) of this section). In addition, the

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performance information specified in subparagraphs (1) through (3) of this paragraph shall be determined by extrapolation and scheduled for the ranges of weights between the maximum landing and maximum take-off weights established in accordance with subparagraphs (a)(1) and (a)(2) of this section. (See also sec. 4T.743.)

(1) Climb in the landing configuration (see sec. 4T.119);

(2) Climb in the approach configuration (see sec. 4T.120(d));

(3) Landing distance (see sec. 4T.122).

AIRPLANE FLIGHT MANUAL

4T.743 *Performance limitations, information, and other data.*

(a) *Limitations.* The airplane's performance limitations shall be given in accordance with section 4T.123(a).

(b) *Information.* The performance information prescribed in section 4T.123(b) for the application of the operating rules of this regulation shall be given together with descriptions of the conditions, air speeds, etc., under which the data were determined.

(c) *Procedures.* Procedures established in accordance with section 4T.111(c) shall be given to the extent such procedures are related to the limitations and information set forth in accordance with paragraphs (a) and (b) of this section. Such procedures, in the form of guidance material, shall be included with the relevant limitations or information, as applicable.

(d) *Miscellaneous.* An explanation shall be given of significant or unusual flight or ground handling characteristics of the airplane.

3. In lieu of sections 40.70 through 40.78, 41.27 through 41.36(d), and 42.70 through 42.83, of Parts 40, 41, and 42 of the Civil Air Regulations, respectively, the following shall be applicable:

OPERATING RULES

40T.80 *Transport category airplane operating limitations.*

(a) In operating any passenger-carrying transport category airplane certificated in accordance with the performance requirements of this regulation, the provisions of sections 40T.80 through 40T.84 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.

(b) The performance data in the Airplane Flight Manual shall be applied in determining compliance with the provisions of sections 40T.81 through 40T.84. Where conditions differ from those for which specific tests were made, compliance shall be determined by approved interpolation or computation of the effects of changes in the specific variables if such interpolations or computations give results substantially equalling in accuracy the results of a direct test.

40T.81 *Airplane's certificate limitations.*

(a) No airplane shall be taken off at a weight which exceeds the take-off weight specified in the Airplane Flight Manual for the elevation of the airport and for the ambient temperature existing at the time of the take-off. (See secs. 4T.123(a)(1) and 4T.743(a).)

(b) No airplane shall be taken off at a weight such that, allowing for normal consumption of fuel and oil in flight to the airport of destination and to the alternate airports, the weight on arrival will exceed the landing weight specified in the Airplane Flight Manual for the elevation of each of the airports involved and for the ambient temperatures anticipated at the time of landing. (See secs. 4T.123(a)(2) and 4T.743(a).

(c) No airplane shall be taken off at a weight which exceeds the weight shown in the Airplane Flight Manual to correspond with the minimum distances required for take-off. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of take-off. (See secs. 4T.123(a)(3) and 4T.743(a).) If the take-off distance includes a clearway as defined in Item 5 of this regulation, the take-off distance shall not include a clearway distance greater than one-half of the take-off run.

(d) No airplane shall be operated outside the operational limits specified in the Airplane Flight Manual. (See secs. 4T.123(a)(4) and 42.743(a).)

40T.82 *Take-off obstacle clearance limitations.* No airplane shall be taken off at a weight in excess of that shown in the Airplane Flight Manual to correspond with a net take-off flight path which clears all obstacles either by at least a height of 35 feet vertically or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing beyond the boundaries. In determining the allowable deviation of the flight path in order to avoid obstacles by at least the distances prescribed, it shall be assumed that the airplane is not banked before reaching a height of 50 feet as shown by the take-off path data in the Airplane Flight Manual, and that a maximum bank thereafter does not exceed 15 degrees. The take-off path considered shall be for the elevation of the airport, the effective runway gradient, and for the ambient temperature and wind component existing at the time of take-off. (See secs. 4T.123(b) and 4T.743(b).)

40T.83 *En route limitations.*

(a) *One engine inoperative.* No airplane shall be taken off at a weight in excess of that which, according to the one-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit compliance with either subparagraph (1) or subparagraph (2) of this paragraph at all points along the route. The net flight path used shall be for the ambient temperatures anticipated along the route. (See secs. 4T.123(b) and 4T.743(b).)

(1) The slope of the net flight path shall be positive at an altitude of at least 1,000 feet above all terrain and obstructions along the route within 5 miles on either side of the intended track.

(2) The net flight path shall be such as to permit the airplane to continue flight from the cruising altitude to an alternate airport where a landing can be made in accordance with the provisions of section 40T.84(b), the net flight path clearing vertically by at least 2,000 feet all terrain and obstructions along the route within 5 miles on either side of the intended track. The provisions of subdivisions (i) through (vii) of this subparagraph shall apply.

(i) The engine shall be assumed to fail at the most critical point along the route.

(ii) 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, except that the Administrator may authorize a procedure established on a different basis where adequate operational safeguards are found to exist.

(iii) The net flight path shall have a positive slope at 1,500 feet above the airport used as the alternate.

(iv) An approved method shall be used to account for winds which would otherwise adversely affect the flight path.

(v) Fuel jettisoning shall be permitted if the Administrator finds that the operator 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 prescribed weather minima.

(vii) The consumption of fuel and oil after the engine becomes inoperative shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

(b) *Two engines inoperative.* No airplane shall be flown along an intended route except in compliance with 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 airport at which a landing can be made in accordance with the provisions of section 40T.84(b), assuming all engines to be operating at cruising power.

(2) No airplane shall be taken off at a weight in excess of that which, according to the two-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit the airplane to continue flight from the point where two engines are assumed to fail simultaneously to an airport where a landing can be made in accordance with the provisions of section 40T.84(b), the net flight path having a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions along the route within 5 miles on either side of the intended track or at an altitude of 2,000 feet, whichever is higher. The net flight path considered shall be for the ambient temperatures anticipated along the route. The provisions of subdivisions (i) through (iii) of this subparagraph shall apply. (See secs. 4T.123(b) and 4T.743(b).)

(i) The two engines shall be assumed to fail at the most critical point along the route.

(ii) 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 the airport and to arrive there at an altitude of at least 1,500 feet directly over the landing area and thereafter to fly for 15 minutes at cruise power and/or thrust.

(iii) The consumption of fuel and oil after the engines become inoperative shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

40T.84 *Landing limitations.*

(a) *Airport of destination.* No airplane shall be taken off at a weight in excess of that which, in accordance with the landing distances shown in the Airplane Flight Manual for the elevation of the airport of intended destination and for the wind conditions anticipated there at the time of landing, would permit the airplane to be brought to rest at the airport of intended destination within 60 percent of the effective length of the runway from a point 50 feet directly above the intersection of the obstruction clearance plane and the runway. The weight of the airplane shall be assumed to be reduced by the weight of the fuel and oil expected to be consumed in flight to the airport of intended destination. Compliance shall be shown with the conditions of subparagraphs (1) and (2) of this paragraph. (See secs. 4T.123(b) and 4T.743(b).)

(1) It shall be assumed that the airplane is landed on the most favorable runway and direction in still air.

(2) It shall be assumed that the airplane is landed on the most suitable runway considering the probable wind velocity and direction and taking due account of the ground handling characteristics of the airplane and of other conditions (i.e., landing aids, terrain, etc.). If full compliance with the provisions of this subparagraph is not shown, the airplane may be taken off if an alternate airport is designated which permits compliance with paragraph (b) of this section.

(b) *Alternate airport.* 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 provisions of paragraph (a) of this section, provided that the airplane can be brought to rest within 70 percent of the effective length of the runway.

4. In lieu of section 43.11 of Part 43 of the Civil Air Regulations, the following shall be applicable:

43T.11 *Transport category airplane weight limitations.* The performance data in the Airplane Flight Manual shall be applied in determining compliance with the following provisions:

(a) No airplane shall be taken off at a weight which exceeds the take-off weight specified in the Airplane Flight Manual for the elevation of the airport and for the ambient temperature existing at the time of the take-off. (See secs. 4T.123(a)(1) and 4T.743(a).)

(b) No airplane shall be taken off at a weight such that, allowing for normal consumption of fuel and oil in flight to the airport of destination and to the alternate airports, the weight on arrival will exceed the landing weight specified in the Airplane Flight Manual for the elevation of each of the airports involved and for the ambient temperatures anticipated at the time of landing. (See secs. 4T.123(a)(2) and 4T.743(a).)

(c) No airplane shall be taken off at a weight which exceeds the weight shown in the Airplane Flight Manual to correspond with the minimum distances required for take-off. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of take-off. (See secs. 4T.123(a)(3) and 4T.743(a).) If the take-off distance includes a clearway as defined in Item 5 of this regulation, the take-off distance shall not include a clearway distance greater than one-half of the take-off run.

(d) No airplane shall be operated outside the operational limits specified in the Airplane Flight Manual. (See secs. 4T.123(a)(4) and 4T.743(a).)

5. The following definitions shall apply:

Clearway. **A clearway is an area beyond the airport runway not less than 300 feet on either side of the extended center line of the runway, at an elevation no higher than the elevation at the end of the runway, clear of all fixed obstacles, and under the control of the airport authorities.**

SPECIAL CIVIL AIR REGULATION NO. SR–422B

Effective: July 9, 1959
Issued: July 9, 1959

Turbine-Powered Transport Category Airplane of Current Design

Special Civil Air Regulation No. SR–422, effective August 27, 1957, prescribes requirements applicable to the type certification and operation of turbine-powered transport category airplanes for which a type certificate is issued after August 27, 1957. Special Civil Air Regulation No. SR–422A, effective July 2, 1958, included substantive changes to SR–422 and was made applicable to all turbine-powered transport category airplanes for which a type certificate is issued after September 30, 1958.

This Special Civil Air Regulation makes further changes to the airworthiness rules for turbine-powered transport category airplanes to be applicable to all such airplanes for which a type certificate is issued after August 29, 1959. These changes were proposed in Draft Release No. 58–1C (24 F.R. 128) by the Civil Aeronautics Board in connection with the 1958 Annual Airworthiness Review. The amendments herein have been adopted after careful consideration of all the discussion and comment received thereon.

Substantive and minor changes have been made to the provisions of SR–422A. For ease in identification they are listed as follows:

(a) Substantive changes: introductory paragraphs; 4T.114 (b), (c), (d), (e), and (f); 4T.115(d); 4T.117a(b); 4T.120 (a)(3), (b), and (d); 40T.81(c); 43T.11(c); and item 5 (a) and (b).

(b) Minor changes; item 2; 4T.112 (title), (b)(1), (c), (d), and (e); 4T.113(b); 4T.116(i)(4); 4T.117(b) (1) and (2); 4T.120(a); 4T.121; 4T.122(d); 4T.123(a); 40T.82; and 40T.83.

Pertinent background information to this regulation is contained in the preambles to SR–422 and SR–422A. Following is a discussion of important issues relevant to the changed provisions contained herein.

One of the most important changes being introduced concerns the rotation speed V_R of the airplane during takeoff (4T.114). Experience gained in the certification of airplanes under the provisions of SR–422 and SR–422A indicates that relating V_R to the stall speed is not essential and might unduly penalize airplanes with superior flying qualities. It has been found that the primary limitations on V_R should be in terms of a margin between the actual lift-off speeds V_{LOF} and the minimum unstick speed V_{MU} at which the airplane can proceed safely with the takeoff. The provisions contained herein require that V_R speeds be established to be applicable to takeoffs with one engine inoperative as well as with all engines operating. The V_{MU} speeds can be established from free air data provided that the data are verified by ground takeoff tests. Certain safeguards are included in conjunction with the establishment of V_R speeds to ensure that takeoffs in service can be made with consistent safety.

A change is being introduced to the provision in 4T.117a(b) concerning the manner in which the net takeoff flight path is obtained. In accordance with this provision as contained in SR–422A, the net takeoff flight path would have a negative slope throughout the acceleration segment. Since this segment usually represents level flight easily controlled by reference to the normal flight instruments, a significant reduction in the flight path's gradient would not be expected. For these reasons, the provision is being changed to permit an equivalent reduction in acceleration in lieu of a reduction in gradient.

Section 4T.117a(b) is being amended additionally by changing the value of gradient margin in the net flight path for two-engine airplanes from 1.0 percent to 0.8 percent. The value for four-engine airplanes remains 1.0 percent. Differentiation in gradient values in the net flight path between two and four-engine airplanes is consistent with the differentiation in the climb gradients for the takeoff, enroute, and approach stages of flight. Statistical analysis substantiates the specific reduction of the net flight path gradient to a value of 0.8 percent. Correlatively, a reevaluation of the climb gradients for twin-engine airplanes in the second segment takeoff and in the approach climb indicates that the respective values should be 2.4 percent and 2.1 percent and these changes are being made in 4T.120 (b) and (d).

A change is introduced in the conditions prescribed for meeting the climb gradient in the first segment takeoff climb (4T.120(a)), by changing the speed V_2 to the speed V_{LOF}. The intent of this requirement is to use the speed at which the airplane lifts off the ground. In SR–422 this speed was considered to be V_2; however, in SR–422A and in this regulation the speed V_2 is a higher speed which is reached at the end of the takeoff distance and no longer reflects the conditions pertinent to the first segment climb. In making this change consistent with relevant changes in SR–422A and in this regulation, no consideration has been given to the appropriateness of the minimum climb gradient values prescribed for the first segment climb. These are subject to alteration if results of further studies so indicate.

There is being introduced in this regulation the concept of "stopways," the definition of which is contained in item 5(b). Stopways have been used outside the United States in meeting the accelerate-stop distances in case of aborted takeoffs. They are considered to result in more practical operations. In order to ensure that they can be used without detrimental effects on safety, a provision is being included in 4T.115(d) requiring taking into account the surface characteristics of the stopways to be used in scheduling the accelerate-stop distances in the Airplane Flight Manual.

In conjunction with the introduction of stopways, there are changes being made in the definition of a "clearway" (item 5(a)). One of the changes is to specify that a clearway begins at the end of the runway whether or not a stopway is being used. Of the other changes, the most significant one expresses the clearway in terms of a clearway plane and permits this plane to have an upward slope of 1.25 percent. In effect, this change will allow, in some cases, use of clearways which would not be allowed under the definition in SR–422A because of relatively small obstacles or slightly sloping terrain. (See also 40T.81(c) and 43T.11(c).)

There are also included in this regulation a number of minor, editorial, or clarifying changes.

Draft Release No. 58–1C included a proposal for expanding lateral obstacle clearances in the takeoff flight path. Studies indicate that some expanding lateral clearances are necessary for safety in operations with all turbine-powered airplanes. It appears, therefore, that an appropriate rule should be made applicable not only to airplanes certificated in accordance with this regulation, but also to those certificated in accordance with SR–422 and SR–422A. Accordingly, no change is being made in this regulation to the lateral obstacle clearance provisions, instead, a Notice of Proposed Rule Making is now being prepared to amend SR–422, SR–422A, and this regulation, to require expanding lateral obstacle clearances for all airplanes certificated thereunder.

This Special Civil Air Regulation is not intended to compromise the authority of the Administrator under section 4b.10 to impose such special conditions as are found necessary in any particular case to avoid unsafe design features and otherwise to ensure equivalent safety.

Interested persons have been afforded an opportunity to participate in the making of this regulation (24 F.R. 128), and due consideration has been given to all relevant matter presented.

This regulation does not require compliance until after August 29, 1959; however, since applicants for a type certificate for turbine-powered transport category airplanes may elect to show compliance with this regulation before that date, it is being made effective immediately.

In consideration of the foregoing, the following Special Civil Air Regulation is hereby promulgated to become effective immediately:

Contrary provisions of the Civil Air Regulations notwithstanding, all turbine-powered transport category airplanes for which a type certificate is issued after August 29, 1959, shall comply with the following requirements. Applicants for a type certificate for a turbine-powered transport category airplane may elect and are authorized to meet the requirements of this Special Civil Air Regulation prior to August 29, 1959, in which case however, all of the following provisions must be complied with.

1. The provisions of Part 4b of the Civil Air Regulations, effective on the date of application for type certificate; and such of the provisions of all subsequent amendments to Part 4b, in effect prior to August 27, 1957, as the Administator finds necessary to ensure that the level of safety of turbine-powered airplanes is equivalent to that generally intended by Part 4b.

2. In lieu of sections 4b. 110 through 4b.125, 4b.183, and 4b.743 of Part 4b of the Civil Air Regulations, the following shall be applicable:

PERFORMANCE

4T.110 *General.*

(a) The performance of the airplane shall be determined and scheduled in accordance with, and shall meet the minima prescribed by, the provision of sections 4T.110 through 4T.123. The performance limitations, information, and other data shall be given in accordance with section 4T.743.

(b) Unless otherwise specifically prescribed, the performance shall correspond with ambient atmospheric conditions and still air.

Humidity shall be accounted for as specified in paragraph (c) of this section.

(c) The performance as affected by engine power and/or thrust shall be based on a relative humidity of 80 percent at and below standard temperatures and on 34 percent at and above standard temperatures plus 50° F. Between these two temperatures the relative humidity shall vary linearly.

(d) The performance shall correspond with the propulsive thrust available under the particular ambient atmospheric conditions, the particular flight condition, and the relative humidity specified in paragraph (c) of this section. The available propulsive thrust shall correspond with engine power and/or thrust not exceeding the approved power and/or thrust less the installational losses and less the power and/or equivalent thrust absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

4T.111 *Airplane configuration, speed, power, and/or thrust; general.*

(a) The airplane configuration (setting of wing and cowl flaps, air brakes, landing gear, propeller, etc.), denoted respectively as the takeoff, en route, approach, and landing configurations, shall be selected by the applicant except as otherwise prescribed.

(b) It shall be acceptable to make the airplane configurations variable with weight, altitude, and temperature, to an extent found by the Administrator to be compatible with operating procedures required in accordance with paragraph (c) of this section.

(c) In determining the accelerate-stop distances, takeoff flight paths, takeoff distances, and landing distances, changes in the airplane's configuration and speed, and in the power and thrust shall be in accordance with procedures established by the applicant for the operation of the airplane in service, except as otherwise prescribed. In addition, procedures shall be established for the execution of balked landings and missed approaches associated with the conditions prescribed in sections 4T.119 and 4T.120(d), respectively. All procedures shall comply with the provisions of subparagraphs (1) through (3) of this paragraph.

(1) The Administrator shall find that the procedures can be consistently executed in service by crews of average skill.

(2) The procedures shall not involve methods or the use of devices which have not been proven to be safe and reliable.

(3) Allowance shall be made for such time delays in the execution of the procedures as may be reasonably expected to occur during service.

4T.112 *Stalling and minimum control speeds.*

(a) The speed V_s shall denote the calibrated stilling speed, or the minimum steady flight speed at which the airplane is controllable, in knots, with:

(1) Zero thrust at the stalling speed, or engines idling and throttles closed if it is shown that the resultant thrust has no appreciable effect on the stalling speed;

(2) If applicable, propeller pitch controls in the position

necessary for compliance with subparagraph (1) of this paragraph; the airplane in all other respects (flaps, landing gear, etc.) in the particular configuration corresponding with that in connection with which V_s is being used;

(3) The weight of the airplane equal to the weight in connection with which V_s is being used to determine compliance with a particular requirement;

(4) The center of gravity in the most unfavorable position within the the allowable range.

(b) The stall speed defined in this section shall be the minimum speed obtained in flight tests conducted in accordance with the procedure of subparagraphs (1) and (2) of this paragraph.

(1) With the airplane trimmed for straight flight at a speed chosen by the applicant, but not less than 1.2 V_s nor greater than 1.4 V_s, and from a speed sufficiently above the stalling speed to ensure steady conditions, the elevator control shall be applied at a rate such that the airplane speed reduction does not exceed 1 knot per second.

(2) During the test prescribed in subparagraph (1) of this paragraph, the flight characteristics provisions of section 4b.160 of Part 4b of the Civil Air Regulations shall be complied with.

(c) The minimum control speed V_{MC}, in terms of calibrated air speeed, shall be determined under the conditions specified in this paragraph so that, when the critical engine is suddenly made inoperative at that speed, it is possible to recover control of the airplane with the engine still inoperative and to maintain it in straight flight at that speed, either with zero yaw or, at the option of the applicant, with an angle of bank not in excess of 5 degrees. V_{MC} shall not exceed 1.2 V_s with:

(1) Engines operating at the maximum available takeoff thrust and/or power;

(2) Maximum sea level takeoff weight or such lesser weight as might be necessary to demonstrate V_{MC}.

(3) The airplane in the most critical takeoff configuration existing along the flight path after the airplane becomes airborne, except that the landing gear is retracted;

(4) The airplane trimmed for takeoff;

(5) The airplane airborne and the ground effect negligible;

(6) The center of gravity in the most unfavorable position;

(d) In demonstrating the minimum speed specified in paragraph (c) of this section, the rudder force required to maintain control shall not exceed 180 pounds and it shall not be necessary to reduce the power and/or thrust of the operative engine(s).

(e) During recovery from the maneuver specified in paragraph (c) of this section, the airplane shall not assume any dangerous attitude, nor shall it require exceptional skill, strength, or alertness on the part of the pilot to prevent a change of heading in excess of 20 degrees before recovery is complete.

4T.113 *Takeoff; general.*

(a) The takeoff data in sections 4T.114 through 4T.117 shall be determined under the conditions of subparagraphs (1) and (2) of this paragraph.

(1) At all weights, altitudes, and ambient temperatures, within the operational limits established by the applicant for the airplane.

(2) In the configuration for takeoff (see sec. 4T.111).

(b) Takeoff data shall be based on a smooth, dry, hard-surfaced runway and shall be determined in such a manner that reproduction of the performance does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the takeoff surface shall be smooth water, while for skiplane it shall be smooth, dry snow. In addition, the takeoff data shall include operational correction factors in accordance with subparagraphs (1) and (2) of this paragraph for wind and for runway gradients, within the operational limits established by the applicant for the airplane.

(1) Not more than 50 percent of nominal wind components along the takeoff path opposite to the direction of takeoff, and not less than 150 percent of nominal wind components along the takeoff path in the direction of takeoff.

(2) Effective runway gradients.

4T.114 *Takeoff speeds.*

(a) The critical-engine-failure speed V_1 in terms of calibrated air speed, shall be selected by the applicant, but shall not be less than the minimum speed at which controllability by primary aerodynamic controls alone is demonstrated during the takeoff run to be adequate to permit proceeding safely with the takeoff using average piloting skill, when the critical engine is suddenly made inoperative.

(b) The minimum takeoff safety speed $V_{2\,min}$, in terms of calibrated air speed, shall not be less than:

(1) 1.2 V_s for two-engine propeller-driven airplanes and for airplanes without propellers which have no provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed;

(2) 1.15 V_s for propeller-driven airplanes having more than two engines and for airplanes without propellers which have provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed;

(3) 1.10 times the minimum control speed V_{MC}.

(c) The takeoff safety speed V_2, in terms of calibrated air speed, shall be selected by the applicant so as to permit the gradient of climb required in section 4T.120(b), but it shall not be less than:

(1) The speed $V_{2\,min}$,

(2) The rotation speed V_R (see paragraph (e) of this section) plus the increment in speed attained prior to reaching a height of 35 feet above the takeoff surface in compliance with section 4T.116(e).

(d) The minimum unstick speed V_{MU}, in terms of calibrated air speed, shall be the speed at and above which the airplane can be made to lift off the ground and to continue the takeoff without displaying any hazardous characteristics. V_{MU} speeds shall be selected by the applicant for the all-engines-operating and the one-engine-inoperative conditions. It shall be acceptable to establish the V_{MU} speeds from free air data: *Provided*, That these data are verified by ground takeoff tests.

NOTE: In certain cases, ground takeoff tests might involve some takeoffs at the V_{MU} speeds.

(e) The rotation speed V_R, in terms of calibrated air speed, shall be selected by the applicant in compliance with the conditions of subparagraphs (1) through (4) of this paragraph.

(1) The V_R speed shall not be less than:

(i) The speed V_1;

(ii) A speed equal to 105 percent of V_{MC};

(iii) A speed which permits the attainment of the speed V_2 prior to reaching a height of 35 feet above the takeoff surface as determined in accordance with section 4T.116(e);

(iv) A speed which, if the airplane is rotated at its maximum practicable rate, will result in a lift-off speed V_{LOF} (see paragraph (f) of this section) not less than 110 percent of V_{MU} in the all-engines-operating condition nor less than 105 percent of V_{MU} in the one-engine-inoperative condition.

(2) For any given set of conditions (weight, configuration, temperature, etc.), a single value of V_R speed obtained in accordance with this paragraph shall be used in showing compliance with both the one-engine-inoperative and the all-engines-operating takeoff provisions.

(3) It shall be shown that the one-engine-inoperative takeoff distance determined with a rotation speed 5 knots less than the V_R speed established in accordance with subparagraphs (1) and (2) of this paragraph does not exceed the corresponding one-engine-inoperative takeoff distance determined with the established V_R speed. The determination of the takeoff distances shall be in accordance with section 4T.117(a)(1).

(4) It shall be demonstrated that reasonably expected variations in service from the takeoff procedures established by the applicant for the operation of the airplane (see sec. 4T.111(c)) (e.g., over-rotation of the airplane, out of trim conditions) will not result in unsafe flight characteristics nor in marked increases in the scheduled takeoff distances established in accordance with section 4T.117(a).

(f) The lift-off speed V_{LOF}, in terms of calibrated air speed, shall be the speed at which the airplane first becomes airborne.

4T.115 *Accelerate-stop distance.*

(a) The accelerate-stop distance shall be the sum of the following:

(1) The distance required to accelerate the airplane from a standing start to the speed V_1;

(2) Assuming the critical engine to fail at the speed V_1, the distance required to bring the airplane to a full stop from the point corresponding with the speed V_1.

(b) In addition to, or in lieu of, wheel brakes, the use of other braking means shall be acceptable in determining the accelerate-stop distance, provided that such braking means shall have been proven to be safe and reliable, that the manner of their employment is such that consistent results can be expected in service and that exceptional skill is not required to control the airplane.

(c) The landing gear shall remain extended throughout the accelerate-stop distance.

(d) If the accelerate-stop distance is intended to include a stopway with surface characteristics substantially different from those of a

smooth hard-surfaced runway, the takeoff data shall include operational correction factors for the accelerate-stop distance to account for the particular surface characteristics of the stopway and the variations in such characteristics with seasonal weather conditions (i.e., temperature, rain, snow, ice, etc.), within the operational limits established by the applicant.

4T.116 *Takeoff path.* The takeoff path shall be considered to extend from the standing start to a point in the takeoff where a height of 1,500 feet above the takeoff surface is reached or to a point in the takeoff where the transition from the takeoff to the en route configuration is completed and a speed is reached at which compliance with section 4T.120(c) is shown, whichever point is at a higher altitude. The conditions of paragraphs (a) through (i) of this section shall apply in determining the takeoff path.

(a) The takeoff path shall be based upon procedures prescribed in accordance with section 4T.111(c).

(b) The airplane shall be accelerated on the ground to the speed V_1 at which point the critical engine shall be made inoperative and shall remain inoperative during the remainder of the takeoff. Subsequent to attaining speed V_1, the airplane shall be accelerated to speed V_2 during which time it shall be permissible to initiate raising the nose gear off the

(c) Landing gear retraction shall not be initiated until the ground at a speed not less than the rotating speed V_R.
airplane becomes airborne.

(d) The slope of the airborne portion of the takeoff path shall be positive at all points.

(e) The airplane shall attain the speed V_2 prior to reaching a height of 35 feet above the takeoff surface and shall continue at a speed as close as practical to, but not less than, V_2 until a height of 400 feet above the takeoff surface is reached.

(f) Except for gear retraction and propeller feathering, the airplane configuration shall not be changed before reaching a height of 400 feet above the takeoff surface.

(g) At all points along the takeoff path starting at the point where the airplane first reaches a height of 400 feet above the takeoff surface, the available gradient of climb shall not be less than 1.2 percent for two-engine airplanes, and 1.7 percent for four-engine airplanes.

(h) The takeoff path shall be determined either by a continuous demonstrated takeoff, or alternatively, by synthesizing from segments the complete takeoff path.

(i) If the takeoff path is determined by the segmental method, the provisions of subparagraphs (1) through (4) of this paragraph shall be specifically applicable.

(1) The segments of a segmental takeoff path shall be clearly defined and shall be related to the distinct changes in the configuration of the airplane, in power and/or thrust, and in speed.

(2) The weight of the airplane, the configuration, and the power and/or thrust shall be constant throughout each segment and shall correspond with the most critical condition prevailing in the particular segment.

(3) The segmental flight path shall be based on the airplane's performance without ground effect.

(4) Segmental takeoff path data shall be checked by continuous demonstrated takeoffs up to the point where the airplane's performance is out of ground effect and the airplane's speed is stabilized, to ensure that the segmental path is conservative relative to the continuous path.

NOTE: The airplane usually is considered out of ground effect when it reaches a height above the ground equal to the airplane's wing span.

4T.117 *Takeoff distance and takeoff run.*

(a) *Takeoff distance.* The takeoff distance shall be the greater of the distances established in accordance with subparagraphs (1) and (2) of this paragraph.

(1) The horizontal distance along the takeoff path from the start of the takeoff to the point where the airplane attains a height of 35 feet above the takeoff surface, as determined in accordance with section 4T.116.

(2) A distance equal to 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to the point where the airplane attains a height of 35 feet above the takeoff surface, as determined by a procedure consistent with that established in accordance with section 4T.116.

(b) *Takeoff run.* If the takeoff distance is intended to include a clearway (see item 5 of this regulation), the takeoff run shall be determined and shall be the greater of the distances established in accordance with subparagraphs (1) and (2) of this paragraph.

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the point where the speed V_{LOF} is reached and the point where the airplane attains a height of 35 feet above the takeoff surface, as determined in accordance with section 4T.116.

(2) A distance equal to 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to a point equidistant between the point where the speed V_{LOF} is reached and the point where the airplane attains a height of 35 feet above the takeoff surface, as determined by a procedure consistent with that established in accordance with section 4T.116.

4T.117a *Takeoff flight path.*

(a) The takeoff flight path shall be considered to begin at a height of 35 feet above the takeoff surface at the end of the takeoff distance as determined in accordance with section 4T.117(a).

(b) The net takeoff flight path data shall be determined in such a manner that they represent the airplane's actual takeoff flight paths, determined in accordance with section 4T.116 and with paragraph (a) of this section, reduced at each point by a gradient of climb equal to 0.8 percent for two-engine airplanes and equal to 1.0 percent for four-engine airplanes. It shall be acceptable to apply the prescribed reduction in climb gradient as an equivalent reduction in the airplane's acceleration along that portion of the actual takeoff flight path where the airplane is accelerated in level flight.

4T.118 *Climb; general.* Compliance shall be shown with the climb requirements of sections 4T.119 and 4T.120 at all weights, altitudes, and ambient temperatures, within the operational limits established by the applicant for the airplane. The airplane's center of gravity shall be in the most unfavorable position corresponding with the applicable configuration.

4T.119 *All-engine-operating landing climb.* In the landing configuration the steady gradient of climb shall not be less than 3.2 percent, with:

(a) All engines operating at the power and/or thrust which are available 8 seconds after initiation of movement of the power and/or thrust controls fromthe minimum flight idle to the takeoff position;

(b) A climb speed not in excess of 1.3 V_s.

4T.120 *One-engine-inoperative climb.*

(a) *Takeoff; landing gear extended.* In the critical takeoff configuration existing along the flight path between the points where the airplane reaches the speed V_{LOF} and where the landing gear is fully retracted, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall be positive for two-engine airplanes and shall not be less than 0.5 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available takeoff power and/or thrust existing in accordance with section 4T.116 at the time retraction of the airplane's landing gear is initiated, unless subsequently a more critical power operating condition exists along the flight path prior to the point where the landing gear is fully retracted;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time retraction of the airplane's landing gear is initiated;

(3) The speed equal to the speed V_{LOF}.

(b) *Takeoff; landing gear retracted.* In the takeoff configuration existing at the point of the flight path where the airplane's landing gear is fully retracted, in accordance with section 4T.116 but without ground effect, the steady gradient of climb shall not be less than 2.4 percent for two-engine airplanes and not less than 3.0 percent for four-engine airplanes, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available takeoff power and/or thrust existing in accordance with section 4T.116 at the time the landing gear is fully retracted, unless subsequently a more critical power operating condition exists along the flight path prior to the point where a height of 400 feet above the takeoff surface is reached;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the time the airplane's landing gear is fully retracted;

(3) The speed equal to the speed V_2.

(c) *Final takeoff.* In the en route configuration, the steady gradient of climb shall not be less than 1.2 percent for two-engine airplanes and not less than 1.7 percent for four-engine airplanes, at the end of the takeoff path as determined by section 4T.116, with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust;

(2) The weight equal to the airplane's weight existing in accordance with section 4T.116 at the end of the takeoff path.

(3) The speed equal to not less than 1.25 V_s.

(d) *Approach.* In the approach configuration corresponding with the normal all-engines-operating procedure such that V_s related to this configuration does not exceed 110 percent of the V_s corresponding with the related landing configuration, the steady gradient of climb shall not be less than 2.1 percent for two-engine airplanes and not less than 2.7 percent for four-engine airplanes with:

(1) The critical engine inoperative, the remaining engine(s) operating at the available takeoff power and/or thrust;

(2) The weight equal to the maximum landing weight;

(3) A climb speed established by the applicant in connection with normal landing procedures, except that it shall not exceed 1.5 V_s (see sec. 4T.111(c)).

4T.121 *En route flight paths.* With the airplane in the en route configuration, the flight paths prescribed in paragraphs (a) and (b) of this section shall be determined at all weights, altitudes, and ambient temperatures, within the operational limits established by the applicant for the airplane.

(a) *One engine inoperative.* The one-engine-inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 1.1 percent for two-engine airplanes and 1.6 percent for four-engine airplanes. It shall be acceptable to include in these data the variation of the airplane's weight along the flight path to take into account the progressive consumption of fuel and oil by the operating engine(s).

(b) *Two engines inoperative.* For airplanes with four engines, the two-engine-inoperative net flight path data shall be determined in such a manner that they represent the airplane's actual climb performance diminished by a gradient of climb equal to 0.5 percent. It shall be acceptable to include in these data the variation of the airplane's weight along the flight path to take into account the progressive consumption of fuel and oil by the operating engines.

(c) *Conditions.* In determining the flight paths prescribed in paragraphs (a) and (b) of this section, the conditions of subparagraphs (1) through (4) of this paragraph shall apply.

(1) The airplane's center of gravity shall be in the most unfavorable position.

(2) The critical engine(s) shall be inoperative, the remaining engine(s) operating at the available maximum continuous power and/or thrust.

(3) Means for controlling the engine cooling air supply shall be in the position which provides adequate cooling in the hot-day condition.

(4) The speed shall be selected by the applicant.

4T.122 *Landing distance.* The landing distance shall be the horizontal distance required to land and to come to a complete stop (to a speed

of approximately 3 knots in the case of seaplanes or float planes) from a point at a height of 50 feet above the landing surface. Landing distances shall be determined for standard temperatures at all weights, altitudes, and winds, within the operational limits established by the applicant for the airplane. The conditions of paragraphs (a) through (g) of this section shall apply.

(a) The airplane shall be in the landing configuration. During the landing, changes in the airplane's configuration, in power and/or thrust, and in speed shall be in accordance with procedures established by the applicant for the operation of the airplane in service. The procedures shall comply with the provisions of section 4T.111(c).

(b) The landing shall be preceded by a steady gliding approach down to the 50-foot height with a calibrated air speed of not less than 1.3 V_s.

(c) The landing distance shall be based on a smooth, dry, hard-surfaced runway, and shall be determined in such a manner that reproduction does not require exceptional skill or alertness on the part of the pilot. In the case of seaplanes or float planes, the landing surface shall be smooth water, while for skiplanes it shall be smooth, dry snow. During landing, the airplane shall not exhibit excessive vertical acceleration, a tendency to bounce, nose over, ground loop, porpoise, or water loop.

(d) The landing distance data shall include operational correction factors for not more than 50 percent of nominal wind components along the landing path opposite to the direction of landing and not less than 150 percent of nominal wind components along the landing path in the direction of landing.

(e) During landing, the operating pressures on the wheel braking system shall not be in excess of those approved by the manufacturer of the brakes, and the wheel brakes shall not be used in such a manner as to produce excessive wear of brakes and tires.

(f) In addition to, or in lieu, of, wheel brakes, the use of other braking means shall be acceptable in determining the landing distance, provided such braking means shall have been proven to be safe and reliable, that the manner of their employment is such that consistent results can be expected in service, and that exceptional skill is not required to control the airplane.

(g) If the characteristics of a device (e.g., the propellers) dependent upon the operation of any of the engines noticeably increase the landing distance when the landing is made with the engine inoperative, the landing distance shall be determined with the critical engine inoperative unless the Administrator finds that the use of compensating means will result in a landing distance not greater than that attained with all engines operating.

4T.123 *Limitations and information.*

(a) *Limitations.* The performance limitations on the operation of the airplane shall be established in accordance with subparagraph (1) through (4) of this paragraph. (See also sec. 4T.743.)

(1) *Takeoff weights.* The maximum takeoff weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with the takeoff climb provisions pre-

scribed in section 4T.120 (a), (b), and (c) for altitudes and ambient temperatures, within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(2) *Landing weights.* The maximum landing weights shall be established at which compliance is shown with the generally applicable provisions of this regulation and with the landing and takeoff climb provisions prescribed in sections 4T.119 and 4T.120 for altitudes and ambient temperatures, within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(3) *Accelerate-stop distance, takeoff distance, and takeoff run.* The minimum distances required for takeoff shall be established at which compliance is shown with the generally applicable provisions of this regulation and with sections 4T.115 and 4T.117(a) and with 4T.117(b) if the takeoff distance is intended to include a clearway, for weights, altitudes, temperatures, wind components, and runway gradients, within the operational limits of the airplane (see subparagraph (4) of this paragraph).

(4) *Operational limits.* The operational limits of the airplane shall be established by the applicant for all variable factors required in showing compliance with this regulation (weight, altitude, temperature, etc.). (See secs. 4T.113 (a)(1) and (b), 4T.115(d), 4T.118, 4T.121, and 4T.122.)

(b) *Information.* The performance information on the operation of the airplane shall be scheduled in compliance with the generally applicable provisions of this regulation and with sections 4T.117a(b), 4T.121, and 4T.122 for weights, altitudes, temperatures, wind components, and runway gradients, as these may be applicable, within the operational limits of the airplane (see subparagraph (a)(4) of this section). In addition, the performance information specified in subparagraphs (1) through (3) of this paragraph shall be determined by extrapolation and scheduled for the ranges of weights between the maximum landing and maximum takeoff weights established in accordance with subparagraphs (a)(1) and (a)(2) of this section. (See also sec. 4T.743.)

(1) Climb in the landing configuration (see sec. 4T.119);

(2) Climb in the approach configuration (see sec. 4T.120(d));

(3) Landing distance (see sec. 4T.122).

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4T.743 *Performance limitations, information, and other data.*

(a) *Limitations.* The airplane's performance limitations shall be given in accordance with section 4T.123(a).

(b) *Information.* The performance information prescribed in section 4T.123(b) for the application of the operating rules of this regulation shall be given together with descriptions of the conditions, air speeds, etc., under which the data were determined.

(c) *Procedures.* Procedures established in accordance with section 4T.111(c) shall be given to the extent such procedures are related to the limitations and information set forth in accordance with paragraphs (a) and (b) of this section. Such procedures, in the form of

guidance material, shall be included with the relevant limitations or information, as applicable.

(d) *Miscellaneous.* An explanation shall be given of significant or unusual flight or ground handling characteristics of the airplane.

3. In lieu of sections 40.70 through 40.78, 41.27 through 41.36(d), and 42.70 through 42.83, of Parts 40, 41, and 42, respectively, of the Civil Air Regulations, the following shall be applicable:

OPERATING RULES

40T.80 *Transport category airplane operating limitations.*

(a) In operating any passenger-carrying transport category airplane certificated in accordance with the performance requirements of this regulation, the provisions of sections 40T.80 through 40T.84 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.

(b) The performance data in the Airplane Flight Manual shall be applied in determining compliance with the provisions of sections 40T.81 through 40T.84. Where conditions differ from those for which specific tests were made, compliance shall be determined by approved interpolation or computation of the effects of changes in the specific variables if such interpolations or computations give results substantially equalling in accuracy the results of a direct test.

40T.81 *Airplane's certificate limitations.*

(a) No airplane shall be taken off at a weight which exceeds the takeoff weight specified in the Airplane Flight Manual for the elevation of the airport and for the ambient temperature existing at the time of the takeoff. (See secs. 4T.123(a)(1) and 4T.743(a).)

(b) No airplane shall be taken off at a weight such that, allowing for normal consumption of fuel and oil in flight to the airport of destination and to the alternate airports, the weight on arrival will exceed the landing weight specified in the Airplane Flight Manual for the elevation of each of the airports involved and for the ambient temperatures anticipated at the time of landing. (See secs. 4T.123(a)(2) and 4T.743(a).)

(c) No airplane shall be taken off at a weight which exceeds the weight at which, in accordance with the minimum distances for takeoff scheduled in the Airplane Flight Manual, compliance with subparagraphs (1) through (3) of this paragraph is shown. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of takeoff. (See secs. 4T.123(a)(3) and 4T.743(a).)

(1) The accelerate-stop distance shall not be greater than the length of the runway plus the length of the stopway if present.

(2) The takeoff distance shall not be greater than the length of the runway plus the length of the clearway if present, except that the length of the clearway shall not be greater than one-half of the length of the runway.

(3) The takeoff run shall not be greater than the length of the runway.

(d) No airplane shall be operated outside the operational limits specified in the Airplane Flight Manual. (See secs. 4T.123(a)(4) and 4T.743(a).)

40T.82 *Takeoff obstacle clearance limitations.* No airplane shall be taken off at a weight in excess of that shown in the Airplane Flight Manual to correspond with a net takeoff flight path which clears all obstacles either by at least a height of 35 feet vertically or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing beyond the boundaries. In determining the allowable deviation of the net takeoff flight path in order to avoid obstacles by at least the distances prescribed, it shall be assumed that the airplane is not banked before reaching a height of 50 feet as shown by the net takeoff flight path data in the Airplane Flight Manual, and that a maximum bank thereafter does not exceed 15 degrees. The net takeoff flight path considered shall be for the elevation of the airport, the effective runway gradient, and for the ambient temperature and wind component existing at the time of takeoff. (See secs. 4T.123(b) and 4T.743(b).)

40T.83 *En route limitations.* All airplanes shall be operated in compliance with paragraph (a) of this section. In addition, no airplane shall be flown along an intended route if any place along the route is more than 90 minutes away from an airport at which a landing can be made in accordance with section 40T.84(b), assuming all engines to be operating at cruising power, unless compliance is shown with paragraph (b) of this section.

(a) *One engine inoperative.* No airplane shall be taken off at a weight in excess of that which, according to the one-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit compliance with either subparagraphs (1) or (2) of this paragraph at all points along the route. The net flight path shall have a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engine fails. The net flight path used shall be for the ambient temperatures anticipated along the route. (See secs. 4T.123(b) and 4T.743(b).)

(1) The slope of the net flight path shall be positive at an altitude of at least 1,000 feet above all terrain and obstructions along the route within 5 statute miles (4.34 nautical miles) on either side of the intended track.

(2) The net flight path shall be such as to permit the airplane to continue flight from the cruising altitude to an airport where a landing can be made in accordance with the provisions of section 40T.84(b), the net flight path clearing vertically by at least 2,000 feet all terrain and obstructions along the route within 5 statute miles (4.34 nautical miles) on either side of the intended track. The provisions of subdivisions (i) through (vi) of this subparagraph shall apply.

(i) The engine shall be assumed to fail at the most critical point along the route.

(ii) 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, except that the Administrator may authorize a procedure established on a different basis where adequate operational safeguards are found to exist.

(iii) An approved method shall be used to account for winds which would otherwise adversely affect the flight path.

(iv) Fuel jettisoning shall be permitted if the Administrator finds that the operator has an adequate training program, proper instructions are given to the flight crew, and all other precautions are taken to ensure a safe procedure.

(v) The alternate airport shall be specified in the dispatch release and shall meet the prescribed weather minima.

(vi) The consumption of fuel and oil after the engine is assumed to fail shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

(b) *Two engines inoperative.* No airplane shall be taken off at a weight in excess of that which, according to the two-engine-inoperative en route net flight path data shown in the Airplane Flight Manual, will permit the airplane to continue flight from the point where two engines are assumed to fail simultaneously to an airport where a landing can be made in accordance with the provisions of section 40T.84(b), the net flight path clearing vertically by at least 2,000 feet all terrain and obstructions along the route within 5 statute miles (4.34 nautical miles) on either side of the intended track. The net flight path considered shall be for the ambient temperatures anticipated along the route. The provisions of subparagraphs (1) through (5) of this paragraph shall apply. (See secs. 4T.123(b) and 4T.734(b).)

(1) The two engines shall be assumed to fail at the most critical point along the route.

(2) The net flight path shall have a positive slope at 1,500 feet above the airport where the landing is assumed to be made after failure of two engines.

(3) Fuel jettisoning shall be permitted if the Administrator finds that the operator has an adequate training program, proper instructions are given to the flight crew, and all other precautions are taken to ensure a safe procedure.

(4) 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 the airport and to arrive there at an altitude of at least 1,500 feet directly over the landing area and thereafter to fly for 15 minutes at cruise power and/or thrust.

(5) The consumption of fuel and oil after the engines are assumed to fail shall be that which is accounted for in the net flight path data shown in the Airplane Flight Manual.

40T.84 *Landing limitations.*

(a) *Airport of destination.* No airplane shall be taken off at a weight in excess of that which, in accordance with the landing distances shown in the Airplane Flight Manual for the elevation of the airport of intended destination and for the wind conditions anticipated there at the time of landing, would permit the airplane to be brought to rest at the airport of intended destination within 60 percent of the effective length of the runway from a point 50 feet directly above the intersection of the

obstruction clearance plane and the runway. The weight of the airplane shall be assumed to be reduced by the weight of the fuel and oil expected to be consumed in flight to the airport of intended destination. Compliance shall be shown with the conditions of subparagraphs (1) and (2) of this paragraph. (See secs. 4T.123(b) and 4T.743(b).)

(1) It shall be assumed that the airplane is landed on the most favorable runway and direction in still air.

(2) It shall be assumed that the airplane is landed on the most suitable runway considering the probable wind velocity and direction and taking due account of the ground handling characteristics of the airplane and of other conditions (i.e., landing aids, terrain, etc.). If full compliance with the provisions of this subparagraph is not shown, the airplane may be taken off if an alternate airport is designated which permits compliance with paragraph (b) of this section.

(b) *Alternate airport.* 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 provisions of paragraph (a) of this section, provided that the airplane can be brought to rest within 70 percent of the effective length of the runway.

4. In lieu of section 43.11 of Part 43 of the Civil Air Regulations the following shall be applicable.

43T.11 *Transport category airplane weight limitations.* The performance data in the Airplane Flight Manual shall be applied in determining compliance with the following provisions:

(a) No airplane shall be taken off at a weight which exceeds the takeoff weight specified in the Airplane Flight Manual for the elevation of the airport and for the ambient temperature existing at the time of the takeoff. (See secs. 4T.123(a)(1) and 4T.743(a).)

(b) No airplane shall be taken off at a weight such that, allowing for normal consumption of fuel and oil in flight to the airport of destination and to the alternate airports, the weight on arrival will exceed the landing weight specified in the Airplane Flight Manual for the elevation of each of the airports involved and for the ambient temperatures anticipated at the time of landing. (See secs. 4T.123(a)(2) and 4T.743(a).)

(c) No airplane shall be taken off at a weight which exceeds the weight at which, in accordance with the minimum distances for takeoff scheduled in the Airplane Flight Manual, compliance with subparagraphs (1) through (3) of this paragraph is shown. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of takeoff. (See secs. 4T.123(a)(3) and 4T.734(a).)

(1) The accelerate-stop distance shall not be greater than the length of the runway plus the length of the stopway if present.

(2) The takeoff distance shall not be greater than the length of the runway plus the length of the clearway if present, except that the length of the clearway shall not be greater than one-half of the length of the runway.

(3) The takeoff run shall not be greater than the length of the runway.

(d) No airplane shall be operated outside the operational limits specified in the Airplane Flight Manual. (See secs. 4T.123(a)(4) and 4T.743(a).)

5. The following definitions shall apply:

(a) *Clearway.* A clearway is an area beyond the runway, not less than 500 feet wide, centrally located about the extended center line of the runway, and under the control of the airport authorities. The clearway is expressed in terms of a clearway plane, extending from the end of the runway with an upward slope not exceeding 1.25 percent, above which no object nor any portion of the terrain protrudes, except that threshold lights may protrude above the plane if their height above the end of the runway is not greater than 26 inches and if they are located to each side of the runway.

NOTE: For the purpose of establishing takeoff distances and takeoff runs, in accordance with section 4T.117 of this regulation, the clearway plane is considered to be the takeoff surface.

(b) *Stopway.* A stopway is an area beyond the runway, not less in width than the width of the runway, centrally located about the extended center line of the runway, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff: To be considered as such, a stopway must be capable of supporting the airplane during an aborted takeoff without inducing structural damage to the airplane. (See also sec. 4T.115(d) of this regulation.)

SPECIAL CIVIL AIR REGULATIONS NO. SR-423

Effective: December 20, 1957
Adopted: November 15, 1957

Type Certification of Transport Category Airplanes With Turbo-Prop Replacements

The airworthiness requirements with which a particular airplane is required to comply are established by the date of application for the type certificate. After the type certificate is issued, the holder of the type certificate or an applicant for a supplemental type certificate, at his option, can obtain approval of changes in the design in accordance with requirements in effect at the time of the original application for type certificate or in accordance with later requirements in effect at the time of the change.

Prior to May 18, 1954, the regulations placed no specific limit on the extent of changes to the airplane which could be approved in this manner nor did they define a new type design for which a new application for type certification would be required. Amendment 4b-1 effective on that date, among other changes in Part 4b, lists certain changes in design which if made to an airplane would require it to be considered as a new type. In such a case, a new application for type certification would be required and the regulations, together with all amendments thereto effective on the date of the new application, would have to be complied with (sec. 4b.11(a)). One such change which would require a new type certificate is a change to engines employing different priciples of operation or propulsion (sec 4b.11(e)(2)).

Interest has been shown recently within the aviation industry in the installation of turbo-propeller engines on airplanes presently equipped with reciprocating engines. In accordance with sec. 4b.11(e)(2) such a change would require a showing of compliance with the latest airworthiness requirements of Part 4b. The Board is of the opinion that showing of compliance with all of the latest requirements might be burdensome, impractical, and not essential to safety.

This Special Civil Air Regulation will permit the certification of a turbo-propeller-powered airplane, which previously was type certificated with the same number of reciprocating engines, if compliance is shown with the airworthiness provisions applicable to the airplane as type certificated with reciprocating engines, together with certain later provisions of the Civil Air Regulations in effect on the date of application for a supplemental or new type certificate which are applicable or related to the powerplant of the turbo-propeller-powered version.

In order to insure that the level of safety of the turbine-powered airplane is equivalent to that intended by Part 4b, the Board considers that compliance must be shown with the later provisions of Part 4b which apply to the powerplant installation, airplane performance, and cockpit standardization, such other requirements as the Administrator finds are otherwise related to the changes made in the engines.

Special Civil Air Regulation No. SR–422 establishes certain certification and operational requirements for all turbine-powered airplanes for which a type certificate is issued after the effective date of that regulation. Except as otherwise provided, all of the provisions of SR–422 remain applicable to airplanes certificated in accordance with the regulation prescribed herein. Therefore, to be certificated in accordance with the regulation prescribed herein compliance must be shown with the certification performance requirements prescribed in paragraph 2 of SR–422.

It must be emphasized that the certification performance limitations established by the performance requirements; i.e., the take-off weights, landing weights, take-off and accelerate-stop distances, and the operational limits, become part of the airworthiness certificate and must be complied with at all times, regardless of the type of operations conducted with the airplane. (See sec. 43.10, as amended, of Part 43 of the Civil Air Regulations.)

In addition to certification performance limitations, SR–422 prescribes performance operating limitations which are applicable to turbine-powered transport category airplanes when used in air carrier passenger operations. Since turbo-propeller-powered airplanes certificated in accordance with the regulation prescribed herein are required to comply with the certification performance requirements of SR–422, they are also subject to the performance operating limitations prescribed in paragraph 3 of SR–422 when used in air carrier passenger operations.

Since a change in engines will require a rather extensive change in the cockpit to accommodate the new instruments and controls for turbine engines, the Board considers that compliance with the latest cockpit standardization requirements can be accomplished without any undue burden and such compliance would speed up the cockpit standardization of other airplanes in an airline's fleet in accordance with the Board's objectives. Therefore, this regulation makes the latest cockpit standardization requirements applicable, with the exception of such detailed requirements as the Administrator finds are impracticable, and do not contribute materially to standardization. It should be noted that in referring to this exception in the preamble to Draft Release No. 56–29, the use of the conjunction "or" after the word "impracticable" was inadvertent. As the language of the proposed regulation clearly indicated, "and" was the proper conjunction following the word "impracticable."

The Board also considers it appropriate to call attention to the fact that if other changes to the airplane are made simultaneously with, or subsequent to, such an engine change, then compliance will also have to be shown with all requirements related to the additional changes in effect on the date of the new application for a supplemental or new type certificate. In this regard, if an airplane converted to turbo-propeller power is to be certificated for operation at altitudes, speeds, or weights higher than those which are applicable to the reciprocating-engine-powered airplane, compliance will be required with all the latest provisions of the regulations which are related to such changes.

In order to assure that all airplanes converted to turbo-propeller power meet the minimum requirements considered essential to safety, this regulation is made retroactive and requires compliance with the provisions of the Civil Air Regulations as set forth herein for all of such

airplanes for which application for a supplemental or new type certificate was made prior to the effective date of this regulation.

This Special Civil Air Regulation shall continue in effect for 5 years, at the end of which time the effectiveness of the regulation will be evaluated for the purpose of considering the incorporation of the substance of these rules in the permanent body of the Civil Air Regulations.

Interested persons have been afforded an opportunity to participate in the making of this Special Civil Air Regulation (21 F.R. 9436), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation effective December 20, 1957.

Contrary provisions of section 4b.11(a) as it applies to section 4b.11 (e)(2) of Part 4b of the Civil Air Regulations and paragraph (1) of Special Civil Air Regulation No. SR–422 notwithstanding, the following provisions shall be applicable to the certification of a turbo-propeller-powered airplane which was previously type certificated with the same number of reciprocating engines:

(1) The airworthiness regulations applicable to the airplane as type certificated with reciprocating engines and, in addition thereto or in lieu thereof as appropriate, the following provisions of the Civil Air Regulations effective on the date of application for a supplemental or new type certificate (see paragraph (3)):

(a) The certification performance requirements prescribed in Special Civil Air Regulation No. SR–422;

(b) The powerplant installation requirements of Part 4b applicable to the turbo-propeller-powered airplane;

(c) The requirements of Part 4b for the standardization of cockpit controls and instruments, except where the Administrator finds that showing of compliance with a particular detailed requirement would be impractical and would not contribute materially to standardization; and

(d) Such other requirements of Part 4b applicable to the turbo-propeller-powered airplane as the Administrator finds are related to the changes in engines and are necessary to insure a level of safety of the turbo-propeller-powered airplane equivalent to that generally intended by Part 4b.

(2) If new limitations are established with respect to weight, speed, or altitude of operation and the Administrator finds that such limitations are significantly altered from those approved for the airplane with reciprocating engines, compliance shall be shown with all of the requirements, applicable to the specific limitations being changed, which are in effect on the date of application for the new or supplemental type certificate.

(3) Airplanes converted to turbo-propeller power, for which application for a supplemental or a new type certificate was made prior to the effective date of this Special Civil Air Regulation, shall comply with all of the provisions of the Civil Air Regulations specified in paragraphs (1) and (2) effective on the date of this special regulation, rather than those provisions effective on the date application was made for the supplemental or the new type certificate.

This Special Civil Air Regulation shall terminate December 20, 1962 unless sooner superseded or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION NO. SR–425A

Effective: July 22, 1958
Adopted: July 22, 1958

Provisional Certification and Operation of Multiengine Turbine-Powered Transport Airplanes for Which Type Certificates Have Not Been Issued

Special Civil Air Regulation No. SR–425, adopted by the Board on June 20, 1958, authorizes air carriers holding Part 40, 41, or 42 air carrier operating certificates to conduct crew training, service testing, and simulated air carrier operations in provisionally certificated turbine-powered transport category airplanes. The Board's objective in adopting SR–425 was to provide a means whereby air carriers could conduct crew training and obtain as much experience as possible in ground handling, maintenance, and flight of these transports prior to their introduction into commercial service.

The Board did not specifically extend these operating privileges to the manufacturers under SR–425 as it assumed that training of the personnel of air carriers who were purchasing new transports would be conducted in experimentally certificated aircraft as had been the custom in the past. However, recent administrative and regulatory interpretations have cast doubt on the legality of such operations under existing authority.

To clarify the Board's intent on this point, Section III of SR–425A has been worded so as to make it clear that the manufacturer may provide training to air carrier personnel in provisionally certificated airplanes which are under the operational control of the air carrier or in such airplanes which are under the operational control of the manufacturer.

The other provisions of SR–425A are identical to SR–425 and require no further discussion at this time.

In view of the foregoing, SR–425A is being promulgated to continue the authority to permit the provisional certification and operation of multiengine turbine-powered airplanes and specifically permits manufacturers who hold a provisional type certificate for a multiengine turbine-powered airplane to conduct crew training, service testing, and related operations in airplanes so certificated.

Since this special regulation merely clarifies SR–425 and imposes no additional burden on any person, notice and public procedure hereon are unnecessary, and this regulation may be made effective on less than 30 days' notice.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective July 22, 1958.

Contrary provisions of the Civil Air Regulations notwithstanding, a turbine-powered transport airplane for which the issuance of a transport category type certificate is pending shall be eligible for provisional certification and operation in accordance with the provisions of this special regulation.

Section I—Provisional type certificate.

(a) *Applicant.*

(1) Any U.S. manufacturer of a turbine-powered airplane may apply for the issuance of a provisional type certificate provided that he has applied to the Administrator for the issuance of a transport category type certificate for such airplane. The application for a provisional type certificate shall be made in a manner prescribed by the Administrator.

(2) The applicant shall be a manufacturer who has previously received a type certificate for at least one airplane in the transport category and has a currently effective production certificate for that type.

(b) *Requirements for issuance.* The Administrator shall issue a provisional type certificate for an airplane for which application is made in accordance with paragraph (a) of this section when the conditions of subparagraphs (1) through (8) of this paragraph are met.

(1) The applicant shall submit the report of flight tests required by section 4b.16 of Part 4b of the Civil Air Regulations and the Civil Aeronautics Administration's official flight test program with respect to the issuance of the type certificate shall be in progress.

(2) The applicant shall certify that, to the best of his knowledge, the airplane for which provisional type certification is sought has been designed and constructed in accordance with those airworthiness requirements applicable to the issuance of the type certificate for that airplane.

(3) An airplane conforming with the type for which a type certificate has been applied shall have been flown at least 100 hours by the applicant under the provisions of an experimental certificate issued in accordance with the provisions of Part 1 of the Civil Air Regulations.

(4) The applicant shall have flown the airplane in all maneuvers necessary to show compliance with those flight requirements applicable to the issuance of the type certificate.

(5) The applicant shall have prepared a provisional airplane flight manual containing all the limitations, information, and procedures as are required for the issuance of the type certificate for that airplane: *Provided,* That where all limitations, information, and procedures have not been established, the applicant shall establish appropriate restrictions on the operation of the airplane.

(6) The applicant shall state that the airplane is considered safe for operation for the purposes set forth herein when conducted in accordance with the provisional airplane flight manual prescribed in subparagraph (5) of this paragraph.

(7) The applicant shall establish special inspections and maintenance instructions which are considered necessary to insure continued airworthiness of the airplane.

(8) The Administrator shall find, on the basis of the provisions contained in this special regulation, that the airplane has no feature, characteristic, or condition which renders it unsafe when operated in accordance with the provisional airplane flight manual prescribed in subparagraph (5) of this paragraph and maintained in accordance with the inspections and maintenance instructions prescribed in subparagraph (7) of this paragraph.

(c) *Transferability.* A provisional type certificate issued under this special regulation shall not be transferable.

(d) *Duration.* A provisional type certificate shall remain in effect for 6 months or until the airplane is issued a transport category type certificate, whichever occurs first, unless sooner superseded, revoked, or otherwise terminated by the Administrator or the Board: *Provided,* That a provisional type certificate which would terminate prior to 6 months after issuance due to the issuance of a transport category type certificate may remain in effect for an additional 60 days.

Section II—Provisional airworthiness certificate.

(a) *Applicant.* The holder of a provisional type certificate or a certificated U.S. air carrier authorized to conduct operations by Section III of this regulation may apply for the issuance of a provisional airworthiness certificate for an airplane for which a provisional type certificate has been issued in accordance with the provisions of Section I of this special regulation. The application for a provisional airworthiness certificate shall be made in a manner prescribed by the Administrator.

(b) *Requirements for issuance.*

(1) An applicant for a provisional airworthiness certificate for an airplane for which a provisional type certificate has been issued shall be issued such provisional airworthiness certificate upon presentation of a statement of conformity by the manufacturer that such airplane conforms to the provisional type certificate.

(2) The airplane shall have been manufactured under a quality control system established in anticipation of, and intended to be used as a basis for, the production certificate to be issued to cover that airplane.

(3) The airplane shall have been flown at least 5 hours by the manufacturer and found by him to be in safe operating condition.

(4) The airplane shall be furnished with a provisional airplane flight manual as required by subparagraph (b)(5) of Section I of this special regulation.

(5) The Administrator shall find, on the basis of the provisions contained in this special regulation, that the airplane has no feature, characteristic, or condition which renders it unsafe when operated in accordance with the provisional airplane flight manual prescribed in subparagraph (b)(5) of Section I of this special regulation and maintained in accordance with the inspections and maintenance instruction prescribed in subparagraph (b)(7) of Section I of this special regulation.

(6) The words "provisional airworthiness" shall be displayed on the exterior of the airplane near each entrance to the cabin or cockpit of the airplane with letters not less than 2 inches in height.

(c) *Transferability.* A provisional airworthiness certificate issued under this special regulation shall be transferable only to an air carrier authorized to conduct operations by Section III of this regulation.

(d) *Duration.* A provisional airworthiness certificate shall remain in effect for 6 months, or until the airplane is issued a transport category type certificate, whichever occurs first, unless sooner superseded, revoked, or otherwise terminated by the Administrator or the Board: *Provided,* That provisional airworthiness certificates which would terminate prior

to 6 months after issuance due to the issuance of a transport category type certificate may remain in effect for an additional 60 days.

Section III—Operation rules. A manufacturer holding a provisional type certificate, or an air carrier holding an air carrier operating certificate issued by the Administrator in accordance with Part 40, 41, or 42 of the Civil Air Regulations, may operate turbine-powered transport category airplanes certificated in accordance with Sections I and II of this special regulation in accordance with the following operating rules:

(a) *General*

(1) An air carrier or manufacturer may conduct flights for the purpose of crew training, service testing, and simulated air carrier operations not in air transportation, or as otherwise specifically authorized by the Board.

(2) Operations which are conducted for the purposes delineated in the definition of "flight test" in section 60.60 of Part 60 of the Civil Air Regulations shall be conducted in accordance with section 60.24.

(3) The airplane shall be operated in accordance with the limitations, information, and procedures prescribed in the provisional airplane flight manual prepared in accordance with subparagraph (b)(5) of Section I of this special regulation.

(4) An air carrier or manufacturer shall establish procedures for the use and guidance of flight and ground operations personnel in the conduct of its operations. Specific procedures shall be established for operations from airports where the runways may require a take-off or approach over populated area. These procedures shall be approved by the Administrator.

(5) In addition to crew members, only those persons listed in section 40.356(c) of Part 40 shall be carried in operations conducted under this special regulation.

(6) Each air carrier or manufacturer shall insure that each flight crew member possesses adequate knowledge of, and familiarity with, the airplane and the procedures to be used by him.

(7) Airplanes operated under this special regulation shall be maintained in accordance with applicable Civil Air Regulations, including any special inspections and maintenance instructions prescribed by the manufacturer or the Administrator.

(8) No airplane issued a provisional airworthiness certificate under this special regulation shall be operated if the manufacturer or the Administrator determines that a change in design, construction, or operation is necessary to insure safe operation until such change is made. (See also sec. 1.24 of Part 1 of the Civil Air Regulations.)

(9) The provisional airworthiness certificate shall be prominently displayed in the airplane at all times.

(10) Operations under this special regulation shall be restricted to the United States, its territories, and possessions, unless otherwise authorized by the Board.

(b) *Additional Air Carrier Rules*

(1) Each air carrier shall maintain current records for each flight crew member. These records shall contain such information as is neces-

sary to show that the crew member is properly trained and qualified to perform his assigned duties.

(2) The appropriate instructor, supervisor, or check airman shall certify as to the proficiency of each flight crew member and such certification shall become a part of the flight crew member's record.

(3) A log of flights conducted under this special regulation, and accurate and complete records of the inspections made, shall be kept by each air carrier and made available to the manufacturer and the Administrator.

This special regulation supersedes Special Civil Air Regulation No. SR-425 and shall terminate on June 20, 1961, unless sooner superseded or rescinded by the Board.

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SPECIAL CIVIL AIR REGULATION NO. SR-426

Effective: October 27, 1958
Adopted: September 22, 1958

Performance Credit for Transport Category Airplanes Equipped with Standby Power

Standby power is power and/or thrust obtained from rocket engines and is separate from the power obtained from the airplane's main engines. Such power and/or thrust is available for a relatively short period for use in cases of emergency. The standby power system may be capable of producing more than a single thrust period. This special regulation authorizes the Administrator to grant performance credit to transport category airplanes when standby power is used in one or more of the following regimes of flight: Takeoff with one engine inoperative, approach climb with one engine inoperative, and the balked landing climb. By "performance credit" is meant the taking into account the increased performance of the airplane with standby power and, because thereof, the approval of higher maximum weights for the airplane than the weights approved on the basis of the airplane's performance without standby power. In granting performance credit, this regulation prescribes the applicable conditions and limitations.

Rocket assist takeoff units were developed initially for the military services to provide additional takeoff power for heavily loaded flying boats and carrier-based aircraft. The additional thrust improved the climb performance in the takeoff regime and permitted the airplane to attain a safe altitude and air speed in the event of engine failure. The reliability of such units has increased to the point where some civil operators have adopted them for use as emergency standby power in the event of engine failure. Other operators have been reluctant to adopt standby power installations and the attendant weight penalties without reasonable performance credit being given the airplane. With the performance credit granted by this regulation for the use of standby power, it is anticipated that such credit might be considered a compensating economic factor justifying the installation of standby power on such airplanes.

The currently effective regulations did not contemplate the use of standby power; however, the Administrator of Civil Aeronautics has established for an interim period a conservative policy permitting transport category airplanes equipped with standby power to operate at an increase in the normally approved weights by an amount equal to the weight of the standby power units.

In this regulation, the criteria for granting performance credit were formulated with the intent of providing an overall level of performance equivalent to that intended by the currently effective regulations. To this end, appropriate criteria are established with respect to the amount of performance credit which may be applied in determining the new takeoff paths, the extent to which the maximum certificated takeoff and landing weights may be increased, and operating procedures to be followed in service for the use of standby power and for the associated changes in the airplane's configuration and speed.

The basic element of the various criteria established in this regulation entails a comparison of flight paths. In Civil Air Regulations

Draft Release No. 57–28, all of the flight paths were based on procedures involving attainment of the en route configuration and the acceleration to a safe en route speed. Further consideration of this proposal indicates that an undue amount of flight testing and computation would be required for those flight conditions which presently do not involve the establishment of such flight paths. In addition, it appears that comparison of flight paths involving a particular procedure is not essential for the purpose of establishing an equivalent level of safety. In view of the foregoing, this regulation requires comparison of flight paths with respect to the takeoff regime consistent only with that required by the currently effective airworthiness performance requirements; i.e., Part 4b and Special Civil Air Regulations Nos. SR–422 and SR–422A. Further, the establishment of maximum landing weights is based on a comparison of flight paths obtained with a fixed airplane configuration and at the speed and power condition appropriate to the all-engines-operating landing climb or the one-engine-inoperative approach climb, as applicable.

Performance credit for standby power with respect to the takeoff path is limited by the specification that the all-engines-operating takeoff path reflect a conservatively greater margin of overall performance than the one-engine-inoperative takeoff path with standby power in use. It is intended that this margin exist throughout the takeoff path prescribed by the applicable performance requirements. This regulation provides for the establishment of the margin by the Administrator; however, in no case can this margin be less than 15 percent. In view of the many different types of airplanes to which this regulation is applicable, a higher margin might be necessary in certain cases to insure safe day-to-day operations.

For reciprocating-engine-powered airplanes, the provisions of this regulation require that the applicant establish a procedure for the use of standby power for attaining the en route configuration and a safe en route speed in the event of an engine failure during the takeoff. Provisions for such procedures are contained in the regulations for turbine-powered airplanes and will therefore be applicable to such airplanes. The establishment of the procedures made applicable to reciprocating-engine-powered airplanes is left to the discretion of the applicant to select the altitude at which the acceleration is to take place, the basic limitation being that the slope along all points of the airborne portion of the takeoff path must be positive. This will provide for the critical operation of cleanup and acceleration during the takeoff which are not covered by the performance requirements of Part 4b and which have been cited in the past in connection with several accidents. In addition, with respect to the clearing of obstacles, the takeoff path scheduled in the Airplane Flight Manual for airplanes for which the performance requirements of Part 4b are applicable must be appropriately modified to reflect the effect of the aforementioned procedure.

The criteria for the establishment of maximum certificated takeoff weights involve two separate comparisons of takeoff paths. These comparisons must be carried out to a height of 400 feet above the takeoff surface. This minimum height is intended to be associated with a procedure where standby power is actuated within the neighborhood of

the critical engine failure speed V_1. These provisions are intended to limit the increase in maximum takeoff weight consistent with the overall level of performance currently attained with respect to the one-engine-inoperative takeoff and to limit the amount of standby power for which performance credit can be granted to insure a reasonable margin of performance for the all-engine day-to-day operations.

The provisions for the establishment of maximum certificated landing weights require only a comparison between two flight paths based on a steady climb and fixed configuration. One represents a climb path at the maximum weight previously certificated without standby power and the other a climb path at the increased weight with standby power. In addition, there is a provision which requires the establishment of procedures for the execution of balked landings and missed approaches in conjunction with the use of standby power.

A question has been raised as to whether duplicate sets of standby power units are required to obtain performance credit for both the takeoff and the approach stages of flight. It is intended by this regulation to require duplicate sets of standby power for a flight for which the use of standby power is necessary to comply with both the maximum certificated takeoff and the maximum certificated approach weight limitations. Where the use of standby power is necessary for compliance with the maximum certificated weight limitations for only one regime of flight, i.e., takeoff or approach, one set of standby power units is required.

There are also included safety criteria for the installation and operation of the standby power system.

The Board presently has under consideration a special regulation which would be applicable to nontransport category airplanes equipped with standby power.

Interested persons have been afforded an opportunity to participate in the making of this regulation (22 F.R. 10464), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation, effective October 27, 1958.

Contrary performance provisions of the Civil Air Regulations notwithstanding, the Administrator may grant performance credit for the use of standby power on transport category airplanes. Such credit shall be applicable only to the maximum certificated takeoff and landing weights, the takeoff distance, and the takeoff paths, and shall not exceed that found by the Administrator to result in an overall level of safety in the takeoff, approach, and landing regimes of flight equivalent to that prescribed in the regulations under which the airplane was originally certificated without standby power. (Note: Standby power is power and/or thrust obtained from rocket engines for a relatively short period and actuated only in cases of emergency.) The following provisions shall apply:

(1) *Takeoff; general.* The takeoff data prescribed in sections (2) and (3) shall be determined at all weights and altitudes, and at ambient temperatures if applicable, at which performance credit is to be applied.

(2) *Takeoff path.*

(a) The one-engine-inoperative takeoff path with standby power in use shall be determined in accordance with the performance requirements of the applicable airworthiness regulations.

(b) The one-engine-inoperative takeoff path (excluding that portion where the airplane is on or just above the takeoff surface) determined in accordance with paragraph (a) of this section shall lie above the one-engine-inoperative takeoff path without standby power at the maximum takeoff weight at which all of the applicable airworthiness requirements are met. For the purpose of this comparison, the flight path shall be considered to extend to at least a height of 400 feet above the takeoff surface.

(c) The takeoff path with all engines operating, but without the use of standby power, shall reflect a conservatively greater overall level of performance than the one-engine-inoperative takeoff path established in accordance with paragraph (a) of this section. The aforementioned margin shall be established by the Administrator to insure safe day-to-day operations, but in no case shall it be less than 15 percent. The all-engines-operating takeoff path shall be determined by a procedure consistent with that established in complying with paragraph (a) of this section.

(d) For reciprocating-engine-powered airplanes, the takeoff path to be scheduled in the Airplane Flight Manual shall represent the one-engine-inoperative takeoff path determined in accordance with paragraph (a) of this section and modified to reflect the procedure (see sec. (6)) established by the applicant for flap retraction and attainment of the en route speed. The scheduled takeoff path shall have a positive slope at all points of the airborne portion and at no point shall it lie above the takeoff path specified in paragraph (a) of this section.

(3) *Takeoff distance.* The takeoff distance shall be the horizontal distance along the one-engine-inoperative takeoff path determined in accordance with section (2)(a) from the start of the takeoff to the point where the airplane attains a height of 50 feet above the takeoff surface for reciprocating-engine-powered airplanes and a height of 35 feet above the takeoff surface for turbine-powered airplanes.

(4) *Maximum certificated takeoff weights.* The maximum certificated takeoff weights shall be determined at all altitudes, and at ambient temperatures if applicable, at which performance credit is to be applied and shall not exceed the weights established in compliance with paragraphs (a) and (b) of this section.

(a) The conditions of section (2) (b) through (d) shall be met at the maximum certificated takeoff weight.

(b) Without the use of standby power, the airplane shall meet all of the en route requirements of the applicable airworthiness regulations under which the airplane was originally certificated. In addition, turbine-powered airplanes without the use of standby power shall meet the final takeoff climb requirements prescribed in the applicable airworthiness regulations.

(5) *Maximum certificated landing weights.*

(a) The maximum certificated landing weights (one-engine-inoperative approach and all-engines-operating landing climb) shall be

determined at all altitudes, and at ambient temperatures if applicable, at which performance credit is to be applied and shall not exceed that established in compliance with the provisions of paragraph (b) of this section.

(b) The flight path, with the engines operating at the power and/or thrust appropriate to the airplane configuration and with standby power in use, shall lie above the flight path without standby power in use at the maximum weight at which all of the applicable airworthiness requirements are met. In addition, the flight paths shall comply with the provisions of subparagraphs (i) and (ii) of this paragraph.

(i) The flight paths shall be established without changing the appropriate airplane configuration.

(ii) The flight paths shall be carried out for a minimum height of 400 feet above the point where standby power is actuated.

(6) *Airplane configuration, speed, and power and/or thrust; general.* Any change in the airplane's configuration, speed, and power and/or thrust shall be made in accordance with the procedures established by the applicant for the operation of the airplane in service and shall comply with the provisions of paragraphs (a) through (c) of this section. In addition, procedures shall be established for the execution of balked landings and missed approaches.

(a) The Administrator shall find that the procedure can be consistently executed in service by crews of average skill.

(b) The procedure shall not involve methods or the use of devices which have not been proven to be safe and reliable.

(c) Allowances shall be made for such time delays in the execution of the procedures as may be reasonably expected to occur during service.

(7) *Installation and operation; standby power.* The standby power unit and its installation shall comply with the provisions of paragraphs (a) and (b) of this section.

(a) The standby power unit and its installation shall not adversely affect the safety of the airplane.

(b) The operation of the standby power unit and its control shall have proven to be safe and reliable.

SPECIAL CIVIL AIR REGULATION NO. SR-429

Effective: February 3, 1959
Adopted: December 30, 1958

Authorization for Alaskan Air Taxi Operators to Conduct Operations Under the Provisions of Part 42 of the Civil Air Regulations

Concurrently with this regulation, the Board is adopting a new Part 293 of the Economic Regulations which reclassifies the present "Alaskan pilot-owner", covered under Part 292 of the Board's Economic Regulations, as an "Alaskan Air Taxi Operator" and enlarges the permissible activities of such Alaskan pilot-owners. Under the new Part 293, the Alaskan air taxi operator will be permitted *inter alia* to use aircraft having a maximum gross take-off weight of 7,900 pounds and to engage in the air transportation of person and property within Alaska without limitation, except that scheduled service would be prohibited between points served by certificated carriers with a frequency of two or more scheduled round trips per week.

At the present time, the Alaskan air carriers using large aircraft (12,500 pounds maximum certificated take-off weight and above) are conducting their operations pursuant to the provisions of Part 41 of the Civil Air Regulations. Those Alaskan air carriers using small aircraft (less than 12,500 pounds maximum certificated take-off weight) including the Alaskan pilot-owners are presently conducting their operations under Part 42 pursuant to authorizations by the Administrator of Civil Aeronautics.

Since the air carriers operating in Alaska with small aircraft are presently conducting their operations under Part 42, the Board believes that until operating experience reveals that further or different rules are necessary, Alaskan air taxi operators should be allowed to conduct their operations pursuant to Part 42.

As the exemptions under Part 293 of the Economic Regulations are only temporary and are stated to run for two years from the effective date of that part, it seems desirable to limit the authorization contained herein to the same period of time.

This regulation is necessary in order to give effect to the new Part 293 referred to above, which was published as a notice of proposed rule making dated May 17, 1958, and on which public comment was received and considered. Since this regulation is ancillary to such part and since it continues in effect the same rules as are presently applicable to the Alaskan pilot-owners, without diminution in safety standards, the Board finds that notice and public procedure hereon are unnecessary.

In consideration of the foregoing, the Civil Aeronautics Board hereby makes and promulgates the following Special Civil Air Regulation effective February 3, 1959.

Notwithstanding the provisions of Parts 41 and 42 of the Civil Air Regulations, any Alaskan air taxi operator as defined in section 293.1(a)(2) of Part 293 of the Economic Regulations shall be certificated and shall conduct operations in air transportation in accordance with the provisions of Part 42 of the Civil Air Regulations. An air carrier operating certificate presently issued by the Civil Aeronautics Administration to an Alaskan pilot-owner shall, until its stated expiration date, be valid as an air carrier operating certificate for Alaskan air taxi operations, unless such certificate is sooner surrendered, suspended or revoked. Such certificate may be renewed as an air carrier operating certificate for Alaskan air taxi operations.

This regulation shall terminate two years after its effective date unless sooner terminated or rescinded by the Board.

SPECIAL CIVIL AIR REGULATION No. SR-432

Effective: May 30, 1959
Issued: May 26, 1959

Carriage of Persons Other Than "Crew Members" and "Passengers" Aboard All-Cargo Aircraft

Recently there has been a great increase in the demand for the transportation by air of classified or special cargo, as well as the shipment of deceased members of the Armed Forces. This transportation frequently requires the presence of persons other than crew members such as guards, escorts, couriers, or attendants aboard the airplane to serve as security or honor guards for shipments made by the U.S. Government.

For a number of years it has been the general practice in cargo operations to carry animal attendants, or other attendants necessary for the safety of the airplane, as crew members while in the performance of such duties. However, guards or escorts of classified or special cargo, including those of the U.S. Government, are considered as passengers when their presence is not necessary for the safe operation of the airplane being used for the carriage of the particular cargo. Similarly, when cargo attendants are carried aboard the cargo airplane to or from their specific duty assignments, they may be considered in the category of passengers. As a consequence, the cargo airplane becomes subject to the passenger operation rules which differ from the cargo operation rules primarily with respect to fire prevention requirements, allowable weights, and performance limitations. Compliance with these requirements by an air carrier when such persons are assigned specific duties in connection with cargo in an all-cargo airplane places an unreasonable burden upon air carriers engaging in such operations, since such individuals should not and were not intended to fall within the normally accepted category of air carrier passengers.

In view of the foregoing it appeared desirable to exclude from the passenger category certain persons authorized to perform a specific duty in connection with cargo being carried aboard a cargo airplane while in the performance of such duty, or while traveling to or from such duty assignment aboard such cargo airplane. Associated with the objective of authorizing carriage of these special cargo attendants aboard cargo airplanes without compliance with the passenger-carrying requirements was the problem of suitable seats and seat belts for these persons. Since it was apparent that in many cargo airplanes there would not be suitable seats in the cargo compartment, it appeared desirable to permit such persons to be seated on the flight deck.

To accomplish this it was proposed in Civil Air Regulations Draft Release No. 58-16, dated August 29, 1958 (23 F.R. 6836) to define passenger- and cargo-carrying airplanes, the effect of which was to permit cargo-carrying airplanes to carry certain cargo attendants without complying

with the passenger-carrying airplane requirements, and to amend the admission to flight deck requirements to permit the admission and seating of these persons on the flight deck when seats were not otherwise available in the airplane.

Although the draft release proposed to accomplish this by amendments to Parts 40, 41, and 42 it has been determined that in view of the fact that Parts 40 and 41 are primarily used for passenger operations it would be more appropriate to cover these special conditions of operations under a Special Civil Air Regulation than to amend the individual parts concerned.

Comments received on the draft release were favorable to the proposal although certain recommendations were made to give the pilot in command complete discretion with respect to admitting cargo attendants to the flight deck and to require that seats be made available at a point separate from the flight deck.

On the question of a suitable seat and safety belt for special cargo attendants separate from the flight deck, it is to be noted that many cargo compartments, due to their design and intended functions, either do not have seats for occupants or are not suitable for extended occupancy. Consequently, to achieve the objective of this regulation it has been determined that such cargo attendants must be authorized to enter and be seated elsewhere on the airplane when they otherwise qualify to be aboard a cargo airplane and a seat is not available or suitable in the cargo compartment. Therefore, this Special Civil Air Regulation permits such cargo attendants to be seated on the flight deck as well as in the cargo compartment, if such seat is located so as to preclude interference with the flight crew members in the performance of their duties. In any event authority must be obtained from the pilot in command for such cargo attendants to be admitted to the flight deck.

Interested persons have been afforded an opportunity to participate in the making of this rule, and due consideration has been given to all relevant matter presented. Since this special regulation relaxes a present restriction, it may be made effective on less than 30 days notice.

In consideration of the foregoing, the following Special Civil Air Regulation is hereby promulgated to become effective May 30, 1959.

1. Contrary provisions of Part 40, 41, or 42 of the Civil Air Regulations notwithstanding, the following persons, when duly authorized by the air carrier, may be carried aboard an airplane engaged in the carriage of cargo only without compliance with the passenger-carrying or passenger-service airplane requirements of those parts:

(a) A person performing a specific duty assignment aboard an airplane in connection with the safety of the flight, or the safe carriage of animals, or radioactive materials within the meaning of and subject to the requirements of section 49.2 of Part 49 of this subchapter; or while traveling to or from such duty assignment where the air carrier finds that other means of transportation are not practicable; and

(b) A person performing duty as a security or honor guard aboard an airplane for shipments made by or under the authority of the Federal Government.

2. An approved seat with safety belt shall be available for the use of the persons described in paragraph 1. The location of the seat shall be such that the occupant will not be in a position to interfere with the flight crew members in the performance of their duties.

3. Persons described in paragraph 1 may be admitted to the flight deck of the airplane when authorized by the pilot in command.

SPECIAL CIVIL AIR REGULATION No. SR-436

Effective: February 15, 1960*
Issued: January 7, 1960

Airborne Weather Radar Equipment Requirements for Airplanes Carrying Passengers

In a notice of rule making published in the Federal Register (24 F.R. 5847) and circulated as Draft Release No. 59-10, dated July 15, 1959, the Federal Aviation Agency proposed to amend Parts 40, 41, and 42 of the Civil Air Regulations to require airborne weather radar to be installed on all aircraft certificated under the transport category rules and carrying passengers. Operationally, it was proposed to require that such radar equipment be in operation for all IFR flights, and for night VFR flights when thunderstorms or severe weather conditions were forecast for the flight plan route during the time of flight.

In commenting upon the draft release, the Air Line Pilots Association was strongly in favor of the proposal and recommended its extension to all large aircraft engaged in air transportation.

Comments from representatives of the scheduled trunkline carriers recognized the desirability of having airborne weather radar on aircraft but opposed the mandatory requirement of such equipment by regulation.

Comments from local service air carriers, or their representatives, were generally opposed to any requirement for radar equipment on airplanes certificated in the nontransport category or for airplanes such as the DC-4 or C-46 certificated in the transport category, which are the type of airplanes being used by such air carriers.

As stated in the draft release, a recent survey of air carrier aircraft accidents for the calendar years 1950 through 1958 has indicated the importance of airborne weather radar as a safety measure in preventing aircraft accidents during certain severe weather conditions. The value of airborne weather radar as an aid to the safety of flight is further supported by the fact that a considerable number of air carrier airplanes are presently equipped with such radar and provisions have been made for the installation of such equipment on practically all new transport-type airplanes. It is considered particularly significant that at least one large air carrier presently has its entire fleet of airplanes fully equipped with airborne weather radar and during a two-year period has not experienced a single passenger or crew injury or any appreciable airplane damage due to thunderstorms or hail. Moreover, the air carrier has completed a high percentage of scheduled trips. As experience has indicated, radar equipment contributes to greater safety in passenger operations, since it facilitates the early detection and location by the pilot of certain areas of severe turbulence and enables him to avoid such areas or to take such other action as may be necessary in the interest of safety.

*Except as otherwise specified in this Special Regulation.

In view of the foregoing, the Administrator has concluded that, in the interest of safety, approved airborne weather radar should be made a required item of equipment at the earliest practicable date for transport category airplanes used in passenger operations under the provisions of Parts 40, 41, or 42 of the Civil Air Regulations, with the exception of Curtiss-Wright C–46 airplanes. The C–46 has been specifically exempted since it was not originally certificated under transport category rules. The notice of proposed rule making did not make this point clear.

The draft release proposed to allow 6 months for the procurement and installation of required radar equipment. However, in consideration of comments received and upon further investigation, the problems associated with the procurement and installation of the airborne radar equipment reasonably appear to require a longer period of time for the industry to comply with this regulation. The airlines have stated that the installation of the airborne radar equipment requires approximately 1,450 hours per airplane and some airplanes may require more time because of necessary modifications. Also, the manufacturers may not be able to furnish the total number of airborne radar units for all airplanes within the proposed six-month period. These problems, together with the problems associated with the scheduling of airplanes for maintenance and overhaul, as well as for the installation of airborne radar equipment, have been considered in establishing the time allowed for the industry to meet this regulation. Upon these considerations the Administrator has determined that except for turbine-powered airplanes, a greater period of time should be allowed for the orderly procurement and installation of required equipment in order to avoid imposing any undue hardship upon operators of airplanes who are subject to this regulation. Accordingly, July 1, 1960, has been established as the date after which approved airborne weather radar will become required equipment for all turbine-powered airplanes used in the carriage of passengers under the provisions of Parts 40, 41, or 42 of the Civil Air Regulations. Since all turbine-powered aircraft subject to this regulation are, with very few exceptions, now equipped or are scheduled to be equipped with airborne weather radar prior to July 1, 1960, it appears that this compliance date will provide an adequate period of time to procure the required equipment and install it in those few remaining turbine-powered aircraft. January 1, 1961, has been established as the compliance date for certain other transport category airplanes specified in section 1(b) and used in passenger operations. Since approximately 80 percent of such airplanes used in passenger operations already have radar equipment installed, it appears that the January 1, 1961, compliance date will provide the operators with an adequate period of time to procure the required equipment and install it in the balance of such airplanes. After Janaury 1, 1962, approved airborne weather radar will be required equipment for the remaining airplanes certificated under the transport category rules, except for Curtiss-Wright C–46 airplanes, and used in passenger operations under Parts 40, 41, or 42 of the Civil Air Regulations.

For the information of the operators, a note has been added to section 1(c) to indicate some of the transport category airplanes in current use which will have to have such equipment by January 1, 1962.

Technical Standard Order C–63, adopted by the Administrator, effective December 1, 1959 (24 F.R. 9262), contains the minimum performance standards for the approval of airborne weather radar equipment required by this regulation. Under the provisions of this Technical Standard Order, airborne weather radar equipment approved prior to the effective date of that order will also be approved for installation under this regulation.

To provide for the accomplishment of an orderly installation of the required airborne weather radar equipment, each operator conducting passenger operations under the provisions of Parts 40, 41, or 42 of the Civil Air Regulations is required by section 2 of this regulation to establish a schedule for the progressive completion of such radar installations on its transport category airplanes on or before the dates specified therein. On or before July 1, 1960, a copy of the schedule required by paragraph (a) of section 2 shall be submitted to an authorized representative of the Administrator, together with a list of any airplanes the operator intends to discontinue using in the carriage of passengers prior to the date on which radar equipment must be installed.

Equipment requirements for dispatch and continuation of flight are described in section 3 of this regulation. Draft Release 59–10 proposed to require the radar equipment to be in operation for all IFR operations, and for night VFR operations when thunderstorms or severe weather conditions were forecast for the flight plan route during the time of flight. However, in the light of comments received, it appears that the original proposal would be unreasonably restrictive. Accordingly, the original proposal has been modified so as to bring the dispatch rule into accord with the capabilities of the radar equipment required to be installed. Thus, the dispatching rule prescribed herein provides that no airplane subject to this regulation shall be dispatched under IFR or night VFR conditions when current weather reports indicate that thunderstorms, or other potentially hazardous weather conditions detectable by airborne weather radar, may reasonably be expected to be encountered along the route to be flown, unless the approved airborne weather radar equipment is in a satisfactory operating condition. Should such equipment become inoperative en route, the airplane must be operated in accordance with the instructions and procedures specified in the operations manual for such occurrence. It should be noted that these dispatch and en route rules will apply after March 31, 1960, to all transport category airplanes subject to this regulation that have approved airborne weather radar equipment installed even though such equipment is not required to be installed until a later date. It should also be noted that approval of the instructions and procedures for the continuation of flight, in the event the radar equipment becomes inoperative en route, will be required at such time as the particular aircraft is required to have approved airborne weather radar equipment installed. In order to permit adequate time for the review of such instructions and procedures the operator should submit them to the assigned air carrier inspector at least 30 days prior to the required approval date. In this regard, the Federal Aviation Agency expects all air carrier aircraft not equipped with airborne weather radar to be operated strictly in accordance with procedures specified in the air carrier's operations manual,

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when there is a possibility of encountering potentially hazardous weather conditions.

Section 4 expressly exempts from the provisions of this regulation airplanes used for the carriage of passengers solely within the States of Alaska and Hawaii. These operations have been excluded because thunderstorms and other potentially hazardous meteorological conditions detectable by radar rarely occur in those areas. The language of section 4 also makes it clear that the provisions of this regulation are not intended to be applicable to a transport category airplane during the conduct of a bona fide all-cargo, training, test, or ferry flight.

It will be noted that helicopters have not been made subject to this regulation. Upon further consideration of the original proposal, the Administrator has concluded that the installation of radar equipment is not a necessary safety requirement for helicopters at this time. Finally, attention is directed to the fact that large nontransport category airplanes presently being used in passenger service have been omitted from the list of airplanes subject to this regulation, as for example, C–46, DC–3 and L–18 type airplanes. However, the Federal Aviation Agency will continue to give active consideration to the necessity of requiring approved radar equipment to be installed on such airplanes.

This special regulation is being promulgated in lieu of individual amendments to Parts 40, 41, and 42 of the Civil Air Regulations because such a regulation is considered the most expedient method of implementing the original proposal.

Interested persons have been afforded an opportunity to participate in the making of this regulation (24 F.R. 5847), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Administrator of the Federal Aviation Agency hereby makes and promulgates the following Special Civil Air Regulation:

1. *Airborne weather radar equipment requirement.* After the dates specified, the following transport category airplanes shall not be used for the carriage of passengers under the provisions of Parts 40, 41, or 42 of the Civil Air Regulations, unless approved airborne weather radar equipment is installed in such airplanes:

(a) July 1, 1960, for all turbine-powered airplanes certificated under the transport category rules.

(b) January 1, 1961, for the airplane types listed below:
Douglas DC–7 Series,
Douglas DC–6 Series, and
Lockheed 1049 and 1649 Series.

(c) January 1, 1962, for all airplanes certificated under the transport category rules, except C–46 type airplanes.

NOTE: Airplanes subject to the provisions of paragraph (c) of this section include, but are not limited to, the following types: Boeing 377; Convair 240, 340, and 440; Lockheed 049 and 749; Martin 202 and 404; and Douglas DC–4.

2. *Schedule for installation of equipment.*

(a) Each operator conducting passenger operations under the provisions of Parts 40, 41, or 42 of the Civil Air Regulations with transport category airplanes on which airborne weather radar is not installed, shall establish a schedule for the progressive completion of

such radar installations, in accordance with the provisions of section 1 of this regulation. The schedule shall provide for the completion of all required radar installations on or before the dates specified in section 1 of this regulation, and the completion of at least 40 percent of the required installations on or before the following dates:

(1) August 1, 1960, for airplanes of the types specified in section 1(b), and

(2) February 1, 1961, for airplanes of the types specified in section 1(c).

(b) On or before July 1, 1960, a copy of the schedule required by paragraph (a) of this section shall be submitted to an authorized representative of the Administrator, together with a list of any airplanes the operator intends to discontinue using in the carriage of passengers prior to the date on which radar equipment must be installed.

3. *Requirement for dispatch and continuance of flight.* After March 31, 1960, all transport category airplanes having approved airborne weather radar installed shall be operated in accordance with the following rules when used in passenger operations under Parts 40, 41, or 42:

(a) *Dispatch.* No airplane shall be dispatched (or flight of an airplane started under the provisions of Part 42) under IFR or night VFR conditions when current weather reports indicate thunderstorms, or other potentially hazardous weather conditions which can be detected by airborne weather radar, may reasonably be expected to be encountered along the route to be flown, unless approved airborne weather radar equipment is installed in the airplane and is in a satisfactory operating condition.

(b) *En route.* In the event the airborne weather radar becomes inoperative en route, the airplane shall be operated in accordance with the instructions and procedures specified in the operations manual for such occurrence. After the date specified by section 1 of this regulation for the mandatory installation of approved airborne weather radar on the type of airplane involved, such instructions and procedures shall meet with the approval of an authorized representative of the Administrator.

4. *Exceptions.* The provisions of this regulation shall not apply to those airplanes used solely within the States of Alaska or Hawaii, or during all-cargo, training, test, or ferry flights.

5. *Effective date.* Except as otherwise specified, this regulation shall become effective February 15, 1960.

Appendix B

Air Taxi Operators

42.0–2 *Provisions of Part 42 which are applicable to air taxi operators (FAA interpretations which apply to sec. 42.0 and SR–395A).*

(a) Under SR–395A, the following sections of the certification and operation rules of Part 42 apply to air taxi operators:

42.0 Applicability of Part 42 (a).
42.1 Definitions.
42.5 Certificate issuance.
42.7 Display.
42.8 Inspection.
42.11 Aircraft required.
42.14 Minimum performance requirements for all aircraft.
42.16 Aircraft limitations for IFR and land aircraft over water operations.
42.21 Basic required instruments and equipment for aircraft.
42.24a First aid kits and emergency equipment.
42.24b Equipment for overwater operations.
42.24c Emergency evacuation equipment.
42.25 Cockpit checklist.
42.26 Supplemental oxygen.
42.28 Equipment standards.
42.29 Protective breathing equipment for the flight crew.
42.30 General. (Maintenance requirements.)
42.31 Inspections and maintenance. (a) (2), (b).
42.40 Airman requirements.
42.41 Composition of flight crew. (a), (b), (c).
42.42 Pilot qualification for small aircraft.
42.44 Recent flight experience requirements for flight crew members.
42.46 Logging flight time.
42.47 Grace period for airman periodic checks.
42.51 Pilot responsibilities.
42.52 Fuel supply. (a) (1), (3), (b).
42.53 Minimum flight altitude rules.
42.54 Flight into known icing conditions.
42.55 Weather minimums.
42.56 Instrument approach.
42.57 Airport lighting for night operations.
42.58 Navigational aids for IFR flight.
42.59 Passenger use of emergency equipment.
42.62 Flight manifest for large aircraft and passenger-carrying aircraft operating under IFR conditions.
42.91 Maintenance records.
42.92 Airman records.
42.93 Emergency flight reports.
42.94 Pilot's emergency deviation report.
42.95 Flight manifest record.
42.96 Reporting of malfunctioning and defects.

(b) The following sections of CAM 42 are applicable to the provisions of Part 42 listed in paragraph (a):

42.1–1 Flight time (*FAA interpretations which apply to sec. 42.1*).
42.1–2 Twilight (*FAA interpretations which apply to sec. 42.1*).
42.11–1 Listing of aircraft (*FAA rules which apply to sec. 42.11 (a)*).
42.21–1 Seats and safety belts (*FAA rules which apply to sec. 42.21 (a) (11)*).
42.21–2 Fire extinguishers (*FAA rules which apply to sec. 42.21 (a) (12)*).

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42.21–3 Altimeter (*FAA policies which apply to sec. 42.21 (b) (1)*).
42.24a–1 First-aid kits and emergency equipment (*FAA policies which apply to sec. 42.24a*).
42.24b–1 Survival kit for overwater operations (*FAA policies which apply to sec. 42.24 (b)*).
42.25–1 Cockpit check list (*FAA policies which apply to sec. 42.25*).
42.25–2 Minimum standard cockpit check list (*FAA policies which apply to sec. 42.25*).
42.30–1 General (Maintenance) (*FAA policies which apply to sec. 42.30*).
42.31–4 Maintenance and inspection records (*FAA policies which apply to sec. 42.31 (b)*).
42.51–2 Responsibilities of the pilot in command (*FAA policies which apply to sec. 42.51*).
42.51–3 Time of reporting for duty (*FAA policies which apply to sec. 42.51 (b)*).
42.51–4 Flight equipment (*FAA policies which apply to sec. 42.51 (c)*).
42.51–5 Serviceability of equipment (*FAA policies which apply to sec. 42.51 (e)*).
42.52–1 Operation in the Territory of Alaska (*FAA policies which apply to sec. 42.52 (a)*).
42.54–1 Other parts of the aircraft (*FAA interpretations which apply to sec. 42.54*).
42.55–2 Air traffic clearance (*FAA interpretations which apply to sec. 42.55 (a)*).
42.56–1 Standard instrument approach procedures (*FAA rules which apply to sec. 42.56*).
42.57–1 Minimum facilities (*FAA policies which apply to sec. 42.57*).
42.58–1 Off-airway instrument operation (*FAA rules which apply to sec. 42.58*).
42.62–1 Content of flight manifest (*FAA policies which apply to sec. 42.62*).
42.91–1 Content of maintenance records (*FAA policies which apply to sec. 42.91*).
42.91–3 Retention of records (*FAA policies which apply to sec. 42.91*).
42.92–1 Content of airman records (*FAA policies which apply to sec. 42.92*).
42.92–2 Availability of records (*FAA policies which apply to sec. 42.92*).
42.92–3 Retention of records (*FAA policies which apply to sec. 42.92*).
42.93–1 Submission of emergency flight reports (*FAA policies which apply to sec. 42.93*).
42.94–1 Submission of pilot's emergency deviation report (*FAA policies which apply to sec. 42.94*).

(c) In addition to the items listed in (a) and (b), air taxi operators are governed by the following regulations:

(1) Economic Regulations Part 298.

(2) Economic Regulations Part 242, if aircraft having more than five passenger seats are used.

42.0–3 *Operations for which an Air Taxi Operator Certificate is not required* (*FAA interpretations which apply to sec. 42.0 and SR–395A*). The following operations which may involve remuneration are not considered as coming within the meaning of carriage by aircraft of persons or property as an air taxi operator:

(a) Student instruction.

(b) Local sightseeing flights which return to the point of departure without landing at other points.

(c) Any crop dusting, spraying, seeding, pest control, or other agricultural operations.

(d) Any industrial aviation operations such as patrol, photography, banner towing, etc.

(e) Any other aviation operation when the carriage of persons or materials is incidential to the main purpose of the flight.

42.5–5 *Application for an Air Taxi Operator Certificate* (*FAA rules which apply to sec. 42.5 and SR–395A*). Application for an Air Taxi Operator Certificate shall be made in triplicate on form ACA–1602, provided for this purpose by the Administrator. The application form may be obtained by contacting the local inspector or district office. When the requirements, as prescribed in this part, have been met (see sec. 42.0–2), the applicant shall present his application to the local inspector and arrange for an inspection of his flight equipment and all ground facilities.

Where inspection indicates that the applicant is capable of conducting the proposed operation in accordance with the provisions of 42.0–2, an Air Taxi Operator Certificate, form ACA–1603, will be issued, together with operations specifications. The operations specifications which have been approved on the application form become a part of the certificate, and specify the carriage of passengers, cargo, or both; the category and class of aircraft (e. g., aircraft single-engine land); and the flight conditions under which operations are authorized (e. g., VFR (day), VFR (night), IFR (day), IFR (night).

42.5–6 *Amendment and reissuance of Air Taxi Operator Certificates* (*FAA rules which apply to sec. 42.5*). Application for amendment and reissuance of an Air Taxi Operator Certificate shall be made, in accordance with procedure for original issuance, when the operator desires a change in:

(a) Name of address of operator.

(b) Ownership.
(c) Area of operations.
(d) Base of operations.
(e) Type of operations.

In cases of (a), (b), and (c) the inspector may elect to inspect the aircraft as for original issuance.

In cases of (d) the inspector may elect to inspect the aircraft if the base of operations is not moved out of the region of previous certification. Inspection will be made and a new certificate and number will be issued when the base is moved to another region.

In cases of (e) inspection as for original issuance will be made.

42.5–8 *International air taxi operations (FAA policies which apply to sec. 42.5 and SR–395A).* (a) Air taxi operators who wish to conduct commercial operations into, or over, foreign countries should obtain prior authorization to conduct such operations from all of the foreign countries involved.

NOTE: For commercial operations into Canada, or Mexico, requests for authorization should be directed as follows:

Canada: Department of Transport
Air Transport Board
Ottawa, Canada

Mexico: Director
General Civil Aviation
Mexico, D. F.

(Published effective June 15, 1957.)

42.11–2 *Listing of small aircraft (FAA interpretations which apply to sec. 42.11).* An air taxi operator is required to have the exclusive use of at least one aircraft. However, such aircraft are not required to be listed on the operations specifications of air carrier operating certificates issued to air taxi operators. Therefore, no amendment of the certificate is required when an air taxi operator changes aircraft.

Appendix C

Civil Air Regulations Amendments

CIVIL AIR REGULATIONS AMENDMENT 42–23

Effective: January 1, 1961*
Issued: December 1, 1959

Approval of Air Carrier Training Programs; Qualification of Pilots Other Than Pilots in Command; Proficiency Checks for Pilots Other Than Pilots in Command

The Federal Aviation Agency published as a notice of rule making (24 F.R. 5246) and circulated as Civil Air Regulations Draft Release No. 59–3, dated June 25, 1959, a proposal to amend Part 42 of the Civil Air Regulations to require: (1) FAA approval of air carrier training programs, (2) appropriate aircraft ratings for pilots serving as other than pilots in command, and (3) more specific initial training and recurrent proficiency checks for pilots serving as other than pilots in command.

Interested persons have been afforded an opportunity to participate in the making of this amendment and due consideration has been given to all relevant matter presented. Because of the importance of this amendment, each portion thereof has been evaluated in the light of such comments.

(1) *FAA approval of air carrier training programs.* The air carriers commenting on this portion of the proposal expressed strong opposition to it. Briefly, the air carriers contend that the present regulatory scheme for the establishment of methods and procedures for crew member training programs has been adequate and that no justification has been shown for requiring FAA approval of such programs. The Federal Aviation Agency is unable to agree with these contentions.

It must be emphasized that the training program is one of the most important factors in the safety of air carrier operations. The quality and scope of such programs are the key to insuring that all crew members are competent to perform their duties with the high degree of skill expected and required in air carrier operations. Under the provisions of the present regulation, the air carriers are given discretion in establishing "adequate" or "appropriate" training, or "training as necessary." As a result some air carriers have prepared and are administering excellent training programs. However, others have not achieved the minimum safety objective sought by the training requirements of section 42.45. While the methods and procedures employed by the various air carriers in their training programs may differ to fit the particular operation of each air carrier, each training program must provide a uniform and minimum standard of flight and ground training necessary for safety in air transportation. Experience in the administration of the present regulations shows that this standard can only be achieved by FAA approval of each training program.

*Except as otherwise provided in section 42.45g.

Accordingly, because of the vital importance which the air carrier training program has to safety in air carrier operations, each air carrier subject to this part will be required to obtain approval of its training program by a representative of the Administrator.

Part 42 presently requires each air carrier to establish a training program sufficient to insure that each crew member used by the air carrier is adequately trained and maintains adequate proficiency to perform the duties to which he is to be assigned. However, Part 42 does not contain sufficient guidance to the air carrier with respect to ground and flight training requirements which should be included in the training program in order to obtain FAA approval. Accordingly, pertinent training program requirements similar to those in Part 40 are being prescribed in Part 42 by this amendment.

This final regulation will not alter the responsibility which each air carrier has at present for the preparation and administration of its training program. However, each air carrier will be required to submit its training program, and subsequent changes thereto, to the Federal Aviation Agency for prior approval.

(2) *Initial training qualifications of pilots other than pilots in command.* The complexity of modern aircraft and the operational demands of today's navigation, communication, and air traffic control systems require a high level of skill and competence for air carrier copilots. Many of the functions which are required of the copilot, particularly with respect to emergency procedures, must be performed properly or the safety of the flight may be seriously affected. In addition, in the event that the pilot in command becomes incapacitated during flight, the copilot must possess adequate knowledge and skill to fly the aircraft safely to a destination.

In order to properly determine the ability of the copilot to operate a particular type of aircraft, it was proposed in Draft Release 59–3 to provide for the issuance of appropriate aircraft type ratings for all pilots serving as other than pilot in command, or as second in command of an aircraft requiring three or more pilots.

Part 42 currently provides for two different types of pilot crew complements: Namely, (a) a two-pilot crew and (b) a three or more pilot crew. With respect to the two-pilot crew, upon reevaluation of the original proposal in light of comments received, it appears that the objective of the original proposal can be achieved without requiring the second in command in a two-pilot crew to obtain an appropriate aircraft type rating, provided adequate flight training for such a pilot is provided in the initial and recurrent training requirements of this part and is part of the training program approved by the Administrator.

Accordingly, the original proposal has been modified in this regulation by omitting the aircraft type rating requirement for the second in command in a two-pilot crew. In lieu of a type rating this regulation prescribes in section 42.45b(c) certain minimum maneuvers and procedures in which it is considered necessary that pilots serving as second in command in a two-pilot crew be proficient, and requires that they receive instructions and practice in such maneuvers and procedures during initial flight training.

The term "second in command," is used in lieu of second pilot in this regulation in order that the air carrier rules of Parts 40, 41, and 42 will contain uniform terminology with respect to the copilot function. In this regard, it will be noted that an appropriate definition of "second in command" is added to this regulation and that the term second in command has been substituted for the term second pilot in section 42.43(b).

With regard to an operation requiring a crew combination of three or more pilots, Part 42 presently provides that the pilot in command and second in command shall hold valid airline transport pilot certificates and ratings for the aircraft when serving in such a crew combination. Since the pilot designated as second in command in a crew requiring three or more pilots is required by the present regulations to have the same basic qualifications as the pilot in command, it is deemed reasonable to require such second in command to be initially trained on the aircraft to a degree of proficiency commensurate to that of the pilot in command. Accordingly, the provisions of this amendment require a pilot serving as second in command in an operation requiring three or more pilots to comply with the same initial training requirements as apply to the pilot in command.

With respect to pilots other than the pilot in command and second in command in a crew complement requiring three or more pilots, the original proposal has been modified so as not to require such pilots to obtain an aircraft type rating. In lieu of a type rating, this regulation requires in the interest of safety that such pilots accomplish the initial training prescribed in section 42.45b(a). In this connection it should be understood that such pilots will not be required to comply with the training requirements specifically applicable to a pilot in command, or a second in command serving in a crew requiring 3 or more pilots.

(3) *Proficiency checks for pilots other than pilots in command.* In order to make certain that all pilots serving as second in command are initially proficient and continue to maintain their proficiency to pilot and navigate, and to perform their duties on, aircraft to which they are assigned for duty, it was proposed in Draft Release 59–3 to require proficiency checks to be given such pilots prior to their initial assignment to duty and twice each 12 months thereafter by a check pilot or a representative of the Administrator.

Although the air carriers were opposed to this requirement, the Agency remains firm in its belief that in order to make certain that all pilots serving as second in command are initially proficient and continue to maintain such proficiency, they must be given a proficiency check by a designated check pilot or a representative of the Administrator. However, upon reconsideration of the original proposal in the light of comment received, the Administrator has concluded that an adequate level of safety will be maintained if such proficiency checks are given only once each 12 months to pilots serving as second in command. Accordingly, such requirements are reflected in this amendment.

In Draft Release 59–3, it was proposed to include in the proficiency check at least the takeoffs and landings and other flight maneuvers

generally covered in section 42.45b(a). However, the original proposal is being modified by this amendment to provide that the proficiency check for the second in command of a two-pilot crew shall include an oral or written equipment examination, and at least the procedures and flight maneuvers specified in new section 42.45b(c)(1).

The original proposal is also modified with respect to the second in command of a crew requiring three or more pilots to require the second in command to take the same proficiency check as is presently required for a pilot in command, except that the second in command is required to take the proficiency check only once each 12 months.

Comment received indicated that interested persons opposing Draft Release 59–3 believed the proposal would require copilots to acquire and demonstrate the same level of proficiency as is presently required of pilots in command. The Administrator wishes to make it clear that identical proficiency standards will not be required for such pilots. Under the provisions of Part 42 a pilot assigned to duty on an aircraft as second in command in a two-pilot crew is presently required to hold a commercial pilot certificate and instrument rating, whereas a pilot in command is required to hold the higher rating of an airline transport certificate with appropriate aircraft type ratings. Accordingly, in view of this difference in the certification requirements, pilots serving as second in command in two-pilot crews will not be held to the high degree of skill required of a pilot in command. However, they will be required to demonstrate that they possess the knowledge and skill to perform their duties as a copilot safely and efficiently, and to navigate and pilot the airplane to which they are assigned safely to a destination in the event the pilot in command becomes incapacitated during flight.

This final regulation is so drafted as to permit the air carriers to use the flight crew method of training and checking pilots. Air carriers utilizing the flight crew method have found that it has economic advantages over the method of training and checking crew members individually and is an effective method of standardizing training. Although initial flight training and some proficiency check maneuvers will make it necessary in the interest of safety for the check pilot to occupy one of the pilot positions, it is believed that many maneuvers can be conducted safely using the flight crew concept of training and checking pilots.

This regulation is being made effective January 1, 1961. This effective date will allow air carriers subject to Part 42 sufficient time in which to obtain FAA approval of their training programs and to accomplish the initial demonstration check of pilots other than pilot in command required by this amendment. However, each air carrier will be required to submit its training program to the FAA for approval not later than May 1, 1960.

Although compliance with the requirements prescribed in this amendment may result in some additional costs to the air carriers, it appears that such costs are outweighed by the considerations of safety involved.

In consideration of the foregoing, the Federal Aviation Agency hereby amends Part 42 of the Civil Air Regulations (14 CFR Part 42, as amended) as follows:

1. By adding a definition to section 42.1 to read as follows:

42.1 *Definitions.*

Second in command. Second in command means a pilot other than the pilot in command who is designated by the air carrier to act as second in command of an airplane.

2. By deleting the words "second pilot" in the title and first sentence of section 42.43(b), and by adding in lieu thereof the words "Second in command".

3. By adding a new sentence at the end of section 42.43(c) to read as follows: "All other pilots shall meet the requirements of subparagraphs (1) and (2) of paragraph (b) of this section."

4. By amending section 42.44(a) (2) and (3) to read as follows:

42.44 *Recent flight experience requirements for flight crew members.*

(a) *Pilots.* * * *

(2) *Proficiency check for pilot in command on large aircraft.* An air carrier shall not utilize a pilot as pilot in command until he has satisfactorily demonstrated to a check pilot or a representative of the Administrator his ability to pilot and navigate airplanes to be flown by him. Thereafter, he shall not serve as pilot in command unless each 6 months he successfully completes a similar pilot proficiency check. The proficiency check may be given at any time during the month preceding or following the month in which it becomes due. The effective date of the check, if given within the preceding or following month, shall be the same as if given within the month in which it became due. Where such pilots serve in more than one airplane type, at least every other successive proficiency check shall be given in flight in the larger airplane type. The pilot proficiency check shall include at least the following:

(i) The flight maneuvers specified in section 42.45b(b)(1), except that the simulated engine failure during takeoff need not be accomplished at speed V_1, nor at actual or simulated maximum authorized weight.

(ii) Flight maneuvers approved by the Administrator accomplished under simulated instrument conditions utilizing the navigational facilities and letdown procedures normally used by the pilot: *Provided,* That maneuvers other than those associated with approach procedures for which the lowest minimums are approved may be given in a synthetic trainer which contains the radio equipment and instruments necessary to simulate other navigational and letdown procedures approved for use by the air carrier.

(iii) Prior to serving as pilot in command in a particular type of airplane, a pilot shall have accomplished during the preceding 12 months a proficiency check in that type of airplane.

(3) *Proficiency checks, second in command on large aircraft.* An air carrier shall not utilize a pilot as second in command until he has satisfactorily demonstrated to a check pilot or a representative of the Administrator his ability to pilot and navigate airplanes to be flown by him and to perform his assigned duties. Thereafter, he shall not serve as second in command unless each 12 months he successfully com-

pletes a similar pilot proficiency check. The proficiency check may be given at any time during the month preceding or following the month in which it becomes due. The effective date of the check, if given within the preceding or following month, shall be the same as if given within the month in which it became due. Where such pilots serve in more than one airplane type, at least every other successive proficiency check shall be given in flight in the larger airplane type. The proficiency check shall include at least an oral or written equipment examination, and the procedures and flight maneuvers specified in section 42.45b(c)(1). The pilot proficiency check may be demonstrated from either the right or left pilot seat.

(i) The proficiency check for the second in command of a crew requiring 3 or more pilots shall be the same as required under subparagraph (2) of this paragraph.

(ii) Subsequent to the initial pilot proficiency check, an approved course of training in an aircraft simulator which meets the requirements of subparagraph (4) of this paragraph if satisfactorily completed may be substituted at alternate 12-month intervals for the proficiency check required by this subparagraph.

(iii) Satisfactory completion of the proficiency check in accordance with the requirements of subparagraph (2) of this paragraph will also meet the requirements of this subparagraph.

5. By amending section 42.45 and adding new sections 42.45a through 42.45h to read as follows:

42.45 *Training requirements for crew members serving on large aircraft.*

(a) Each air carrier shall establish a training program sufficient to insure that each crew member used by the air carrier is adequately trained to perform the duties to which he is to be assigned. The initial training phases shall be satisfactorily completed prior to serving in passenger or cargo operations.

(b) Each air carrier shall be responsible for providing adequate ground and flight training facilities and properly qualified instructors. There also shall be provided a sufficient number of check airmen to conduct the flight checks required by this part. Such check airmen shall hold the same airman certificates and ratings as are required for the airman being checked.

(c) The training program for each flight crew member shall consist of appropriate ground and flight training including proper flight crew coordination. Procedures for each flight crew function shall be standardized to the extent that each flight crew member will know the functions for which he is responsible and the relation of those functions to those of other flight crew members. The initial program shall include at least the appropriate requirements specified in sections 42.45a through 42.45e.

(d) The crew member emergency procedures training program shall include at least the requirements specified in section 42.45e.

(e) The appropriate instructor, supervisor, or check airman responsible for the particular training or flight check shall certify to the proficiency of each crew member upon completion of his training, and such certification shall become a part of the individual's record.

42.45a *Initial pilot ground training.*

Ground training for all pilots shall include instruction in at least the following:

(a) The appropriate provisions of the air carrier operations specifications and appropriate provisions of the regulations of this subchapter with particular emphasis on the operation rules and airplane operating limitations;

(b) Appropriate contents of the manuals;

(c) The duties and responsibilities of crew members;

(d) The type of airplane to be flown, including a study of the airplane, engines, all major components and systems, performance limitations, standard and emergency operating procedures, and appropriate contents of the approved Airplane Flight Manual;

(e) The principles and methods of determining weight and balance limitations for takeoff and landing;

(f) Navigation and use of appropriate aids to navigation, including the instrument approach facilities and procedures which the air carrier is authorized to use;

(g) Airport and airways traffic control systems and procedures, and ground control letdown procedures if pertinent to the operation;

(h) Meteorology sufficient to insure a practical knowledge of the principles of icing, fog, thunderstorms, and frontal systems; and

(i) Procedures for operation in turbulent air and during periods of ice, hail, thunderstorms, and other potentially hazardous meteorological conditions.

42.45b *Initial pilot flight training.*

(a) Flight training for each pilot shall include at least takeoffs and landings, during day and night, and normal and emergency flight maneuvers in each type of airplane to be flown by him in passenger or cargo flights, and flight under simulated instrument flight conditions.

(b) Flight training for a pilot qualifying to serve as pilot in command or as second in command in a crew requiring three or more pilots shall include flight instruction and practice in at least the following maneuvers and procedures:

(1) In each type of airplane to be flown by him:

(i) At the authorized maximum takeoff weight, takeoff using maximum takeoff power with simulated failure of the critical engine. For transport category airplanes the simulated engine failure shall be accomplished as closely as possible to the critical engine failure speed (V_1), and climbout shall be accomplished at a speed as close as possible to the takeoff safety speed (V_2). Each pilot shall ascertain the proper values for speeds V_1 and V_2;

(ii) At the authorized maximum landing weight, flight in a four-engine airplane, where appropriate, with the most critical combinations of two engines inoperative, or operating at zero thrust, utilizing appropriate climb speeds as set forth in the Airplane Flight Manual;

(iii) At the authorized maximum landing weight, simulated pullout from the landing and approach configurations accomplished at a safe altitude with the critical engine inoperative or operating at zero thrust.

(iv) Suitable combinations of airplane weight and power less than those specified in subdivisions (i), (ii), and (iii) of this subparagraph may be employed if the performance capabilities of the airplane under the above conditions are simulated.

(2) Conduct of flight under simulated instrument conditions, utilizing all types of navigational facilities and the letdown procedures used in normal operations. If a particular type of facility is not available in the training area, such training may be accomplished in a synthetic trainer.

(c) Flight training for a pilot qualifying to serve as second in command in a crew requiring two pilots shall include flight instruction and practice in at least the following maneuvers and procedures:

(1) In each type of airplane to be flown by him in scheduled operation:

(i) Assigned flight duties as second in command, including flight emergencies,

(ii) Taxiing,

(iii) Takeoffs and landings,

(iv) Climbs and climbing turns,

(v) Slow flight,

(vi) Approach to stall,

(vii) Engine shutdown and restart,

(viii) Takeoff and landing with simulated engine failure.

(ix) Conduct of flight under simulated instrument conditions including instrument approach at least down to circling approach minimum and missed approach procedures.

(2) Conduct of flight under simulated instrument conditions, utilizing all types of navigational facilities and the letdown procedures used in normal operations. Except for those approach procedures for which the lowest minimums are approved, all other letdown procedures may be given in a synthetic trainer which contains the radio equipment and instruments necessary to simulate other navigational and letdown procedures approved for use by the air carrier.

42.45c *Initial flight navigation training.*

(a) The training for flight navigation shall include the applicable portions of at least paragraphs (a) through (d) and (f) through (h) of section 42.45a.

(b) Prior to serving as a required flight crew member each flight navigator shall be given sufficient ground and flight training to become proficient in those duties assigned him by the air carrier. The flight training may be accomplished during passenger or cargo flights under the supervision of a qualified flight navigator.

42.45d *Initial flight engineer training.*

(a) The training for flight engineers shall include at least the instrucution specified in section 42.45a (a) through (e).

(b) Flight engineers shall be given sufficient training in flight to become proficient in those duties assigned them by the air carrier. Except for emergency procedures, this training may be accomplished during passenger or cargo flights under the supervision of a qualified flight engineer.

42.45e *Initial crew member emergency training.*

(a) The training in emergency procedures shall be designed to give each crew member appropriate individual instruction in all emergency procedures, including assignments in the event of an emergency, and proper coordination between crew members. At least the following subjects as appropriate to the individual crew members shall be taught: The procedures to be followed in the event of the failure of an engine, or engines, or other airplane components or systems, emergency decompression, fire in the air or on the ground, ditching, evacuation, the location and operation of all emergency equipment, and power setting for maximum endurance and maximum range.

(b) Synthetic trainers may be used for training of crew members in emergency procedures where the trainers sufficiently simulate flight operating emergency conditions for the equipment to be used.

42.45f *Recurrent training.*

(a) Each air carrier shall provide such training as is necessary to insure the continued competence of each crew member and to insure that each possesses adequate knowledge of and familiarity with all new equipment and procedures to be used by him.

(b) Each air carrier shall, at intervals established as part of the training program, but not to exceed 12 months, check the competence of each crew member with respect to procedures, techniques, and information essential to the satisfactory performance of his duties. Where the check of the pilot in command or second in command requires actual flight, such check shall be considered to have been met by the checks accomplished in accordance with sections 42.44(a)(2) or 42.44(a)(3), respectively.

(c) The appropriate instructor, supervisor, or check airman shall certify as to the proficiency demonstrated, and such certification shall become a part of the individual's record.

42.45g *Approval of training programs.*

The training program established by the air carrier under the provisions of sections 42.45 through 42.45f shall meet with the approval of an authorized representative of the administrator: *Provided,* That the curriculum of such training program shall be submitted in appropriate form to an authorized representative of the Administrator not later than May 1, 1960.

42.45h *Flight crew member qualification for large aircraft.*

(a) No air carrier shall utilize any flight crew member, nor shall any such airman perform the duties authorized by his airman certificate, unless he satisfactorily meets the appropriate requirements of sections 42.40, 42.41, 42.43, 42.44; and 42.45 or 42.45f.

(b) Check airman shall certify as to the proficiency of the pilot being examined, as required by sections 42.43(b) and 42.44(a) and such certification shall become a part of the airman's record.

The provisions of this amendment shall become effective January 1, 1961, except as otherwise provided in section 42.45g.

U.S. GOVERNMENT PRINTING OFFICE: 1960 O—535996