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Civil Aeronautics Manual 42

Irregular Air Carrier And Off-Route Rules



August 1954

U. S. DEPARTMENT OF COMMERCE
Sinclair Weeks, Secretary

CIVIL AERONAUTICS ADMINISTRATION
F. B. Lee, Administrator

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Civil Aeronautics Manual 42

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Introductory Note

Civil Aeronautics Manual 42 contains in a consolidated form (1) the irregular air carrier and off-route regulations adopted by the Civil Aeronautics Board and (2) the rules, policies and interpretations issued by the Administrator in application to the various sections of the regulations.

CAA 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.

CAA 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.

CAA 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 Administration in determining compliance with the regulations.

The manual is arranged to show the number of each section of the regulations followed by the title of the particular section in italic letters. Any rules, policies or interpretations follow the pertinent section of the regulations and are identified by consecutive dash numbers appended to the regulation section number with the title in bold type letters.

This manual supersedes Civil Aeronautics Manual 42 dated May 1953. Moreover, the contents of this manual supersede any contradictory material which may be found in any Aviation Safety Release or like publication outstanding on the issuance date of this manual.

This edition extends and brings up to date the text in the edition dated May 1953 by including material on the following subjects:

CAA interpretations and policies relative to sections 42.26 and 42.27 on providing oxygen for, and administering oxygen to, crew members and passengers in pressurized and nonpressurized cabin aircraft at various operating altitudes.

A revised definition of "facilities for the proper inspection, maintenance, overhaul, and repair" under section 42.32 and an explanation of how the Administrator will determine the acceptability of arrangements for such facilities.

The operational use of hourly sequence weather reports, including end-of-runway weather reports, in executing an instrument approach, landing, or takeoff under the provisions of section 42.56.

CAA rules and policies relative to sections 42.70, 42.71, 42.72, 42.76, and 42.77 outline acceptable methods of complying with the operating limitations for transport category airplanes.

En route limitations for Aero Commander 520, Beech AT–11, Beech 50, Grumman G–21, and Lockheed 10A aircraft as required by section 42.80.

Appendix B. A list of provisions of part 42, CAM 42, and other regulations applicable to the certification and operation of air taxi service.

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Irregular Air Carrier and Off-Route Rules

Applicability

"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 (i. e. the Civil Air Regulations), 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 Part 41, or 40 and 61 of this subchapter (i. e. the Civil Air Regulations), 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 (CAA policies which apply to section 42.0(b)).*

(a) *General.* The policies provided in this section will be applied by the Civil Aeronautics Administration 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 aviation safety district office. 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 aviation safety agent.

(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 CAA 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 para-

graph will also be included on the form ACA–1014:

When operating aircraft pursuant to the terms of this certificate and these operations 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) *Areas of operation.* The areas of operation will be included on the form ACA–1014 and will encompass specific 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 group, rather than the individual islands, should be listed, i. e., Solomon Islands, Bahama Islands, British, French, or Dutch West Indies, Hawaiian Islands, etc.

(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 Civil Aeronautics Administration for cancellation at the time the amendment to the scheduled operating certificate becomes effective.

42.0–2 *Provisions of part 42 which are applicable to air taxi operators (CAA interpretations which apply to section 42.0 and SR–378).* See appendix B.

42.0–3 *Operations for which an Air Taxi Operator Certificate is not required (CAA interpretations which apply to section 42.0 and SR–378).* See appendix B.

Definitions

"42.1 *Definitions.*

"(a) As used in this part the words listed below shall be defined as follows:

"(1) *Accelerated-stop distance.* Accelerate-stop distance is the distance required to reach the critical point of take-off 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.)

"(2) *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.

"(3) *Alaskan air carrier.* Alaskan air carrier includes any air carrier subject to the provisions of Part 292 [1] of this chapter (i. e. the Economic Regulations) 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 transportation within the Territory of Alaska.

"(4) *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.

"(5) *Approach or take-off 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 take-off path for instrument approaches where there is a multiplicity of parallel runways or a large hard-surfaced area continuously available for landing or take-off. 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 take-off 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 centerline. This distance shall increase uniformly to 500 feet on each side of such centerline 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 centerline.

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

"(7) *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.

"(8) *Crew member.* Crew member means any individual assigned by the air carrier for the performance of duty on the aircraft in flight.

"(9) *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.)

"(10) *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 become suddenly inoperative. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such speed is determined.)

"(11) *Critical point of take-off.* The critical point of take-off 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.)

"(12) *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.

"(12a) *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 Civil Aeronautics Act of 1938, as amended (52 Stat. 1001, 49 U. S. C. 488) 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 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.

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

"(14) *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.

"(15) *IFR.* The symbol used to designate instrument flight rules.

"(16) *Irregular air carrier.* Irregular air carrier includes any air carrier subject to

the provisions of part 291 [3] of this chapter (i. e. Economic Regulations), as heretofore or hereafter amended.

[3] Part 291 currently provides that the term 'irregular air carrier' means any air carrier which (1) directly engages in air transportation, (2) does not hold a certificate of public convenience and necessity under section 401 of the Civil Aeronautics Act of 1938, as amended, and (3) does not operate or hold out to the public, expressly or by course of conduct, that it operates one or more aircraft between designated points, or within a designated point, regularly or with a reasonable degree of regularity, upon which aircraft it accepts for transportation, for compensation or hire, such members of the public as apply therefor or such property as the public offers. No air carrier shall be deemed to be an irregular air carrier unless the air transportation services offered and performed by it are of such infrequency as to preclude an implication of a uniform pattern or normal consistency of operation between, or within, such designated points.

"(17) *Large aircraft.* Aircraft of 12,500 pounds or more maximum certificated take-off weight shall be considered large aircraft.

"(18) *Maximum certificated take-off weight.* Maximum certificated take-off weight shall mean the maximum take-off weight authorized by the terms of the aircraft airworthiness certificate.[4]

" [4] 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.

"(19) *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.)

"(20) *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.[5]

" [5] The Nautical Almanac containing the ending of evening twilight and the beginning of morning twilight tables may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Information is also available concerning such tables in the offices of the Civil Aeronautics Administration or the United States Weather Bureau.

"(21) *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 take-off area which has a slope to the horizontal of 1/20.

"(22) *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.

"(23) *Pilot compartment.* Pilot compartment means that part of the aircraft designed for the use of the flight crew.

"(24) *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.

"(25) *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.

"(26) *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.)

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

"(28) *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.

"(29) *Second pilot.* Second pilot shall include any pilot other than the pilot in command assigned as a member of the flight crew.

"(30) *Small aircraft.* Aircraft of less than 12,500 pounds maximum certificated takeoff weight shall be considered small aircraft.

"(31) *Transport category aircraft.* Transport category aircraft are aircraft which have been certificated in accordance with the requirements of part 4b of this chapter (i. e. the Civil Air Regulations), or under the transport category performance requirements of part 4a of this chapter (i. e. the Civil Air Regulations).

"(32) *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.

"(33) *VFR.* The symbol used to designate visual flight rules.

"(34) 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 (CAA interpretations which apply to section 42.1 (a) (14)).* This is construed to mean from "block to block."

42.1–2 *Twilight. (CAA interpretations which apply to section 42.1 (a) (20)).* 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." [1]

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 to title IV of the Civil Aeronautics Act of 1938, 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. The Administrator shall promptly notify the Board of any deviation included in the air carrier operating certificate and the reasons therefor."

42.5–1 *Appropriate economic authority (CAA interpretations which apply to section 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.

42.5–2 *Application for an Irregular Air Carrier Operating Certificate (CAA rules which apply to section 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 aviation safety agent. When the requirements, as prescribed in this part, have been met, the applicant should present his application to the local aviation safety agent 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)).

42.5–3 *Application for amendment (CAA rules which apply to section 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 aviation safety 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.

[1] Supplement to the American Ephemeris, 1946—Tables of Sunrise, Sunset, and Twilight, 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.

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 aviation safety agent.

42.5–4 *Application for overseas and international authorization (CAA rules which apply to section 42.5).* Application for overseas and international authorization shall be made to the local aviation safety agent 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 headquarters 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 aviation safety agent, 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.[2]

42.5–5 *Application for an Air Taxi Operator Certificate (CAA rules which apply to section 42.5 and SR–378).* See appendix B.

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

"42.6 *Duration and renewal.*

"(a) An air carrier operating certificate issued under this part prior to July 1, 1950, shall expire on June 30, 1951, unless (1) such certificate is sooner surrendered, suspended, or revoked, or (2) the Administrator, prior to that date, shall reinspect and reexamine the holder thereof and issue to the air carrier the new-type air carrier operating certificate hereinafter provided. An air carrier operating certificate issued under this part subsequent to July 1, 1950, shall expire 1 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 or the Board

[2] This information is normally contained in the International Flight Information Manual obtainable from the Office of Aviation Information CAA, Washington 25, D. C.

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 (i. e. the Civil Air Regulations).

"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 (CAA rules which apply to section 42.9).* Three copies of each notice, in letter form, shall be delivered by the air carrier to the district office of the Civil Aeronautics Administration serving the air carrier's principal business office, operations base, or maintenance base, whichever is appropriate, in order to give notice to the Administrator.

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 (CAA rules which apply to section 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.

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

"42.12 *Fire prevention requirement.* Aircraft powered by an engine or engines rated at more than 600 horse power each for maximum continuous operation shall, when used in passenger service, comply with the applicable fire-prevention requirements of part 4b of this subchapter (i. e., the Civil Air Regulations): *Provided,* That in those instances where the Administrator, prior to June 1, 1949, has authorized an air carrier to operate aircraft without full compliance with such requirements, such aircraft may be operated in accordance with such authorization. For particular types of aircraft, where the Administrator finds that literal compliance with specific items of this requirement would not contribute materially to the objective sought, he may accept such measures of compliance as he finds will so contribute."

42.12–1 *Fire prevention requirements (CAA rules which apply to section 42.12).* That portion of section 42.12 which requires compliance with applicable fire prevention requirements of part 4b is interpreted as meaning those requirements contained in part 4b as amended September 20, 1946.

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

"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."

42.14–1 *Takeoff performance limitations for large aircraft (CAA rules which apply to section 42.14).* Whenever large aircraft are utilized in cargo operation, the following take-off 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.

"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: *Provided,* That airplanes certificated as a basic type after June 30, 1942, and prior to July 1, 1951, which are not transport category airplanes, need not be so certificated prior to July 1, 1954, in which case such airplanes shall comply with paragraph (a) of this section.

"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 §42.74 or §42.82.

"(b) *Overwater operations.* Land aircraft shall be multiengine and shall meet the appro-

priate en route operating requirements of §42.74 or §42.82, unless the overwater operation consists only of take-offs 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 (CAA policies which apply to section 42.16(b)).* Performance data applicable to this section are published under §42.80.

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:

"(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 gage for each engine using pressure system.

"(6) Coolant temperature gage for each liquid-cooled engine.

"(7) Oil temperature gage for each air-cooled engine.

"(8) Manifold pressure gage or equivalent when required for the proper operation of the engine.

"(9) Fuel gage 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 (i. e. the Civil Air Regulations), 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 three spare fuses of each magnitude.

"(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 gage,

"(3) Carburetor heating or deicing 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 beyond a 3-mile radius from the center of the airport of takeoff;

Maximum certificated takeoff weight of aircraft	*Flares*
Less than 3,500 pounds	5 class 3 or 3 class 2.
3,500 pounds to 5,000 pounds	4 class 2.
More than 5,000 pounds	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 gyro direction indicator.

"(10) Generator of adequate capacity.

"(11) One outside air temperature gage easily readable from the pilot's position.

"(12) One carburetor temperature gage or equivalent approved device.

"(13) Power failure warning means or vacuum gage on instrument panel connecting to lines leading to gyroscopic instruments.

"(14) Carburetor heating or deicing equipment for each engine.

"(15) Heated pitot tube for each air-speed 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 (CAA rules which apply to section 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.

42.21–2 *Fire extinguishers (CAA rules which apply to section 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.

42.21–3 *Altimeter (CAA policies which apply to section 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.

"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 landling light."

"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. After March 31, 1954, 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 paragraphs (a) (1) and (3) of this section."

42.23–1 *Radio communications system and navigational equipment for large aircraft (CAA policies which apply to section 42.23 (b)).*

(a) It is the intent of § 42.23 (b) to provide, in part, for an alternative means of receiving radio navigational signals in the event of failure of the primary means.

(b) The type of the ground radio navigational facilities utilized governs the airborne radio equipment requirements. If the route to be flown is equipped with radio range facilities, then duplicate radio range receivers would fulfill the requirements. If the route to be flown is equipped with omnidirectional radio beacon facilities, then duplicate D/F equipment would fulfill the requirements. However, if the route to be flown is equipped with both types of radio facilities, the installation of duplicate D/F airborne equipment would constitute a simple means of compliance, since the D/F equipment is operative on either facility provided that there is a satisfactory method for selection of the proper antenna ("LOOP ANTENNA" switch).

(c) Radio equipment used for communications and/or navigation should be type certificated and adequate for the operation. In the event radio equipment is not type certificated, approval for its use may be granted after inspection has determined safety and adequacy for the operation involved.

"42.24 ***First-aid and emergency equipment.***

"(a) Each aircraft shall be equipped with readily available first-aid and emergency evacuation equipment adequate for the type of operation and number of persons carried.

"(b) Each aircraft operated over uninhabited terrain shall carry such emergency equipment as the Administrator finds necessary for the preservation of life for the particular operation.

"(c) Except for takeoffs, landings, or flights for short distances over water for which the Administrator finds that any of the equipment in subparagraphs (1), (2), or (3) of this paragraph is unnecessary, each aircraft operated over water shall be equipped with:

"(1) Individual life preservers or flotation

devices readily available for each person aboard the aircraft,

"(2) Life rafts of sufficient capacity to contain all persons aboard the aircraft,

"(3) A Very pistol or equivalent signal equipment,

"(4) Portable emergency radio signalling device which is not dependent upon the aircraft power supply.

"(5) Such additional emergency equipment as the Administrator finds necessary for the preservation of life for the particular operation involved."

42.24–1 *First-aid and emergency equipment (CAA policies which apply to section 42.24).* First-aid kits, flotation equipment, and other emergency gear shall regularly be inspected to determine their condition and shall be provided with a means for readily determining that such equipment has not been tampered with or articles removed since last inspection. This will normally be accomplished by means of seals showing date or time of last inspection on each kit or item of emergency equipment.

The adequacy of all emergency equipment will be determined by the Administrator.

42.24–2 *First-aid kits (CAA policies which apply to section 42.24).* 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:

(a) *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

(b) *No. 2 kit for aircraft of 6 to 25 persons capacity.*[3]

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

(c) *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

42.24–3 *Emergency evacuation equipment (CAA policies which apply to section 42.24 (a)).* This requirement includes under emergency evacuation equipment such items as: ropes, ladders, chutes, etc., when such equipment is necessary for safe, rapid evacuation of passengers and crew in event of emergency or crash landings; e. g., a DC–4 would require such equipment, while a DC–3 normally would not, due to differences in height from fuselage exits to ground. This equipment shall be approved

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

by the CAA after demonstration of the adequacy of the equipment. Instructions shall be included on placards within the aircraft as to the location and operation of such evacuation equipment or procedures for briefing occupants of the aircraft shall be included as a part of the Operations Manual, if required by section 42.60.

42.24-4 *Emergency equipment (CAA rules which apply to section 42.24 (b)).*

(a) *General.* The aircraft shall be equipped with the appropriate emergency equipment specified in this section. 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.

(b) *Tropical land areas:*
- 1 first-aid kit (from aircraft).
- 1 machete.
- 1 axe.
- 1 mosquito headnet for each person.
- 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.

(c) *Frigid land areas:*
- 1 first-aid kit (from aircraft).
- 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.
- 5-day supply emergency food ration for each person.
- 1 pint drinking water for each person.

(d) *Tropical water areas:*
- 1 Gibson-girl radio and accessories.
- 1 first-aid kit (from aircraft).
- 1 life vest for each person.
- Sufficient number of liferafts to accommodate all persons. Each liferaft shall contain the following:
  - 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.
  - 5-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.

(e) *Frigid water areas:*
- 1 Gibson-girl radio and accessories.
- 1 first-aid kit (from aircraft).
- 1 life vest for each person.
- Sufficient number of liferafts to accommodate all persons. Each liferaft shall contain the following:
  - 1 canopy (for sail, sunshade, rain catcher or protection from elements).
  - 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.

5-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.

"42.25 *Cockpit checklist.* The air carrier shall provide for each type of aircraft a cockpit checklist adapted to each operation in which the aircraft is to be utilized. The checklist 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 (CAA policies which apply to section 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.

42.25–2 *Mimimum standard cockpit checklist (CAA policies which apply to section 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:[4]
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:[4]
Hydraulic pressures and quantity—checked.
Brakes—checked.
Hydraulic selector valves—checked.

Anti-icing and de-icing equipment:[4]
Checked and set.

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

Powerplants and propellers:[4]
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.

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

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:[4]
Checked.
Flaps:[4]
Wing flaps—takeoff position.
Cowl flaps—takeoff position.
Controls:[4]
Auto pilot—off.
Trim tabs—set for takeoff.
Gust locks—off.
Free and tested through full limit of travel.

PRIOR TO LANDING

Fuel system:[5]
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:[5]
Hydraulic pressure—checked.
Brakes—checked and off.
Hydraulic selector valves—checked.
Anti-icing and de-icing equipment:[5]
Checked.
Powerplants and propellers:[5]
Propellers—as required.
Superchargers—as required.
Manual reverse pitch actuator or indicator[5]—checked.
Heaters:[5]
Checked.
Instruments:
Static and vacuum selectors—checked.
Altimeter—set.
Directional gyro—set.
Pressurization:[5]
Checked.
Controls:
Autopilot—off.
Trim tabs—as desired.
Landing gear:[4]
Down and locked—checked.
Flaps:[5]
Wing flaps—as desired.
Cowl flaps—as desired.

POWERPLANT EMERGENCIES

Fuel system:
Mixtures—idle cutoff on dead engine; required position on all others.
Fuel-selector valve: dead engine—off.
Fuel-booster pumps: dead engine—off.
Cross feeds—as required.
Throttle: dead engine—closed.
Hydraulic system:
Hydraulic selector valve—set on proper engine.
Hydraulic pressures—checked.
Brakes—checked.
Ignition: off—dead engine.
Generators: off—dead engine.
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.

"42.26 *Supplemental oxygen.* Except where supplemental oxygen is provided in accordance with the requirements of section

[4] Items thus marked will be doublechecked, such as by challenge and response, or positively checked, such as by a mechanical method.
[5] 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.

42.27, supplemental oxygen shall be furnished and used as set forth below: *Provided,* That upon application by an air carrier prior to March 1, 1950, the Administrator may authorize such air carrier to operate without full compliance with the following requirements where the Administrator finds that the air carrier has made a diligent effort to meet such requirements by March 1, 1950, and that the air carrier has shown that it will comply with such requirements by a date certain. The amount of supplemental oxygen required for a particular operation to comply with the rules in this part shall be determined on the basis of flight altitudes and flight duration consistent with the operating procedures established for such operation and route. As used in the oxygen requirements hereinafter set forth, "altitude" shall mean the pressure altitude corresponding with the pressure in the cabin of the airplane, and "flight altitude" shall mean the altitude above sea level at which the airplane is operated.

"(a) *Crew members.*

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

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

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

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

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

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

42.26–1 *Supplemental oxygen for crew members (CAA interpretations which apply to section 42.26 (a) (1)).* 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.

42.26–2 *Oxygen requirements for standby crew members (CAA interpretations which apply to 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.

42.26–3 *Operating instructions (CAA policies which apply to section 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.

42.26–4 *Oxygen requirements for jump-seat occupant (CAA policies which apply to section 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.

42.26–5 *Oxygen requirements for infants in arms (CAA policies which apply to section 42.26 (b)).* Provisions should be made for adminis-

tering 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.

42.26–6 *Oxygen requirements for clinical purposes (CAA policies which apply to section 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.

"42.27 *Supplemental oxygen requirements for pressurized cabin 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: *Provided,* That upon application by an air carrier prior to March 1, 1950, the Administrator may authorize such air carrier to operate without full compliance with such requirements where the Administrator finds that the air carrier has made a diligent effort to meet such requirements by March 1, 1950, and that the air carrier has shown that it will comply with such requirements by a date certain.

"(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 2-hour supply of oxygen shall be provided for the flight crew members on flight-deck duty. (The oxygen supply required by section 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 amount of oxygen:

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

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

"(i) For the duration of the flight in excess of 4 minutes at altitudes above 15,000 feet, a supply sufficient to comply with section 42.46 (b) (3);

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

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

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

section 42.26 (b) (2) and (b) (3) for flight above 14,000 feet.

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

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

(2) The operator may use the supply furnished for protective breathing purposes (see section 42.29) for compliance with the 2-hour requirement for supplementary breathing oxygen. For example, the 300-liter STPD supply per flight crew member which is the protective breathing supply when demand (or diluter-demand) systems are used, will provide a 2-hour supplementary breathing supply for one flight crew member at 20,000 feet, so that both the minimum 2-hour supplementary breathing requirement and the protective breathing requirement would be fulfilled under most emergency conditions resulting from loss of cabin pressure or from contamination of cabin air with smoke or poisonous gases.

(b) *Cabin altitudes greater than 10,000 feet.* When operating a pressurized cabin aircraft which is certificated to fly with a cabin pressure altitude greater than 10,000 feet, a supply of oxygen 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.

42.27–2 *Computation of supply for passengers in pressurized cabin aircraft (CAA policies which apply to section 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 than 10,000 feet.* When a pressurized cabin aircraft is certificated to fly with a cabin pressure altitude greater than 10,000 feet, the following policies should be considered: When the cabin pressure altitude is above 10,000 feet to and including 14,000 feet, sufficient oxygen shall be provided for 10 percent of the number of passengers for the duration of flight between such cabin pressure altitudes. When the cabin pressure altitude is above 14,000 feet to and including 15,000 feet, sufficient oxygen shall be provided for 30 percent of the number of passengers for the duration of flight between such cabin pressure altitudes. When the cabin pressure altitude is above 15,000 feet, sufficient oxygen shall be provided for each passenger for the duration of flight above such a cabin pressure altitude. In addition to the above supply of oxygen, in order to provide for loss of cabin pressure, the supplementary oxygen required by whatever portions of section 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.

42.27–3 *Oxygen requirements for clinical purposes (CAA policies which apply to section 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.

42.27–4 *Oxygen requirements for infants-in-arms (CAA policies which apply to section 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 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.

"42.28 *Equipment standards.* 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 sections 4b.831 and 4b.832: *Provided,* That where full compliance with such standards is found by the Administrator to be impractical, he may authorize such changes in these standards as he finds will provide an equivalent level of safety: *And provided further,* That upon application by an air carrier prior to March 1, 1950, the Administrator may authorize such air carrier to operate without full compliance with such requirements where the Administrator finds that the air carrier has made a diligent effort to meet such requirements by March 1, 1950, and that the air carrier has shown that

it will comply with such requirements by a date certain.

"Note: All references in this section to sections of Part 4b of this subchapter are those sections in effect on October 1, 1949.

"42.29 *Protective breathing equipment for the flight crew.*

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

"(1) Not less than a 300-liter STPD supply of oxygen for each 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 altitude 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 (CAA policies which apply to section 42.29).* Protective breathing equipment for the flight crew and its installation should comply with sections 4b.651–1 and 4b.651–2.

42.29–2. *Requirement of protective breathing equipment in nonpressurized cabin airplanes (CAA rules which apply to section 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).

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 (i. e. the Civil Air Regulations), and with the maintenance manual when required by section 42.32 (d)."

42.30–1 *General (CAA policies which apply to section 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) CAA 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 com-

pliance 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.

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

"(2) Small aircraft shall either be maintained and inspected in accordance with subparagraph (1) of this paragraph or be given a periodic inspection at least every 100 hours of flight time and an annual inspection at least every 12 months. The annual inspection may be accepted as a periodic inspection.

"(b) A record shall be carried in the aircraft at all times showing that the latest inspections required by paragraphs (a) (1) or (2) 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 (CAA policies which apply to section 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 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.

42.31–2 *Maintenance and inspection—small aircraft (CAA policies which apply to section 42.31 (a) (2)).* The operator may elect to establish a continuous maintenance and inspection system in his maintenance manual for the maintenance of small aircraft in the same manner as is required for the maintenance of large aircraft. Under such circumstances the maintenance manual requirements and all limitations applicable to large aircraft will also be applicable to small aircraft. Otherwise the inspections shall be conducted in accordance with the periodic and annual inspection requirements of this section and, in addition, overhauls must be conducted at or before the time limitations recommended by the manufacturers of the aircraft, aircraft engine, or other components as prescribed in part 18 of this subchapter (i. e. the Civil Air Regulations).

42.31–3 *Maintenance and inspection—all aircraft (CAA policies which apply to section 42.31 (a) (1) and (2)).* The following procedures will be applicable in establishing initial overhaul time limitations for both large and small irregular air carrier aircraft:

(a) Initial overhaul time limitations for large multiengine aircraft powerplants of a new model or one which has never been used in air carrier service will not exceed 600 hours.

(b) The initial overhaul time limitations for an engine which is a development of a basic model on which substantial air carrier service experience exists will not exceed a value which is 400 hours less than the maximum time approved for any irregular air carrier on the basic model at that date or 600 hours, whichever is greater.

(c) The initial overhaul time limitation for an engine model on which substantial irregular air carrier service experience exists will not exceed a value which is 300 hours less than the maximum approved time for any irregular air carrier on that model engine and aircraft combination at that date or 700 hours, whichever is greater.

(d) Time limitations for all aircraft components (except engines) of aircraft new to the operation of a particular air carrier, but which has had previous substantial air carrier service experience, will not be greater than the lowest times approved (at that time) for the same components for other irregular air carrier operators of the same model aircraft.

(e) 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.

(1) 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 limitation for that engine established at a figure not to exceed 600 hours.

(2) Operators who have not had the experience necessary to demonstrate the ability to operate and maintain the pertinent engine in accordance with subparagraph (1) of this paragraph, may have initial overhaul time limitations established at a figure not to exceed 500 hours for the engine concerned.

42.31–4 *Maintenance and inspection records (CAA policies which apply to section 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 the 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.

"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.[6]

[6] 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 (CAA interpretations which apply to section 42.32).*

(a) The facilities required in section 42.32 (a) 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 aircraft (including airframes, powerplants, propellers, and appliances) can be satisfactorily performed at all times by either the air carrier or persons with whom the air carrier has made arrangements for the performance of such functions. The housing, facilities, equipment, and materials specified in section 52.21–1 through section 52.21–3 and section 52.30–1 through section 52.36–1 which are appropriate to the particular air carrier's aircraft and maintenance system, are considered to be the minimum facilities required by section 42.32 (a).

42.32–2 *Arrangements acceptable to the Administrator (CAA policies which apply to section 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 a 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 inspections and maintenance specified in subparagraphs (1) and (2) may be performed and/or approved by a certificated mechanic in accordance with section 18.10 (a) and section 18.11 (a) (1).

(1) The performance of preventative maintenance and the performance and approval of minor maintenance, minor repairs, and minor inspections at points in the air carrier's area of operation, where persons specified in section 18.10 (b), (d), or (e) do not provide the facilities required in section 42.32 (a).

(2) The performance of inspections and associated minor maintenance operations which are limited to preflight inspections, daily inspections, and the most frequent periodic inspection and/or check as listed in the air carrier's maintenance manual other than preflight or daily inspections.

(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.

42.32–3 *Maintenance personnel (CAA policies which apply to section 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 contracts 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.

42.32–4 *Reporting of mechanical irregularities in operation (CAA policies which apply to section 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.

42.32–5 *Maintenance manual (CAA rules which apply to section 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 appliances 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 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 30 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 30 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) *Limitations of time adjustments.* Requested increase of time limitations for the various components of the aircraft will not be in excess of the following increments:

(i) *Airframe.* Time adjustment up to 50 hours for the major or highest inspection periods may be made when properly substantiated. Where the inspection periods are in excess of 1,000 hours, deviation from this increment may be made on an individual component judged on its own merit. The maximum increases in overhaul periods for airframe will be 1,000 hours. Components of the aircraft such as landing gear, control systems, hydraulic systems, fuel systems, etc., should not be increased by more than approximately 10 percent of the existing overhaul period; however, this percentage may be adjusted by a reasonable amount so as to conform with the scheduling of other maintenance functions.

(ii) *Powerplant.* Time adjustments for engines, propellers, and accessories will be limited to increments of 100 hours for overhaul periods and 50 hours for the major or highest inspection periods when substantiated as outlined below.

Extensions of engine overhaul periods in excess of the existing approved time limitation may be substantiated on the basis of satisfactory findings resulting from three engine overhauls conducted at the completion of the existing authorized overhaul period. This procedure may be followed until the engine overhaul period reaches 1,000 hours. Extension of engine overhaul periods beyond 1,000 hours may be based on the results of the operation of 3 engines for an additional period of 100 hours in excess of the currently authorized period. Authorization to operate such engines must be obtained from the assigned agent. This will be accomplished when properly substantiated by a letter in which the engines are identified by make, type or model and serial number. The condition of these engines will be determined at completion of the additional period of operations. The overhaul inspection will be witnessed by the assigned agent in order that he may recommend approval or disapproval of the operator's request for additional time. Installation of engines which are being operated in excess of the currently approved time limitations in accordance with these provisions will be limited to one on a twin-engine aircraft and two on a four-engine aircraft installed on opposite sides.

Increases of time limitations for individual components or systems must be predicated upon the service experience of the involved component and not upon its relation to another component which may receive approval for an increase.

(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 oper-

ating 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 a CAA representative [6] 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 CAA 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 CAA 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 CAA 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 a CAA 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.

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

(*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.

(*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 CAA.

(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 CAA 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 subparagraph (vii) below. 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 (v) above 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 CAA[7] 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.

42.32–6 *Copy of maintenance manual in aircraft (CAA policies which apply to section 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.

42.32–7 *Mandatory revisions (CAA rules which apply to section 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 be made promptly in all copies of the manual in the hands of designated personnel.

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

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 this subchapter (i. e. the Civil Air Regulations).

"(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 this subchapter (i. e. the Civil Air Regulations).

"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 pounds maximum certificated takeoff weight, and on all other aircraft certificated for more than 30,000 pounds 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 meet the following requirements:

"(1) After December 31, 1949, he shall possess a valid airline transport pilot rating with an appropriate rating for the aircraft on which he is to serve:

"(2) Prior to and including December 31, 1949, he shall either meet the above or;

"(i) Possess a valid commercial pilot certificate with an appropriate rating for the aircraft on which he is to serve;

"(ii) Possess a currently effective instrument rating;

"(iii) Have logged at least 1,200 hours of flight time of which 500 hours shall have been cross-country;

"(iv) Have logged at least 100 hours of night flight of which 50 hours shall have been cross-country.

"(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 airline 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 take-offs 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 take-offs and landings in an aircraft of the same type on which he is to serve. For night flight one of the take-offs 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.

"(b) *Flight radio operator.* No individual shall perform, or be assigned to perform, the duties of a flight radio operator unless he has met the recent experience requirements specified in Part 33 of this subchapter (i. e. the Civil Air Regulations).

"(c) *Flight engineer.* No individual shall be assigned to nor perform duties as a flight engineer unless within the preceding 12 months he has had at least 50 hours of experience as a flight engineer on the type of aircraft on which he is to serve, or until a person designated by the Administrator has checked the airman and determined that he is (1) familiar with all current information and operating procedures relating to the type of aircraft on which he is to serve and (2) competent with respect to the flight engineer's duties on such aircraft.

"(d) *Flight navigator.* No individual shall be assigned to nor perform duties as a flight navigator unless within the preceding 12 months he has had at least 50 hours of experience as a flight navigator, or until a person designated by the Administrator has checked the airman and determined that he is (1) familiar with all current navigational information pertaining to the operations of the air carrier and (2) competent with respect to the operating procedures and navigational equipment to be used."

42.44–1 *Equipment check (CAA policies which apply to section 42.44 (a) (2)).*

(a) *General.* The equipment check for pilots on large aircraft, other than pilots in command, should consist of (1) an equipment examination (oral or written) and (2) a flight check.

The equipment check for pilots in command on large aircraft need only consist of the equipment examination, since a pilot in command should successfully accomplish all of the instrument checks prescribed in section 42.44–2.

(b) *Equipment examination for all pilots.* This examination, which may be oral or written, should be pertinent to the type of aircraft to be flown by the pilot and should be given (1) in the air carrier's ground school, (2) during a routine line check, (3) during the flight phase of the equipment check, or (4) during the instrument checks prescribed in section 42.44–2. The examination should include, but need not be limited to, questions relative to engine power settings, stall speeds at various configurations

and weights, airplane placard speeds, critical engine failure speeds, control systems, fuel and lubrication systems, propeller and supercharger operations, hydraulic systems, electric systems, anti-icing, heating and ventilating, and pressurization system (if pressurized).

(c) *Flight check for pilots other than pilots in command.* This check should include at least the following items, but no maneuvers need be accomplished solely by reference to instruments. It may be given during any flight which is of at least one hour duration.

(1) *Preflight planning.* The pilot should be directed to execute a flight plan for the flight involved, including the interpretation of weather maps, upper air charts, and sequence reports.

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

(3) *Runup.* Attention to detail in the use of cockpit check list and cockpit procedure should be observed on all flight checks.

(4) *Takeoff.* The check pilot should observe the pilot's ability to maintain a constant 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.

42.44–2 *Instrument checks (CAA policies which apply to section 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. It 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

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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.*[8]

(m) *Orientation.*[8]

(n) *Beam bracketing.*[8]

(o) *Cone identification.*[8]

(p) *Loop orientation.*[8]

(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

[8] 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.

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 take-off. The simulated failure should occur at any time after the aircraft has passed the V_1 speed pertinent to the particular take-off 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 pilot's file which will list the emergency procedures accomplished, date performed, and grade received.

42.44–3 *Aircraft used in instrument checks (CAA policies which apply to section 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).

42.44–4 *Use of flight simulator in instrument checks (CAA policies which apply to section 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.

"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 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 6 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 provision for such additional pilot training as may be required in each particular case."

42.45-1 *Training program (CAA policies which apply to section 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 (i. e. the Civil Air Regulations) 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 CAA 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.

"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, a grace period of 30 days shall be allowed: *Provided,* That the effective date of the check, if met within the grace period, shall be the same as if met on the day immediately preceding such grace period.

"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" (CAA interpretations which apply to section 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.

Flight Operation Rules

"42.51 *Pilot responsibilities.*

"(a) *Pilot in command.* The pilot in com-

mand 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 flights.[7]

"[7] 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) *Pilots at controls.* In the case of aircraft requiring two or more pilots, two pilots shall remain at the controls at all times while taking off, landing, and while the aircraft is en route except when the absence of one is necessary in connection with his regular duties or when he is replaced by a person authorized under the provisions of paragraph (g) of this section.

"(g) *Admission to pilot compartment.* In aircraft having a separate pilot compartment, no person other than a crew member, a check pilot, an authorized representative of the Administrator or the Board in pursuance of official duty, or a person whose admission is approved by the pilot in command may be admitted to the pilot compartment. In the latter case, the pilot in command shall remain at the controls."

42.51–1 *Preflight responsibilities (CAA interpretations which apply to section 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 enroute 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.

42.51–2 *Responsibilities of the pilot in command (CAA policies which apply to section 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.

42.51–3 *Time of reporting for duty (CAA policies which apply to section 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.

42.51–4 *Flight equipment (CAA policies which apply to section 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.

42.51–5 *Serviceability of equipment (CAA policies which apply to section 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.

"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 Territory of Alaska (CAA policies which apply to section 42.52 (a)).* For operations in the Territory 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.

42.52–2 *Operations in the Territory of Alaska (CAA policies which apply to section 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 Territory 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.

"42.53 *Minimum flight altitude rules.* Except during take-off and landing, the flight altitude rules prescribed in paragraphs (a) and (b) of this paragraph, in addition to the applicable provisions of section 60.17, 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 (CAA interpretations which apply to section, 42.50).* 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.

"42.55 *Weather minimums.* No flight shall be started unless the take-off, en route operation, and landing at destination can be conducted in accordance with the weather requirements of part 60 of this subchapter (i. e. the Civil Air Regulations),[8] but in no case less than the minimums specified below:

"(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, and

"(b) For IFR operations the weather minimums, including alternate airport requirements, shall be not less than those specified in the CAA Flight Information Manual, or as otherwise specified or authorized by the Administrator.

" [8] See the Flight Information Manual for specific en route, take-off, and landing minimums for particular routes and airports."

42.55–1 *En route weather minimums (CAA interpretations which apply to section 42.55).* En route weather minimums are not contained in the Flight Information Manual. However, the requirements for ceiling and distance from clouds and flight visibility while en route are prescribed in part 60 of this subchapter (i. e. the Civil Air Regulations).

42.55–2 *Air traffic clearance (CAA interpretations which apply to section 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.

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

42.56–2 *Takeoff and landing weather minimums (CAA rules which apply to section 42.55 and section 42.56).*

(a) Whenever the latest weather report, furnished by the United States Weather Bureau of a source approved by the Weather Bureau contains a visibility value specified as a runway visibility for a particular runway of an airport, such visibility shall be used for straight-in instrument approach and landing or takeoff for that runway only. The terminal visibility as reported in the main body of such weather report shall be used for instrument approach and landing or takeoff for all other runways.

(b) The ceiling value reported in the main body of such weather report shall constitute the ceiling for both circling and straight-in instrument approach and landing or takeoff for all runways.

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

42.57–1 *Minimum facilities (CAA policies which apply to section 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 Aviation Information Office, Civil Aeronautics Administration, 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.

"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 (CAA rules which apply to section 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% on either side (whichever is the lesser) from a straight line drawn between the point of departure and the next point of arrival.

(b) This term "off-airways," as used in this manual and in the printed Standard Operations Specifications (form ACA–1014), does not apply where a projected course of a radio range extends along the route to be flown. Therefore, no special authorization will be required where complete coverage by radio range projected courses is provided and radio facilities for authorized instrument approach and let-down are available at the point of destination.

"42.59. *Passenger use of emergency equipment.* The air carrier shall establish procedures for familiarizing passengers with the location and use of emergency equipment."

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

"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 (CAA rules which apply to section 42.60).* The opera-

tions 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 Aviation Safety Agent (Operations).

42.60–2 *Content of operations manual (CAA rules which apply to section 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).

42.60–3 *Copies of operations manual (CAA rules which apply to section 42.60 (a)).*

(a) A current copy of the operations manual shall be furnished by the air carrier to the pilot.

(b) Two copies of the operations manual and all revisions thereto shall be delivered by the air carrier to the district office of the Civil Aeronautics Administration serving the principal operations base of the air carrier.

42.60–4 *Copy of operations manual in aircraft (CAA policies which apply to section 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.

42.60–5 *Preflight certification (CAA rules which apply to section 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.

"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 (i. e. the Civil Air Regulations) is filed by the air carrier with the nearest CAA 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 airborne. 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 (CAA policies which apply to section 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.

"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.[9]

[9] "See sec. 42.95 for record-keeping requirements for the flight manifest."

42.62–1 *Content of flight manifest (CAA policies which apply to section 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.

42.62–2 *Weight control system (CAA interpretations which apply to section 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.

"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."

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 take-off runway limitations of the transport category operating rules, after taking into account the temperature operating correction factors required by section 4a.749a-T or section 4b.117 of this subchapter (i. e., the Civil Air Regulations), and set forth in the Airplane Flight Manual for the airplane."

42.70–1 *Deviations (CAA rules which apply to section 42.70 (a)).* An application for any deviation shall include all supporting data and shall be forwarded to the CAA Aviation Safety District Office charged with the over-all inspection of the air carrier's operations.

42.70–2 *Accuracy of data (CAA policies which apply to section 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.

42.70–3 *Temperature accountability (CAA policies which apply to section 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.

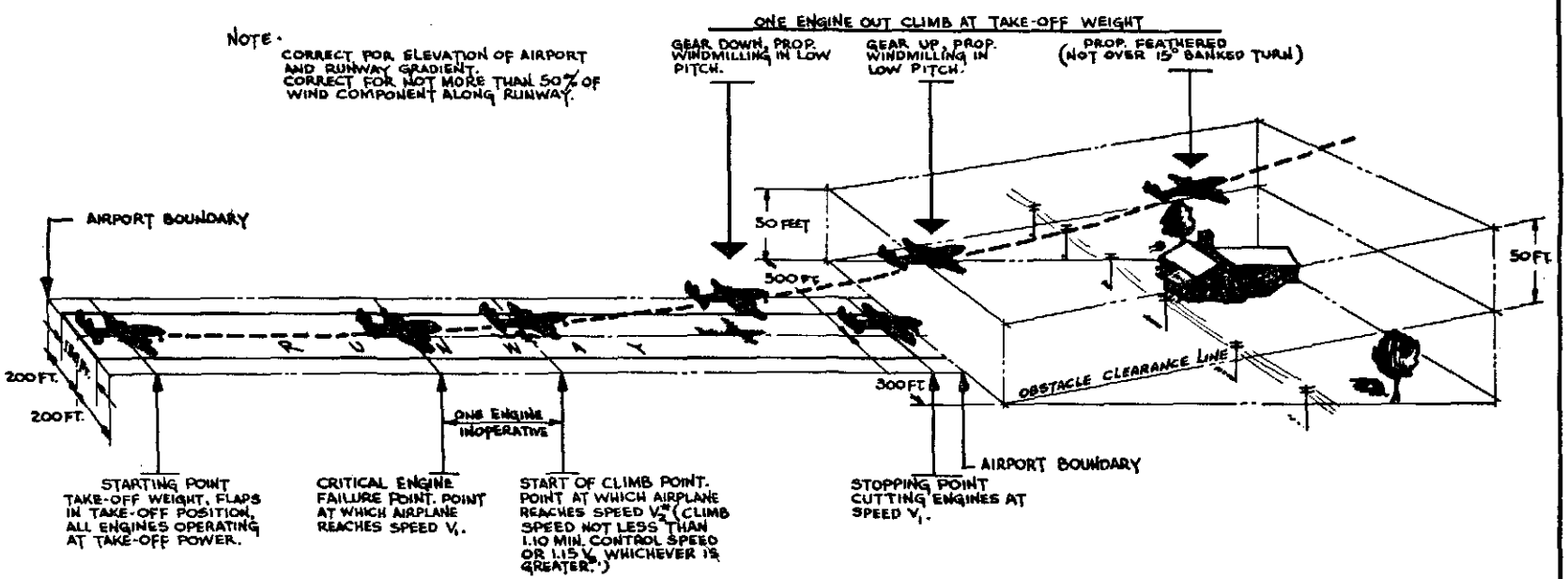
"42.71 *Weight limitations.*

"(a) No airplane shall be taken off from any airport located at an elevation outside of the altitude range for which maximum take-off 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 take-off shall not exceed the authorized maximum take-off weight for the elevation of the airport from which the take-off is to be made.

"(c) The weight at take-off 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."

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.

* $1.2V_{S_1}$ FOR AIRPLANES WITH TWO ENGINES
$1.15V_{S_1}$ FOR AIRPLANES WITH MORE THAN TWO ENGINES.
} V_{S_1} = STALL SPEED WITH TAKE-OFF CONFIGURATION.

Diagram I

42.71–1 *Weight limitations (CAA policies which apply to section 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.

"42.72 *Take-off limitations to provide for engine failure.* No take-off shall be made except under conditions which will permit compliance with the following requirements.

"(a) It shall be possible, from any point on the take-off 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 take-off and attain a height of 50 feet, as indicated by the take-off path data, before passing over the end of the take-off area. Thereafter, it 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 take-off 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 take-off surface. To allow for wind effect, take-off data based on still air may be corrected by not more than 50 percent of the reported wind component along the take-off path if opposite to the direction of take-off, and shall be corrected by not less than 150 percent of the reported wind component if in the direction of take-off."

42.72–1 *Takeoff limitations to provide for engine failure (CAA policies which apply to section 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. Therefore, 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 climbout 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.

"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 6 V_{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 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.* Airplanes shall be dispatched only at such take-off weights that, in proceeding along the intended track with the weight of the airplane progressively reduced by the anticipated consumption of fuel and oil, the rate of climb with one engine inoperative (as set forth in the Airplane Flight Manual) shall be, in feet per minute

$$\left(0.06 - \frac{0.08}{N}\right) V_{s_0}^2,$$

where N is the number of engines installed and V_{s_0} is expressed in miles per hour, at an altitude at least 1,000 feet above the elevation of the highest ground or obstruction within 10 miles of either side of the intended track; except that for airplanes certificated under the performance requirements of Part 4a of this chapter (i. e. Civil Air Regulations) the above

rate-of-climb value shall be 0.02 $V_{S_0}^2$ irrespective of the number of engines installed.

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

"(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 an altitude at which the rate of descent becomes zero, if the latter is sufficiently above the prescribed minimum altitude to assure compliance with the prescribed rate of climb at the prescribed minimum altitudes during the subsequent portion of the flight.

"(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 (CAA policies which apply to section 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.

"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 hereinafter 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 take-off 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 (CAA policies which apply to section 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 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).

"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 paragraphs (a) and (b) of section 42.77 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 airplane 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 this part."

42.80–1 *Performance data on Curtiss model*

C46 aircraft certificated for maximum weights of 45,000 pounds to 48,000 pounds (CAA rules which apply to section 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 tables 1 through 3 and figures 1 through 3.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 (a) (12). (Distance to accelerate to 107 miles per hour 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	7,180
8,000	5,940	6,280	6,750	7,550

[1] For use with Curtiss model C46 airplanes when approved for this weight.

(b) Actual length of runway required when "effective length", considering obstacles, is not determined (distance to accelerate to 107 miles per hour 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	8,445
8,000	6,990	7,390	7,940	8,880

[1] For use with Curtiss model C46 airplanes when approved for this weight.

TABLE 2.—*En route limitations*

(a) Curtiss model C–46 certificated for maximum weight of 45,000 pounds (based on a climb speed of 130 miles per hour (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 130 miles per hour (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 (a) (12) 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 miles per hour							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	3,700	99.0	3,855	101.5	4,030	104.0	4,110	105.0
1,000	3,800	99.0	3,960	101.5	4,140	104.0	4,220	105.0
2,000	3,900	99.0	4,070	101.5	4,250	104.0	4,335	105.0
3,000	4,050	99.0	4,180	101.5	4,360	104.0	4,450	105.0
4,000	4,110	99.0	4,290	101.5	4,475	104.0	4,565	105.0
5,000	4,215	99.0	4,400	101.5	4,595	104.0	4,680	105.0
6,000	4,330	99.0	4,515	101.5	4,710	104.0	4,800	105.0
7,000	4,430	99.0	4,635	101.5	4,845	104.0	4,930	105.0
8,000	4,550	99.0	4,755	101.5	4,970	104.0	5,060	105.0

[1] Steady approach speed through 50 foot-height-miles per hour 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 miles per hour							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	2,890	92.5	3,000	94.5	3,110	97.5	3,215	99.0
1,000	2,960	92.5	3,070	94.5	3,180	97.5	3,285	99.0
2,000	3,035	92.5	3,145	94.5	3,250	97.5	3,360	99.0
3,000	3,110	92.5	3,215	94.5	3,330	97.5	3,430	99.0
4,000	3,185	92.5	3,300	94.5	3,410	97.5	3,520	99.0
5,000	3,260	92.5	3,370	94.5	3,495	97.5	3,615	99.0
6,000	3,330	92.5	3,460	94.5	3,580	97.5	3,700	99.0
7,000	3,415	92.5	3,545	94.5	3,670	97.5	3,800	99.0
8,000	3,500	92.5	3,635	94.5	3,765	97.5	3,900	99.0

[1] For use with Curtiss model C–46 aircraft when approved for this weight.
[2] Steady approach speed through 50 foot-height-miles per hour TIAS denoted by symbol V_{50}.

(Continued ou page 54)

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 (a) (12).

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds.[1]

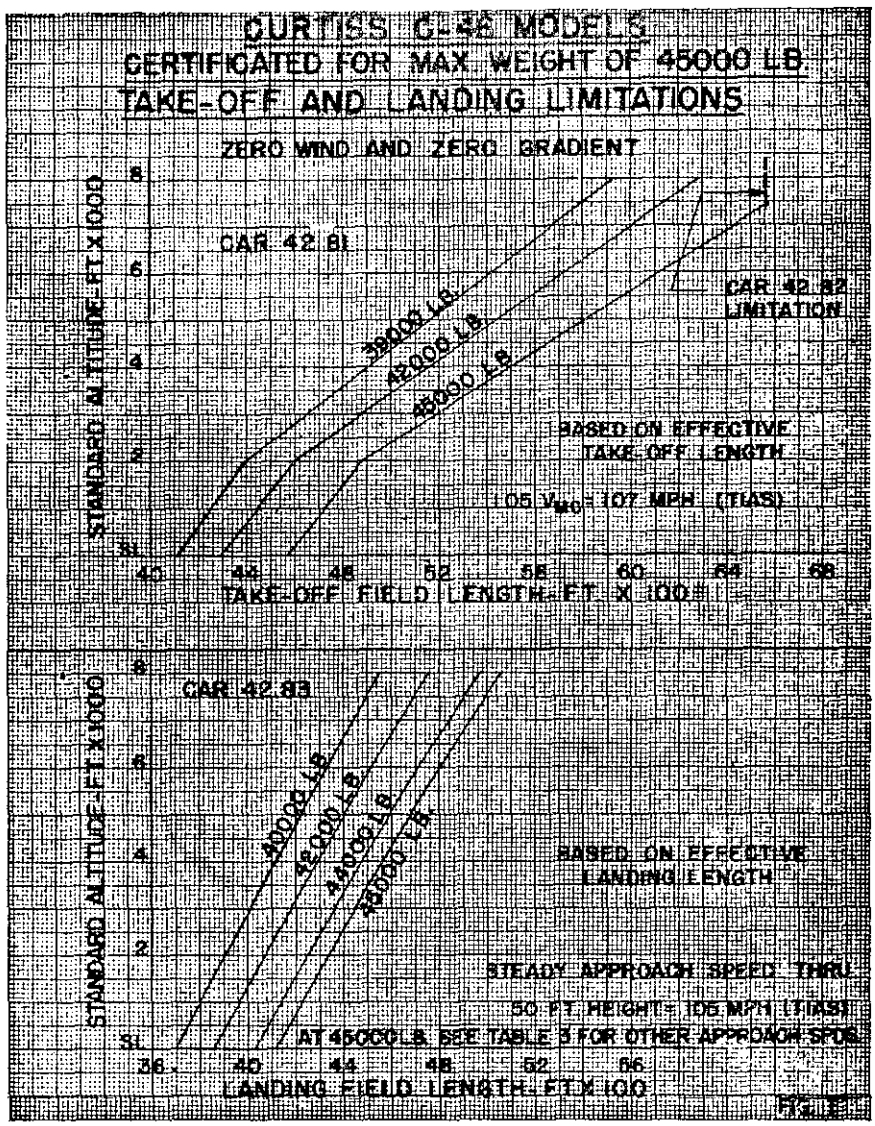
Standard altitude in feet	Airplane weight in pounds and approach speeds[2] in miles per hour							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	4,710	99.0	4,910	101.5	5,130	104.0	5,230	105.0
1,000	4,835	99.0	5,050	101.5	5,270	104.0	5,370	105.0
2,000	4,965	99.0	5,180	101.5	5,410	104.0	5,520	105.0
3,000	5,155	99.0	5,320	101.5	5,550	104.0	5,665	105.0
4,000	5,230	99.0	5,560	101.5	5,695	104.0	5,810	105.0
5,000	5,365	99.0	5,600	101.5	5,850	104.0	5,955	105.0
6,000	5,510	99.0	5,745	101.5	5,995	104.0	6,110	105.0
7,000	5,640	99.0	5,900	101.5	6,165	104.0	6,275	105.0
8,000	5,790	99.0	6,050	101.5	6,325	104.0	6,550	105.0

[1] Steady approach speed through 50 foot-height-miles per hour 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 miles per hour							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	3,680	92.5	3,820	94.5	3,960	97.5	4,090	99.0
1,000	3,765	92.5	3,905	94.5	4,045	97.5	4,180	99.0
2,000	3,860	92.5	4,000	94.5	4,135	97.5	4,275	99.0
3,000	3,960	92.5	4,090	94.5	4,240	97.5	4,365	99.0
4,000	4,055	92.5	4,200	94.5	4,340	97.5	4,480	99.0
5,000	4,150	92.5	4,290	94.5	4,450	97.5	4,600	99.0
6,000	4,240	92.5	4,405	94.5	4,555	97.5	4,710	99.0
7,000	4,345	92.5	4,510	94.5	4,670	97.5	4,835	99.0
8,000	4,455	92.5	4,625	94.5	4,790	97.5	4,965	99.0

[1] For use with Curtiss model C–46 aircraft when approved for this weight.
[2] Steady approach speed through 50 foot-height-miles per hour 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
38000 LB.
42000 LB.
45000 LB.
BASED ON EFFECTIVE
TAKE-OFF LENGTH
105 V_{MO} = 107 MPH (TIAS)
STANDARD ALTITUDE-FT. X 1000
TAKE-OFF FIELD LENGTH-FT. X 100
CAR 42.83
38000 LB.
42000 LB.
45000 LB.
BASED ON EFFECTIVE
LANDING LENGTH
STEADY APPROACH SPEED THRU
50 FT. HEIGHT = 105 MPH (TIAS)
AT 45000 LB. SEE TABLE 3 FOR OTHER APPROACH SPDS.
LANDING FIELD LENGTH-FT. X 100

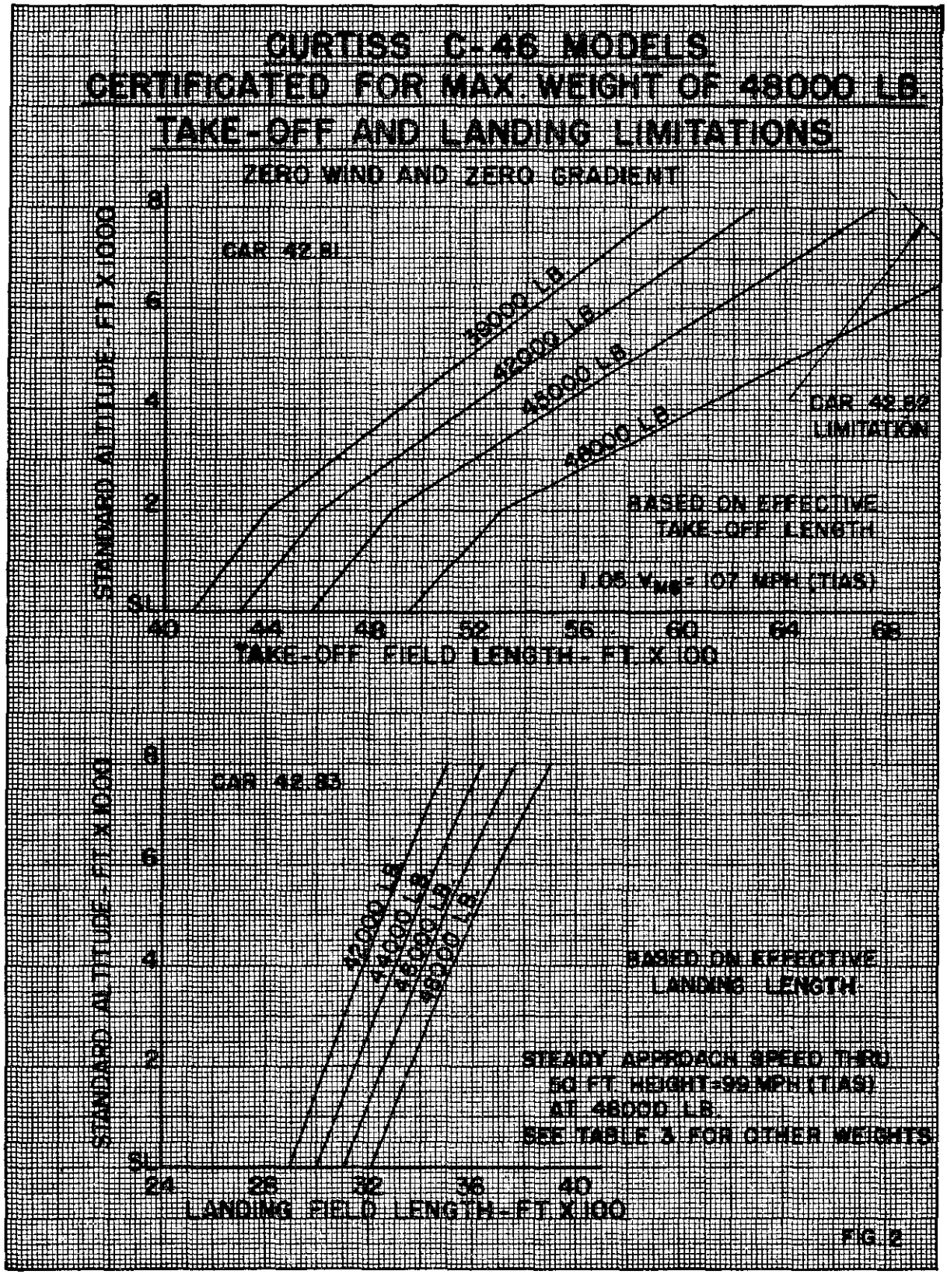

CURTISS C-46 MODELS
CERTIFICATED FOR MAX. WEIGHT OF 48000 LB.
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STANDARD ALTITUDE-FT. X 1000
SL
2
4
6
8
40
44
48
52
56
60
64
68
TAKE-OFF FIELD LENGTH-FT. X 100
38000 LB.
43000 LB.
48000 LB.
CAR 42.82 LIMITATION
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC} = 107 MPH (TIAS)
CAR 42.83
24
26
32
36
40
LANDING FIELD LENGTH-FT. X 100
BASED ON EFFECTIVE LANDING LENGTH
STEADY APPROACH SPEED THRU 50 FT. HEIGHT=99 MPH (TIAS) AT 48000 LB.
SEE TABLE 3 FOR OTHER WEIGHTS.

FIG. 2

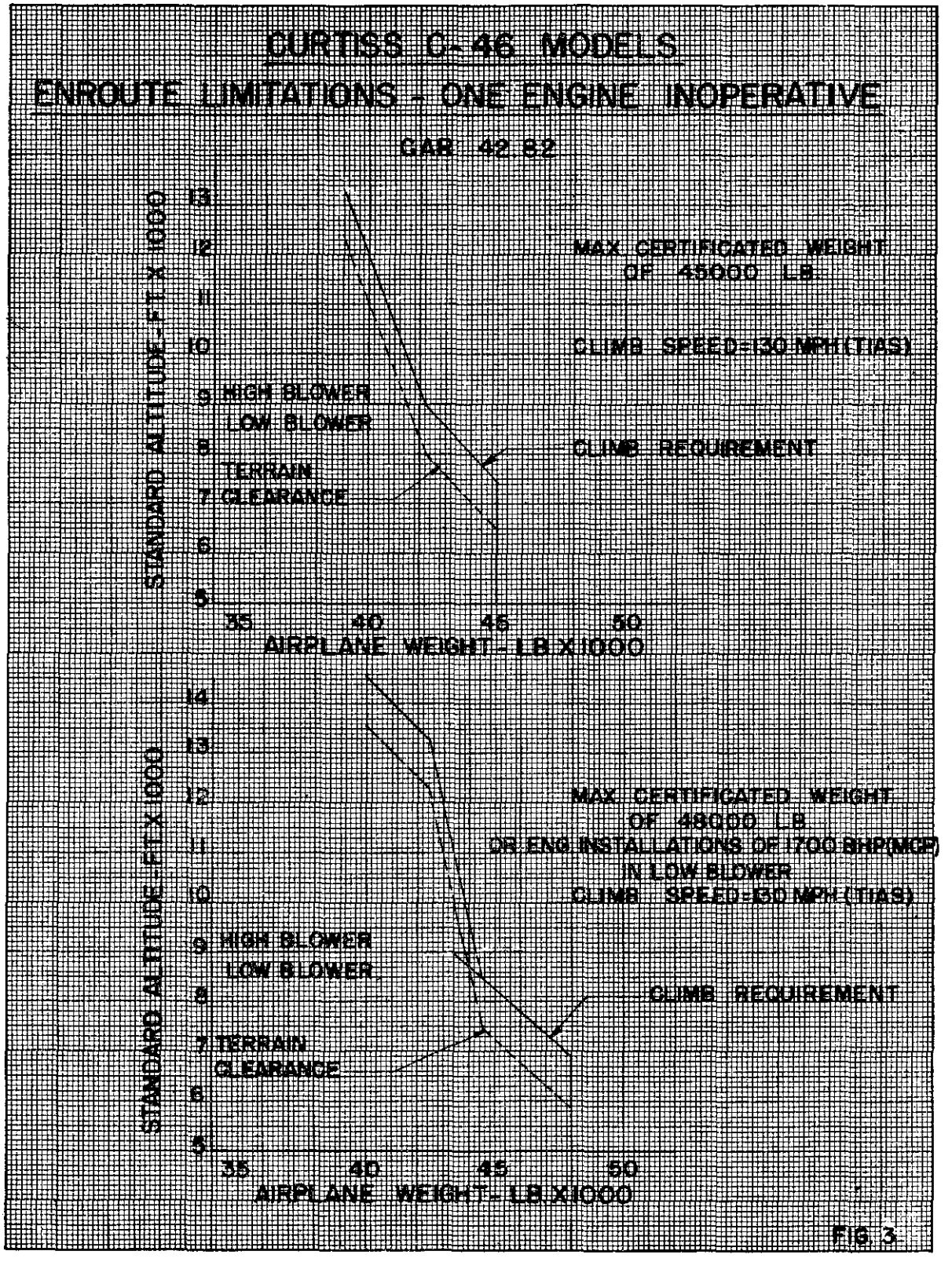


FIG. 3

295219—54——5

42.80–2 *Performance data on Douglas DC–3 aircraft (CAA 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 tables 1 through 4 and figures 1 through 3.

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 (a) (12). (Distance to accelerate to 92 miles per hour 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 92 miles per hour 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 (a) (12). (Distance to accelerate to 92 miles per hour 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 92 miles per hour 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.

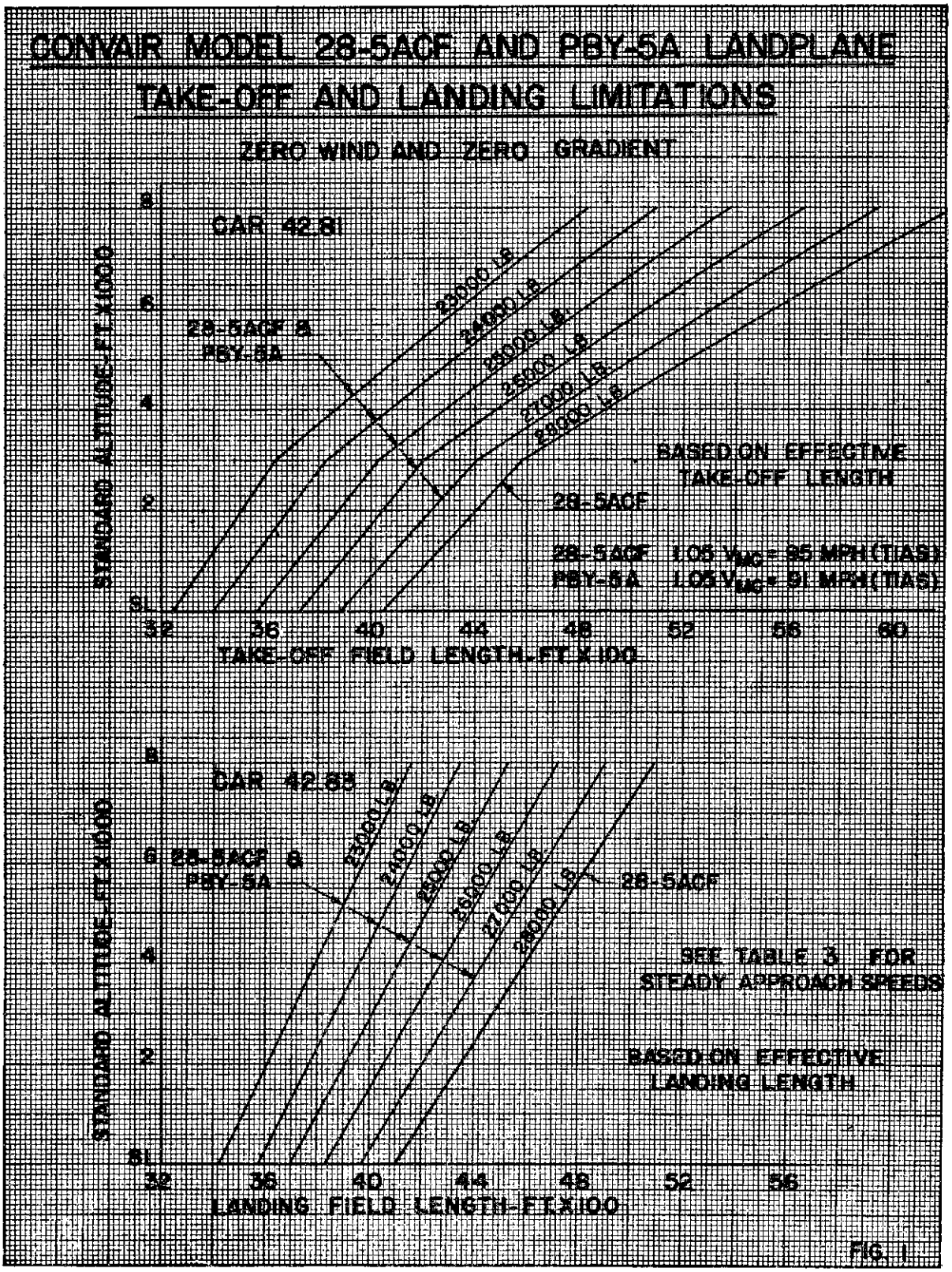
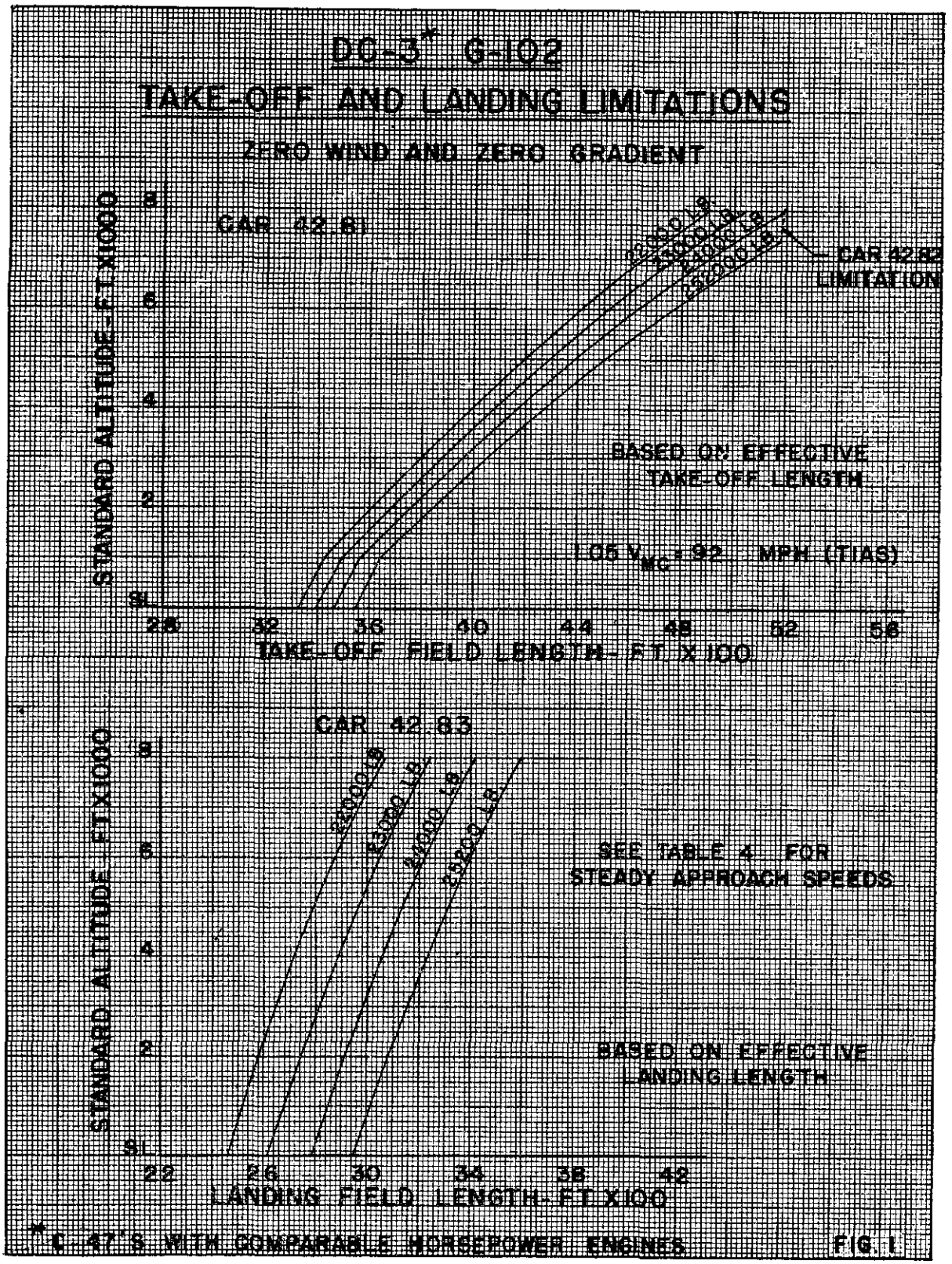

CONVAIR MODEL 28-5ACF AND PBY-5A LANDPLANE
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STANDARD ALTITUDE-FT. X1000
8
6
4
2
SL
28-5ACF & PBY-5A
28000 LB
26000 LB
24000 LB
22000 LB
20000 LB
18000 LB
BASED ON EFFECTIVE TAKE-OFF LENGTH
28-5ACF
28-5ACF LOS V_{MC} = 85 MPH (TIAS)
PBY-5A LOS V_{MC} = 91 MPH (TIAS)
32
36
40
44
48
52
56
60
TAKE-OFF FIELD LENGTH-FT X 100
CAR 42.33
28000 LB
26000 LB
24000 LB
22000 LB
20000 LB
18000 LB
16000 LB
28-5ACF
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT X 100

FIG. 1


DC-3* G-102
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.61
CAR 42.82 LIMITATION
BASED ON EFFECTIVE TAKE-OFF LENGTH
LG5 V_{MC} = 92 MPH (TIAS)
STANDARD ALTITUDE - FT X 1000
SL
2
4
6
8
26
32
36
40
44
48
52
56
TAKE-OFF FIELD LENGTH - FT X 100
CAR 42.83
SEE TABLE 4 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
22
26
30
34
38
42
LANDING FIELD LENGTH - FT X 100
* C-47'S WITH COMPARABLE HORSEPOWER ENGINES
FIG. 1

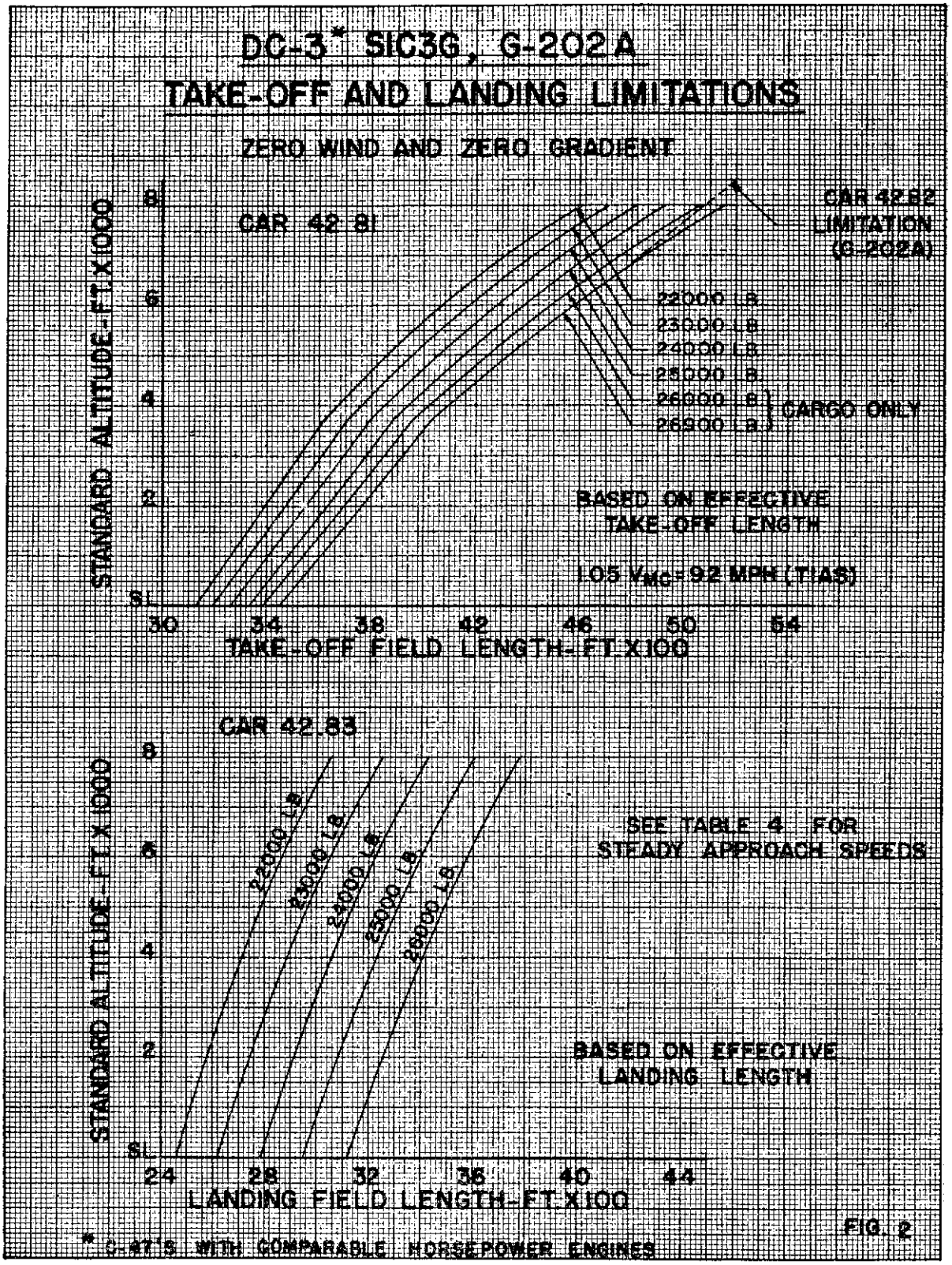

DC-3* SIC3G, G-202A
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
CAR 42.82 LIMITATION (G-202A)
22000 LB.
23000 LB.
24000 LB.
25000 LB.
26000 LB.
26900 LB.
CARGO ONLY
BASED ON EFFECTIVE TAKE-OFF LENGTH
105 VMC=92 MPH (TIAS)
STANDARD ALTITUDE-FT.X1000
SL
2
4
6
8
30
34
38
42
46
50
54
TAKE-OFF FIELD LENGTH-FT.X100
CAR 42.83
22000 LB.
23000 LB.
24000 LB.
25000 LB.
26000 LB.
SEE TABLE 4 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
24
28
32
36
40
44
LANDING FIELD LENGTH-FT.X100
* C-47'S WITH COMPARABLE HORSEPOWER ENGINES

FIG. 2

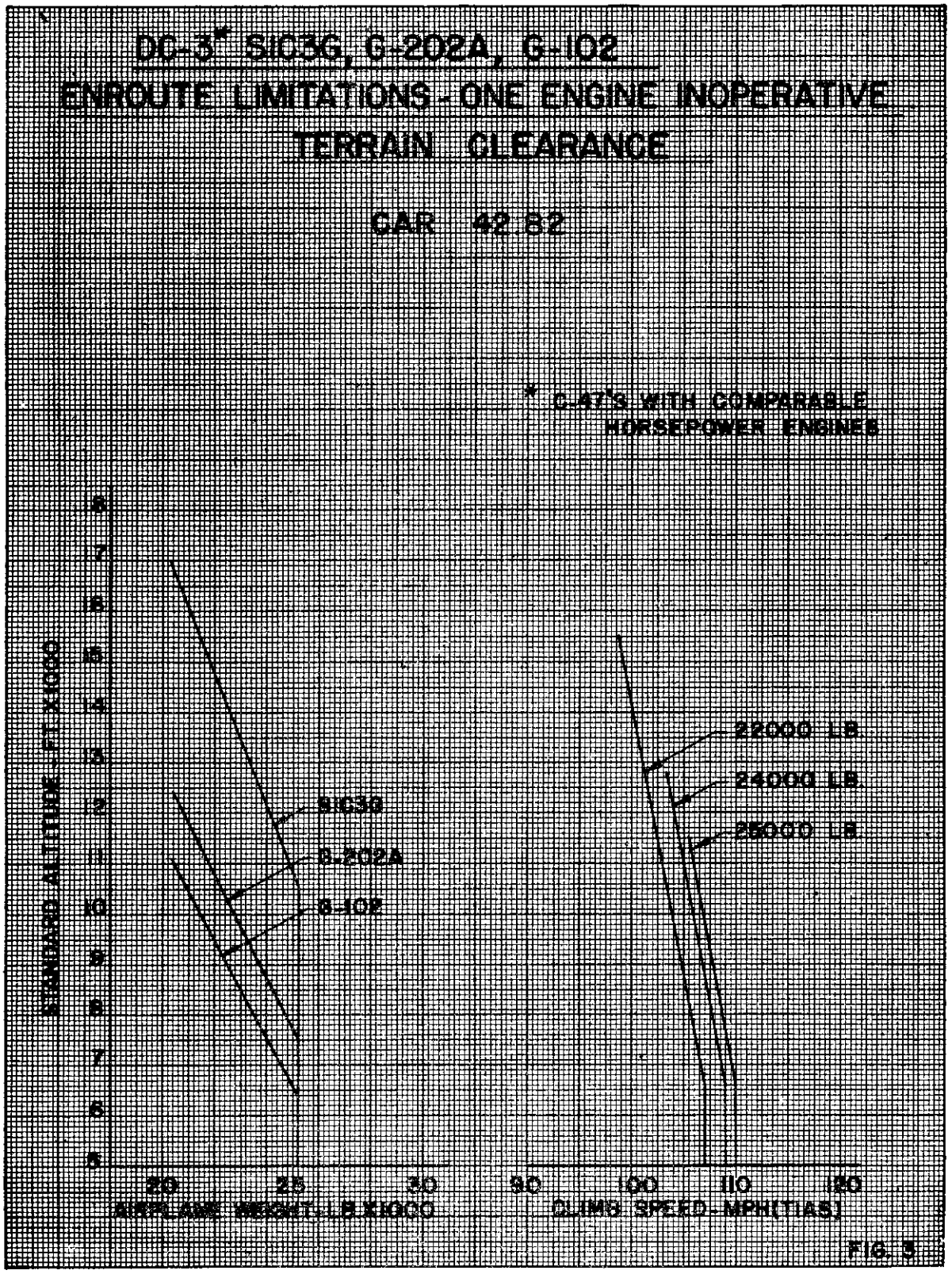

DC-3* SIC3G, C-202A, C-102
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.82
* C-47'S WITH COMPARABLE HORSEPOWER ENGINES
STANDARD ALTITUDE - FT. X1000
9
8
7
6
5
SIC3G
C-202A
C-102
22000 LB.
24000 LB.
25000 LB.
20
25
30
90
100
110
120
AIRPLANE WEIGHT - LB. X1000
CLIMB SPEED - MPH (TIAS)

FIG. 3

42.80–3 *Performance data on Lockheed 18 G202A aircraft (CAA 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 tables 1 through 3 and figures 1 and 2.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 (a) (12). (Distance to accelerate to 114.5 miles per hour 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 114.5 miles per hour 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 miles per hour TIAS	
	Feet	Miles per hour
18,500	9,800	120.5
18,000	10,600	119.0
17,500	11,350	117.5
17,000	12,150	116.5
16,500	12,900	115.0
16,000	13,700	114.0

[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 (a) (12) with zero wind and zero gradient.

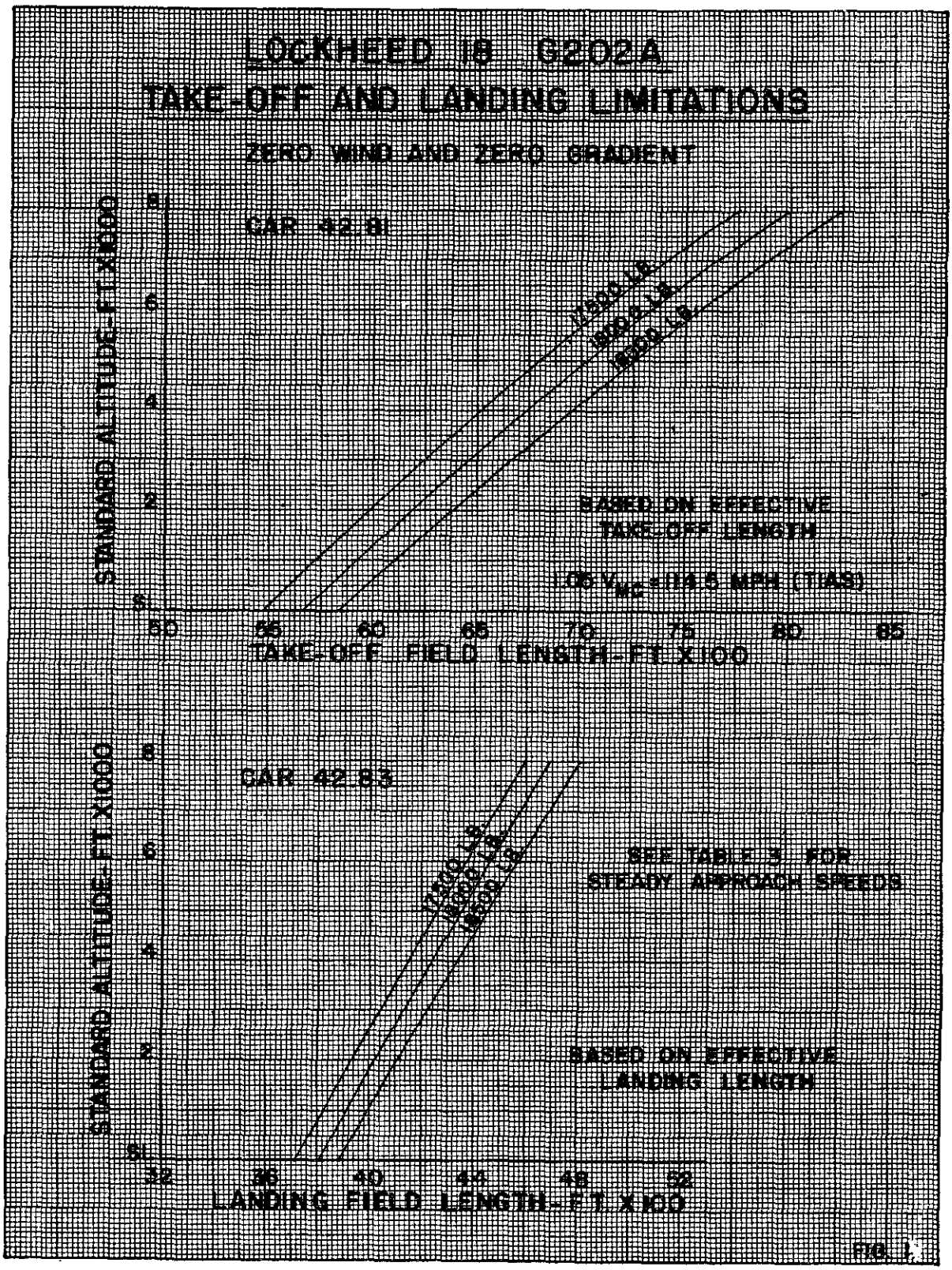
Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L.	3,715	96	3,810	97	3,885	99
1,000	3,825	96	3,910	97	3,995	99
2,000	3,930	96	4,020	97	4,105	99
3,000	4,040	96	4,130	97	4,220	99
4,000	4,150	96	4,240	97	4,335	99
5,000	4,240	96	4,350	97	4,450	99
6,000	4,370	96	4,460	97	4,570	99
7,000	4,480	96	4,575	97	4,690	99
8,000	4,595	96	4,690	97	4,810	99

[1] Steady approach speed through 50-foot height miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L.	4,720	96	4,840	97	4,935	99
1,000	4,860	96	4,965	97	5,075	99
2,000	4,990	96	5,105	97	5,215	99
3,000	5,130	96	5,245	97	5,360	99
4,000	5,270	96	5,385	97	5,505	99
5,000	5,385	96	5,525	97	5,650	99
6,000	5,550	96	5,665	97	5,805	99
7,000	5,690	96	5,810	97	5,955	99
8,000	5,835	96	5,955	97	6,110	99

[1] Steady approach speed through 50-foot height miles per hour TIAS denoted by symbol V_{50}.


LOCKHEED 18 G202A
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.61
STANDARD ALTITUDE-FT X100
8
6
4
2
SL
50
55
60
65
70
75
80
85
TAKE-OFF FIELD LENGTH-FT X100
BASED ON EFFECTIVE TAKE-OFF LENGTH
LOF V_{MC} = 114.5 MPH (TIAS)
CAR 42.83
STANDARD ALTITUDE-FT X100
8
6
4
2
SL
32
36
40
44
48
52
LANDING FIELD LENGTH-FT X100
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
FIG. 1

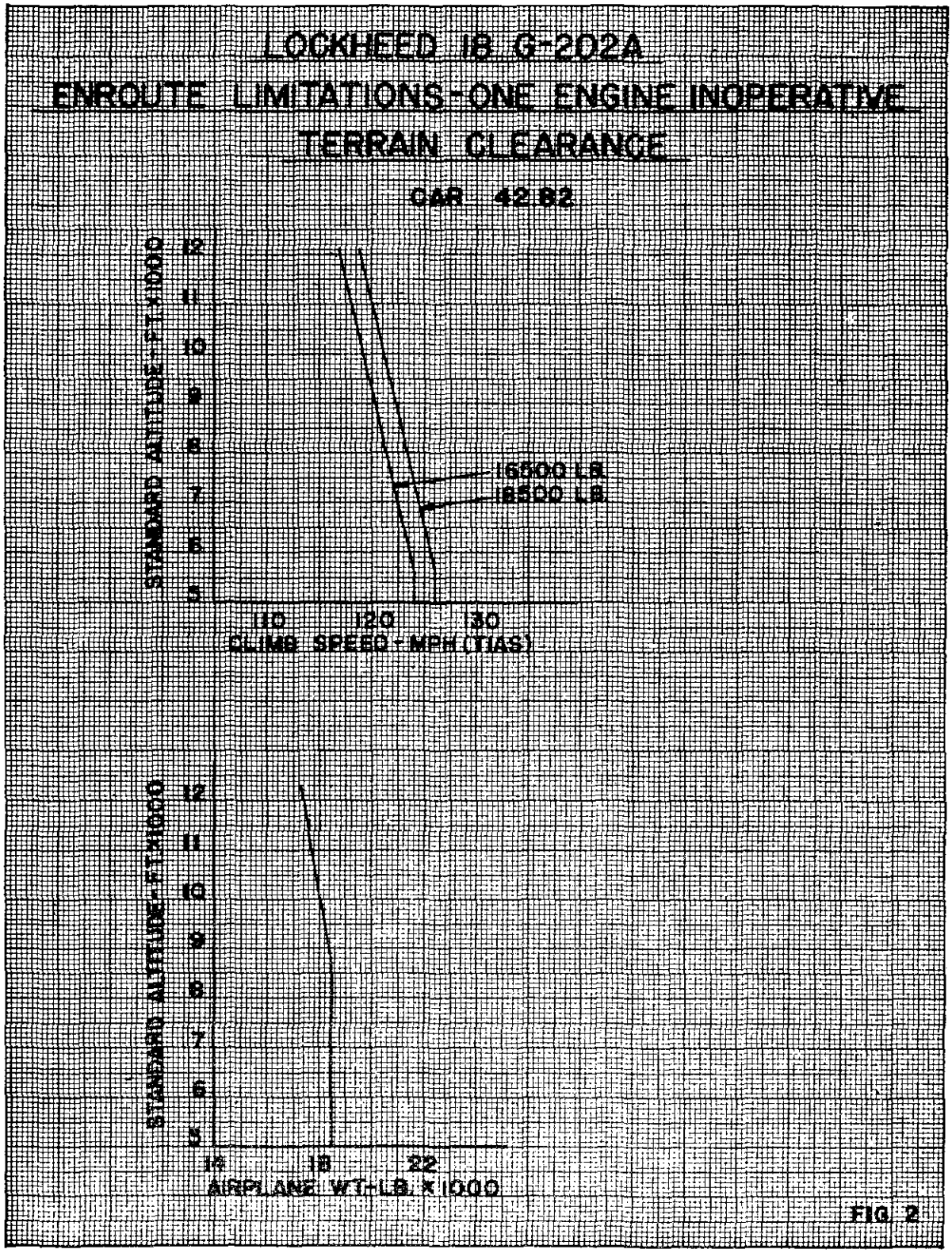

LOCKHEED 18 G-202A
ENROUTE LIMITATIONS-ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.82
STANDARD ALTITUDE-FT.×1000
12
11
10
9
8
7
6
5
16500 LB.
18500 LB.
110
120
130
CLIMB SPEED-MPH (TIAS)
STANDARD ALTITUDE-FT.×1000
12
11
10
9
8
7
6
5
14
18
22
AIRPLANE WT-LB.×1000

FIG. 2

42.80–4 *Convair Model 28–5ACF and PBY–5A landplane aircraft (CAA rules which apply to section 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 tables 1 through 4 and figures 1 and 2.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 (a) (12). (Distance to accelerate to 91 miles per hour TIAS (28–5ACF), 95 miles per hour 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 91 miles per hour TIAS (28–5ACF), 95 miles per hour 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	4,557	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 miles per hour TIAS			
	Model PBY–5A		Model 28–5ACF	
	Feet	Miles per hour	Feet	Miles per hour
28,000			7,500	104.0
27,500			8,000	103.0
27,000	7,200	93.5	8,500	102.0
26,500	7,700	92.5	9,050	101.0
26,000	8,200	91.5	9,600	100.0
25,500	8,700	90.5	10,100	99.0
25,000	9,200	89.0	10,650	97.5
24,500	9,700	88.0	11,150	96.5
24,000	10,200	87.0	11,700	95.0

[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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	3,420	86	3,570	88	3,690	90
1,000	3,515	86	3,665	88	3,800	90
2,000	3,605	86	3,765	88	3,900	90
3,000	3,700	86	3,860	88	4,010	90
4,000	3,790	86	3,955	88	4,110	90
5,000	3,885	86	4,055	88	4,215	90
6,000	3,975	86	4,150	88	4,320	90
7,000	4,070	86	4,245	88	4,425	90
8,000	4,160	86	4,340	88	4,525	90

[1] Steady approach speed through 50 feet height in miles per hour. 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	4,350	86	4,544	88	4,696	90
1,000	4,475	86	4,664	88	4,836	90
2,000	4,588	86	4,792	88	4,964	90
3,000	4,709	86	4,913	88	5,104	90
4,000	4,824	86	5,034	88	5,231	90
5,000	4,944	86	5,161	88	5,364	90
6,000	5,059	86	5,282	88	5,498	90
7,000	5,180	86	5,403	88	5,632	90
8,000	5,294	86	5,524	88	5,759	90

[1] Steady approach speed through 50 feet height in miles per hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	26,000	V_{50}	[2]27,000	V_{50}	[3]28,000	V_{50}
	Distance in feet					
S. L.	3,830	92	3,965	93	4,100	95
1,000	3,940	92	4,080	93	4,220	95
2,000	4,050	92	4,200	93	4,345	95
3,000	4,160	92	4,315	93	4,470	95
4,000	4,275	92	4,430	93	4,595	95
5,000	4,385	92	4,550	93	4,720	95
6,000	4,495	92	4,665	93	4,840	95
7,000	4,610	92	4,785	93	4,970	95
8,000	4,720	92	4,900	93	5,090	95

[1] Steady approach speed through 50 feet height in miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	26,000	V_{50}	[2]27,000	V_{50}	[3]28,000	V_{50}
	Distance in feet					
S. L.	4,874	92	5,046	93	5,218	95
1,000	5,014	92	5,193	93	5,371	95
2,000	5,154	92	5,345	93	5,530	95
3,000	5,294	92	5,492	93	5,689	95
4,000	5,441	92	5,638	93	5,848	95
5,000	5,581	92	5,791	93	6,007	95
6,000	5,721	92	5,937	93	6,160	95
7,000	5,867	92	6,090	93	6,325	95
8,000	6,007	92	6,236	93	6,478	95

[1] Steady approach speed through 50 feet height in miles per hour TIAS denoted by symbol V_{50}.
[2] Maximum weight for PBY-5A landplane.
[3] Maximum weight for 28-5ACF.

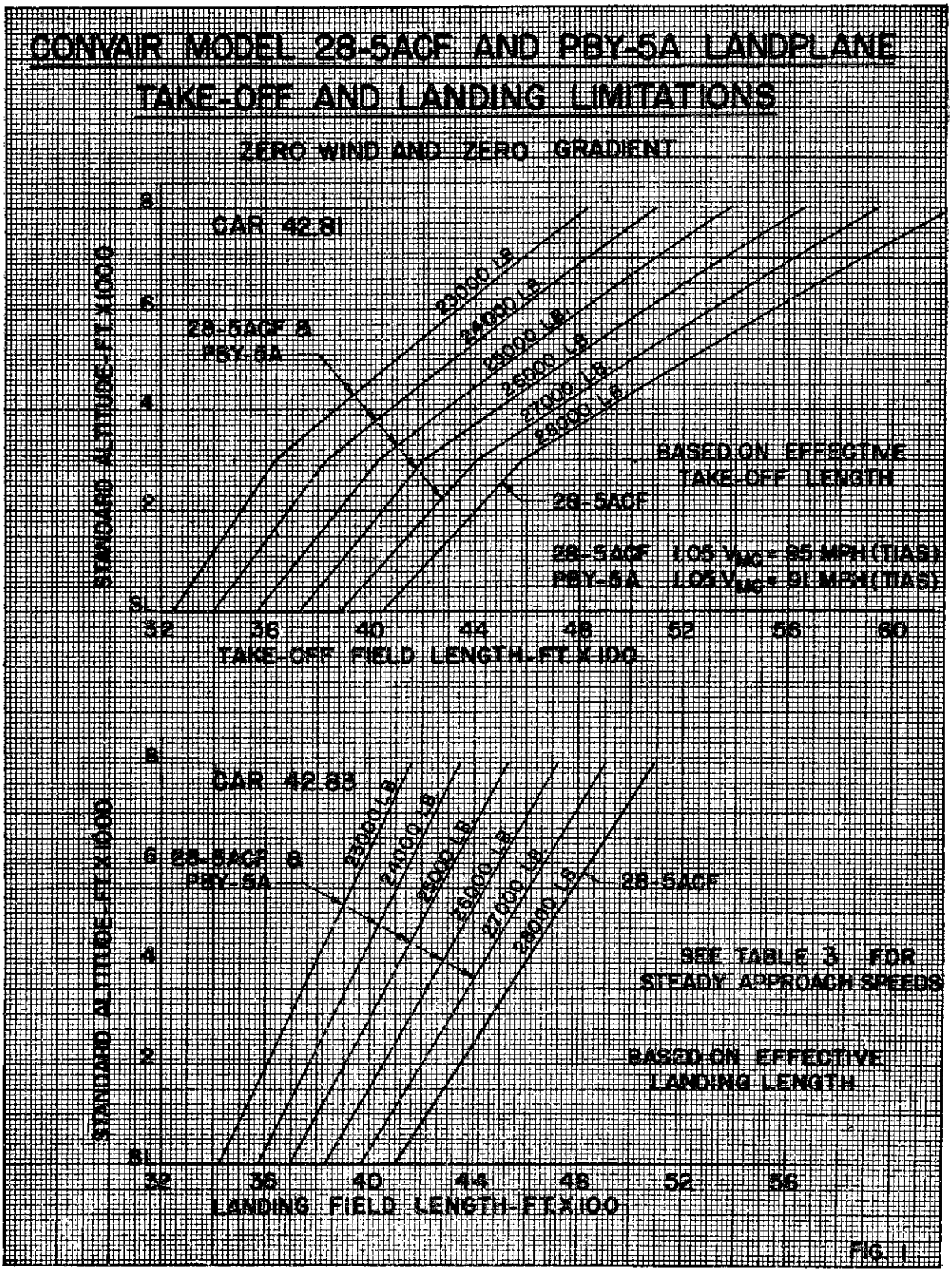
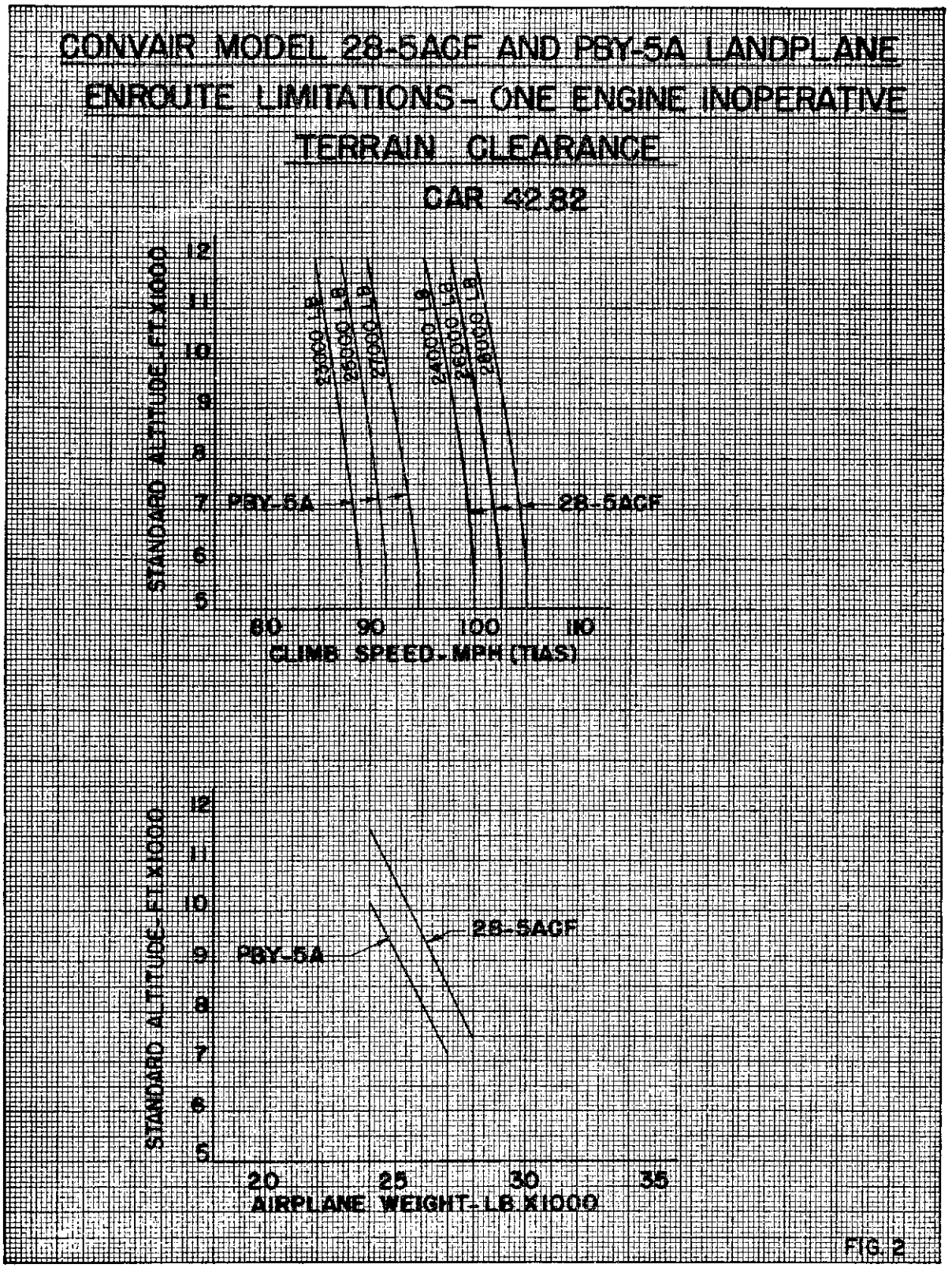

CONVAIR MODEL 28-5ACF AND PBY-5A LANDPLANE
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STANDARD ALTITUDE-FT. X1000
8
6
4
2
SL
28-5ACF & PBY-5A
28000 LB
26000 LB
24000 LB
22000 LB
20000 LB
18000 LB
BASED ON EFFECTIVE TAKE-OFF LENGTH
28-5ACF
28-5ACF LOS V_{MC} = 85 MPH (TIAS)
PBY-5A LOS V_{MC} = 91 MPH (TIAS)
32
36
40
44
48
52
56
60
TAKE-OFF FIELD LENGTH-FT X 100
CAR 42.33
28000 LB
26000 LB
24000 LB
22000 LB
20000 LB
18000 LB
16000 LB
28-5ACF
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
LANDING FIELD LENGTH-FT X 100

FIG. 1


CONVAIR MODEL 28-5ACF AND PBY-5A LANDPLANE
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.82
STANDARD ALTITUDE-FT.X1000
12
11
10
9
8
7
6
5
PBY-5A
28-5ACF
60
90
100
110
CLIMB SPEED-MPH (TIAS)
STANDARD ALTITUDE-FT.X1000
12
11
10
9
8
7
6
5
PBY-5A
28-5ACF
20
25
30
35
AIRPLANE WEIGHT-LB X1000
FIG. 2

42.80–5 *Performance data on Douglas B–18, RB–18A (R1820–53) aircraft (CAA 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 tables 1 through 3 and figures 1 and 2. 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 (a) (12). (Distance to accelerate to 94 miles per hour 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 94 miles per hour 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 miles per hour TIAS			
	Low blower		High blower	
	Feet	Miles per hour	Feet	Miles per hour
21,000	4,270	99.0	----	----
20,600	----	----	4,600	98.0
20,500	----	----	5,900	97.5
20,200	----	----	8,800	96.0
20,000	----	----	8,950	96.0
19,500	----	----	9,400	95.0

[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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	2,850	86.0	3,110	88.5	3,370	90.5	3,445	91.0
1,000	2,930	86.0	3,200	88.5	3,470	90.5	3,545	91.0
2,000	3,010	86.0	3,290	88.5	3,565	90.5	3,640	91.0
3,000	3,085	86.0	3,380	88.5	3,660	90.5	3,740	91.0
4,000	3,165	86.0	3,470	88.5	3,755	90.5	3,835	91.0
5,000	3,245	86.0	3,560	88.5	3,850	90.5	3,935	91.0
6,000	3,325	86.0	3,650	88.5	----	----	----	----
7,000	3,405	86.0	3,735	88.5	[2]	[2]	[2]	[2]
8,000	3,485	86.0	3,825	88.5	----	----	----	----

[1] Steady approach speed through 50 feet height miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	3,630	86.0	3,960	88.5	4,290	90.5	4,390	91.0
1,000	3,730	86.0	4,070	88.5	4,410	90.5	4,510	91.0
2,000	3,835	86.0	4,190	88.5	4,540	90.5	4,630	91.0
3,000	3,925	86.0	4,300	88.5	4,655	90.5	4,760	91.0
4,000	4,025	86.0	4,415	88.5	4,775	90.5	4,880	91.0
5,000	4,130	86.0	4,535	88.5	4,900	90.5	5,005	91.0
6,000	4,230	86.0	4,645	88.5	----	----	----	----
7,000	4,340	86.0	4,750	88.5	----	[2]	[2]	----
8,000	4,440	86.0	4,865	88.5	----	----	----	----

[1] Steady approach speed through 50 feet height miles per hour TIAS denoted by symbol V_{50}.
[2] Limited by sec. 42.82.

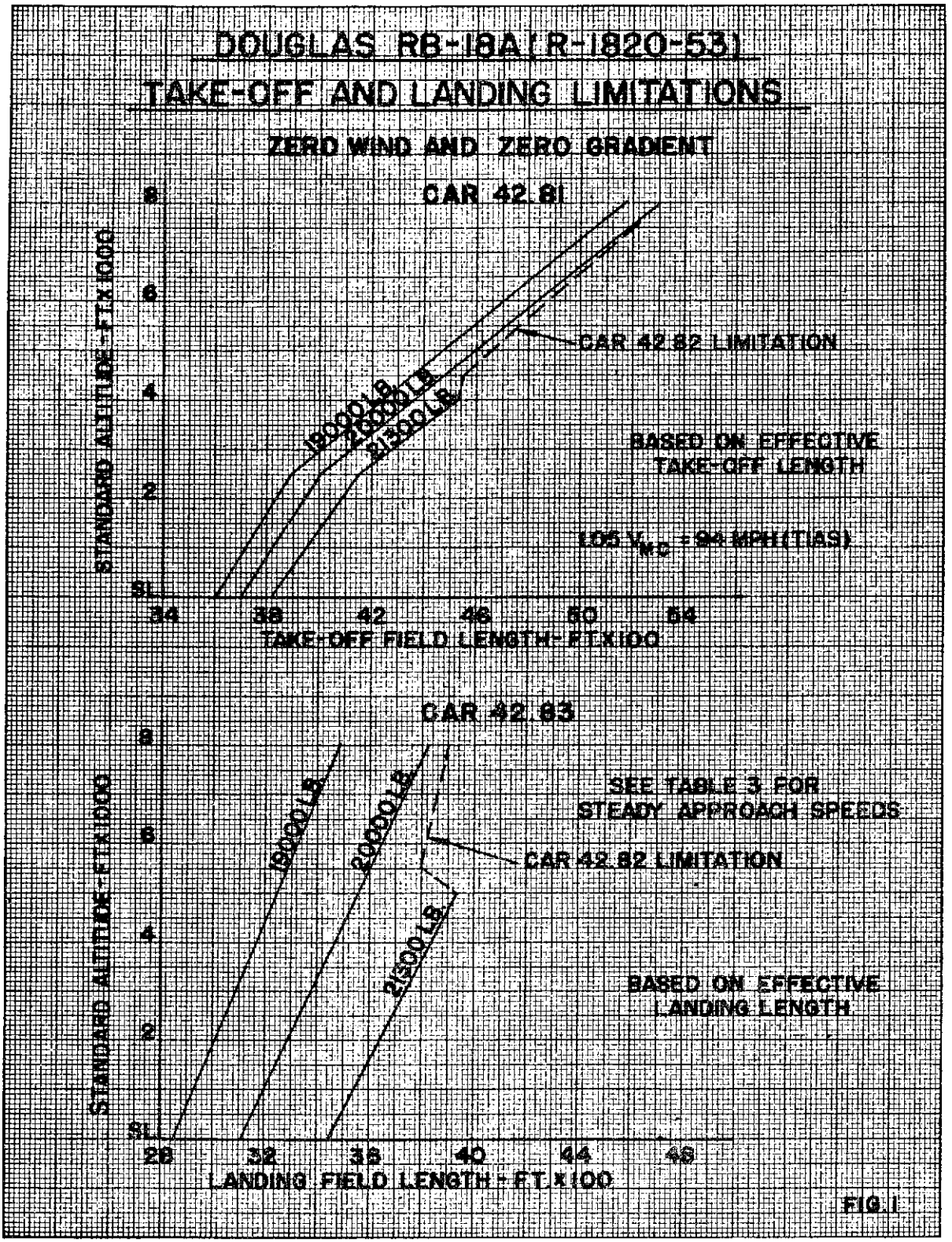
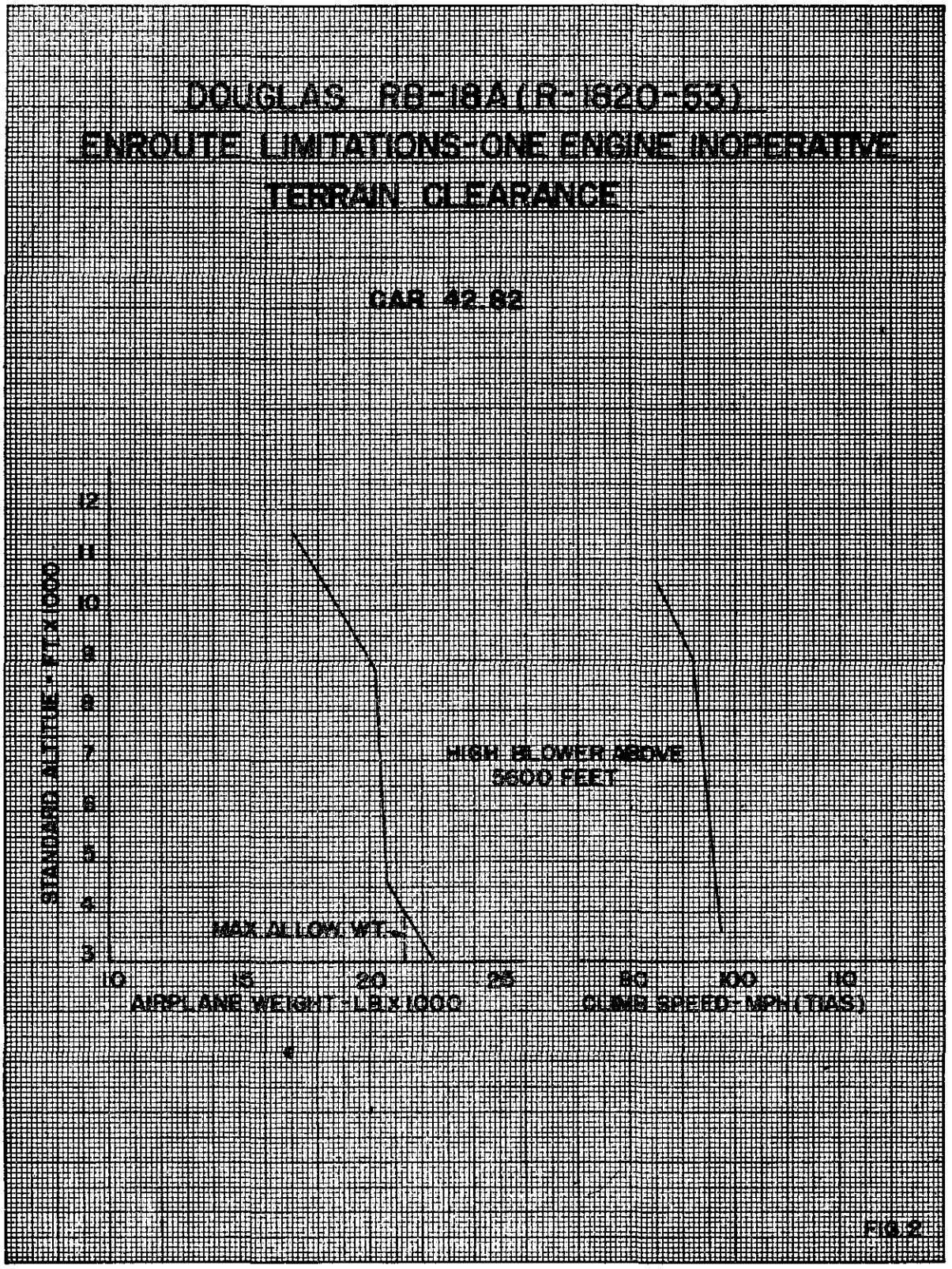

DOUGLAS RB-18A (R-1820-53)
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STANDARD ALTITUDE - FT. X 1000
8
6
4
2
SL
CAR 42.82 LIMITATION
19000 LB
20000 LB
21300 LB
BASED ON EFFECTIVE TAKE-OFF LENGTH
1.05 V_{MC} = 94 MPH (TIAS)
34
38
42
46
50
54
TAKE-OFF FIELD LENGTH - FT. X 100
CAR 42.83
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
CAR 42.82 LIMITATION
BASED ON EFFECTIVE LANDING LENGTH
18000 LB
20000 LB
21300 LB
28
32
36
40
44
48
LANDING FIELD LENGTH - FT. X 100

FIG. 1


DOUGLAS RB-18A (R-1820-53)
ENROUTE LIMITATIONS-ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.82
STANDARD ALTITUDE - FT. x 1000
12
11
10
9
8
7
6
5
4
3
HIGH BLOWER ABOVE 5500 FEET
MAX ALLOW WT.
10
15
20
25
80
100
110
AIRPLANE WEIGHT - LBS x 1000
CLIMB SPEED - MPH (TIAS)
FIG 2

42.80–6 *En route limitations on multiengine aircraft with maximum allowable takeoff weights below 12,500 pounds (CAA rules which apply to section 42.16 and section 42.80).* The following en route limitations data, applicable to Aero Commander 520, Beech AT–11, Beech D18C, Beech D18S, Beech 50, Grumman G–21, Lockheed 10A, Lockheed 10E, and Lockheed 12A aircraft, shall be used in determining compliance with section 42.80. These data are presented in table 1 and figures 1 through 6. 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.

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 CAR 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.

TABLE 1.—*En route limitations*

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 CAR 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 CAR 42.82.

NOTE.—Inoperative propeller feathered.

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 CAR 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 CAR 42.82.

NOTE.—Inoperative propeller windmilling.

TABLE 1.—*En route limitations*

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 CAR 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.

TABLE 1.—*En route limitations*

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 sec. 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 CAR 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.

LOCKHEED 10E

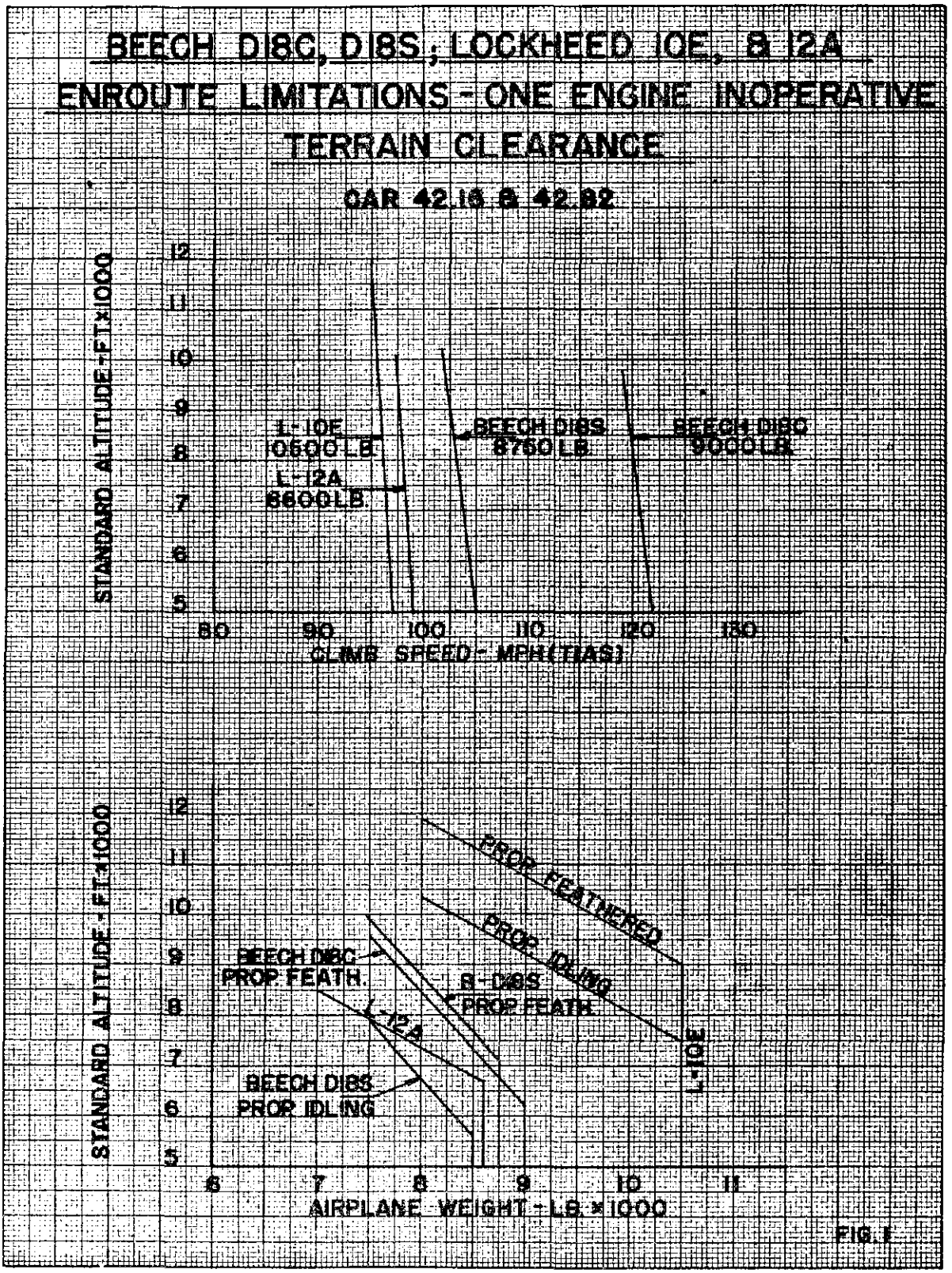
Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour TIAS			
	Propeller feathered		Propeller idling	
	Feet	Miles per hour	Feet	Miles per hour
10,500	9, 000	96	7, 500	96. 5
10,000	9, 600	96	8, 100	96. 5
9,500	10, 200	96	8, 600	96. 5
9,000	10, 700	96	9, 200	96. 5
8,500	11, 300	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.

LOCKHEED 12A

Weight in pounds	Terrain clearance [1] in feet and climb speed 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.


BEECH D18C, D18S; LOCKHEED 10E, & 12A
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
STANDARD ALTITUDE - FT. x 1000
12
11
10
9
8
7
6
5
L-10E 10600 LB.
L-12A 8600 LB.
BEECH D18S 8760 LB.
BEECH D18C 9000 LB.
80
90
100
110
120
130
CLIMB SPEED - MPH (TIAS)
STANDARD ALTITUDE - FT. x 1000
PROP FEATHERED
PROP IDLING
BEECH D18C PROP FEATH.
L-12A
BEECH D18S PROP FEATH.
L-10E
BEECH D18S PROP IDLING
6
7
8
9
10
11
AIRPLANE WEIGHT - LB. x 1000
FIG. 1

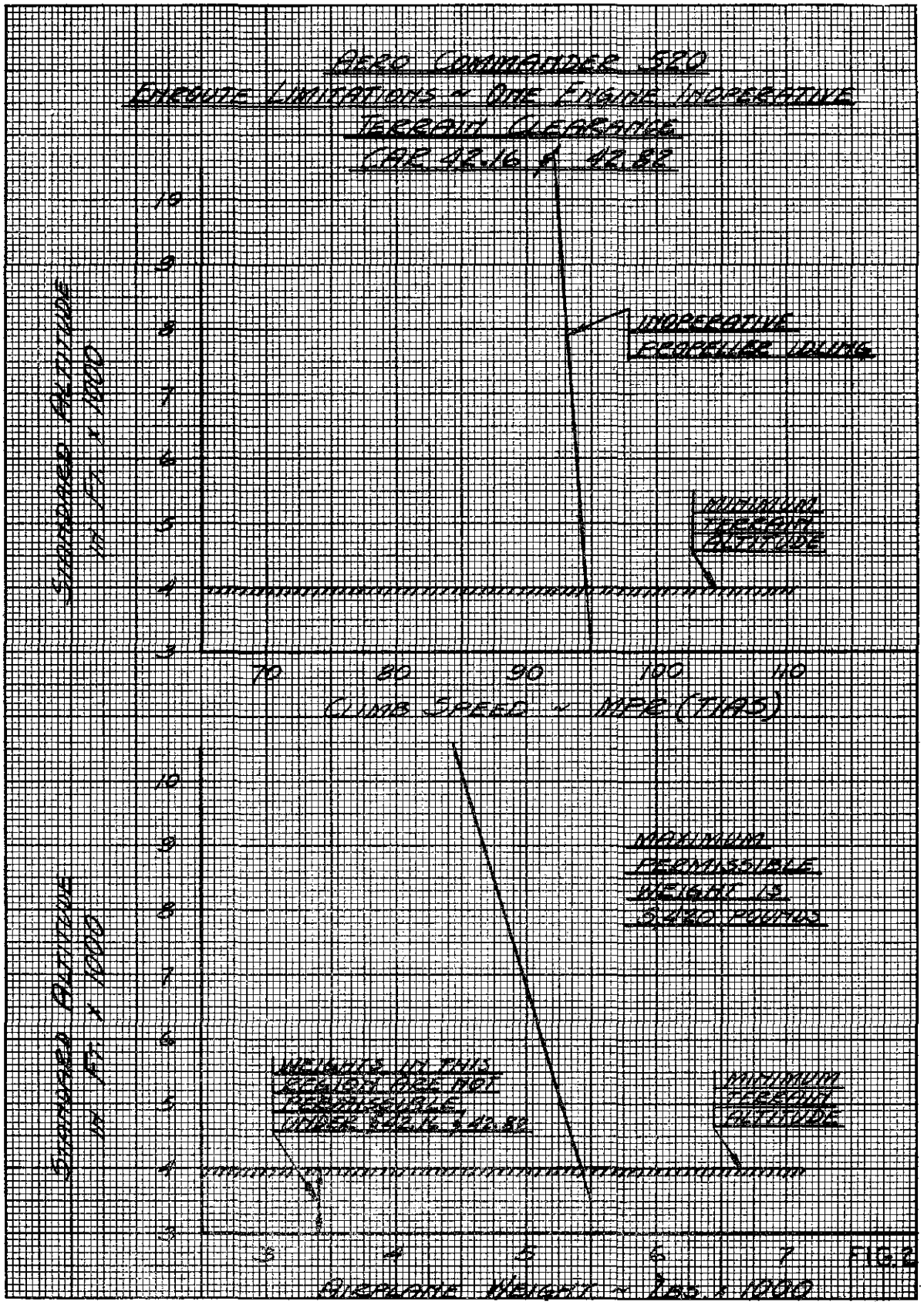

AERO COMMANDER 520
ENROUTE LIMITATIONS ~ ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
STANDARD ALTITUDE IN FT. x 1000
10
9
8
7
6
5
4
3
INOPERATIVE PROPELLER IDLING
MINIMUM TERRAIN ALTITUDE
70
80
90
100
110
CLIMB SPEED ~ MPR (TIAS)
MAXIMUM PERMISSIBLE WEIGHT IS 5420 POUNDS
WEIGHTS IN THIS REGION ARE NOT PERMISSIBLE UNDER §42.16 & 42.82
MINIMUM TERRAIN ALTITUDE
3
4
5
6
7
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 2

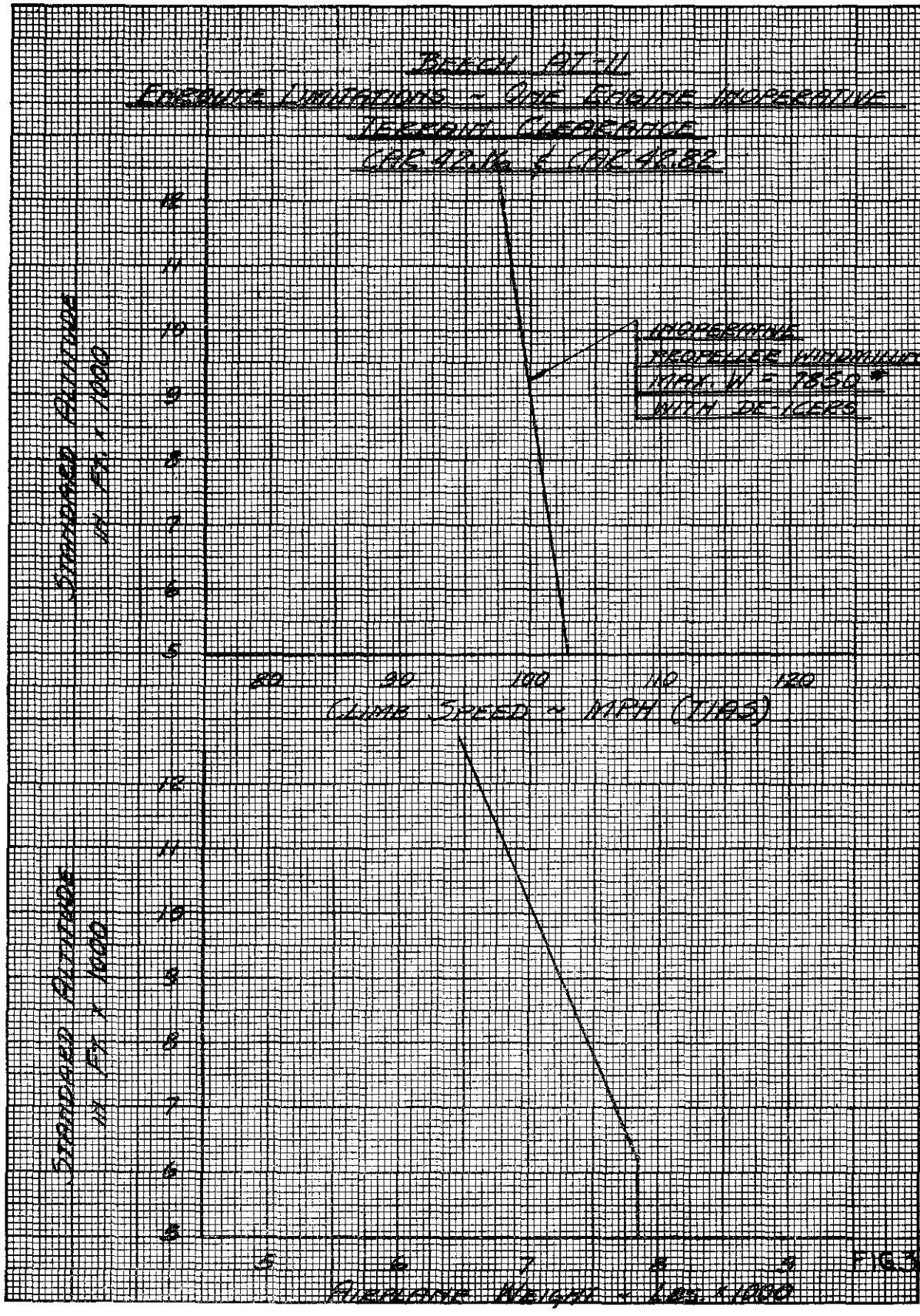

BEECH AT-11
ENROUTE LIMITATIONS ~ ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & CAR 42.82
INOPERATIVE
PROPELLER WINDMILLING
MAX. W = 7850 #
WITH DE-ICERS
STANDARD ALTITUDE IN FT. x 1000
12
11
10
9
8
7
6
5
80
90
100
110
120
CLIMB SPEED ~ MPH (TIAS)
STANDARD ALTITUDE IN FT. x 1000
12
11
10
9
8
7
6
5
5
6
7
8
9
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 3

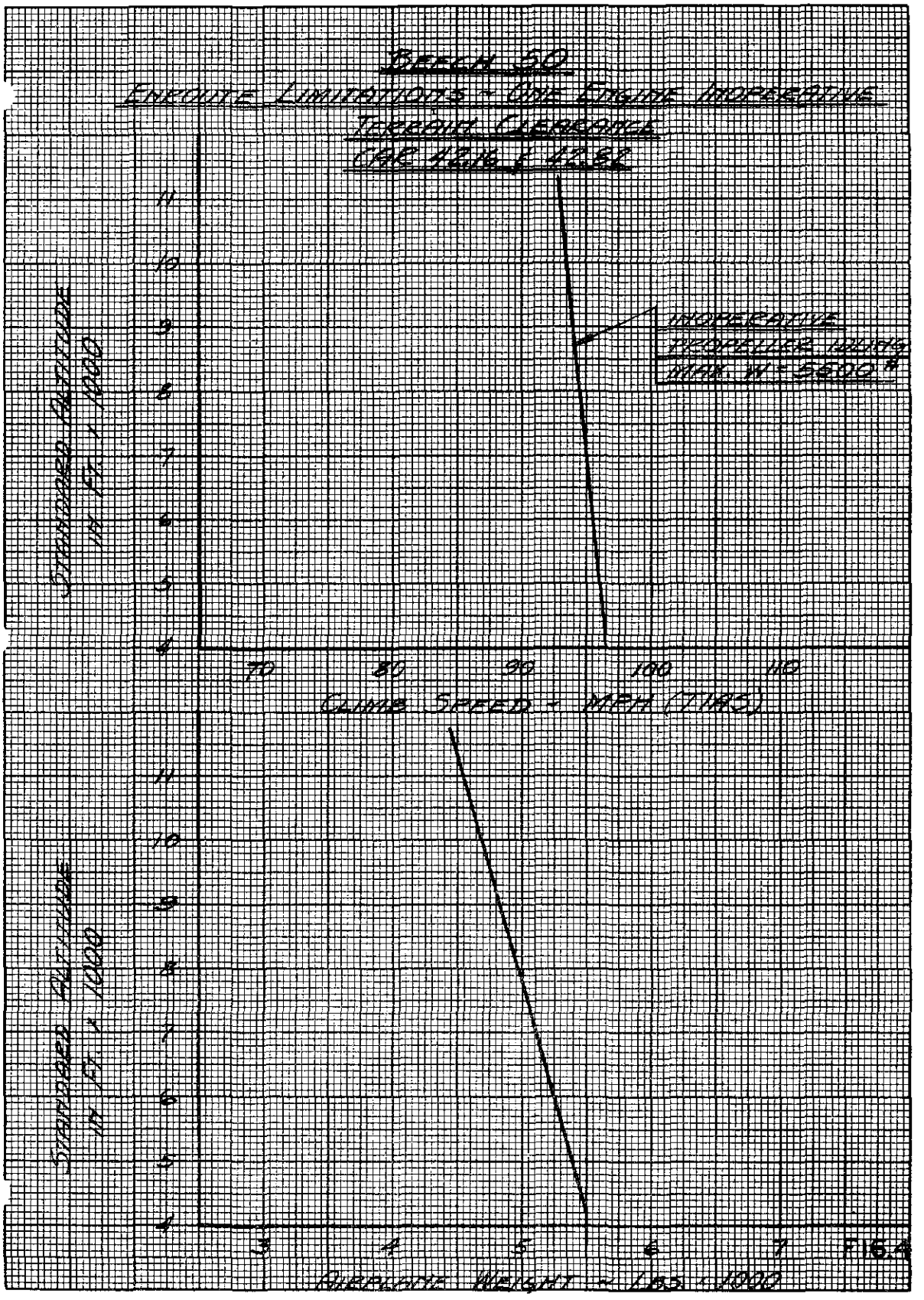

BEECH 50
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
INOPERATIVE PROPELLER IDLING
MAX. W = 5500#
STANDARD ALTITUDE IN FT. x 1000
11
10
9
8
7
6
5
4
70
80
90
100
110
CLIMB SPEED - MPH (TIAS)
STANDARD ALTITUDE IN FT. x 1000
11
10
9
8
7
6
5
4
3
4
5
6
7
AIRPLANE WEIGHT - LBS. x 1000

FIG. 4

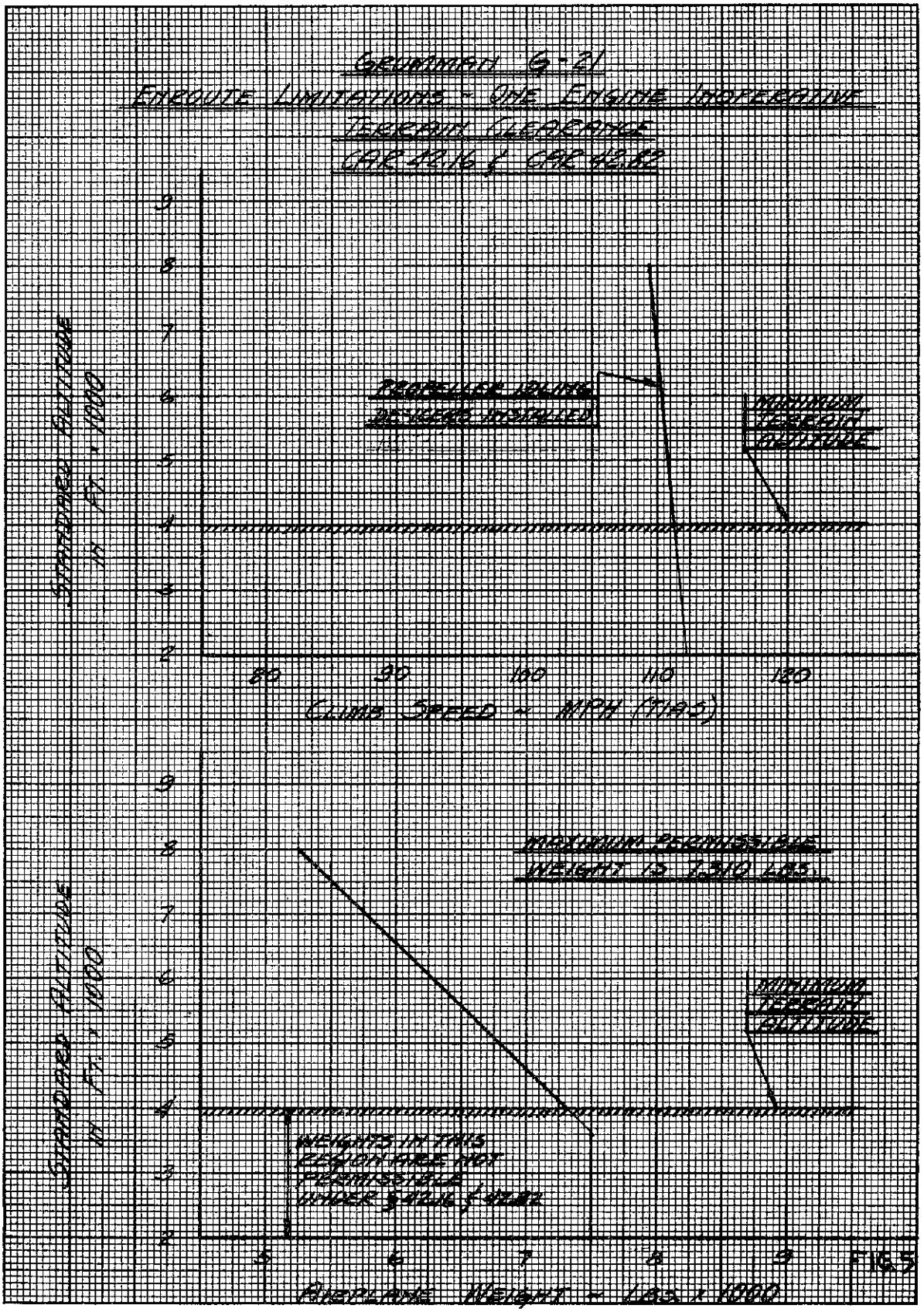

GRUMMAN G-21
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & CAR 42.82
STANDARD ALTITUDE IN FT. x 1000
PROPELLER IDLING DEVICES INSTALLED
MINIMUM TERRAIN ALTITUDE
CLIMB SPEED ~ MPH (TIAS)
MAXIMUM PERMISSIBLE WEIGHT IS 7310 LBS.
WEIGHTS IN THIS REGION ARE NOT PERMISSIBLE UNDER §42.16 & 42.82
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 5

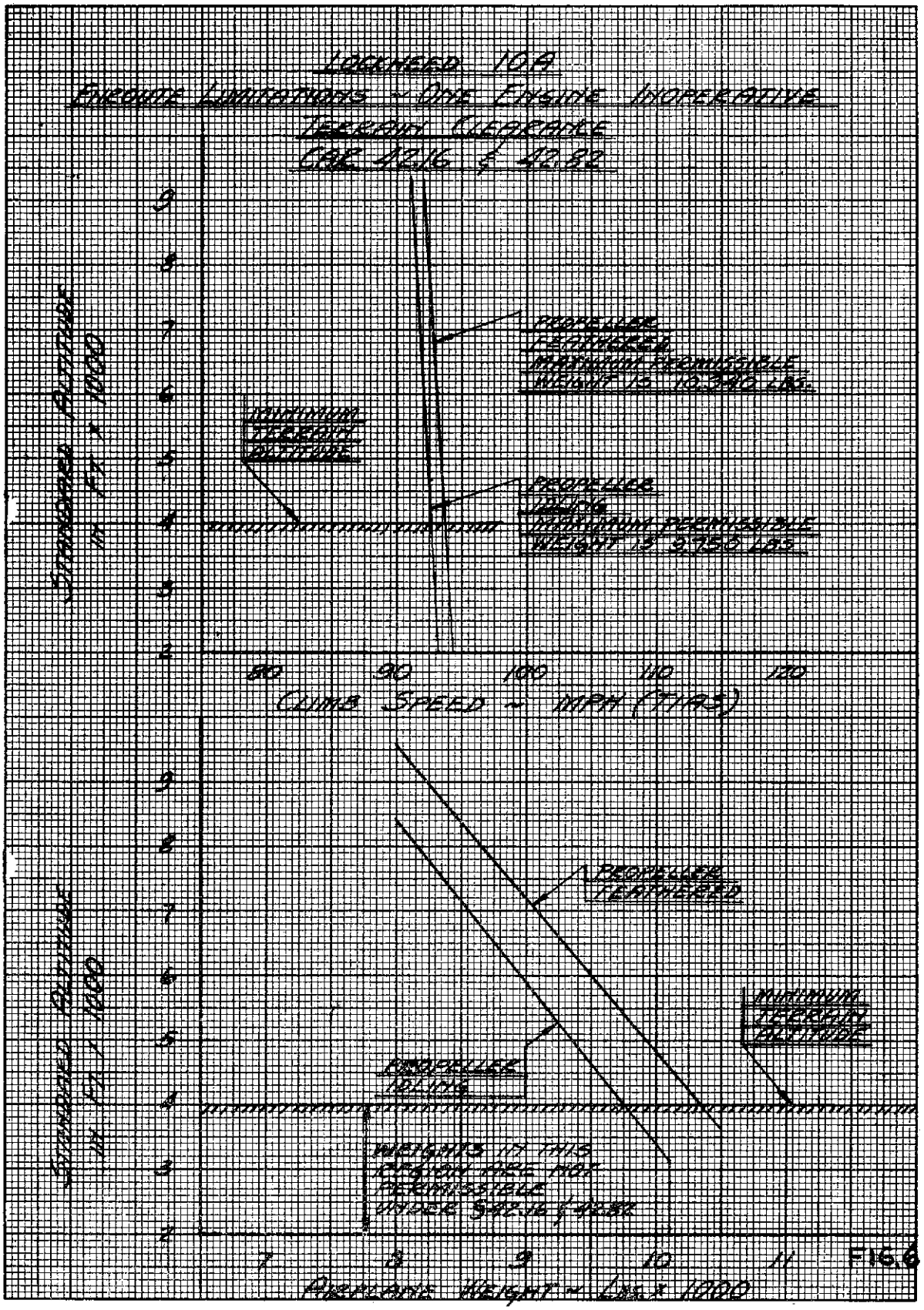

LOCKHEED 10A
ENROUTE LIMITATIONS ~ ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.16 & 42.82
STANDARD ALTITUDE IN FT. x 1000
PROPELLER FEATHERED MAXIMUM PERMISSIBLE WEIGHT IS 10,340 LBS.
MINIMUM TERRAIN ALTITUDE
PROPELLER IDLING MAXIMUM PERMISSIBLE WEIGHT IS 9,750 LBS
CLIMB SPEED ~ MPH (TIAS)
PROPELLER FEATHERED
MINIMUM TERRAIN ALTITUDE
PROPELLER IDLING
WEIGHTS IN THIS REGION ARE NOT PERMISSIBLE UNDER §42.16 & 42.82
AIRPLANE WEIGHT ~ LBS. x 1000

FIG. 6

42.80–7 *Performance data on Boeing S–307 aircraft (CAA 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 tables 1 through 3 and Figures 1 and 2.

TABLE 1.—*Takeoff limitations*

(a) "Effective length" of runway required when effective length is determined in accordance with section 42.1 (a) (12) (distance to accelerate to 1.15 V_{s1}=1.15 (98.4)$\sqrt{\text{Wgt.}/50{,}000}$ miles per hour TIAS and stop, with zero wind and zero gradient)

Standard altitude in feet	Airplane weight in pounds and critical engine failure speeds in miles per hour TIAS		
	46,000 V_1=108.5	48,000 V_1=111.0	50,000 V_1=113.0
	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 (98.4) $\sqrt{\text{Wgt.}/50{,}000}$ miles per hour 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 miles per hour TIAS		
	46,000 V_1=108.5	48,000 V_1=111.0	50,000 V_1=113.0
	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 miles per hour TIAS		Weight in pounds	Terrain clearance [1] in feet and climb speed in miles per hour TIAS	
	Feet	Miles per hour		Feet	Miles per hour
40,000	17,000	103.0	46,000	13,750	114.0
41,000	16,400	105.0	47,000	13,200	115.5
42,000	15,900	107.0	48,000	12,700	117.0
43,000	15,350	108.5	49,000	12,150	118.5
44,000	14,800	110.5	50,000	11,650	120.0
45,000	14,300	112.0			

[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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	3,065	93	3,445	99.5	3,815	105
1,000	3,145	93	3,540	99.5	3,915	105
2,000	3,225	93	3,630	99.5	4,015	105
3,000	3,310	93	3,725	99.5	4,120	105
4,000	3,390	93	3,820	99.5	4,225	105
5,000	3,480	93	3,925	99.5	4,340	105
6,000	3,575	93	4,035	99.5	4,460	105
7,000	3,670	93	4,140	99.5	4,580	105
8,000	3,770	93	4,260	99.5	4,715	105

[1] Steady approach speed through 50-foot height miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour TIAS					
	35,000	V_{50}	40,000	V_{50}	45,000	V_{50}
	Distance in feet					
S. L.	3,890	93	4,375	99.5	4,845	105
1,000	3,995	93	4,495	99.5	4,970	105
2,000	4,095	93	4,610	99.5	5,100	105
3,000	4,205	93	4,730	99.5	5,230	105
4,000	4,305	93	4,850	99.5	5,365	105
5,000	4,420	93	4,985	99.5	5,510	105
6,000	4,540	93	5,125	99.5	5,665	105
7,000	4,660	93	5,260	99.5	5,815	105
8,000	4,790	93	5,410	99.5	5,990	105

[1] Steady approach speed through 50-foot height miles per hour TIAS denoted by symbol V_{50}.

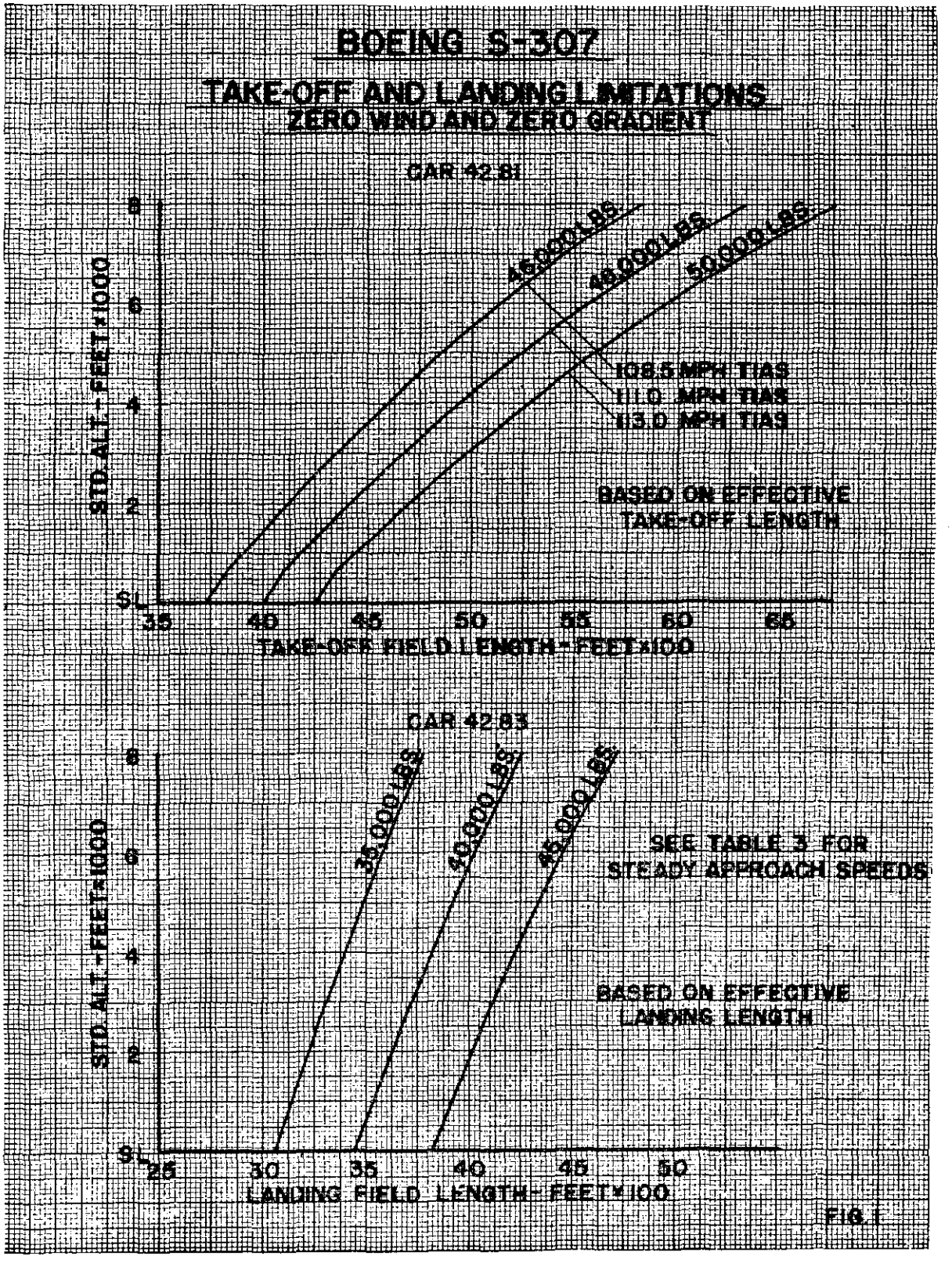

BOEING S-307
TAKE-OFF AND LANDING LIMITATIONS
ZERO WIND AND ZERO GRADIENT
CAR 42.81
STD. ALT. - FEET x 1000
8
6
4
2
SL
45,000 LBS
48,000 LBS
50,000 LBS
108.5 MPH TIAS
111.0 MPH TIAS
113.0 MPH TIAS
BASED ON EFFECTIVE TAKE-OFF LENGTH
35
40
45
50
55
60
65
TAKE-OFF FIELD LENGTH - FEET x 100
CAR 42.83
STD. ALT. - FEET x 1000
8
6
4
2
SL
45,000 LBS
48,000 LBS
50,000 LBS
SEE TABLE 3 FOR STEADY APPROACH SPEEDS
BASED ON EFFECTIVE LANDING LENGTH
25
30
35
40
45
50
LANDING FIELD LENGTH - FEET x 100

FIG. 1

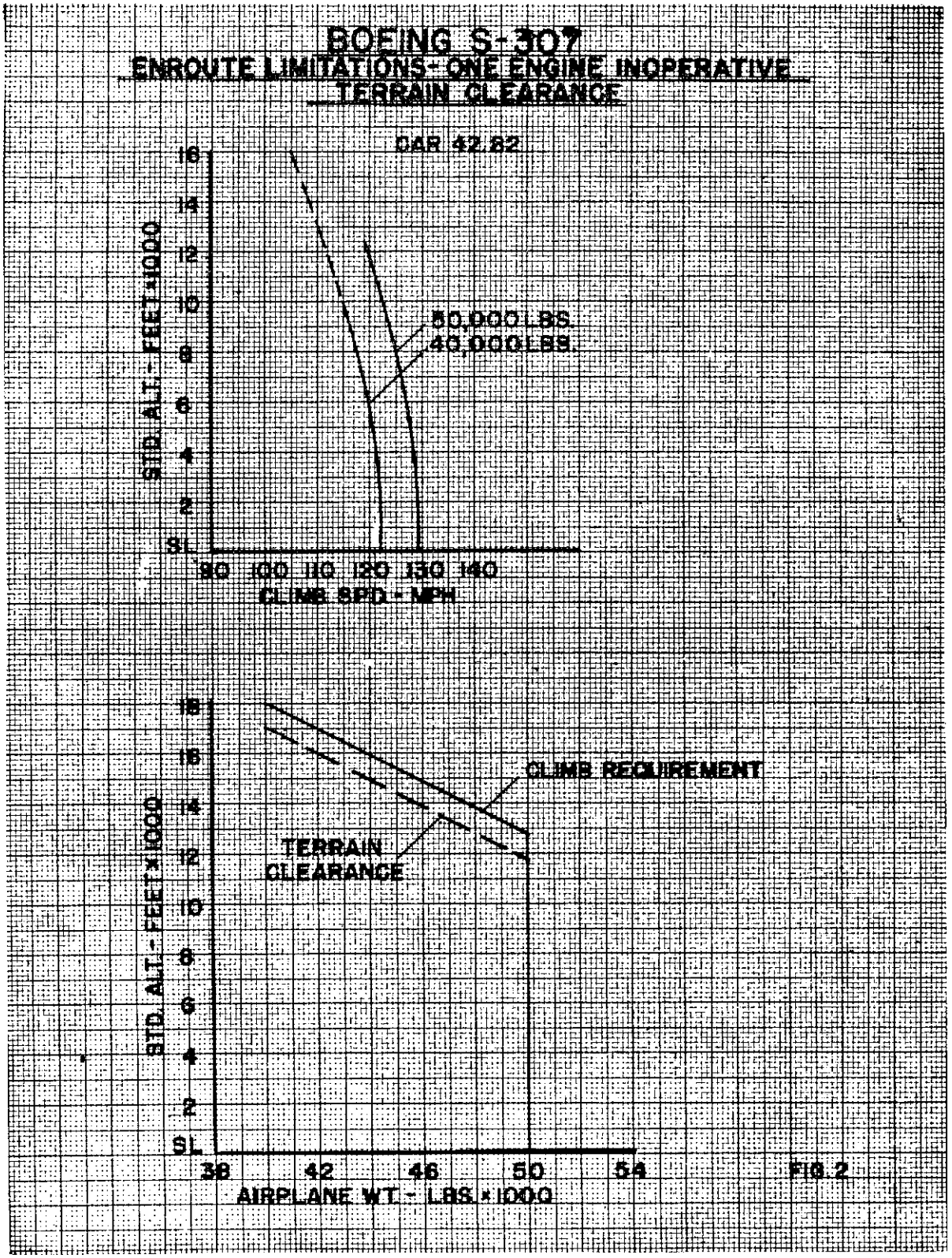

BOEING S-307
ENROUTE LIMITATIONS- ONE ENGINE INOPERATIVE
TERRAIN CLEARANCE
CAR 42.82
50,000 LBS.
40,000 LBS.
STD. ALT. - FEET x 1000
16
14
12
10
8
6
4
2
SL
80 100 110 120 130 140
CLIMB SPD. - MPH
CLIMB REQUIREMENT
TERRAIN CLEARANCE
18
16
14
12
10
8
6
4
2
SL
38 42 46 50 54
AIRPLANE WT. - LBS. x 1000

FIG. 2

42.80–8 *Performance data—operations from sod runway surfaces (CAA 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,200	V_{50}
	Distance in feet							
S. L	2, 830	86	3, 015	88	3, 210	90	3, 390	92
1,000	2, 900	86	3, 080	88	3, 275	90	3, 465	92
2,000	2, 965	86	3, 155	88	3, 350	90	3, 540	92
3,000	3, 040	86	3, 235	88	3, 425	90	3, 630	92
4,000	3, 115	86	3, 320	88	3, 520	90	3, 715	92
5,000	3, 210	86	3, 410	88	3, 605	90	3, 805	92
6,000	3, 300	86	3, 505	88	3, 705	90	3, 910	92
7,000	3, 410	86	3, 610	88	3, 810	90	4, 015	92
8,000	3, 500	86	3, 725	88	3, 935	90	4, 135	92

[1] Steady approach speed through 50 feet height—miles per hour TIAS denoted by symbol V_{50}.

(Continued on page 88)

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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] miles per hour							
	22,000	V_{50}	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet							
S. L.	3,595	86	3,825	88	4,075	90	4,305	92
1,000	3,680	86	3,900	88	4,165	90	4,405	92
2,000	3,765	86	4,010	88	4,255	90	4,495	92
3,000	3,865	86	4,110	88	4,355	90	4,605	92
4,000	3,955	86	4,215	88	4,470	90	4,715	92
5,000	4,075	86	4,330	88	4,575	90	4,835	92
6,000	4,190	86	4,455	88	4,705	90	4,970	92
7,000	4,330	86	4,590	88	4,840	90	5,095	92
8,000	4,445	86	4,730	88	4,995	90	5,250	92

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L.	4,270	96	4,380	97	4,470	99
1,000	4,400	96	4,495	97	4,595	99
2,000	4,520	96	4,625	97	4,720	99
3,000	4,645	96	4,750	97	4,855	99
4,000	4,770	96	4,875	97	4,985	99
5,000	4,875	96	5,000	97	5,115	99
6,000	5,025	96	5,130	97	5,255	99
7,000	5,150	96	5,260	97	5,395	99
8,000	5,285	96	5,395	97	5,530	99

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	17,500	V_{50}	18,000	V_{50}	18,500	V_{50}
	Distance in feet					
S. L.	5,430	96	5,565	97	5,675	99
1,000	5,590	96	5,710	97	5,835	99
2,000	5,740	96	5,870	97	5,995	99
3,000	5,900	96	6,030	97	6,165	99
4,000	6,060	96	6,195	97	6,330	99
5,000	6,195	96	6,355	97	6,495	99
6,000	6,380	96	6,515	97	6,675	99
7,000	6,545	96	6,680	97	6,850	99
8,000	6,710	96	6,850	97	7,025	99

[1] Steady approach speed through 50 feet height—miles per hour 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 (b) (12) 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 miles per hour							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	4,255	99.0	4,435	101.5	4,635	104.0	4,725	105.0
1,000	4,370	99.0	4,555	101.5	4,760	104.0	4,855	105.0
2,000	4,485	99.0	4,680	101.5	4,890	104.0	4,985	105.0
3,000	4,660	99.0	4,805	101.5	5,015	104.0	5,120	105.0
4,000	4,730	99.0	4,935	101.5	5,145	104.0	5,250	105.0
5,000	4,845	99.0	5,060	101.5	5,285	104.0	5,380	105.0
6,000	4,980	99.0	5,190	101.5	5,415	104.0	5,520	105.0
7,000	5,095	99.0	5,330	101.5	5,570	104.0	5,670	105.0
8,000	5,235	99.0	5,470	101.5	5,715	104.0	5,820	105.0

[1] Steady approach speed through 50 feet height—miles per hour 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 miles per hour							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	3,325	92.5	3,450	94.5	3,575	97.5	3,695	99.0
1,000	3,405	92.5	3,530	94.5	3,655	97.5	3,780	99.0
2,000	3,490	92.5	3,615	94.5	3,740	97.5	3,865	99.0
3,000	3,575	92.5	3,695	94.5	3,830	97.5	3,945	99.0
4,000	3,675	92.5	3,795	94.5	3,920	97.5	4,050	99.0
5,000	3,750	92.5	3,875	94.5	4,020	97.5	4,155	99.0
6,000	3,830	92.5	3,980	94.5	4,115	97.5	4,255	99.0
7,000	3,925	92.5	4,075	94.5	4,220	97.5	4,370	99.0
8,000	4,025	92.5	4,180	94.5	4,330	97.5	4,485	99.0

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

(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 miles per hour							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S. L.	5,415	99.0	5,645	101.5	5,900	104.0	6,015	105.0
1,000	5,560	99.0	5,795	101.5	6,060	104.0	6,175	105.0
2,000	5,710	99.0	5,955	101.5	6,220	104.0	6,350	105.0
3,000	5,930	99.0	6,120	101.5	6,385	104.0	6,515	105.0
4,000	6,015	99.0	6,280	101.5	6,550	104.0	6,680	105.0
5,000	6,170	99.0	6,440	101.5	6,730	104.0	6,850	105.0
6,000	6,335	99.0	6,605	101.5	6,895	104.0	7,025	105.0
7,000	6,485	99.0	6,785	101.5	7,090	104.0	7,215	105.0
8,000	6,650	99.0	6,960	101.5	7,275	104.0	7,405	105.0

[1] Steady approach speed through 50 feet height—miles per hour TIAS denoted by symbol V_{50}.

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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 miles per hour							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S. L.	4, 230	92. 5	4, 395	94. 5	4, 555	97. 5	4, 705	99. 0
1,000	4, 330	92. 5	4, 490	94. 5	4, 650	97. 5	4, 805	99. 0
2,000	4, 440	92. 5	4, 600	94. 5	4, 755	97. 5	4, 915	99. 0
3,000	4, 555	92. 5	4, 705	94. 5	4, 875	97. 5	5, 020	99. 0
4,000	4, 665	92. 5	4, 830	94. 5	4, 990	97. 5	5, 150	99. 0
5,000	4, 775	92. 5	4, 935	94. 5	5, 120	97. 5	5, 290	99. 0
6,000	4, 875	92. 5	5, 065	94. 5	5, 240	97. 5	5, 415	99. 0
7,000	4, 995	92. 5	5, 185	94. 5	5, 370	97. 5	5, 560	99. 0
8,000	5, 125	92. 5	5, 320	94. 5	5, 510	97. 5	5, 710	99. 0

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	3, 935	86	4, 105	88	4, 245	90
1,000	4, 040	86	4, 215	88	4, 370	90
2,000	4, 145	86	4, 330	88	4, 485	90
3,000	4, 255	86	4, 370	88	4, 610	90
4,000	4, 360	86	4, 585	88	4, 725	90
5,000	4, 470	86	4, 665	88	4, 845	90
6,000	4, 570	86	4, 775	88	4, 970	90
7,000	4, 680	86	4, 880	88	5, 090	90
8,000	4, 785	86	4, 990	88	5, 205	90

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	23,000	V_{50}	24,000	V_{50}	25,000	V_{50}
	Distance in feet					
S. L.	5, 005	86	5, 225	88	5, 400	90
1,000	5, 145	86	5, 365	88	5, 560	90
2,000	5, 275	86	5, 510	88	5, 710	90
3,000	5, 415	86	5, 650	88	5, 870	90
4,000	5, 550	86	5, 790	88	6, 015	90
5,000	5, 685	86	5, 935	88	6, 170	90
6,000	5, 820	86	6, 075	88	6, 325	90
7,000	5, 955	86	6, 215	88	6, 475	90
8,000	6, 090	86	6, 355	88	6, 625	90

[1] Steady approach speed through 50 feet height—miles pes hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	26,000	V_{50}	[2] 27,000	V_{50}	[3] 28,000	V_{50}
	Distance in feet					
S. L.	4,405	92	4,560	93	4,715	95
1,000	4,530	92	4,690	93	4,855	95
2,000	4,660	92	4,830	93	4,995	95
3,000	4,785	92	4,960	93	5,140	95
4,000	4,915	92	5,095	93	5,285	95
5,000	5,045	92	5,235	93	5,430	95
6,000	5,170	92	5,365	93	5,565	95
7,000	5,300	92	5,505	93	5,715	95
8,000	5,430	92	5,635	93	5,855	95

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	26,000	V_{50}	[2] 27,000	V_{50}	[3] 28,000	V_{50}
	Distance in feet					
S. L.	5,605	92	5,805	93	6,000	95
1,000	5,765	92	5,970	93	6,175	95
2,000	5,925	92	6,145	93	6,360	95
3,000	6,090	92	6,315	93	6,540	95
4,000	6,255	92	6,485	93	6,725	95
5,000	6,420	92	6,660	93	6,910	95
6,000	6,580	92	6,830	93	7,085	95
7,000	6,745	92	7,005	93	7,275	95
8,000	6,910	92	7,170	93	7,450	95

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	3,280	86.0	3,575	88.5	3,875	90.5	3,960	91.0
1,000	3,370	86.0	3,680	88.5	3,990	90.5	4,075	91.0
2,000	3,460	86.0	3,785	88.5	4,100	90.5	4,185	91.0
3,000	3,550	86.0	3,885	88.5	4,210	90.5	4,300	91.0
4,000	3,640	86.0	3,990	88.5	4,320	90.5	4,410	91.0
5,000	3,730	86.0	4,095	88.5	4,430	90.5	4,525	91.0
6,000	3,825	86.0	4,200	88.5				
7,000	3,915	86.0	4,295	88.5	(2)	(2)	(2)	(2)
8,000	4,010	86.0	4,400	88.5				

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour							
	19,000	V_{50}	20,000	V_{50}	21,000	V_{50}	21,300	V_{50}
	Distance in feet							
S. L.	4, 175	86. 0	4, 555	88. 5	4, 935	90. 5	5, 050	91. 0
1,000	4, 290	86. 0	4, 680	88. 5	5, 070	90. 5	5, 185	91. 0
2,000	4, 410	86. 0	4, 820	88. 5	5, 220	90. 5	5, 325	91. 0
3,000	4, 515	86. 0	4, 945	88. 5	5, 355	90. 5	5, 475	91. 0
4,000	4, 630	86. 0	5, 075	88. 5	5, 490	90. 5	5, 610	91. 0
5,000	4, 750	86. 0	5, 215	88. 5	5, 635	90. 5	5, 755	91. 0
6,000	4, 865	86. 0	5, 340	88. 5	[2]	[2]	[2]	[2]
7,000	4, 990	86. 0	5, 465	88. 5				
8,000	5, 105	86. 0	5, 590	88. 5				

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12) with zero wind and zero gradient.

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	35, 000	V_{50}	40, 000	V_{50}	45, 000	V_{50}
	Distance in feet					
S. L.	3, 525	93	3, 960	99. 5	4, 385	105
1,000	3, 615	93	4, 070	99. 5	4, 500	105
2,000	3, 710	93	4, 175	99. 5	4, 615	105
3,000	3, 805	93	4, 285	99. 5	4, 740	105
4,000	3, 900	93	4, 395	99. 5	4, 860	105
5,000	4, 000	93	4, 515	99. 5	4, 990	105
6,000	4, 110	93	4, 640	99. 5	5, 130	105
7,000	4, 220	93	4, 760	99. 5	5, 265	105
8,000	4, 335	93	4, 900	99. 5	5, 420	105

[1] Steady approach speed through 50 feet height—miles per hour 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 (a) (12).

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in miles per hour					
	35, 000	V_{50}	40, 000	V_{50}	45, 000	V_{50}
	Distance in feet					
S. L.	4, 475	93	5, 040	99. 5	5, 570	105
1,000	4, 595	93	5, 170	99. 5	5, 715	105
2,000	4, 710	93	5, 300	99. 5	5, 865	105
3,000	4, 835	93	5, 440	99. 5	6, 015	105
4,000	4, 950	93	5, 580	99. 5	6, 170	105
5,000	5, 085	93	5, 735	99. 5	6, 335	105
6,000	5, 220	93	5, 895	99. 5	6, 515	105
7,000	5, 360	93	6, 050	99. 5	6, 685	105
8,000	5, 510	93	6, 220	99. 5	6, 890	105

[1] Steady approach speed through 50 feet height—miles per hour TIAS denoted by symbol V_{50}.

"42.81 *Take-off limitations.* No take-off 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 take-off up to the time of attaining, with all engines operating at normal take-off power, 105 percent of the minimum control speed or 115 percent of the power-off stall speed in the take-off configuration, whichever is greater, as shown by the accelerate-stop distance data.

"(a) In applying this requirement take-off 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 take-off 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 hereinafter 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 take-off 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 manufacturer's production tolerances. Such rebuilding of the propeller shall be accomplished

by the manufacturer or by a certificated repair station having the proper rating. The new record shall be signed by the manufacturer or by the repair agency, giving the date the propeller hub or blade was rebuilt and such other information as the Administrator may require."

42.91–1 *Content of maintenance records (CAA policies which apply to section 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.

42.91–2 *Principal maintenance base (CAA policies which apply to section 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.

42.91–3 *Retention of records (CAA policies which apply to section 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).

"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 (i. e. the Civil Air Regulations). 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 (CAA policies which apply to section 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.

42.92–2 *Availability of records (CAA policies which apply to section 42.92).* The above information shall be made available at any time for inspection by an authorized representative of the Administrator or Board.

42.92–3 *Retention of records (CAA policies which apply to section 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).

"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 giving the names and addresses of the crew and passengers."

42.93–1 *Submission of emergency flight reports (CAA policies which apply to section 42.93).* The report referred to in this section shall be submitted in duplicate to the local aviation safety agent, and a copy shall be retained by the air carrier for at least 1 year.

"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 (CAA policies which apply to section 42.94).* The report referred to in this section shall be submitted in duplicate to the local aviation safety agent, and a copy shall be retained by the air carrier for at least 1 year.

"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 (CAA rules which apply to section 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 [9] 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 CAA aviation safety 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 aviation safety office before noon of the following working day when possible, except that 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 at the CAA 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, CAA 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);

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[9] Failures, malfunctions, or other defects not covered by Part 62 of this subchapter (i. e. the Civil Air Regulations), 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.

(*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 aviation safety agent—aircraft maintenance.

"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 contain such information as the Administrator may prescribe."

Appendix A

Special Civil Air Regulations

Appendix A is reserved for inclusion of those Special Civil Air Regulations issued by the Civil Aeronautics Board in application to this part. The special regulations listed below, as well as copies of subsequent issues of such regulations, may be obtained from the Publications Section, Civil Aeronautics Board, Washington 25, D. C. It is suggested that this listing of special regulations be maintained current by recording all changes and new issues.

Number	Supersedes	Effective date	Termination date
SR–356		Dec. 20, 1950	Dec. 21, 1953.
SR–368	SR–350	Aug. 1, 1951	Aug. 1, 1954.
SR–378		Feb. 20, 1952	Feb. 20, 1955.
SR–379		Jan. 31, 1952	Indefinite.
SR–385A	SR–385	Aug. 1, 1953	Nov. 1, 1953.
SR–387			
SR–389	SR–387 (Suspended).	Oct. 27, 1952	Indefinite.
SR–391	SR–379 (Suspended).	Apr. 1, 1953	Do.
SR–391A	SR–391 (Amended).	Mar. 31, 1953	Do.
SR–392	SR–390	May 16, 1953	June 30, 1955.
SR–395	SR–378 (Rescinded).	June 1, 1953	Feb. 20, 1955.
SR–397		June 30, 1953	Indefinite.
SR–399	SR–375 SR–376	Oct. 25, 1953	Oct. 25, 1955.
SR–401	SR–329	Apr. 1, 1954	Mar. 31, 1956.
SR–402		June 2, 1954	Indefinite.

Appendix B

Air Taxi Operators

42.0–2 *Provisions of part 42 which are applicable to air taxi operators (CAA interpretations which apply to section 42.0 and SR–378).*

(a) Under SR–378, 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. (a) (2), (4), (5), (6), (7), (12a), (13), (14), (15), (20), (21), (22), (23), (24), (27), (28), (29), (30), (32), (33).
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.
42.24 First aid and emergency 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 (*CAA interpretations which apply to 42.1 (a) (14)*).
42.1–2 Twilight (*CAA interpretations which apply to 42.1 (a) (20)*).
42.11–1 Listing of aircraft. (*CAA rules which apply to 42.11 (a)*.
42.21–1 Seats and safety belts (*CAA rules which apply to 42.21 (a) (11)*).
42.21–2 Fire extinguishers (*CAA rules which apply to 42.21 (a) (12)*).
42.21–3 Altimeter (*CAA policies which apply to 42.21 (b) (1)*).

42.24–1 First-aid and emergency equipment (*CAA policies which apply to 42.24*).
42.24–2 First-aid kit (*CAA rules which apply to 42.24* (*a*)).
42.24–4 Emergency equipment (*CAA rules which apply to 42.24* (*b*)).
42.25–1 Cockpit check list (*CAA policies which apply to 42.25*).
42.25–2 Minimum standard cockpit check list (*CAA policies which apply to 42.25*).
42.30–1 General (Maintenance) (*CAA policies which apply to 42.30*).
42.31–2 Maintenance and inspection—small aircraft (*CAA policies which apply to 42.31* (*a*) (*2*)).
42.31–3 Maintenance and inspection; all aircraft (*CAA policies which apply to 42.31* (*a*) (*1*) and (*2*)). (e) (1), (2).
42.31–4 Maintenance and inspection records (*CAA policies which apply to 42.31* (*b*)).
42.51–1 Responsibilities of the pilot in command (*CAA policies which apply to 42.51*).
42.51–2 Time of reporting for duty (*CAA policies which apply to 42.51* (*b*)).
42.51–3 Flight equipment (*CAA policies which apply to 42.51* (*c*)).
42.51–4 Serviceability of equipment (*CAA policies which apply to 42.51* (*e*)).
42.53–3 Operation in the territory of Alaska (*CAA policies which apply to 42.52* (*b*)).
42.54–1 Other parts of the aircraft (*CAA interpretations which apply to 42.54*).
42.55–1 En route weather minimums (*CAA interpretations which apply to 42.55* (*a*)).
42.55–2 Air traffic clearance (*CAA interpretations which apply to 42.55* (*a*)).
42.56–1 Standard instrument approach procedures (*CAA rules which apply to 42.56*).
42.57–1 Minimum facilities (*CAA policies which apply to 42.57*).
42.58–1 Off-airway instrument operation (*CAA rules which apply to 42.58*).
42.62–1 Content of flight manifest (*CAA policies which apply to 42.62*).
42.91–1 Content of maintenance records (*CAA policies which apply to 42.91*).
42.91–3 Retention of records (*CAA policies which apply to 42.91*).
42.92–1 Content of airman records (*CAA policies which apply to 42.92*).
42.92–2 Availability of records (*CAA policies which apply to 42.92*).
42.92–3 Retention of records (*CAA policies which apply to 42.92*).
42.93–1 Submission of emergency flight reports (*CAA policies which apply to 42.93*).
42.94–1 Submission of pilot's emergency deviation report (*CAA policies which apply to 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* (*CAA interpretations which apply to section 42.0 and SR–378*). 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* (*CAA rules which apply to section 42.5 and SR–378*). 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 aviation safety agent 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 aviation safety agent 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 (CAA rules which apply to section 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 agent may elect to inspect the aircraft as for original issuance.

In cases of (d) the agent may elect to inpect 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.

42.11–2 *Listing of small aircraft (CAA interpretations which apply to section 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.

AVIATION INFORMATION