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PART 40—SCHEDULED INTERSTATE AIR CARRIER CERTIFICATION AND OPERATION RULES

PART 41—CERTIFICATION AND OPERATION RULES FOR CERTIFICATED ROUTE AIR CARRIERS ENGAGING IN OVERSEAS AND FOREIGN AIR TRANSPORTATION AND AIR TRANSPORTATION WITHIN HAWAII AND ALASKA

PART 42—AIRCRAFT CERTIFICATION AND OPERATION RULES FOR SUPPLEMENTAL AIR CARRIERS, COMMERCIAL OPERATORS USING LARGE AIRCRAFT, AND CERTIFICATED ROUTE AIR CARRIERS ENGAGING IN CHARTER FLIGHTS OR OTHER SPECIAL SERVICES

C–46 NONTRANSPORT CATEGORY AIRPLANE CARGO OPERATIONS

The Federal Aviation Agency published as a notice of proposed rule making (29 F.R. 2880) and circulated as Civil Air Regulations Notice 64–10 dated February 29, 1964, a proposal to amend Parts 40, 41, and 42 of the Civil Air Regulations to provide for the operation of the nontransport category C–46 airplane in cargo operations.

As indicated in the notice, the Agency believes that the C–46 airplane can continue to be operated with reasonable safety without full compliance with the certification and operating requirements applicable to transport category airplanes. However, there is a need for improvement in the safety requirements over and above the applicable requirements in old Part 42.

The purpose of this amendment is to set forth the minimum safety requirements necessary for the continued use of the C–46 nontransport category airplane in cargo operations.

Although the provisions of the proposal specifically referred to C–46 nontransport category cargo-only operations which are conducted under Part 42 of the Civil Air Regulations, it was proposed to make similar amendments to Parts 40 and 41 to provide for the use of such airplanes in cargo operations conducted under those parts. As adopted herein, the final amendment also permits the nontransport category C–46 to be used in parts 40 and 41 cargo operations under the same conditions as such airplanes are used for the carriage of cargo-only under Part 42. Since the type of engines required for the C–46 airplanes, the performance data related to such airplanes, and the minimum acceptable means of compliance with the special airworthiness requirements are identical for the operation of the C–46 under Parts 40, 41, and 42, these requirements are set forth in a new Appendix C to Part 42 and incorporated by reference in Parts 40 and 41.

Because the amendments to Parts 40, 41, and 42 are identical, the discussion of the comments relating to the proposal have been combined in a single preamble for all the parts, using references to the applicable sections of Part 42. Consequently, any comment or discussion in this preamble referring to a particular section of Part 42, is equally applicable to the corresponding sections of Parts 40 and 41.

Comments received in response to Notice 64–10 were primarily concerned with the Agency's proposal to require the installation of R2800–51–M1 or R2800–75–M1 engines or other engines acceptable to the Administrator on nontransport category C–46 airplanes used in cargo-only operations. The Agency proposed that if engines other than those specified were used, the approved takeoff gross weight would be reduced from 48,000 pounds to 45,000 pounds.

While one organization indicated general agreement with this proposal, they requested that conversion to the 51–M1 and 75–M1 engines be made at each scheduled engine change that occurs after the effective date of the rule, with all "B" engines being changed or converted prior to March 1, 1965. They further suggested that during this period operation of the airplanes be permitted to continue at a maximum gross takeoff weight of 48,000 pounds.

With respect to the compliance dates for these amendments, the Agency agrees that the C–46 operators should be given a period of time in excess of that specified in the proposal in which to show compliance with all of the special airworthiness requirements and to accomplish the engine conversion required by this amendment. The Agency believes that full compliance with such requirements can reasonably be accomplished by January 1, 1965, without imposing an undue burden on any operator, and the amendments adopted herein specify such date for compliance. Compliance with the airplane performance operating limitations set forth in §§ 42.90 through 42.94 (or the comparable sections of Parts 40 and 41), is not required under these amendments until August 12, 1964, if the requirements of § 42.14–1(b) of Part 42 in effect on November 10, 1963, are complied with. These amendments also permit continued use of the airplanes at a maximum gross takeoff weight of 48,000 pounds through December 31, 1964 with unmodified R2800 "B" series engines. After that date, C–46 nontransport category airplanes equipped with such unmodified engines may continue to be used in cargo operations but at a reduced maximum gross takeoff weight not exceeding 45,000 pounds. However, such airplanes must be in full compliance with all the other provisions of this regulation.

In addition, certain of the Alaskan operators objected to the proposal insofar as it required the installation of M1 engines. They contend that in their area of operation, they have experienced no problem of engine cooling in operating the R2800–51 or R2800–75 unmodified engines. In fact, they state that it is almost impossible to get the cylinder head temperatures with unmodified engines above 140°–150° during winter operation; and, quite often, cylinder head temperatures of 120° are difficult to maintain. The Alaskan operators also contend that, in their geographical area of operations, they have never encountered high cylinder head temperatures or difficulty in maintaining desired temperatures during

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single-engine operations. On the other hand, they contend that if they are required to install the M1 engines, considerably lower cylinder head temperatures can be expected, to a point where safety would be adversely affected. They also point out that operators using the M1 engines in the colder climates are continually trying to devise methods for raising engine cylinder head temperatures to the normal operating range.

As expressed in Notice 64–10, engine cooling during one-engine-out operation is one area in the operation of C–46 nontransport category cargo-only airplanes which the Agency believes needs improvement. The R2800–51–M1 or R2800–75–M1 engines are known to operate cooler than unmodified "B" series engines when either type are installed in nontransport category C–46 airplanes. In most areas, this feature of the M1 type engines will provide increased safety during one-engine-out operations at high gross weight and utilizing high engine horsepower on the remaining engine. However, since it is quite possible that operations in some areas of Alaska with modified R2800 M1 engines may produce problems that cannot be corrected by other means, the Agency agrees that some relief should be provided those C–46 Alaskan operators who operate only in those areas, provided, the Alaskan operators can show that adequate safety will be provided with unmodified R2800 "B" series engines. Therefore, the regulation, as adopted herein, permits an Alaskan operator of C–46 cargo airplanes to continue to operate such airplanes at a maximum takeoff weight in excess of 45,000 pounds with unmodified R2800 "B" series engines, if such operator shows to the satisfaction of the FAA that the installation of the M1 engines is not necessary to provide adequate cooling in one-engine-out operations. The use of such unmodified engines is made subject to such conditions and limitations as may be found necessary and incorporated in the appropriate operations specifications of the operator concerned.

Another operator located in the southwestern part of the United States also objected to the proposal to either convert to the M1 engine or to accept a load penalty of 3,000 pounds. It was not clear to him as to whether the oil temperature or the cylinder head temperature was considered critical under METO engine operations and maximum gross weight. Thus it was difficult for him to rationalize how the arbitrary reduction in gross weight of 3,000 pounds was selected. The proposal referred to engine cooling as an area requiring improvement. The cooling of both the oil and the cylinder heads are relevant to this problem and must be considered in its solution. The selection of a 45,000-pound maximum takeoff weight for operation with unmodified engines provides a needed improvement in the airplane's single-engine performance. Moreover, the performance charts and related information are readily available at this gross weight and pilots and operators are generally familiar with the airplane's operation and performance at such weight.

Comments were also received concerning the proposed content of the new Appendix C of Part 42, which sets forth the acceptable means of compliance with the special airworthiness requirements of §§ 42.110 through 42.154.

In response to a comment received, the language of the section of the Appendix relating to § 42.115, has been changed to make it clear that a C–46 main cabin is considered a Class A compartment if it meets all the requirements specified in that section of the Appendix.

Another comment requested clarification of the "barrier cable assembly" also referred to in the Appendix provision relating to § 42.115. It was not intended that the barrier assembly meet the G load requirements of transport category airplanes. The barrier was proposed primarily to fix the forward cabin boundary beyond which cargo cannot be carried, and thus prevent the storing of cargo too close to components of the airplane which are essential to its safe operation, and to protect the forward cabin from damage that may be caused by small pieces of cargo not retained by the cargo tiedown equipment. The Appendix has been revised to clairfy the requirements for a cargo barrier in accordance with the foregoing.

In addition, a comment requested that, if the forward and aft lower baggage compartments are used, the external skin be considered minimum acceptable compliance with the fire-resistant liner requirement for Class B compartments. The Agency has considered this comment and finds that the external skin would not be acceptable as fire-resistant lining in Class B compartments.

The proposal contained a requirement, relating to §§ 42.127 and 42.128, that the combustion heater compartments of nontransport category C–46 airplanes be modified to comply with Airworthiness Directive (AD) 49–18–1. Paragraph (5) of that AD requires the installation of a manual fuel shutoff valve. One comment received by the Agency requested that an electric fuel shutoff valve also be considered as acceptable. The Agency agrees with this comment and the Appendix has been changed to provide for the acceptability of a fail safe electric fuel shutoff valve in lieu of a manually operated fuel shutoff valve.

Compliance with AD 49–18–1 also requires the installation of a fixed fire extinguisher in the C–46 airplane combustion heater compartment. One comment requested that a portable fire extinguisher be considered as acceptable compliance with that portion of the AD. The Agency does not agree that a portable fire extinguisher can provide the necessary protection because of the restricted access, in flight, to C–46 heater compartments. Since any fire in this area is serious, immediate extinguishment must be available.

With respect to the requirement for a shutoff valve in the alcohol supply line between the supply tank and those alcohol pumps located under the main cabin floor, one comment requested that the valve not be required if the alcohol pumps are located above the main cabin floor. Since this result was intended in the proposal, the language has been revised to make it clear that the valve is required only if the alcohol pumps are located under the main cabin floor.

Certain of the comments received in response to Notice 64–10 indicated some concern as to the type of C–46 engine fire-extinguishing system proposed by the Agency. As stated by the Agency in Notice 64–10, "The fire-extinguishing systems, the quantity of extinguishing agent, and the rate of discharge shall be such as to provide a minimum of one adequate discharge for each designated fire zone." The notice further explained that "insofar as the engine compartment is concerned, the system shall be capable of protecting the entire compartment against the various types of fires likely to occur in the compartment." For the purpose of further clarification, the provision in the Appendix relating to § 42.136 has been revised to state that to meet the requirement of one adequate discharge for each fire zone, requires the installation of a separate fire extinguisher for each engine compartment. The notice also mentioned types of engine fire-extinguishing systems that would meet the foregoing adequacy requirements. One such type was described as a system which "provides the same or equivalent protection to that demonstrated by the CAA in tests conducted in 1941 and 1942 using a CW–20 type engine nacelle (without diaphragm)."

Comments received from the National Air Carrier Association (NACA) citing CAA Technical Development Report No. 37, titled "Determination of Means to Safeguard Aircraft From Powerplant Fires in Flight"—Part II, dated October 1943, furnished a comparison between data contained in CAA Report No. 37 and the flow rates and distribution of fire-extinguishing agent provided by one type of C–46 engine fire-extinguishing system now in use. The comparison, according to NACA, shows that the system they describe does provide fire protection equivalent to that demonstrated by the CAA in the CW–20 tests. Furthermore, the system they describe was approved by FAA February 9, 1953, for American Airmotive, Miami, Florida, as presented in American Airmotive Report No. 128–52–1, titled "Engine Section CO_2 Fire Extinguishing System Installation (C–46 airplanes)," dated November 25, 1952.

The Agency has evaluated the material submitted by NACA and has concluded that C–46 engine fire-extinguishing systems which conform to all other applicable airworthiness requirements in design and installation, and which provide the flow rates and distribution of extinguishing agent at least equivalent to that approved for American Airmotive in their report No. 128–52–1, would meet the requirements of § 42.136.

From the comments received concerning the provision in the Appendix relating to § 42.154, it appears that there is a general lack of familiarity with the "Logair cargo configuration" referred to therein. Therefore, reference to such Logair configuration is deleted from the final rule.

Interested persons have been afforded an opportunity to participate in the making of these amendments, and due consideration has been given to all relevant matter presented. The provisions of these amendments, with the exception of the minimum oil requirement, become

effective at least 30 days from the date of publication. The Agency finds that compliance with the oil requirement is necessary and good cause exists for making it effective without further delay.

In consideration of the foregoing, Chapter I of Title 14 of the Code of Federal Regulations is amended as follows, effective July 12, 1964:

1. Part 40 is amended by adding a new paragraph (c) to § 40.61 to read as follows:

§ 40.61 Airplane certification requirements.

* * * * *

(c) *C–46 type airplanes.* Notwithstanding the provisions of paragraph (b) of this section, a nontransport category C–46 type airplane may be used in cargo operations under the following conditions:

(1) It is certificated at a maximum gross takeoff weight not in excess of 48,000 pounds;

(2) It meets the requirements of §§ 40.90 through 40.94 using the performance data specified in Appendix C of Part 42, revised effective November 11, 1963, except that it may be operated without meeting such requirements until August 12, 1964, if it meets the requirements of § 42.14–1(b) of this chapter, in effect on November 10, 1963;

(3) Prior to each flight, each engine is serviced to a minimum of 25 gallons of oil; and

(4) After December 31, 1964—

(i) It is powered by a type and model engine as specified in Appendix C of Part 42 of this chapter, revised effective November 11, 1963, when certificated at a maximum gross takeoff weight in excess of 45,000 pounds; and

(ii) It complies with the special airworthiness requirements as set forth in §§ 40.110 through 40.154 or in Appendix C of Part 42 of this chapter, revised effective November 11, 1963.

2. Part 41 is amended by adding a new paragraph (c) to § 41.61 to read as follows:

§ 41.61 Airplane certification requirements.

* * * * *

(c) *C–46 type airplanes.* Notwithstanding the provisions of paragraph (b) of this section, a nontransport category C–46 type airplane may be used in cargo operations under the following conditions:

(1) It is certificated at a maximum gross takeoff weight not in excess of 48,000 pounds;

(2) It meets the requirements of §§ 41.90 through 41.94 using the performance data specified in Appendix C of Part 42 of this chapter, revised effective November 11, 1963, except that it may be operated without meeting such requirements until August 12, 1964, if it meets the requirements of § 42.14–1(b) of this chapter, in effect on November 10, 1963;

(3) Prior to each flight, each engine is serviced to a minimum of 25 gallons of oil; and

(4) After December 31, 1964—

(i) It is powered by a type and model engine as specified in Appendix C of Part 42 of this chapter, revised effective November 11, 1963, when certificated at a maximum gross takeoff weight in excess of 45,000 pounds; and

(ii) It complies with the special airworthiness requirements as set forth in §§ 41.110 through 41.154 or in Appendix C of Part 42 of this chapter, revised effective November 11, 1963.

3. Part 42 is amended by amending paragraph (b) and by adding a new paragraph (d) to § 42.61 to read as follows:

§ 42.61 Aircraft certification requirements.

* * * * *

(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 § 42.70.

* * * * *

(d) *C–46 type airplanes.* Notwithstanding the provisions of paragraph (b) of this section, a nontransport category C–46 type airplane may be operated in cargo-only operations under the following conditions:

(1) It is certificated at a maximum gross takeoff weight not in excess of 48,000 pounds;

(2) It meets the requirements of §§ 42.90 through 42.94, using the performance data therefor specified in Appendix C, except that it may be operated without meeting such requirements until August 12, 1964, if it meets the requirements of § 42.14–1(b), in effect on November 10, 1963;

(3) Prior to each flight, each engine is serviced to a minimum of 25 gallons of oil; and

(4) After December 31, 1964—

(i) It is powered by a type and model engine as specified in Appendix C of this Part, when certificated at a maximum gross takeoff weight in excess of 45,000 pounds; and

(ii) It complies with the special airworthiness requirements as set forth in §§ 42.110 through 42.154 or in Appendix C of this part.

4. Part 42 is amended by adding a new Appendix C to read as hereinafter set forth.

These amendments are made under the authority of sections 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958, (49 U.S.C. 1354, 1421, 1423, 1424).

Issued in Washington, D.C., on June 26, 1964.

N. E. HALABY,
Administrator.

APPENDIX C

C–46 NONTRANSPORT CATEGORY AIRPLANES

Cargo Operations

1. *Required engines.* (a) Except as provided in paragraph (b) of this section, the engines specified in subparagraphs (1) or (2) of this section must be installed in C–46 nontransport category airplanes operated at gross weights exceeding 45,000 pounds:

(1) Pratt and Whitney R2800–51–M1 or R2800–75–M1 engines (engines converted from basic model R2800–51 or R2800–75 engines in accordance with FAA approved data) that—

(i) Conform to Engine Specification 5E–8;

(ii) Conform to the applicable portions of the operator's manual;

(iii) Comply with all the applicable airworthiness directives; and

(iv) Are equipped with high capacity oil pump drive gears in accordance with FAA approved data.

(2) Other engines found acceptable by the FAA Regional Flight Standards Division having type certification responsibility for the C–46 airplane.

(b) Upon application by an operator conducting cargo operations with nontransport category C–46 airplanes between points within the State of Alaska, the appropriate FAA Air Carrier District Office, Alaskan Region, may authorize the operation of such airplanes, between points within the State of Alaska; without compliance with paragraph (a) of this section if the operator shows that, in its area of operation, installation of the modified engines is not necessary to provide adequate cooling for single-engine operations. Such authorization and any conditions or limitations therefor is made a part of the Operations Specifications of the operator.

2. *Minimum acceptable means of complying with the special airworthiness requirements.* Unless otherwise authorized under § 42.110, the data set forth in §§ 3 through 34 of this Appendix, as correlated to the C–46 nontransport category airplane, is the minimum means of compliance with the special airworthiness requirements of §§ 42.111 through 42.154.

This data is also the minimum means of compliance for C–46 transport category airplanes with the special airworthiness requirements of Parts 40 and 41.

3. *Susceptibility of material to fire.* No change from the requirements of § 42.111.

4. *Cabin interiors.* C–46 crew compartments must meet all the requirements of § 42.112, and, as required in § 42.115, the door between the crew compartment and main cabin (cargo) compartment must be flame resistant.

5. *Internal doors.* Internal doors, including the crew to main cabin door, must meet all the requirements of § 42.113.

6. *Ventilation.* Standard C–46 crew compartments meet the ventilation requirements of § 42.114 if a means of ventilation for controlling the flow of air is available between the crew compartment and main cabin. The ventilation requirement may be met by use of a door between the crew compartment and main cabin. The door need not have louvers installed; however, if louvers are installed, they must be controllable.

7. *Fire precautions.* Compliance is required with all the provisions of § 42.115.

(a) In establishing compliance with this section, the C–46 main cabin shall be considered as a Class A compartment if—

(1) The operator utilizes a standard system of cargo loading and tiedown that allows easy access in flight to all cargo in such compartment, and, such system is included in the appropriate portion of the operator's manual; and

(2) A cargo barrier is installed in the forward end of the main cabin cargo compartment. The barrier must—

(i) Establish the most forward location beyond which cargo cannot be carried;

(ii) Protect the components and systems of the airplane that are essential to its safe operation from cargo damage; and

(iii) Permit easy access, in flight, to cargo in the main cabin cargo compartment.

The barrier may be a cargo net or a network of steel cables or other means acceptable to the Administrator which would provide equivalent protection to that of a cargo net. The barrier need not meet crash load requirements of CAR 4b.260; however, it must be attached to the cargo retention fittings and provide the degree of cargo retention that is required by the operators' standard system of cargo loading and tiedown.

(b) C–46 forward and aft baggage compartments must meet, as a minimum, Class

B requirements of this section or be placarded in a manner to preclude their use as cargo or baggage compartments.

8. *Proof of compliance.* The demonstration of compliance required by § 42.116 is not required for C-46 airplanes in which—

(1) The main cabin conforms to Class A cargo compartment requirements of § 42.115; and

(2) Forward and aft baggage compartments conform to Class B requirements of § 42.115, or are placarded to preclude their use as cargo or baggage compartments.

9. *Propeller deicing fluid.* No change from the requirements of § 42.117. Isopropyl alcohol is a combustible fluid within the meaning of this section.

10. *Pressure cross-feed arrangements, location of fuel tanks, and fuel system lines and fittings.* C-46 fuel systems which conform to all applicable Curtiss design specifications and which comply with the FAA type certification requirements are in compliance with the provisions of §§ 42.118, 42.119, and 42.120.

11. *Fuel lines and fittings in designated fire zones.* No change from the requirements of § 42.121.

12. *Fuel valves.* Compliance is required with all the provisions of § 42.122. Compliance can be established by showing that the fuel system conforms to all the applicable Curtiss design specifications, the FAA type certification requirements, and, in addition, has explosion-proof fuel booster pump electrical selector switches installed in lieu of the open contact type used originally.

13. *Oil lines and fittings in designated fire zones.* No change from the requirements of § 42.123.

14. *Oil valves.* C-46 oil shutoff valves must conform to the requirements of § 42.124. In addition, C-46 airplanes using Hamilton Standard propellers must provide, by use of stand pipes in the engine oil tanks or other approved means, a positive source of oil for feathering each propeller.

15. *Oil system drains.* The standard C-46 "Y" drains installed in the main oil inlet line for each engine meet the requirements of § 42.125.

16. *Engine breather line.* The standard C-46 engine breather line installation meets the requirements of § 42.126 if the lower breather lines actually extend to the trailing edge of the oil cooler air exit duct.

17. *Firewalls and firewall construction.* Compliance is required with all of the provisions of §§ 42.127 and 42.128. The following requirements must be met in showing compliance with these sections:

(a) *Engine compartment.* The engine firewalls of the C-46 airplane must—

(1) Conform to type design, and all applicable airworthiness directives;

(2) Be constructed of stainless steel or approved equivalent; and

(3) Have fireproof shields over the fairleads used for the engine control cables that pass through each firewall.

(b) *Combustion heater compartment.* C-46 airplanes must have a combustion heater fire extinguishing system which complies with AD-49-18-1 or an PAA approved equivalent.

18. *Cowling.* Standard C-46 engine cowling (cowling of aluminum construction employing stainless steel exhaust shrouds) which conforms to the type design and cowling configurations which conform to the C-46 transport category requirements meet the requirements of § 42.129.

19. *Engine accessory section diaphragm.* C-46 engine nacelles which conform to the C-46 transport category requirements meet the requirements of § 42.130. As provided for in that section, a means of equivalent protection which does not require provision of a diaphragm to isolate the engine power section and exhaust system from the engine accessory compartment is the designation of the entire engine compartment forward of and including the firewall as a designated fire zone, and the installation of adequate fire detection and fire extinguishing systems which meet the requirements of § 42.136 and § 42.141, respectively, in such zone.

20. *Powerplant fire protection.* C-46 engine compartments and combustion heater compartments are considered as designated fire zones within the meaning of § 42.131.

21. *Flammable fluids—*

(a) *Engine compartment.* C-46 engine compartments which conform to the type design and which comply with all applicable airworthiness directives meet the requirements of § 42.132.

(b) *Combustion heater compartment.* C-46 combustion heater compartments which conform to type design and which meet all the requirements of AD-49-18-1 or an PAA approved equivalent meet the requirements of § 42.132.

22. *Shutoff means—*

(a) *Engine compartment.* C-46 engine compartments which comply with AD-62-10-2 or PAA approved equivalent meet the requirements of § 42.133 applicable to engine compartments, if, in addition, a means satisfactory to the Administrator is provided to shut off the flow of hydraulic fluid to the cowl flap cylinder in each engine nacelle. The shutoff means must be located aft of the engine firewall. The operator's manual must include, in the emergency portion, adequate instructions for proper operation of the additional shutoff means to assure correct sequential positioning of engine cowl flaps under emergency conditions. In accordance with § 42.176, this positioning must also be incorporated in the emergency section of the pilot's checklist.

(b) *Combustion heater compartment.* C-46 heater compartments which comply with paragraph (5) of AD-49-18-1 or PAA approved equivalent meet the requirements of § 42.133 applicable to heater compartments if, in addition, a shutoff valve located above the main cabin floor level is installed in the alcohol supply line or lines between the alcohol supply tank and those alcohol pumps located under the main cabin floor. If all of the alcohol pumps are located above the main cabin floor, the alcohol shutoff valve need not be installed. In complying with paragraph (5) of AD-49-18-1, a fail-safe electric fuel shutoff valve may be used in lieu of the manually operated valve.

23. *Lines and fittings.*—(a) *Engine compartment.* C-46 engine compartments which comply with all applicable airworthiness directives, including AD-62-10-2, by using PAA approved fire-resistant lines, hoses, and end fittings, and engine compartments which meet the C-46 transport category requirements, meet the requirements of § 42.134.

(b) *Combustion heater compartments.* All lines, hoses, and end fittings, and couplings which carry fuel to the heaters and heater controls, must be of PAA approved fire-resistant construction.

24. *Vent and drain lines.*—(a) *Engine compartment.* C-46 engine compartments meet the requirements of § 42.135 if—

(1) The compartments conform to type design and comply with all applicable airworthiness directives or PAA approved equivalent; and

(2) Drain lines from supercharger case, engine-driven fuel pump, and engine-driven hydraulic pump reach into the scupper drain located in the lower cowling segment.

(b) *Combustion heater compartment.* C-46 heater compartments meet the requirements of § 42.135 if they conform to AD-49-18-1 or PAA approved equivalent.

25. *Fire-extinguishing system.* (a) To meet the requirements of § 42.136, C-46 airplanes must have installed fire estinguishing systems to serve all designated fire zones. The fire-extinguishing systems, the quantity of extinguishing agent, and the rate of discharge shall be such as to provide a minimum of one adequate discharge for each designated fire zone. Compliance with this provision requires the installation of a separate fire extinguisher for each engine compartment. Insofar as the engine compartment is concerned, the system shall be capable of protecting the entire compartment against the various types of fires likely to occur in the compartment.

(b) Fire-extinguishing systems which conform to the C-46 transport category requirements meet the requirements set forth in paragraph (a). Furthermore, fire-extinguishing systems for combustion heater compartments which conform to the requirements of AD-49-18-1 or an PAA approved equivalent also meet the requirements in paragraph (a).

In addition, a fire-extinguishing system for C-46 airplanes meets the adequacy requirement of paragraph (a) if it provides the same or equivalent protection to that demonstrated by the CAA in tests conducted in 1941 and 1942, using a CW-20 type engine nacelle (without diaphragm). These tests were conducted at the Bureau of Standards facilities in Washington, D.C., and copies of the test reports are available through the PAA Regional Engineering Offices. In this connection, the flow rates and distribution of extinguishing agent substantiated in American Airmotive Report No. 128-52-1, PAA approved February 9, 1953, provides protection equivalent to that demonstrated by the CAA in the CW-20 tests. In evaluating any C-46 fire-extinguishing system with respect to the aforementioned CW-20 tests, the Agency would require data in a narrative form, utilizing drawings or photographs to show at least the following:

Installation of containers; installation and routing of plumbing; type, number, and location of outlets or nozzles; type, total volume, and distribution of extinguishing agent; length of time required for discharging; means for thermal relief, including type and location of discharge indicators; means of discharging, e.g., mechanical cutterheads, electric cartridge, or other method; and whether a one- or two-shot system is used; and if the latter is used, means of crossfeeding or otherwise selecting distribution of extinguishing agent; and types of materials used in makeup of plumbing.

High rate discharge (HRD) systems using agents such as bromotrifluoromethane, dibromodifluoromethane and chlorobromomethane (CB), may also meet the requirements of paragraph (a).

26. *Fire-extinguishing agents, Extinguishing agent container pressure relief, Extinguishing agent container compartment temperatures, and Fire-extinguishing system materials.* No change from the requirements of §§ 42.137, 42.138, 42.139, 42.140.

27. *Fire-detector system.* Compliance with the requirements of § 42.141 requires that C-46 fire detector systems conform to:

(a) AD-62-10-2 or PAA approved equivalent for engine compartments; and,

(b) AD-49-18-1 or PAA approved equivalent for combustion heater compartments.

28. *Fire detectors.* No change from the requirements of § 42.142.

29. *Protection of other airplane components against fire.* To meet the requirements of § 42.143, C-46 airplanes must—

(a) Conform to the type design and all applicable airworthiness directives; and

(b) Be modified or have operational procedures established to provide additional fire protection for the wheel well door aft of each engine compartment. Modifications may consist of improvements in sealing of the main landing gear wheel well doors. An operational procedure which is acceptable to the Agency is one requiring the landing gear control to be placed in the up position in case of in-flight engine fire. In accordance with § 42.176, such procedure must be set forth in the emergency portion of the operator's emergency checklist pertaining to in-flight engine fire.

30. *Control of engine rotation.* C–46 propeller feathering systems which conform to the type design and all applicable airworthiness directives meet the requirements of § 42.150.

31. *Fuel system independence.* C–46 fuel systems which conform to the type design and all applicable airworthiness directives meet the requirements of § 42.151.

32. *Induction system ice prevention.* The C–46 carburetor anti-icing system which conforms to the type design and all applicable airworthiness directives meets the requirements of § 42.152.

33. *Carriage of cargo in passenger compartments.* Section 42.153 is not applicable to nontransport category C–46 cargo airplanes.

34. *Carriage of cargo in cargo compartments.* A standard cargo loading and tie-down arrangement set forth in the operator's manual and found acceptable to the Administrator shall be used in complying with § 42.154.

35. *Performance data.* Performance data on Curtiss model C–46 airplane certificated for maximum weight of 45,000 and 48,000 pounds for cargo-only operations.

1. The following performance limitation data, applicable to the Curtiss model C–46 airplane for cargo-only operation, shall be used in determining compliance with §§ 42.91 through 42.94. These data are presented in the tables and figures of this Appendix.

TABLE 1—TAKEOFF LIMITATIONS

(a) Curtiss C–46 certificated for maximum weight of 45,000 pounds.

(1) "Effective length" of runway required when effective length is determined in accordance with section 42.5 (distance to accelerate to 93 knots TIAS and stop, with zero wind and zero gradient). (Factor = 1.00)

Standard altitude in feet	Airplane weight in pounds		
	39,000	42,000	[1] 45,000
	Distance in feet		
S.L.	4,110	4,290	4,570
1,000	4,250	4,440	4,720
2,000	4,400	4,600	4,880
3,000	4,650	4,880	5,190
4,000	4,910	5,170	5,500
5,000	5,160	5,450	5,810
6,000	5,420	5,730	6,120
7,000	5,680	6,000	6,440
8,000	5,940	6,280	(1)

[1] Ref. Fig. 1(a)(1) for weight and distance for altitudes above 7,000'.

(2) Actual length of runway required when "effective length," considering obstacles, is not determined (distance to accelerate to 93 knots TIAS and stop, divided by the factor 0.85).

Standard altitude in feet	Airplane weight in pounds			
	39,000	42,000	45,000	[1] 48,000
	Distance in feet			
S.L.	4,830	5,050	5,370	5,830
1,000	5,000	5,230	5,550	6,030
2,000	5,170	5,410	5,740	6,230
3,000	5,470	5,740	6,100	6,670
4,000	5,770	6,080	6,470	7,120
5,000	6,070	6,410	6,830	7,550
6,000	6,380	6,740	7,200	8,010
7,000	6,680	7,070	7,570	(1)
8,000	6,990	7,410	(1)	(1)

[1] Ref. Fig. 1(a)(2) for weight and distance for altitudes above 7,000'.

(b) Curtiss C–46 Certificated for maximum weight 48,000 pounds.

(1) "Effective length" of runway required when effective length is determined in accordance with section 42.5 (distance to accelerate to 93 knots TIAS and stop, with zero wind and zero gradient). (Factor = 1.00)

Standard altitude in feet	Airplane weight in pounds			
	39,000	42,000	45,000	[1] 48,000
	Distance in feet			
S.L.	4,110	4,290	4,570	4,950
1,000	4,250	4,440	4,720	5,130
2,000	4,400	4,600	4,880	5,300
3,000	4,650	4,880	5,190	5,670
4,000	4,910	5,170	5,500	6,050
5,000	5,160	5,450	5,810	6,420
6,000	5,420	5,730	6,120	6,800
7,000	5,680	6,000	6,440	(1)
8,000	5,940	6,280	6,750	(1)

[1] Ref. Fig. 1(b)(1) for weight and distance for altitudes above 6,000'.

(2) Actual length of runway required when "effective length," considering obstacles, is not determined (distance to accelerate to 93 knots TIAS and stop, divided by the factor 0.85).

Standard altitude in feet	Airplane weight in pounds			
	39,000	42,000	45,000	[1] 48,000
	Distance in feet			
S.L.	4,830	5,050	5,370	5,830
1,000	5,000	5,230	5,550	6,030
2,000	5,170	5,410	5,740	6,230
3,000	5,470	5,740	6,100	6,670
4,000	5,770	6,080	6,470	7,120
5,000	6,070	6,410	6,830	7,550
6,000	6,380	6,740	7,200	8,010
7,000	6,680	7,070	7,570	(1)
8,000	6,990	7,410	7,940	(1)

[1] Ref. Fig. 1(b)(2) for weight and distance for altitudes above 6,000'.

TABLE 2—EN ROUTE LIMITATIONS

(a) Curtiss model C–46 certificated for maximum weight of 45,000 pounds (based on a climb speed of 113 knots (TIAS)).

Weight (pounds)	Terrain clearance (feet) [1]	Blower setting
45,000	6,450	Low.
44,000	7,000	Do.
43,000	7,550	Do.
42,200	8,000	High.
41,000	9,500	Do.
40,000	11,000	Do.
39,000	12,300	Do.

[1] Highest altitude of terrain over which airplanes may be operated in compliance with § 42.92.

Ref. Fig. 2(a).

(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 (based on a climb speed of 113 knots (TIAS)).

Weight (pounds)	Terrain clearance (feet) [1]	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] Highest altitude of terrain over which airplanes may be operated in compliance with § 42.92.

Ref. Fig. 2(b).

TABLE 3—LANDING LIMITATIONS

(a) Intended Destination.

"Effective length" of runway required for intended destination when effective length is determined in accordance with section 42.5 with zero wind and zero gradient.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds. (0.60 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S.L.	4,320	86	4,500	88	4,700	90	4,800	91
1,000	4,440	86	4,620	88	4,830	90	4,930	91
2,000	4,550	86	4,750	88	4,960	90	5,050	91
3,000	4,670	86	4,880	88	5,090	90	5,190	91
4,000	4,800	86	5,000	88	5,220	90	5,320	91
5,000	4,920	86	5,140	88	5,360	90	5,460	91
6,000	5,040	86	5,270	88	5,500	90	5,600	91
7,000	5,170	86	5,410	88	5,650	90	5,750	91
8,000	5,310	86	5,550	88	5,800	90	5,900	91

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

Ref. Fig. 3(a)(1).

(2) Curtiss model C–46 certificated for maximum weight of 48,000 pounds.[1] (0.60 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S.L.	3,370	80	3,490	82	3,620	84	3,740	86
1,000	3,460	80	3,580	82	3,710	84	3,830	86
2,000	3,540	80	3,670	82	3,800	84	3,920	86
3,000	3,630	80	3,760	82	3,890	84	4,020	86
4,000	3,720	80	3,850	82	3,980	84	4,110	86
5,000	3,800	80	3,940	82	4,080	84	4,220	86
6,000	3,890	80	4,040	82	4,180	84	4,320	86
7,000	3,980	80	4,140	82	4,280	84	4,440	86
8,000	4,080	80	4,240	82	4,390	84	4,550	86

[1] Steady approach speed through 50 height knots TIAS denoted by symbol V_{50}.

Ref. Fig. 3(a)(2).

[1] For use with Curtiss model C–46 airplanes when approved for this weight.

(b) Alternate Airports.

"Effective length" of runway required when effective length is determined in accordance with section 42.5 with zero wind and zero gradient.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds. (0.70 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S.L.	3,700	86	3,800	88	4,030	90	4,110	91
1,000	3,800	86	3,900	88	4,140	90	4,220	91
2,000	3,900	86	4,070	88	4,250	90	4,340	91
3,000	4,000	86	4,180	88	4,360	90	4,450	91
4,000	4,110	86	4,290	88	4,470	90	4,560	91
5,000	4,210	86	4,400	88	4,590	90	4,680	91
6,000	4,330	86	4,510	88	4,710	90	4,800	91
7,000	4,430	86	4,630	88	4,840	90	4,930	91
8,000	4,550	86	4,750	88	4,970	90	5,060	91

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

Ref. Fig. 3(b)(1).

(2) Curtiss model C–46 certificated for maximum weight of 43,000 pounds.[1] (0.70 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S.L.	2,890	80	3,000	82	3,110	84	3,220	86
1,000	2,960	80	3,070	82	3,180	84	3,290	86
2,000	3,040	80	3,150	82	3,260	84	3,380	86
3,000	3,110	80	3,220	82	3,340	84	3,440	86
4,000	3,180	80	3,300	82	3,410	84	3,520	86
5,000	3,260	80	3,380	82	3,500	84	3,610	86
6,000	3,330	80	3,460	82	3,580	84	3,700	86
7,000	3,420	80	3,540	82	3,670	84	3,800	86
8,000	3,500	80	3,630	82	3,760	84	3,900	86

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

Ref. Fig. 3(b)(2).

(c) Actual length of runway required when effective length, considering obstacles, is not determined in accordance with section 42.5.

(1) Curtiss model C–46 certificated for maximum weight of 45,000 pounds. (0.55 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	40,000	V_{50}	42,000	V_{50}	44,000	V_{50}	45,000	V_{50}
	Distance in feet							
S.L.	4,710	89	4,910	89	5,130	90	5,230	91
1,000	4,840	89	5,050	89	5,270	90	5,370	91
2,000	4,960	89	5,180	89	5,410	90	5,510	91
3,000	5,090	89	5,320	89	5,550	90	5,660	91
4,000	5,230	89	5,460	89	5,700	90	5,810	91
5,000	5,360	89	5,600	89	5,850	90	5,960	91
6,000	5,500	89	5,740	89	6,000	90	6,110	91
7,000	5,640	89	5,900	89	6,170	90	6,280	91
8,000	5,790	89	6,050	89	6,340	90	6,450	91

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

Ref. Fig. 3(c)(1).

[1] For use with Curtiss model C–46 airplanes when approved for this weight.

(2) Curtiss C–46 certificated for maximum weight of 43,000 pounds.[1] (0.55 factor.)

Standard altitude in feet	Airplane weight in pounds and approach speeds [1] in knots							
	42,000	V_{50}	44,000	V_{50}	46,000	V_{50}	48,000	V_{50}
	Distance in feet							
S.L.	3,680	80	3,820	82	3,960	84	4,090	86
1,000	3,770	80	3,910	82	4,050	84	4,180	86
2,000	3,860	80	4,000	82	4,140	84	4,280	86
3,000	3,960	80	4,090	82	4,240	84	4,380	86
4,000	4,050	80	4,190	82	4,340	84	4,490	86
5,000	4,150	80	4,290	82	4,450	84	4,600	86
6,000	4,240	80	4,400	82	4,560	84	4,710	86
7,000	4,350	80	4,510	82	4,670	84	4,840	86
8,000	4,450	80	4,620	82	4,790	84	4,960	86

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

Ref. Fig. 3(c)(2).

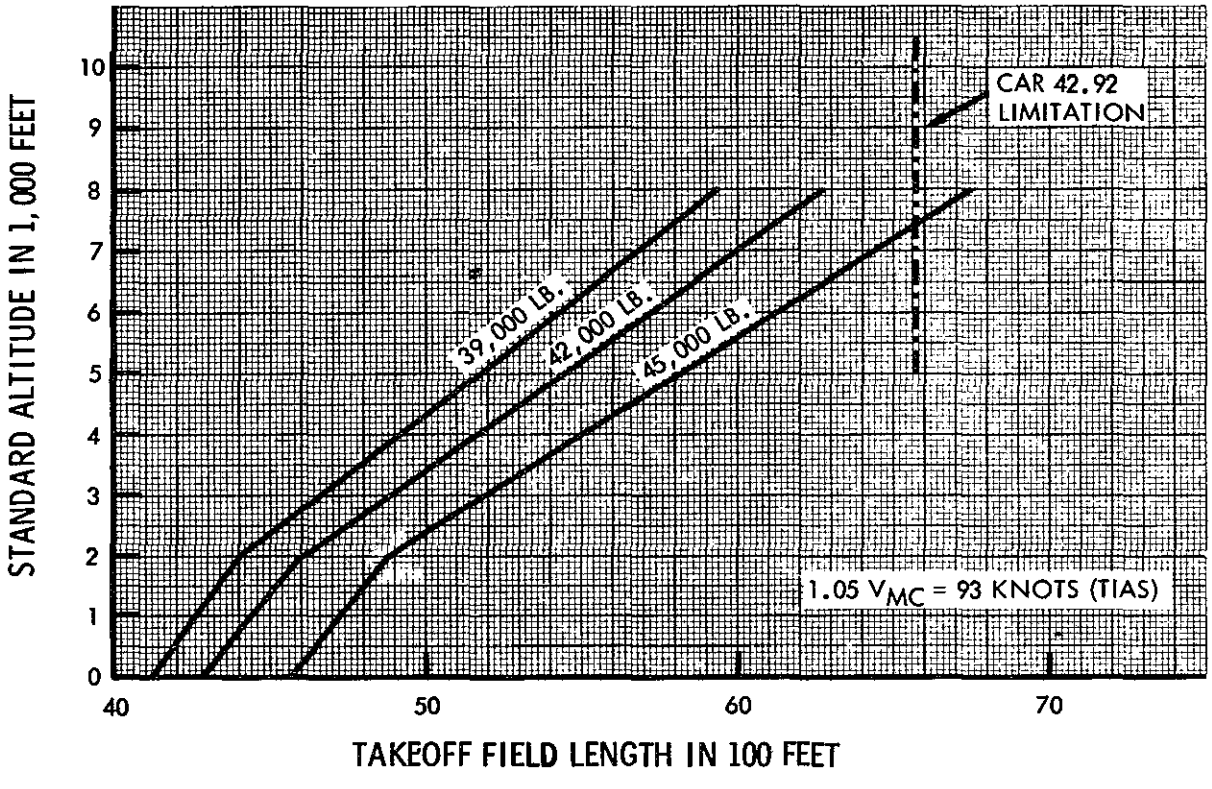
CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 45,000 LBS.

TAKEOFF LIMITATION.
ZERO WIND AND ZERO GRADIENT.

BASED ON EFFECTIVE TAKEOFF
LENGTH. (1.00 FACTOR)

CAR 42.91



REFERENCE TABLE 1(a) (1)

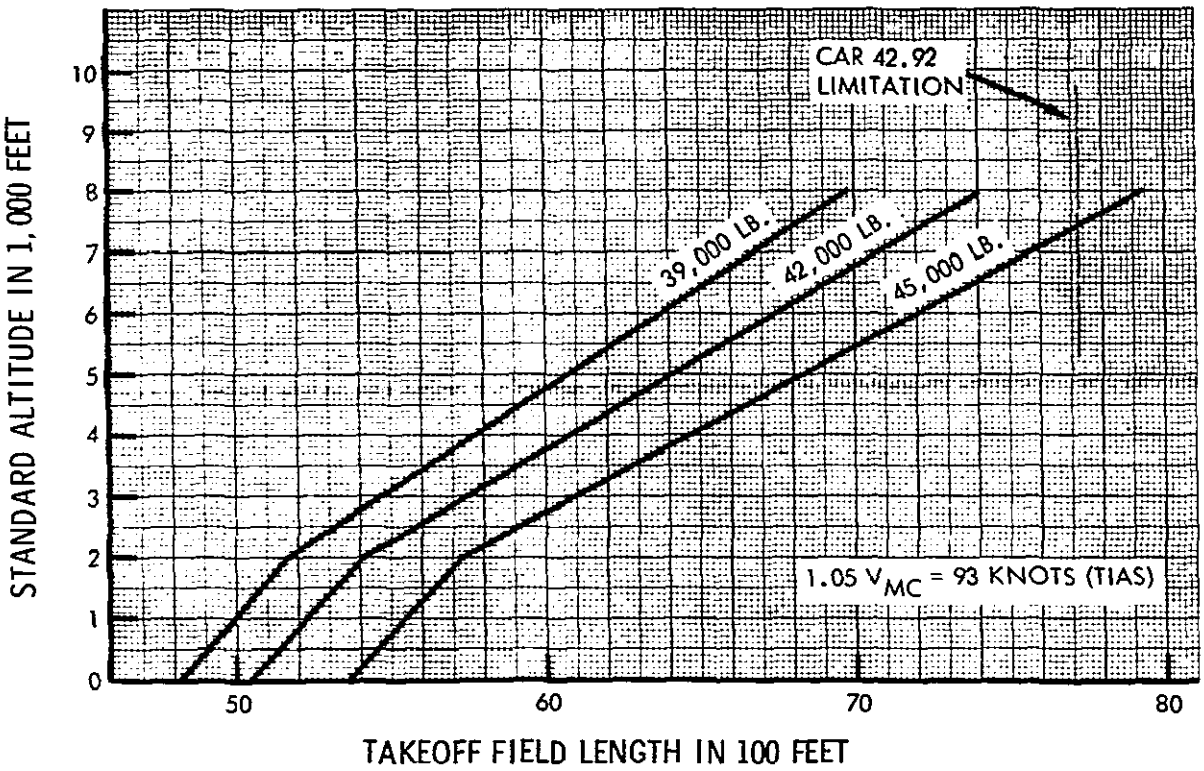
FIG. 1 (a)(1)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 45,000 LBS.

TAKEOFF LIMITATION
ZERO WIND AND ZERO GRADIENT

BASED ON ACTUAL TAKEOFF LENGTH
WHEN EFFECTIVE LENGTH IS NOT
DETERMINED. (0.85 FACTOR)



REFERENCE TABLE 1 (a) (2)

FIG. 1(a) (2)

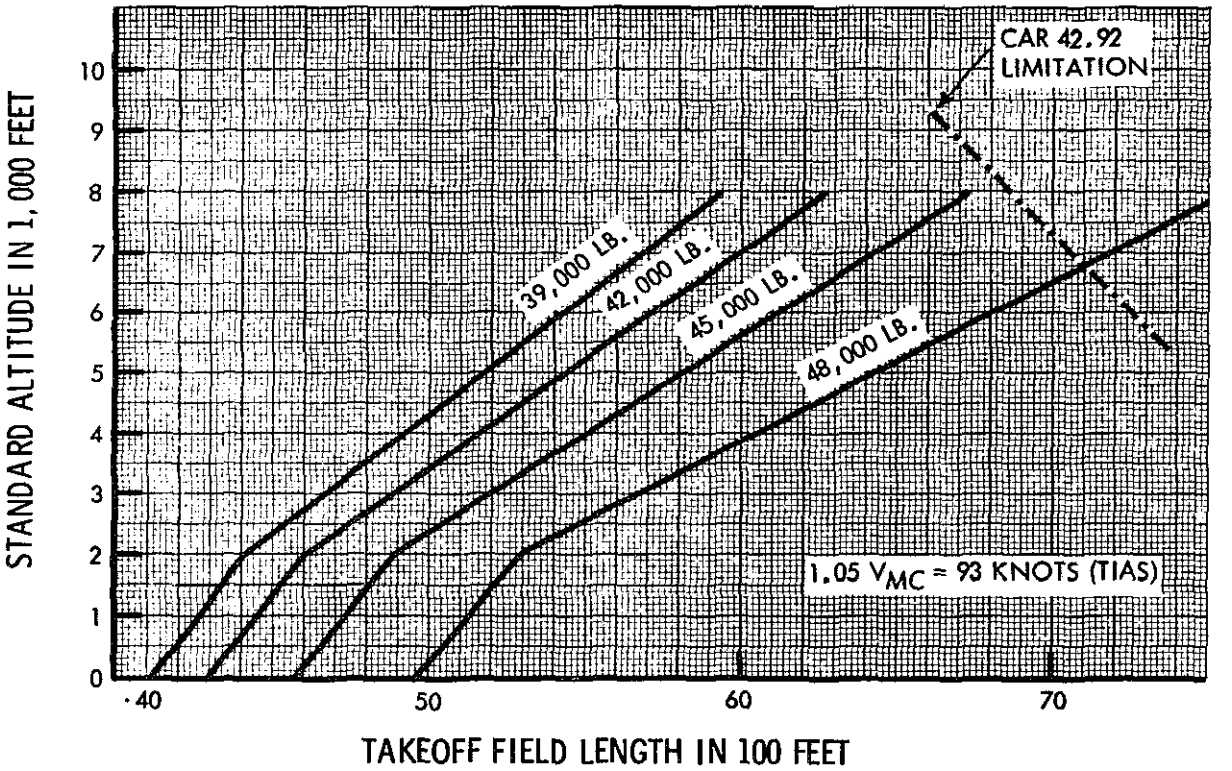
CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 48,000 LBS.

TAKEOFF LIMITATION
ZERO WIND AND ZERO GRADIENT

BASED ON EFFECTIVE TAKEOFF
LENGTH. (1.00 FACTOR)

CAR 42.91



REFERENCE TABLE 1(b) (1)

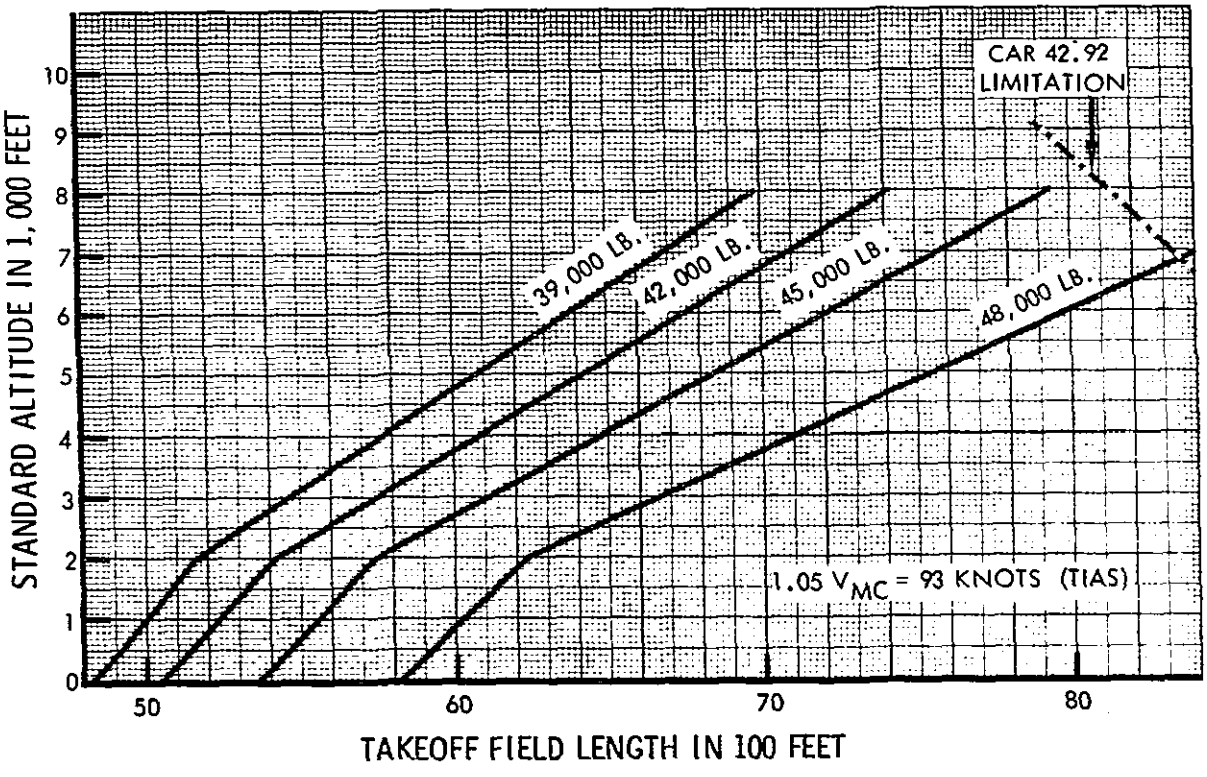
FIG. 1(b) (1)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 48,000 LBS.

TAKEOFF LIMITATION
ZERO WIND AND ZERO GRADIENT

BASED ON ACTUAL TAKEOFF LENGTH
WHEN EFFECTIVE LENGTH IS NOT
DETERMINED. (0.85 FACTOR)



REFERENCE TABLE 1(b) (2)

FIG. 1(b) (2)

RUNWAY GRADIENT CORRECTION
FOR ACCELERATE - STOP DISTANCE

FOR C-46 AIRPLANES UNDER CAR 42.91

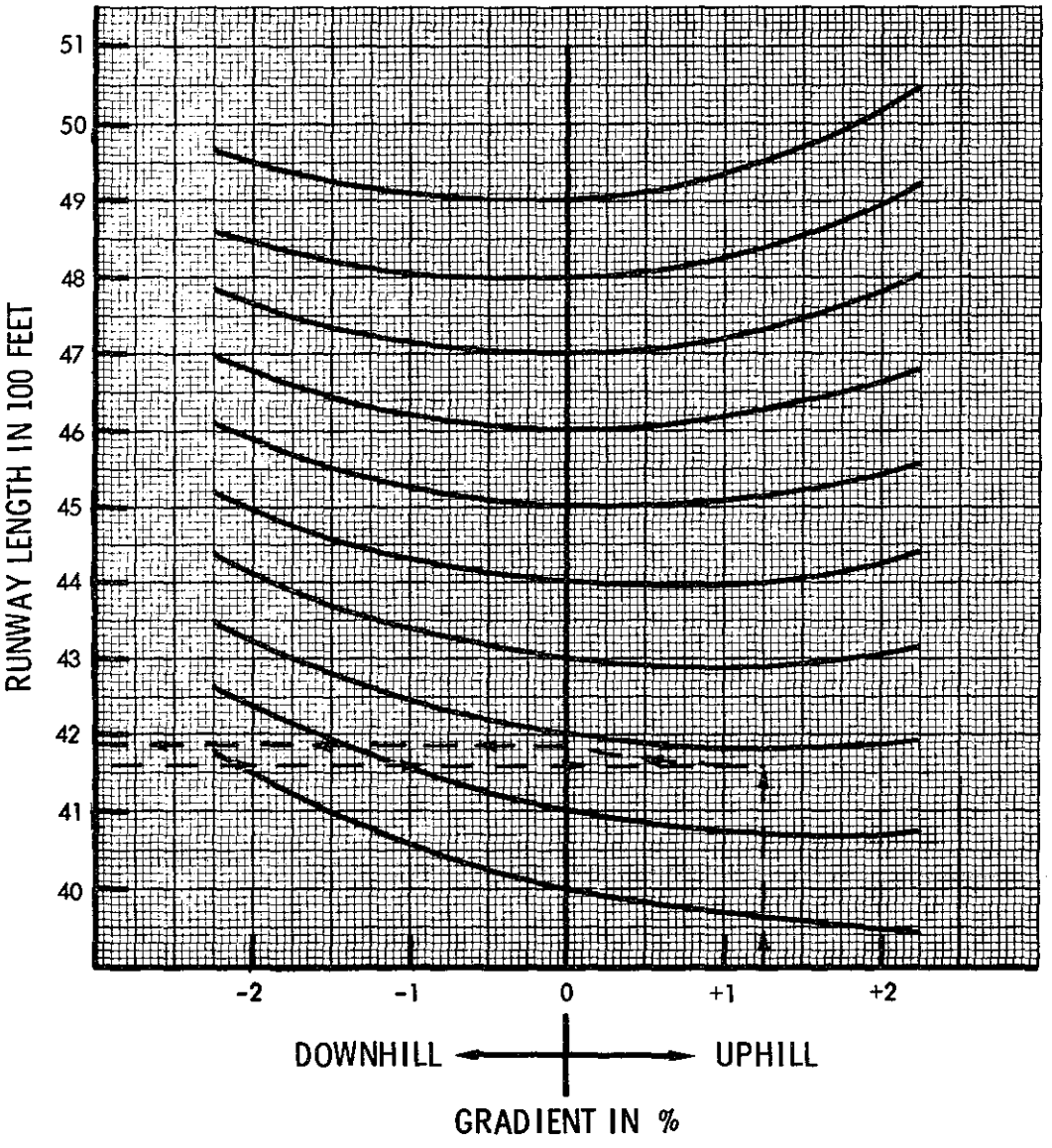


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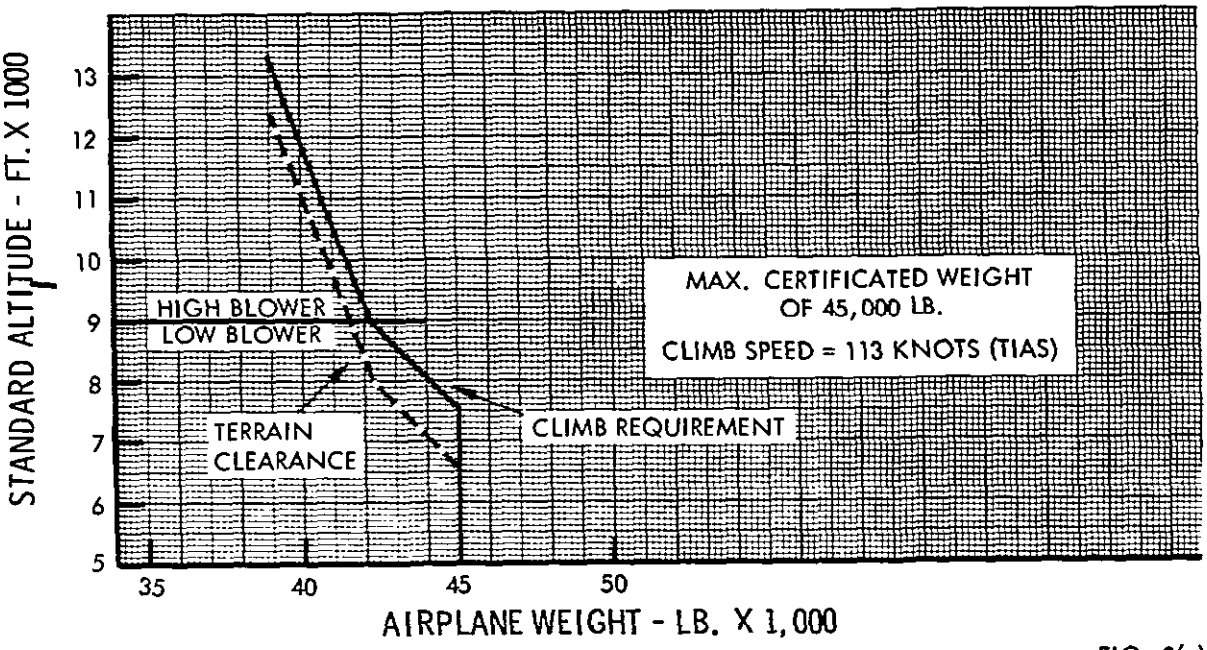
FIG. 1(c)

CURTISS C-46 MODELS

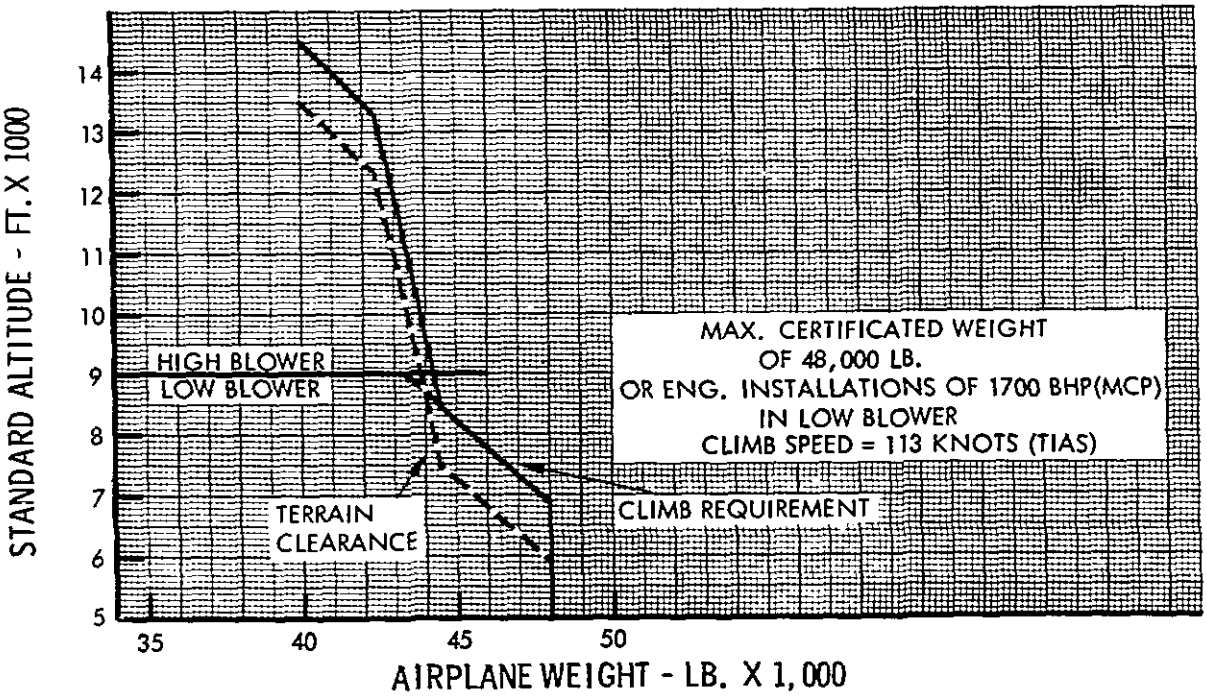
ENROUTE LIMITATIONS - ONE ENGINE INOPERATIVE

CAR 42.92



REFERENCE TABLE 2(a)

FIG. 2(a)



REFERENCE TABLE 2(b)

FIG. 2(b)

C-46 MAX. CERTIFICATED WEIGHT 48,000 LBS.
DRIFT-DOWN CHART CAR 42.92
SINGLE ENGINE ENROUTE OPERATION

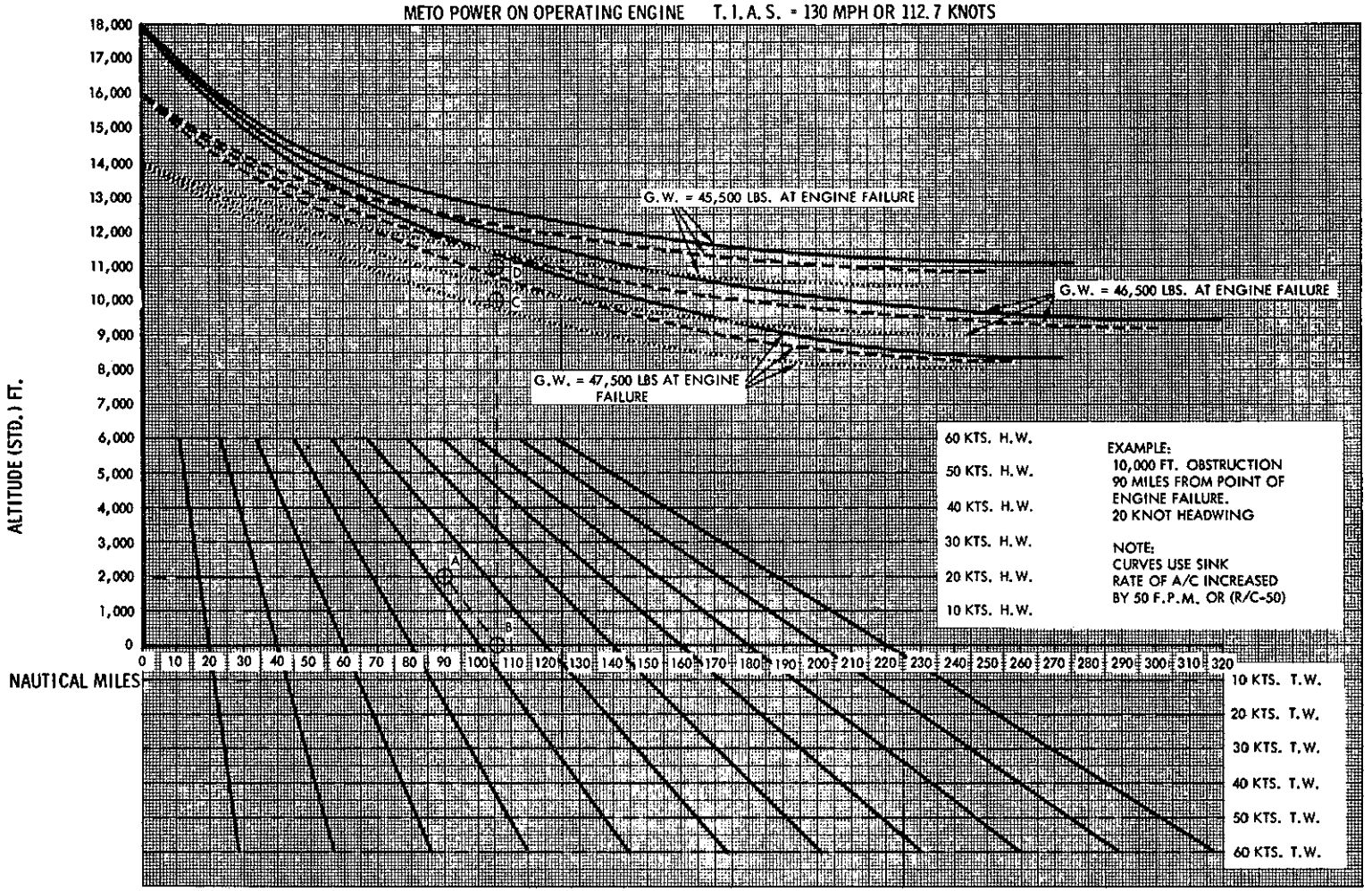


FIG. 26a

C-46 MAX. CERTIFICATED WEIGHT 48,000 LBS.
ENROUTE CLIMB SUMMARY

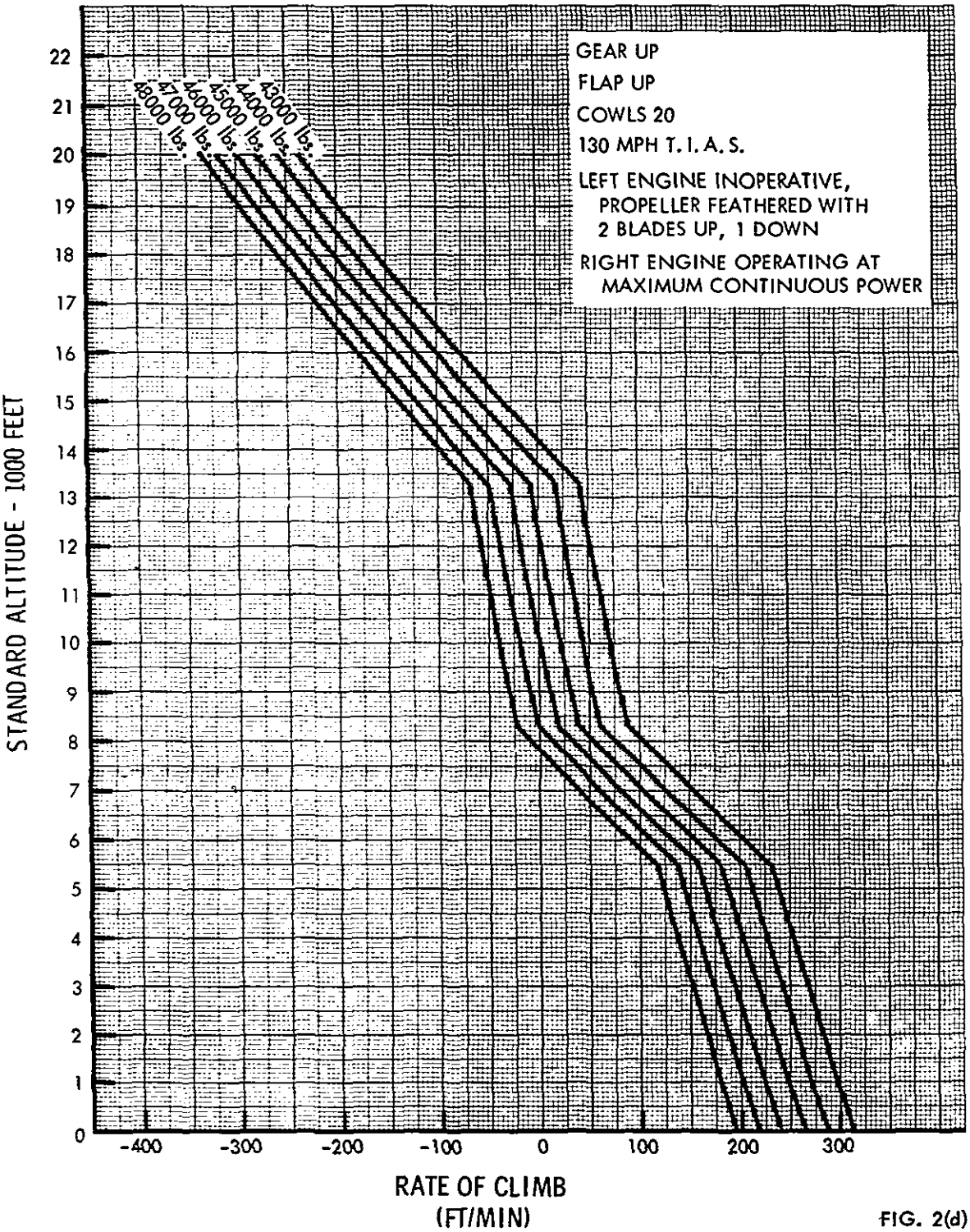


FIG. 2(d)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 45,000 LBS.

LANDING LIMITATIONS.
ZERO WIND AND ZERO GRADIENT

BASED ON EFFECTIVE LANDING LENGTH
AT INTENDED DESTINATION. (0.60 FACTOR)

CAR 42.93

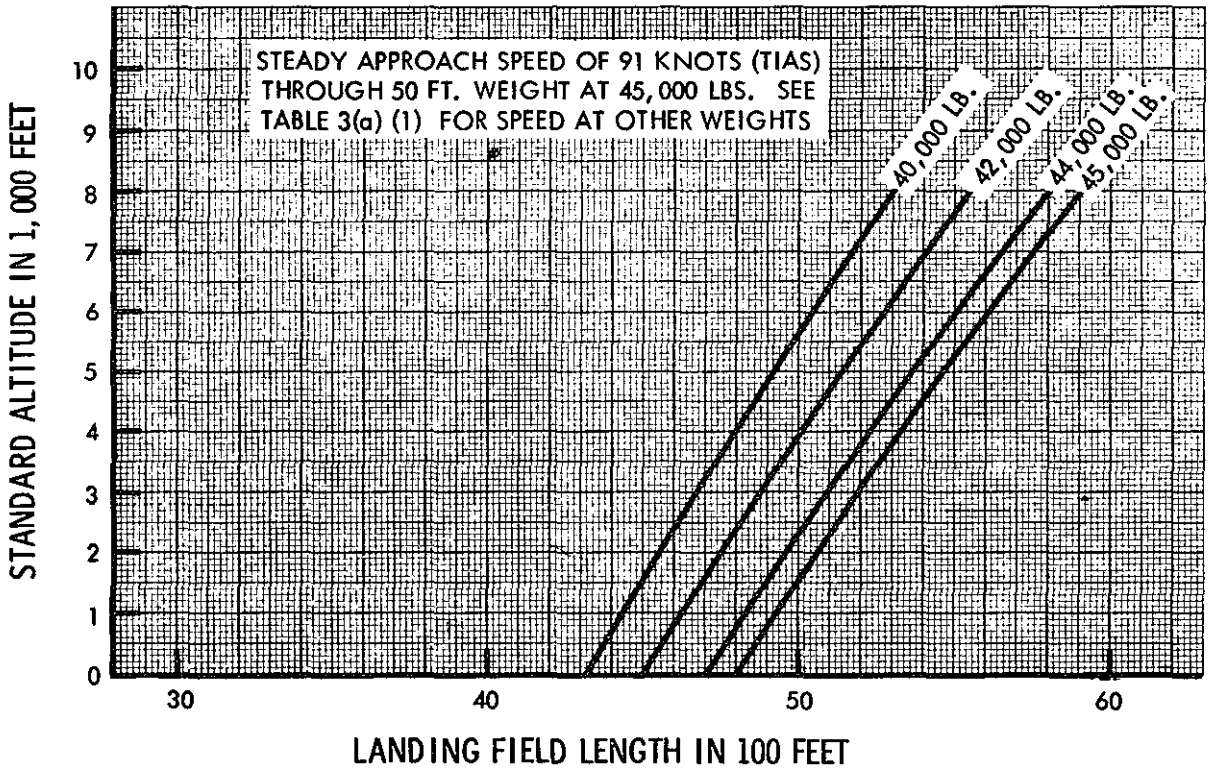


FIG. 3(a) (1)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 48,000 LBS.

LANDING LIMITATIONS.
ZERO WIND AND ZERO GRADIENT

BASED ON EFFECTIVE LANDING LENGTH
AT INTENDED DESTINATION. (0.60 FACTOR)

CAR 42.93

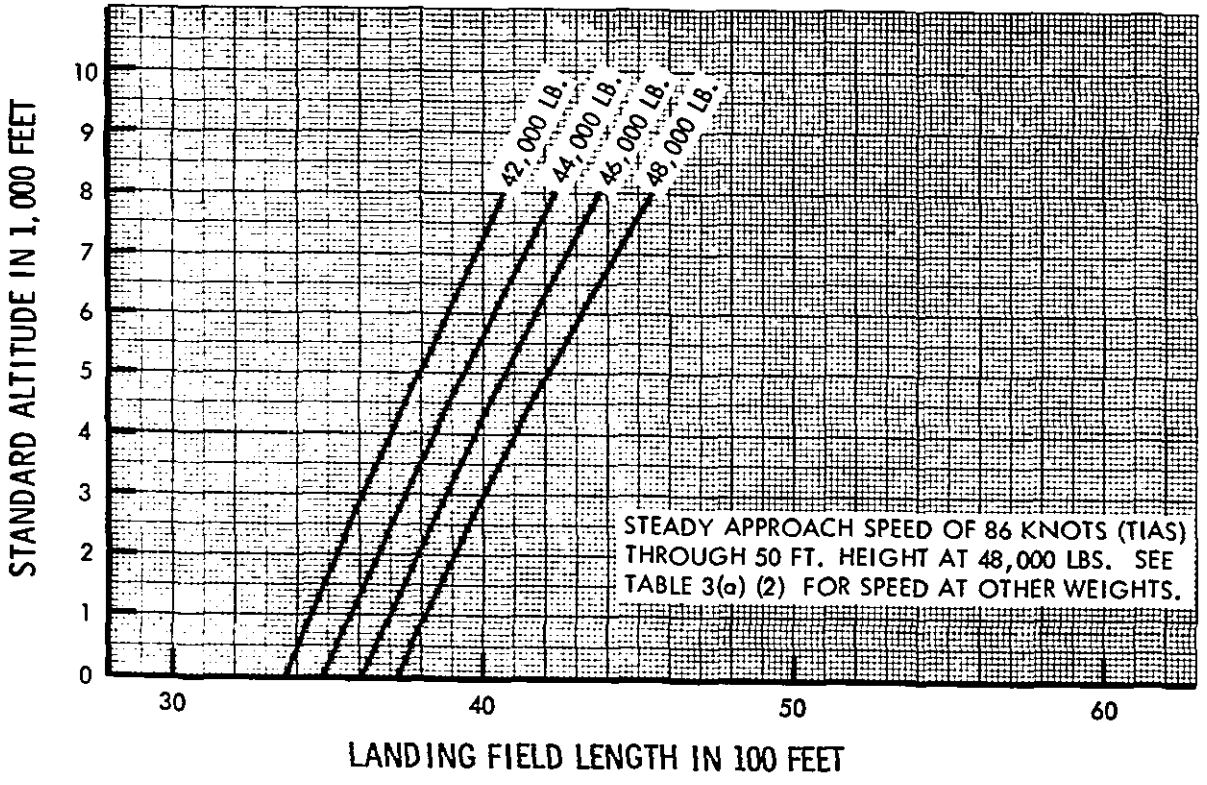


FIG. 3(a) (2)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 45,000 LBS.

LANDING LIMITATIONS.
ZERO WIND AND ZERO GRADIENT

BASED ON EFFECTIVE LANDING LENGTH
AT ALTERNATE AIRPORTS. (0.70 FACTOR).

CAR 42.94

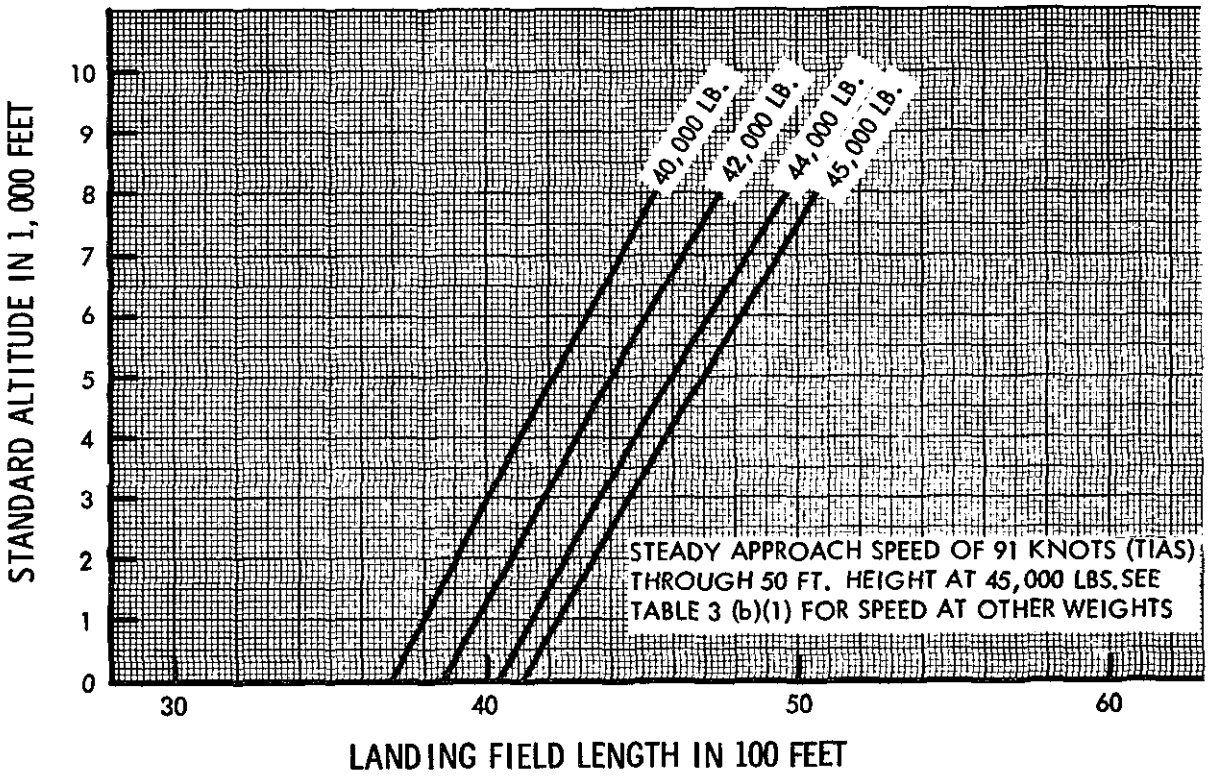


FIG. 3(b) (1)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 48,000 LBS.

LANDING LIMITATIONS.
ZERO WIND AND ZERO GRADIENT

BASED ON EFFECTIVE LANDING LENGTH
AT ALTERNATE AIRPORTS. (0.70 FACTOR).

CAR 42.94

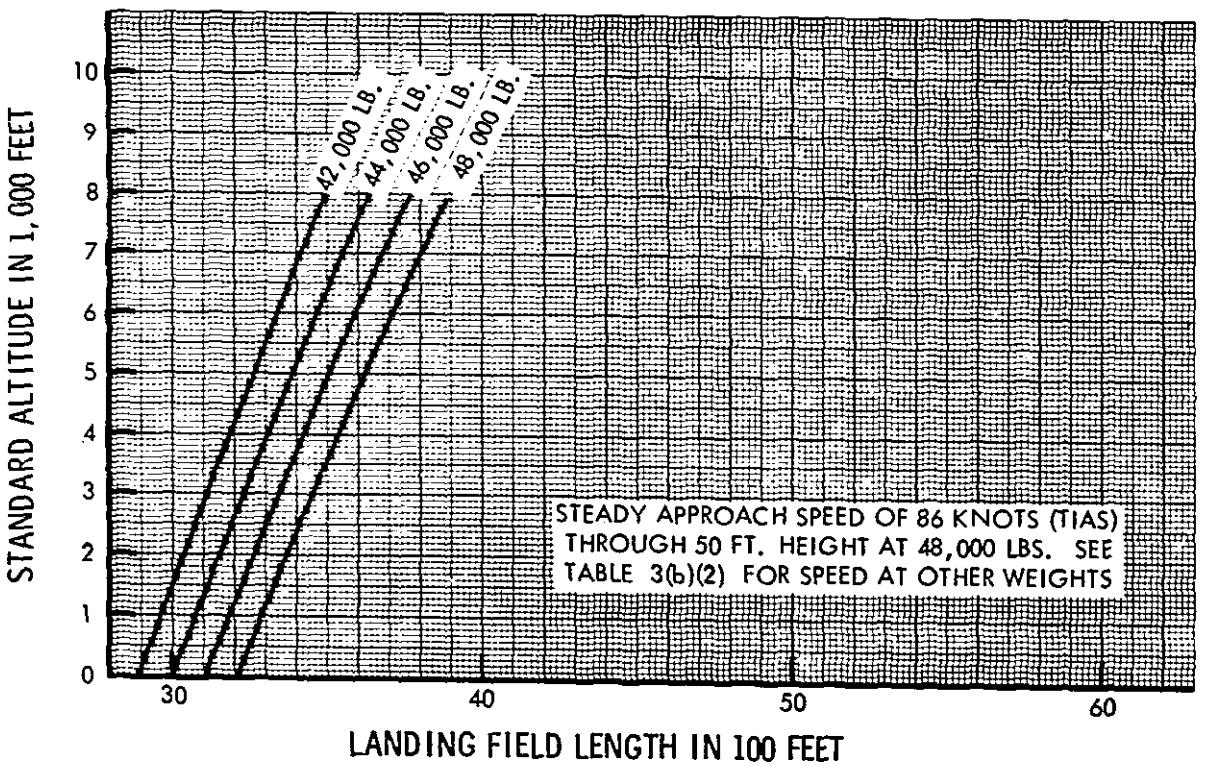


FIG. 3(b) (2)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 45,000 LBS.

LANDING LIMITATIONS.
ZERO WIND AND ZERO GRADIENT

BASED ON ACTUAL LANDING LENGTH
WHEN EFFECTIVE LENGTH IS NOT
DETERMINED. (0.55 FACTOR)

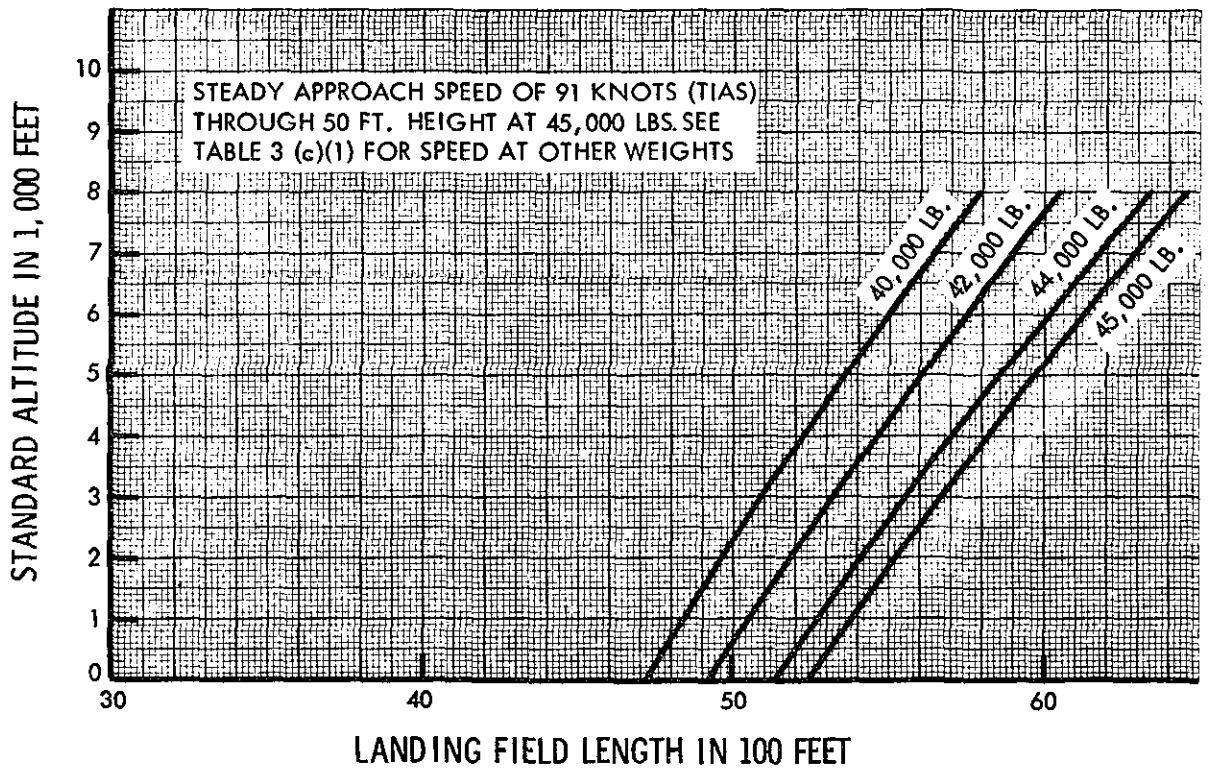


FIG. 3(c) (1)

CURTISS C-46 MODELS

CERTIFICATED FOR MAX. WEIGHT OF 48,000 LBS.

LANDING LIMITATIONS,
ZERO WIND AND ZERO GRADIENT

BASED ON ACTUAL LANDING LENGTH
WHEN EFFECTIVE LENGTH IS NOT
DETERMINED. (0.55 FACTOR)

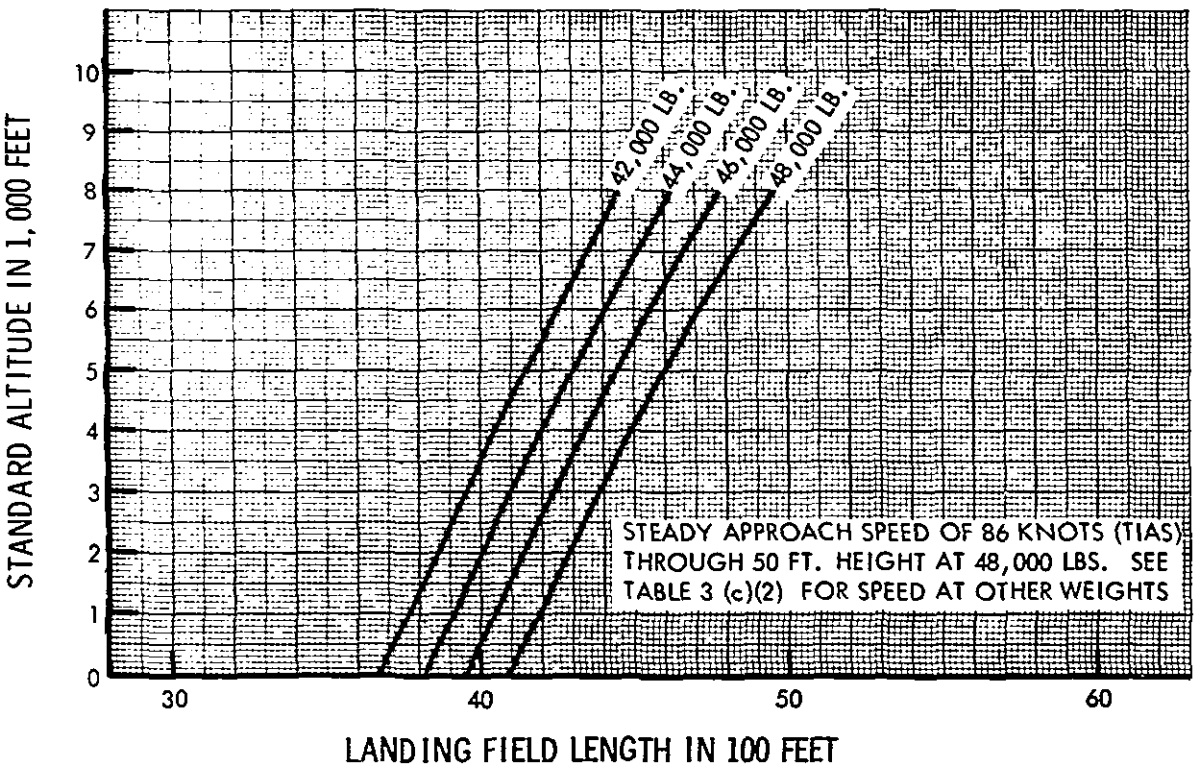


FIG. 3(c) (2)