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Civil Aeronautics Manual 42

Irregular Air Carrier Certification and Operation Rules

September 1, 1949

U. S. DEPARTMENT OF COMMERCE
Charles Sawyer, Secretary

CIVIL AERONAUTICS ADMINISTRATION
D. W. Rentzel, Administrator

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INTRODUCTORY NOTE

This manual contains material interpreting and explaining irregular air carrier requirements as specified in Civil Air Regulations Part 42, as amended. It supersedes CAM 42, dated November 1, 1946, CAM 42 Supplement No. 1, dated June 16, 1949, and in those cases where the manual material may be contradictory to portions of the following releases, the manual material shall govern:

SRR 128, dated September 21, 1942.
SRR 209, dated June 21, 1946.
SRR 232, dated March 19, 1947.
SRR 240, dated April 10, 1947.
ASR 287, dated June 3, 1948.
ASR 289, dated June 14, 1948.
ASR 290, dated June 21, 1948.
ASR 293, dated July 21, 1948.

It should be understood that equipment, procedures, and operating requirements which can be shown to be the equivalent of those set forth in this manual may be acceptable to the Administrator of Civil Aeronautics. Any procedure or operations requirement determined and shown to be inapplicable to a particular irregular air carrier operation may be suitably modified on request. This manual will be revised from time to time as equally acceptable equipment, procedures, operating requirements, new interpretations, or the needs for additional explanation are brought to the attention of the Administrator of Civil Aeronautics.

The numbering system for this material follows exactly that of like material published in the Federal Register. The quotation of the Civil Air Regulation uses the numbering system established by the Civil Aeronautics Board and the Federal Register. CAA material is identified by appending a dash to the regulation number and then numbering consecutively the interpretive material relating to the pertinent section of the CAR, Part 42.

IRREGULAR AIR CARRIER CERTIFICATION AND OPERATION RULES

"CAR § 42.0 *Applicability of Part 42.* (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 § 41.1 (a), 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, 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 APPLICABILITY TO SCHEDULED AIR CARRIERS. (*CAA policies which apply to section 42.0 (b).*)

A scheduled air carrier electing to conduct charter flights or other special services under the provisions of this section may have its scheduled air carrier operating certificate amended upon application. The form to be used for this application may be obtained from the Aviation Safety Agent responsible for the air carrier's operating certificate.

Prior to the conduct of operations off-route, the flight operations and maintenance manuals of the air carrier must be revised to incorporate additional instructions to its flight and ground personnel for the operation, servicing, and handling of the aircraft used in this type of service.

In lieu of amending its scheduled air carrier operating certificate, a scheduled air carrier may apply for an Irregular Air Carrier Operating Certificate in order to conduct charter flights or other special services both on-route and off-route under the provisions of Part 42.

"CAR § 42.1 *Definitions.* (a) As used in this part the words listed below shall be defined as follows:

"(1) *Accelerate-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 car-

rier includes any air carrier subject to the provisions of Part 292 [1] of the Economic Regulations as heretofore or hereafter amended.

[1] Part 292 currently provides that Alaska air carriers shall include certificated and noncertificated air carries 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 take-off 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 center line. This distance shall increase uniformly to 500 feet on each side of such center line at a longitudinal distance of 1,500 feet from such point of intersection. Thereafter, this distance shall be assumed to be 500 feet on each side of such center line.

"(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 for the performance of duty on the aircraft other than as a flight crew member.

"(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 take-off may be safely continued even though the critical engine becomes suddenly inoperative. (See the airworthiness requirements under which the airplane was type certificated for the manner in which such speed is determined.)

"(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.

"(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 [2] of the Economic Regulations as heretofore or hereafter amended.

[2] 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 des-

ignated 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.[3]

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

"(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.[4]

"[4] The Nautical Almanac containing the ending of evening twilight and the beginning of morning twilight tables may be obtained from the Superintendent of Documents, 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 take-off 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 take-off 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, or under the transport category performance requirements of Part 4a.

"(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."

for the service to be offered and has listed it in the air carrier operating certificate."

42.11-1 EXCLUSIVE USE. (*CAA policies which apply to section 42.11.*)

When large aircraft are operated under the terms of an irregular air carrier operating certificate, the air carrier shall own or have the exclusive use of at least one such aircraft. In other words, the air carrier shall have sole possession, control, and use of such aircraft for a definite and reasonable period of time. The minimum duration of a lease which meets the above requirements will be for a period of 60 days. The basic principle in determining what constitutes a reasonable period of time is that which will enable the Administration to perform its enforcement functions. Accordingly, if circumstances warrant, a lease of more than 60 days duration may be required.

42.11-2 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-518-A. 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-518-A. 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 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 following table specifies the minimum number of such exits considered necessary for adequacy. Totals given in the "exits required" column include the cabin exit normally used by boarding or deplaning passengers.

Number of persons for which seats are provided	*Minimum number of exits required*
5 or less	1
Exceeding 5, not exceeding 15	2
Exceeding 15, not exceeding 22	3
Exceeding 22, not exceeding 29	4
Exceeding 29, not exceeding 36	5
Exceeding 36, not exceeding 50	6
Exceeding 50, not exceeding 64	7
Exceeding 64, not exceeding 78	8

Any exceptions from the foregoing minimum requirements must have individual approval for each aircraft concerned. 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, as established in the preceding table.

(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.

42.11-3 LEASING OF AIRCRAFT. (*CAA policies which apply to section 42.11.*)

In those cases where an operator leases an aircraft from other parties, the Operations Specifications—Aircraft Identification form must be amended to include such aircraft. In cases where interchange of equipment agreements are concerned, aircraft may be listed on the Operations Specifications of more than one air carrier provided an explanatory statement is included on such pages indicating briefly the leasing or interchange of equipment agreement,

responsibility for maintenance, applicable time limitations, and the aircraft concerned.

"CAR § 42.12 *Fire prevention requirements.* Aircraft powered by an engine or engines rated at more than 600 h. p. each for maximum continuous operation shall, when used in passenger service, comply with the applicable fire prevention requirements of Part 4b: *Provided*, That in those instances where the Administrator, prior to the effective date of this part, 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.*

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

"CAR § 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."

"CAR § 42.15 *Minimum performance requirements for large airplanes used in passenger operations.* No air carrier shall use large airplanes in passenger operations except as provided below:

"(a) Transport category airplanes shall meet the operating limitations of §§ 42.70 through 42.78.

"(b) Nontransport category airplanes shall either:

"(1) Retain their present airworthiness certificate status and shall meet the operating limitations of §§ 42.80 through 42.83, or

"(2) Qualify by showing compliance with either the performance requirements of §§ 4a.737-T through 4a.750-T, or the requirements contained in Part 4b, and when so qualified shall meet the operating limitations of §§ 42.70 through 42.78 over the area to be traversed.

"(c) Airplanes used after December 31, 1953, shall comply with all of the requirements of Part 4b, or the transport category requirements of Part 4a, and shall meet the requirements of §§ 42.70 through 42.78 over each route to be flown."

"CAR § 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 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 appropriate 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).*)

The following multiengine aircraft, not certificated in the transport category, have been found to meet the en route operating requirements of Section 42.82 at an altitude of 5,000 feet at the maximum certificated take-off weight:

(a) Beechcraft D18S and C18S.
(b) Boeing 247D (with feathering propellers), and 314.
(c) Douglas B-23, DC-2 (with feathering propellers), and DC-3.
(d) Curtiss C-46.
(e) Lockheed 10C, 10E, 12A, 14, and 18.

It will be noted that under the provisions of § 42.80 compliance with the en route operating requirements of § 42.82 is not required prior to January 1, 1950. Therefore, the above-listed aircraft may be operated without regard to the en route performance limitations of § 42.82, until that date. Additional performance data on these aircraft will be published prior to January 1, 1950.

AIRCRAFT EQUIPMENT

"CAR § 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 gauge for each engine using pressure system,

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

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

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

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

"(10) Position indicator, if aircraft has retractable landing gear or flaps,

"(11) Approved seats and safety belts adequate for all persons on board the aircraft,

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

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

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

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

"(1) Instruments and equipment specified in § 42.21 (a),

"(2) Carburetor temperature gauge,

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

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

"(5) At least one landing light,

"(6) Approved landing flares as follows, if the aircraft is operated beyond a 3-mile radius from the center of the airport of take-off:

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

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

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

"(8) Generator of adequate capacity,

"(9) One set of instrument lights.

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

"(1) Instruments and equipment specified in § 42.21 (a),

"(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 § 42.21 (a) (2),

"(8) Clock with a sweep-second hand,

"(9) One gyro direction indicator,

"(10) Generator of adequate capacity,

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

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

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

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

"(15) Heated pitot tube for each 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 two 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 take-off 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 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.

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 co-pilot.

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.

"CAR § 42.22 *Additional required instruments and equipment for large aircraft.* In addition to the basic instruments required by § 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 § 42.12, such additional hand-type fire extinguishers as the Administrator finds necessary for compliance with § 42.21 (a) (12).

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

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

"CAR § 42.23 *Radio communications system and navigational equipment for large aircraft.* In lieu of the radio communications system and navigational equipment specified in § 42.21 (b) (7) and (c) (2), the following shall be required in large aircraft for the type of operations specified:

"(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 paragraphs (a) (1), (2), and (3) 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 compilance 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).*)

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.

The type of the ground radio navigational facilities utilized governs the air-borne 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 omni-directional 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).

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.

"CAR § 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 take-offs, 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."

ignated 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.[3]

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

"(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.[4]

"[4] The Nautical Almanac containing the ending of evening twilight and the beginning of morning twilight tables may be obtained from the Superintendent of Documents, 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 take-off 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 take-off 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, or under the transport category performance requirements of Part 4a.

"(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

"CAR § 42.5 *Certificate Issuance.* 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 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.

"(a) *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 LETTER OF REGISTRATION REQUIRED BY CIVIL AERONAUTICS BOARD. ***(CAA policies which apply to section 42.5.)***

Issuance of an irregular air carrier operating certificate does not relieve the recipient thereof from obtaining a Letter of Registration as required by the Economic Regulations of the Civil Aeronautics Board. An "Application for Letter of Registration" (Form CAB–2789) may be obtained from the Secretary, Civil Aeronautics Board, Attention: Operations Division, B–68, Washington 25, D. C.

42.5–2 APPLICATION FOR AN IRREGULAR AIR CARRIER OPERATING CERTIFICATE. ***(CAA rules which apply to section 42.5.)***

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 the Civil Air Regulations Part 42, 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.

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. 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.

[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.

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 above.

(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]

"CAR § 42.6 *Duration.* An air carrier operating certificate shall continue in effect unless it is surrendered, suspended, or revoked, or a termination date is set by the Board, after which it shall be returned to the Administrator."

"CAR § 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."

"CAR § 42.8 *Inspection.* Any authorized representative of the Administrator or the Board shall be permitted at any time and place to make inspections or examinations to determine the air carrier's compliance with the Civil Air Regulations."

"CAR § 42.9 *Operations Base, Maintenance Base and/or Office.* On or before July 1, 1949, 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, prior to any change in any such office or base, he shall give written notice 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

"CAR § 42.11 *Aircraft Required.* An air carrier shall own or 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 the standard airworthiness requirements. No air carrier shall operate a large aircraft for the carriage of goods or persons for compensation or hire unless the Administrator has found such aircraft safe

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

for the service to be offered and has listed it in the air carrier operating certificate."

42.11-1 EXCLUSIVE USE. (*CAA policies which apply to section 42.11.*)

When large aircraft are operated under the terms of an irregular air carrier operating certificate, the air carrier shall own or have the exclusive use of at least one such aircraft. In other words, the air carrier shall have sole possession, control, and use of such aircraft for a definite and reasonable period of time. The minimum duration of a lease which meets the above requirements will be for a period of 60 days. The basic principle in determining what constitutes a reasonable period of time is that which will enable the Administration to perform its enforcement functions. Accordingly, if circumstances warrant, a lease of more than 60 days duration may be required.

42.11-2 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-518-A. 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-518-A. 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 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 following table specifies the minimum number of such exits considered necessary for adequacy. Totals given in the "exits required" column include the cabin exit normally used by boarding or deplaning passengers.

Number of persons for which seats are provided	*Minimum number of exits required*
5 or less	1
Exceeding 5, not exceeding 15	2
Exceeding 15, not exceeding 22	3
Exceeding 22, not exceeding 29	4
Exceeding 29, not exceeding 36	5
Exceeding 36, not exceeding 50	6
Exceeding 50, not exceeding 64	7
Exceeding 64, not exceeding 78	8

Any exceptions from the foregoing minimum requirements must have individual approval for each aircraft concerned. 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, as established in the preceding table.

(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.

42.11-3 LEASING OF AIRCRAFT. (*CAA policies which apply to section 42.11.*)

In those cases where an operator leases an aircraft from other parties, the Operations Specifications—Aircraft Identification form must be amended to include such aircraft. In cases where interchange of equipment agreements are concerned, aircraft may be listed on the Operations Specifications of more than one air carrier provided an explanatory statement is included on such pages indicating briefly the leasing or interchange of equipment agreement,

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 KIT. (*CAA rules which apply to section 42.24 (a).*)

The adequacy of the first-aid kit required by this section is determined by the number of persons aboard the aircraft. Any first-aid kit which includes at least the items listed herein, or their equivalent, shall be deemed adequate for the number of persons indicated:

(a) No. 1 Kit for Aircraft of 1 to 5 Persons Capacity—

6 iodine swabs,
2 compression bandages—sterile,
2 paper drinking cups,
1 container ¾ inch band-aids,
6 individual sterile gauze-flats,
1 tube burn ointment,
1 tourniquet,
2 ampoules aromatic ammonia,
1 Esmarch triangular bandage,
1 first-aid book,
2 3-inch bandages (to aid in improvising splints),
1 ½-inch by 2½ yards adhesive,
1 pair scissors.
Approximate weight of kit—1¼ pounds.

(b) No. 2 Kit for Aircraft of 6 to 25 Persons Capacity—

12 iodine swabs,
6 compression bandages—sterile,
4 paper drinking cups,
15 assorted band-aids,
1 yard Red Cross gauze,
2 tubes burn ointment,
2 tourniquets,
6 ampoules aromatic ammonia,
2 Esmarch triangular bandages,
1 first-aid book,
4 2-inch bandages,
4 3-inch bandages,
2 1½-inch by 2½ yards adhesive,
1 pair scissors.
Approximate weight of kit—3¼ pounds.

(c) No. 3 Kit for Aircraft of More Than 25 Persons Capacity—

20 iodine swabs,
10 compression bandages—sterile,
10 paper drinking cups,
20 assorted band-aids,
3 yards Red Cross gauze,
2 tubes burn ointment,
4 tourniquets,
6 ampoules aromatic ammonia,
2 Esmarch triangular bandages,
1 first-aid book,
6 2-inch bandages,
4 3-inch bandages,
3 ½-inch by 2½ yards adhesive,
2 pairs scissors.

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 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 § 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 herein. 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 signalling 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 sun glasses for each person,
1 book on Arctic survival,
1 waterproof box of matches,
1 magnetic compass,
1 bottle of chlorine tablets for water,
1 signalling 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 life rafts to accommodate all persons.
Each life raft shall contain the following:
1 canopy (for sail, sunshade, or for rain catcher),
1 life raft repair kit,
1 bailing bucket,
1 signalling 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 de-salting 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 life rafts to accommodate all persons.
Each life raft shall contain the following:
1 canopy (for sail, sunshade, rain catcher or protection from elements),
1 life raft repair kit,
1 bailing bucket,
1 signalling 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 de-salting 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.

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

42.25-1 COCKPIT CHECK LIST. (*CAA policies which apply to section 42.25.*)

The cockpit check list shall be legible during hours of daylight and darkness under the light conditions of the cockpit.

Check lists 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 take-off,
Cruising,
Prior to landing,
Powerplant emergencies,
After landing,
Stopping engines.

It is recommended that in all multiengine equipment a one-engine inoperative check list 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 check lists prepared for emergency use in event of failure.

42.25-2 MINIMUM STANDARD COCKPIT CHECK LIST. (*CAA policies which apply to section 42.25.*)

The following check list 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 check list 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.
Cross feeds—as required.

Hydraulic System [3]

Brakes—set.

Electrical System

Battery switch—proper position.

PRIOR TO TAKE-OFF

Weight and Balance

Pilot is aware of weight and take-off limitations.

Fuel System [3]

Quantity—rechecked.
Proper tank selection—rechecked.
Mixtures—take-off position.
Fuel booster pumps—as required.
Cross feed—as required.

Hydraulic System [3]

Hydraulic pressures and quantity—checked.
Brakes—checked.
Hydraulic selector valves—checked.

Anti-Icing and De-Icing Equipment [3]

Checked and set.

Electrical System

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

Powerplants and Propellers [3]

Propellers—checked and set in take-off position.
All engines—checked for proper functioning and required power.
Superchargers—checked and set in proper take-off position.

Heaters

Checked and set.

Instruments

Engine—
Oil: quantity, temperature, and pressure—normal for take-off.
Fuel pressure—normal for take-off.
Carburetor temperature—checked.
Cylinder head temperature—checked.

Flight—
Static and vacuum selectors—checked.
Directional gyro—set.
Altimeter—set.
Horizon—uncaged.
Turn and bank—checked.
Clock—set.

[3] These items will be double-checked, such as by challenge and response, or positively checked, such as by a mechanical method.

Pressurization [3]
Checked.

Flaps [3]
Wing flaps—take-off position.
Cowl flaps—take-off position.

Controls [3]
Auto pilot—off.
Trim tabs—set for take-off.
Gust locks—off.
Free and tested through full limit of travel.

PRIOR TO LANDING

Fuel System [3]
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 [3]
Hydraulic pressure—checked.
Brakes—checked and off.
Hydraulic selector valves—checked.

Anti-Icing and De-Icing Equipment [3]
Checked.

Powerplants and Propellers
Propellers—as required.
Superchargers—as required.

Heaters [3]
Checked.

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

Pressurization [3]
Checked.

Controls
Auto pilot—off.
Trim tabs—as desired.

Landing Gear [3]
Down and locked—checked.

[3] These items will be double-checked, such as by challenge and response, or positively checked, such as by a mechanical method.

Flaps [3]
Wing flaps—as desired.
Cowl flaps—as desired.

POWERPLANT EMERGENCIES

Fuel System
Mixture—Idle cut-off 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.

Electrical System
Ignition: off—dead engine.
Generators: off—dead engine.

Powerplants and Propellers
Propellers: low r. p. m. and feathered on dead engine—set as required on all live engines.
Engine—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 presure checked.
Carburetor—temperature checked.
Cylinder head—temperature checked.

Flight Instruments
Checked and reset if necessary.

Pressurization
Checked.

"CAR § 42.26 *Oxygen.* Aircraft operated at an altitude exceeding 10,000 feet above sea level continuously for more than 30 minutes, or at an altitude exceeding 12,000 feet above sea level for any length of time, shall be equipped with effective oxygen apparatus and an adequate supply of oxygen available for the use of the operating crew. Such air-

craft shall also be equipped with an adequate separate supply of oxygen available for the use of passengers when operated at an altitude exceeding 12,000 feet above sea level."

MAINTENANCE REQUIREMENTS

"CAR § 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 the Civil Air Regulations, and with the maintenance manual when required by § 42.32 (d)."

42.30-1 GENERAL. (*CAA policies which apply to section 42.30.*)

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

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.

All repairs, overhauls, and alterations shall be in accordance with materials, procedures, and standards set forth in CAM 18 using proper equipment and tools for the type of work involved.

CAA Airworthiness Directives and manufacturers' manuals, directives, bulletins, and notes shall be complied with as directed.

Large aircraft must be maintained in accordance with the time limitations and maintenance schedules prescribed in the approved maintenance manual and the applicable Civil Air Regulations.

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

Small aircraft must be maintained in accordance with the provisions of the applicable 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.

"CAR § 42.31 *Inspections and maintenance.* (a) Aircraft shall be given a preflight check to determine compliance with § 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 INSPECTIONS 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 the Administrator. The schedules of maintenance functions shall include the overhaul time limitations and inspection program including time limitations which are considered adequate by the Administrator to maintain the aircraft in a continuously airworthy condition.

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 CAM 18.

42.31-3 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.

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

"[5] See § 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. (*CAA policies which apply to section 42.32 (a).*)

Operators who perform their own maintenance on large aircraft will be required to show hangars, shops, servicing facilities, equipment, and spare parts adequate to maintain the aircraft in a continuous condition of airworthiness, in accordance with the details included in the maintenance manual. Some operators will no doubt contract maintenance functions to an outside agency. In such cases, it must be determined that the agency concerned meets the same requirements as above. It will be necessary, however, that the operator provide complete details in the maintenance manual of the maintenance functions to be performed as outlined in 42.31 (a) (1).

All facilities, and equipment for the inspection, maintenance, overhaul, and repair of large aircraft must be acceptable to the Administrator. When maintenance, inspection, or overhaul work is contracted to other agencies, the working agreement must be acceptable to the Administrator as well as the facilities offered by the contractor.

42.32-2 MAINTENANCE PERSONNEL. (*CAA policies which apply to section 42.32 (b).*)

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

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

42.32-3 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.

42.32-4 MAINTENANCE MANUAL. (*CAA rules which apply to section 42.32 (d) (1).*)

(a) GENERAL. The section of the maintenance manual which pertains to maintenance, repair, and inspection of aircraft shall include a detailed break-down 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.

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.

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.

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 Civil Air Regulations and which is in accordance with the following provisions:

(1) DEFINITIONS OF TERMS AS SPECIFICALLY RELATED TO WEIGHT AND BALANCE CONTROL.

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

(ii) OPERATING OR BASIC WEIGHT. The operating or basic weight is the take-off 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.

NOTE: 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.

NOTE: 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 [4] 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 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 two 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 herein.)

(*d*) It is necessary to show the actual c.g. location on the weight manifest, except when a schedule has been prepared which in-

[4] 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.

sures 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.

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

NOTE: 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 over-all weight and c.g. location for each group or list.

NOTE: 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 lower 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; however, in lieu of actual weight, the following approved averages may be used:

(*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. As in the case of passenger weights the actual weight of crew members may be used or the following approved average weights may be utilized:

(*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 $\frac{1}{12}$ 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 pick-up" 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 one percent of the maximum land-

ing weight from the basic or operating fleet weight or the c.g. position varies more than plus or minus one-half of one 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) Re-establishment 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 procedure must be acceptable to the CAA [5] 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.

42.32-5 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 Part 42 and CAM 42 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.

42.32-6 MANDATORY REVISIONS. *(CAA rules which apply to section 42.32 (d) (3).)*

[5] 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.

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.

FLIGHT CREW REQUIREMENTS

"CAR § 42.40 *Airman requirements.* No air carrier shall utilize an individual as an airman unless he has met the appropriate requirements of the Civil Air Regulations.

"CAR § 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 hereinafter prescribed, and specified in the air carrier operations manual for the area in which operations are authorized.

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

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

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

"(e) *Flight engineer.* An airman holding a flight engineer certificate shall be required on all aircraft of more than 80,000 lbs. maximum certificated take-off weight, and on all other aircraft certificated for more than 30,000 lbs. maximum certificated take-off 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."

"CAR § 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 flights.* A currently effective instrument rating."

"CAR § 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.* Any pilot serving as second pilot in large aircraft shall:

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

"(2) Possess a currently effective instrument rating.

"(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."

"CAR § 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 in 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 designated by the Administrator.

"(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 have been given by an authorized representative of the Administrator or a check pilot designated by the Administrator on an aircraft which the air carrier is authorized to use.

"(b) *Flight radio operator.* No individual shall be assigned to nor perform duties as a flight radio operator unless within the preceding 12 months he has had at least four months of satisfactory experience as a radiotelegraph operator and at least 25 hours of experience in the operation of aircraft radio during flight, or until a person designated by the Administrator has checked the airman and has determined that he is (1) familiar with all radio information pertinent to the operations of the air carrier and (2) competent with respect to the operating procedures and radio equipment to be used.

"(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) PILOT IN COMMAND. The equipment check for a pilot in command shall include, but not necessarily be limited to:

(1) Thorough familiarization with the aircraft to be flown, including engines, all major components and systems, and operating procedures;

(2) Take-offs and landings under varying conditions of load, wind, inoperative engine, etc.;

(3) Flight with one or more engines inoperative, including flight with any one engine fully throttled and at maximum authorized landing weight, either at the one-engine-inoperative service ceiling or at an altitude equivalent to 1,000 feet above the highest part of the

terrain over which the air carrier normally operates;

(4) Operating under normal and maximum limits of power, speed, etc.

(b) OTHER PILOT. The equipment check for a pilot not serving as pilot in command shall consist of:

(1) Familiarization with the aircraft to be flown, including the established operating procedures for the engines, propellers, and all major components and systems. This portion of the equipment check may be given on the ground or while in flight.

(2) Demonstration of his ability to take off and land aircraft of the type on which he is to serve.

(c) CREW OF THREE OR MORE PILOTS. Whenever a flight crew of three or more pilots is utilized, those pilots who are required by section 42.43 to meet the pilot in command qualifications of that section shall also have successfully accomplished the equipment check required for a pilot in command.

42.44-2 INSTRUMENT COMPETENCY CHECK. (*CAA policies which apply to section 42.44 (a) (3).*)

A pilot in command of large aircraft shall be required to complete satisfactorily the applicable items pertaining to the Airline Transport Rating listed on Form ACA-342A. Whenever a flight crew of three or more pilots is utilized, those pilots who are required by section 42.43 to meet the pilot in command qualifications of that section shall also have successfully accomplished the instrument check required by this section. Determination of the applicable items will be predicated on the certificate and rating held by the pilot, the equipment to be used for the flight test, and the type of operation authorized the air carrier employing the pilot.

A pilot in command of small aircraft shall be required to satisfactorily complete the applicable items pertaining to instrument rating listed on Form ACA-342A.

A pilot may be required to demonstrate his competency in each type aircraft he flies in irregular air carrier operations. However, if he satisfactorily completes a competency check on the larger and more complicated type of aircraft, he is presumed to be competent on aircraft which are smaller and present fewer problems.

"CAR § 42.45 *Proficiency of crew members serving on large aircraft.* The air carrier shall by means of a training program or otherwise insure that crew members are proficient in their duties and are kept currently informed of all techniques and new developments pertinent thereto. The program shall include instruction in emergency procedures and in crew coordination."

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 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 take-offs;

(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) Thorough 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) Take-offs 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 adequate training and instruction shall be included in the air carrier's training program.

42.45–2 FAMILIARIZATION WITH AIRCRAFT INVOLVED IN INTERCHANGE OF EQUIPMENT. (*CAA policies which apply to section 42.45.*)

In the event that an interchange of equipment involves the utilization of a large aircraft in which cockpit instrumentation and arrangement of equipment differ materially from those in the types of large aircraft regularly operated by the air carrier, the air carrier's training program shall include appropriate and adequate instruction so as to insure that flight crew and crew personnel are thoroughly familiar with such dissimilarity prior to serving on the aircraft.

"CAR § 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% 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."

"CAR § 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."

"CAR § 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. Time spent in deadhead transportation to or from duty assignment shall not be considered part of such rest period.

"(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.

"(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

"CAR § 42.51 *Pilot responsibilities.*—(a) *Pilot in command.* The pilot in command of the aircraft shall be designated by the air carrier.

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

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

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

"[6] See § 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 air-

craft 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 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.

42.51-2 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.

42.51-3 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.

42.51-4 SERVICEABILITY OF EQUIPMENT. (*CAA policies which apply to section 42.51 (e).*)

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.

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.

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.

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

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

(b) 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.

"CAR § 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 CAM 42.52–2.

42.52–2 OPERATION 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.

"CAR § 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 § 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."

"CAR § 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 deicing 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 42.54.*)

The other parts of the aircraft referred to in this section include, but are not limited to, carburetors, windshields, pitot-static tubes, and empennage surfaces.

"CAR § 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,[7] but in no case less than the minimums specified below:

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

"(a) For VFR take-off, 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."

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.

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.

"CAR § 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."

"CAR § 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 shall be obstruction lighted. Examples of obstruction marking are outlined in the "Obstruction Marking Manual," published by the Civil Aeronautics Administration.

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

"CAR § 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.*)

Off-airway instrument operation may be authorized provided the aircraft is properly equipped, and the flight crew demonstrates they are capable of navigating along a predetermined flight path over a proposed route without deviating more than 5 miles or 5 degrees on either side (whichever is the lesser) from a straight line drawn between the point of departure and the next point of arrival.

The 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.

"CAR § 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.

"CAR § 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

rules, after taking into account the temperature operating correction factors required by §§ 4a.749a–T or 4b.98, and set forth in the Airplane Flight Manual for the airplane."

"CAR § 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."

"CAR § 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 take-off 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 conditions in paragraphs (a) and (b) of this section, correction shall be made for any gradient of the take-off surface. Take-off data based on still air may be corrected to allow for the effect of a favorable wind according to reported wind conditions: *Provided,* That not more than 50% of the wind component along the direction of take-off may be used.[9]

"[9] It will be noted that Special Civil Air Regulations Serial Number 397 requires the pilot to take account of temperature variations as well as his wind component in take-off."

"CAR § 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."

"CAR § 42.74 *En route limitations; one engine inoperative.* No airplane of a maximum certificated weight of less than 40,000 lbs. shall be taken off at a weight in excess of that which would permit a rate of climb (expressed in feet per minute), with one engine inoperative, of at least 0.02 $V_{s_0}^2$ (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 either side of the intended track; for airplanes of a maximum certificated weight of 40,000 to 60,000 lbs., inclusive, the rate of climb shall increase linearly in relation to weight to 0.04 $V_{s_0}^2$; for airplanes of a maximum certificated weight of over 60,000 lbs. the rate of climb shall be 0.04 $V_{s_0}^2$; for transport category airplanes certificated under Part 4a the rate of climb shall be 0.02

$V_{s_0}^2$ for all maximum certificated weights. 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."

"CAR § 42.75 *En route limitations; two engines inoperative.* No airplane having four or more engines shall be flown along an intended track except under the following conditions: *Provided,* That this section shall not apply to transport category airplanes certificated under Part 4a:

"(a) No place along the intended track shall be more than 90 minutes away from an available landing area at which a landing may be made in accordance with the requirements of § 42.78, assuming all engines are operating at cruising speed; or

"(b) The take-off weight is such that the airplane with two engines inoperative shall have a rate of climb (expressed in feet per minute) of at least 0.01 $V_{s_0}^2$ (when V_{s_0} is expressed in miles per hour) 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.

"(1) The rate of climb referred to in this paragraph shall be determined by assuming the airplane's weight to be either that attained at the moment of failure of the second engine, assuming that failure to occur 90 minutes after departure, or that which may be attained by dropping fuel at the moment of failure of the second engine, assuming that sufficient fuel is retained to arrive at an altitude of at least 1,000 feet directly over the landing area."

"CAR § 42.76 *En route limitations; where special air navigational facilities exist.* The 10-mile lateral distance specified in §§ 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."

"CAR § 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% 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% 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 § 42.78."

"CAR § 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 take-off can comply with the requirements of paragraphs (a) and (b) of § 42.77 at such airport: *Provided,* That the aircraft can be brought to rest within 70% of the effective length of the runway."

"CAR § 42.80 *Operating limitations for aircraft not certificated in the transport category.* In operating any passenger-carrying, large, nontransport category airplanes after January 1, 1950, the provisions of §§ 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. Per-

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 the Economic Regulations of the Civil Aeronautics Board.

"CAR § 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.

"CAR § 42.94 *Pilot's emergency deviation report.* Where pursuant to authority granted in § 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.

"CAR § 42.95 *Flight manifest record.* A signed copy and any revision of the flight manifest required by § 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 for at least one year after completion of the flight."

"CAR § 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[6] 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

[6] Failures, malfunctions, or other defects not covered by CAR Part 62, which are to be reported under these rules, comprise generally the following basic items: Fire hazards, structural hazards, serious system or component malfunctions or failures, unsafe procedures or conditions, and defects in design or quality of parts and materials found installed on aircraft or intended for such installation.

at 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 shall be obstruction lighted. Examples of obstruction marking are outlined in the "Obstruction Marking Manual," published by the Civil Aeronautics Administration.

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

"CAR § 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.*)

Off-airway instrument operation may be authorized provided the aircraft is properly equipped, and the flight crew demonstrates they are capable of navigating along a predetermined flight path over a proposed route without deviating more than 5 miles or 5 degrees on either side (whichever is the lesser) from a straight line drawn between the point of departure and the next point of arrival.

The 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.

"CAR § 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.

"CAR § 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 operations manual shall be loose leaf in form with letter-size pages, and shall be numbered and indexed in a manner to facilitate its use as reference material by the personnel concerned. Each page shall include a space in which the date of last revision will be indicated. Existing manuals may be utilized if they are found to fulfill the requirements of this section and are considered acceptable by the local 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 current copy of the operations manual shall be furnished by the air carrier to the pilot.

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 Part 42 and CAM 42 and the operations specifications.

"CAR § 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 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 air-borne."

42.61–1 IFR OPERATION IN CONTROL ZONE OR CONTROL AREA. (*CAA policies which apply to section 42.61.*)

Prior to take-off 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.

"CAR § 42.62 *Flight manifest for large aircraft and passenger-carrying aircraft operating under IFR conditions.* For all large aircraft, or any aircraft carrying passengers under IFR conditions, a flight manifest form shall be prepared and signed for each flight by qualified personnel of the air carrier charged with the duty of supervising the loading of the aircraft and the preparation of the flight manifest form. The form and contents of this manifest shall be in accordance with the instructions contained in the air carrier's operations manual and shall include the names and addresses of the passengers carried, points of departure and destination, the weight of the cargo and passengers, and the distribution of such weight in the aircraft in accordance with the weight control system prescribed in the operations manual. The weight of the passengers may be determined in accordance with a weight control system prescribed by the Administrator. In the event passengers are picked up at points other than the principal operations base or discharged at points other than as shown on the latest manifest, the pilot shall, before starting the flight, cause a duplicate copy of the revised manifest to be mailed to such base, unless other requirements are set forth in the carrier's operations manual.[8]

"[8] See § 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.

OPERATING LIMITATIONS FOR LARGE PASSENGER-CARRYING AIRPLANES

"CAR § 42.70 *Operating limitations for transport category airplanes.* (a) In operating any passenger-carrying transport category airplane the provisions of §§ 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 §§ 4a.749a–T or 4b.98, and set forth in the Airplane Flight Manual for the airplane."

"CAR § 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."

"CAR § 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 take-off 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 conditions in paragraphs (a) and (b) of this section, correction shall be made for any gradient of the take-off surface. Take-off data based on still air may be corrected to allow for the effect of a favorable wind according to reported wind conditions: *Provided,* That not more than 50% of the wind component along the direction of take-off may be used.[9]

"[9] It will be noted that Special Civil Air Regulations Serial Number 397 requires the pilot to take account of temperature variations as well as his wind component in take-off."

"CAR § 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."

"CAR § 42.74 *En route limitations; one engine inoperative.* No airplane of a maximum certificated weight of less than 40,000 lbs. shall be taken off at a weight in excess of that which would permit a rate of climb (expressed in feet per minute), with one engine inoperative, of at least 0.02 $V_{s_0}^2$ (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 either side of the intended track; for airplanes of a maximum certificated weight of 40,000 to 60,000 lbs., inclusive, the rate of climb shall increase linearly in relation to weight to 0.04 $V_{s_0}^2$; for airplanes of a maximum certificated weight of over 60,000 lbs. the rate of climb shall be 0.04 $V_{s_0}^2$; for transport category airplanes certificated under Part 4a the rate of climb shall be 0.02

$V_{s_0}^2$ for all maximum certificated weights. 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."

"CAR § 42.75 *En route limitations; two engines inoperative.* No airplane having four or more engines shall be flown along an intended track except under the following conditions: *Provided,* That this section shall not apply to transport category airplanes certificated under Part 4a:

"(a) No place along the intended track shall be more than 90 minutes away from an available landing area at which a landing may be made in accordance with the requirements of § 42.78, assuming all engines are operating at cruising speed; or

"(b) The take-off weight is such that the airplane with two engines inoperative shall have a rate of climb (expressed in feet per minute) of at least 0.01 $V_{s_0}^2$ (when V_{s_0} is expressed in miles per hour) 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.

"(1) The rate of climb referred to in this paragraph shall be determined by assuming the airplane's weight to be either that attained at the moment of failure of the second engine, assuming that failure to occur 90 minutes after departure, or that which may be attained by dropping fuel at the moment of failure of the second engine, assuming that sufficient fuel is retained to arrive at an altitude of at least 1,000 feet directly over the landing area."

"CAR § 42.76 *En route limitations; where special air navigational facilities exist.* The 10-mile lateral distance specified in §§ 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."

"CAR § 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% 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% 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 § 42.78."

"CAR § 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 take-off can comply with the requirements of paragraphs (a) and (b) of § 42.77 at such airport: *Provided,* That the aircraft can be brought to rest within 70% of the effective length of the runway."

"CAR § 42.80 *Operating limitations for aircraft not certificated in the transport category.* In operating any passenger-carrying, large, nontransport category airplanes after January 1, 1950, the provisions of §§ 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. Per-

formance data published by the Administrator for each such nontransport category type aircraft shall be used in determining compliance with these provisions."

"CAR § 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% of the minimum control speed or 115% 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% 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%, the effective take-off length of the runway shall be reduced 20% for each 1% grade."

42.81–1 PERFORMANCE DATA ON DOUGLAS DC–3 AND LOCKHEED 18. (*CAA policies which apply to section 42.81.*)

The take-off limitations data determined for the Douglas DC–3 with S1C3G engines and the Lockheed 18 with G202A engines are shown in tabular form in Tables 1 and 2 (Appendix A) and in graphical form in Figures 1 and 2 (Appendix B). The limiting air speed used in determining the accelerate-stop distance for the above aircraft was 1.05 V_{mc} which is 97 m. p. h. true-indicated air speed for the Douglas DC–3 and 109 m. p. h. true-indicated air speed for the Lockheed 18. V_{mc} is the minimum control speed when one engine suddenly becomes inoperative.

Performance data on other large nontransport category airplanes will be published prior to January 1, 1950.

"CAR § 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."

42.82–1 PERFORMANCE DATA ON DOUGLAS DC–3 and LOCKHEED 18. (*CAA policies which apply to section 42.82.*)

The data for en route limitations, one engine inoperative, determined for the Douglas DC–3 S1C3G and the Lockheed 18 G202A is shown in graphical form in Figure 3 (Appendix B).

Performance data on other large nontransport category airplanes will be published prior to January 1, 1950.

"CAR § 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% 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% 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 paragraphs (a) and (b) of this section."

42.83-1 PERFORMANCE DATA ON DOUGLAS DC-3 and LOCKHEED 18. (*CAA policies which apply to section 42.83.*)

The landing distance limitations data determined for the Douglas DC-3 S1C3G and the Lockheed 18 G202A is shown in tabular form in Appendix A, Tables 1 and 2, and in graphical form in Appendix B, Figures 1 and 2.

Performance data on other large nontransport category airplanes will be published prior to January 1, 1950.

REQUIRED RECORDS AND REPORTS

"CAR § 42.91 *Maintenance records.* Each air carrier shall 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:

"(a) Total time and service,

"(b) Time since last overhaul,

"(c) Time since last inspection, and

"(d) Mechanical failures."

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 the Economic Regulations of the Civil Aeronautics Board.

"CAR § 42.92 *Airman records.* An air carrier shall maintain at its principal operations base 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 Civil Air Regulations. No air carrier shall utilize any airman as a flight crew member unless records are maintained for such airman as required herein."

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 the Economic Regulations of the Civil Aeronautics Board.

"CAR § 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.

"CAR § 42.94 *Pilot's emergency deviation report.* Where pursuant to authority granted in § 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.

"CAR § 42.95 *Flight manifest record.* A signed copy and any revision of the flight manifest required by § 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 for at least one year after completion of the flight."

"CAR § 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[6] 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

[6] Failures, malfunctions, or other defects not covered by CAR Part 62, 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.

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 & W R-2800-34);

(*e*) Apparent cause of trouble (wear, cracks, design, personnel error, etc.);

(*f*) Disposition (repaired, replaced, aircraft grounded, etc.);

(*g*) Brief narrative summary to supply any other pertinent data required for more complete identification, determination of seriousness, corrective action, etc.

(4) SUPPLEMENTARY INFORMATION. The daily reports should not be withheld pending presentation of all specific details pertaining to such items of information. As soon as the additional information is obtained, it is to be submitted in an expedited supplement to the original report, making reference to the date and place of submission of the first report.

(c) MONTHLY REPORT OF CHRONIC MECHANICAL DIFFICULTIES. As soon as practicable after the end of each calendar month, each certificated irregular air carrier operating large aircraft shall submit three copies of a report covering the mechanical difficulties experienced during the preceding month which they consider chronic or otherwise particularly significant from a safety standpoint. The report is to fully identify all components (manufacturer, model, type, etc.) and contain sufficient information so as to enable a determination of the trend of failures and defects and to provide information on which to base corrective action. The detailed information from which such reports are prepared shall be kept current and available for examination at the air carrier'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 for review, appropriate investigation, and forwarding to the Washington office of the Air Carrier Maintenance Branch.

TABLES

(Tables I and II, to which reference has been made in CAM 42, are here presented.)

TABLE I.—DOUGLAS DC-3 S1C3G

TAKE-OFF LIMITATION CAR 42.81
(Based on Effective Take-Off Length)

ALTITUDE *feet*	WEIGHT			
	Pounds 23, 000	*Pounds* 24, 000	*Pounds* 25, 000	*Pounds* 25, 200
	Feet	*Feet*	*Feet*	*Feet*
Sea level	3, 195	3, 260	3, 330	3, 340
1,000	3, 325	3, 395	3, 470	3, 555
2,000	3, 465	3, 540	3, 615	3, 710
3,000	3, 615	3, 695	3, 780	3, 875
4,000	3, 780	3, 860	3, 960	4, 060
5,000	3, 970	4, 060	4, 160	4, 265
6,000	4, 180	4, 280	4, 385	4, 510

LANDING DISTANCE LIMITATION CAR 42.83
(Based on Effective Landing Length)

ALTITUDE *feet*	WEIGHT			
	Pounds 23, 000	*Pounds* 24, 000	*Pounds* 25, 000	*Pounds* 25, 200
	Feet	*Feet*	*Feet*	*Feet*
Sea level	2, 625	2, 795	2, 960	2, 975
1,000	2, 680	2, 850	3, 030	3, 045
2,000	2, 750	2, 920	3, 090	3, 105
3,000	2, 810	2, 980	3, 160	3, 175
4,000	2, 880	3, 060	3, 235	3, 250
5,000	2, 955	3, 140	3, 315	3, 330
6,000	3, 040	3, 225	3, 410	3, 430

TABLE II.—LOCKHEED 18 G202A

TAKE-OFF LIMITATION CAR 42.81
(Based on Effective Take-Off Length)

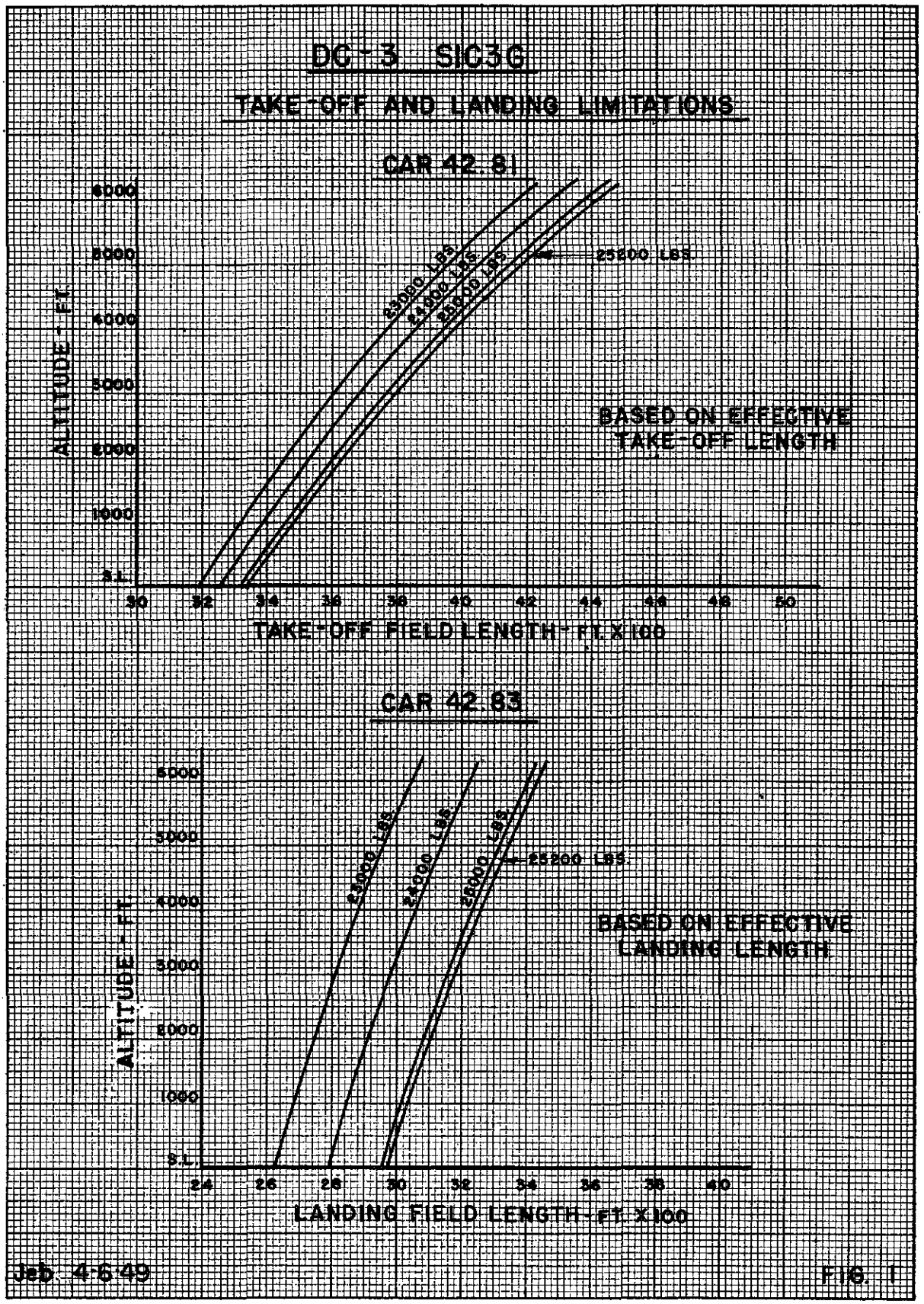
ALTITUDE *feet*	WEIGHT		
	Pounds 17, 500	*Pounds* 18, 000	*Pounds* 18, 500
	Feet	*Feet*	*Feet*
Sea level	5, 470	5, 650	5, 825
1,000	5, 740	5, 920	6, 100
2,000	6, 000	6, 195	6, 390
3,000	6, 270	6, 470	6, 680
4,000	6, 545	6, 760	6, 970
5,000	6, 830	7, 050	7, 275
6,000	7, 120	7, 350	7, 580

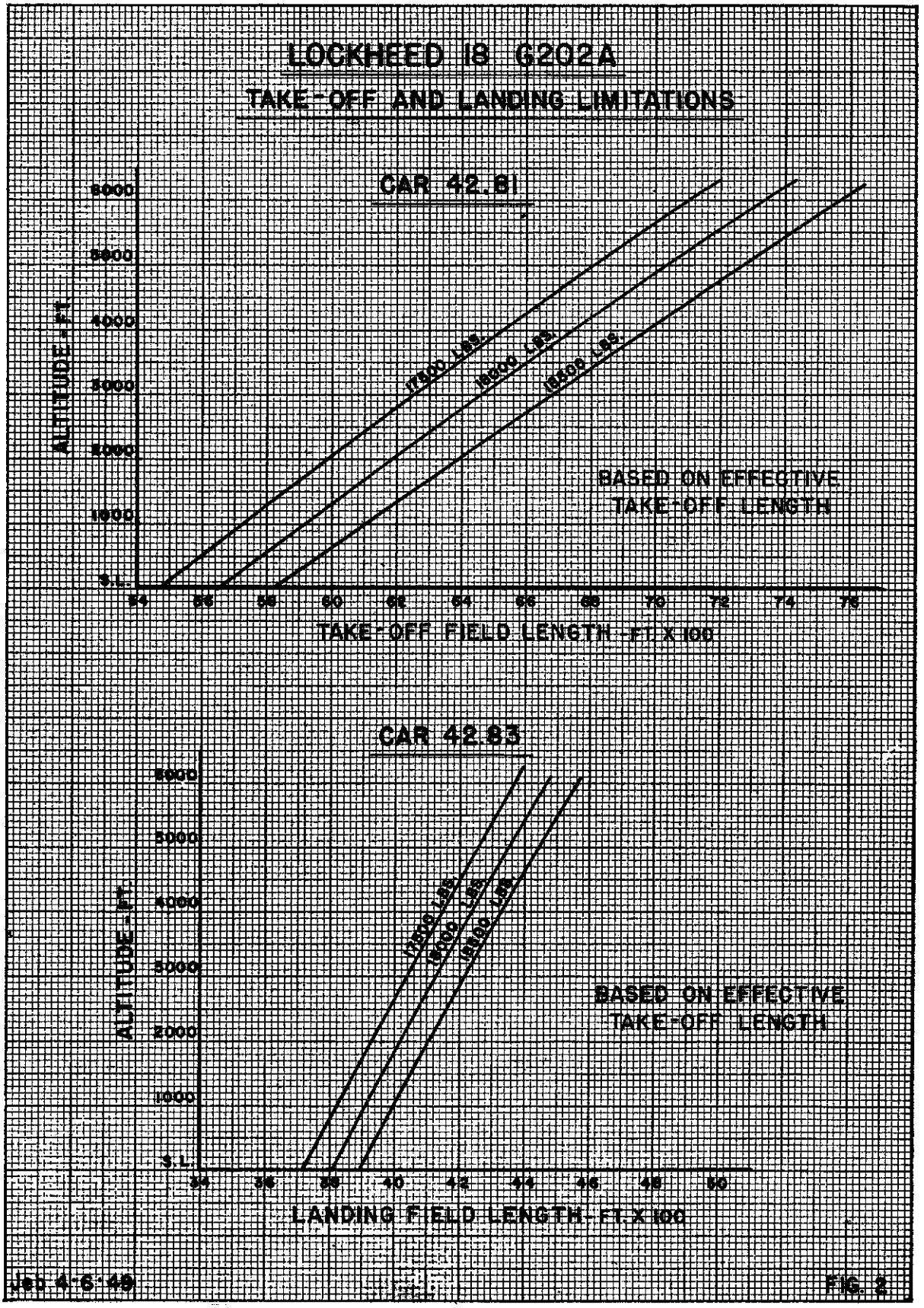
LANDING LIMITATION CAR 42.83
(Based on Effective Landing Length)

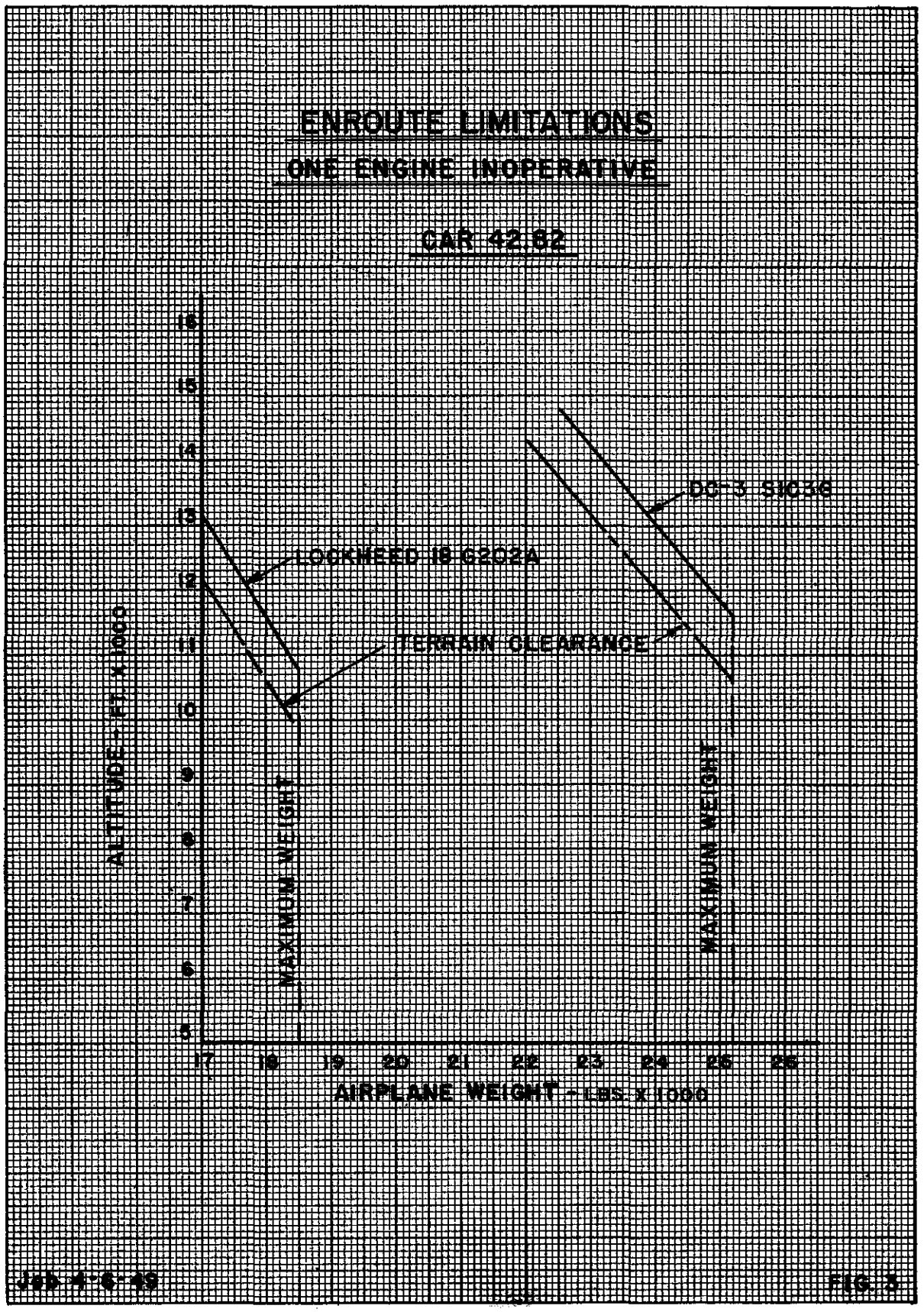
ALTITUDE *feet*	WEIGHT		
	Pounds 17, 500	*Pounds* 18, 000	*Pounds* 18, 500
	Feet	*Feet*	*Feet*
Sea level	3, 720	3, 810	3, 895
1,000	3, 825	3, 910	4, 000
2,000	3, 930	4, 020	4, 110
3,000	4, 030	4, 130	4, 220
4,000	4, 140	4, 240	4, 330
5,000	4, 255	4, 355	4, 450
6,000	4, 370	4, 470	4, 570

FIGURES

The following pages are devoted to those figures to which reference has been made throughout Civil Aeronautics Manual 42.


DC-3 SIC3G
TAKE-OFF AND LANDING LIMITATIONS
CAR 42.81
ALTITUDE - FT.
6000
5000
4000
3000
2000
1000
S.L.
25200 LBS.
BASED ON EFFECTIVE TAKE-OFF LENGTH
30
32
34
36
38
40
42
44
46
48
50
TAKE-OFF FIELD LENGTH - FT. X 100
CAR 42.83
ALTITUDE - FT.
6000
5000
4000
3000
2000
1000
S.L.
25200 LBS.
BASED ON EFFECTIVE LANDING LENGTH
24
26
28
30
32
34
36
38
40
LANDING FIELD LENGTH - FT. X 100
Jeb 4-6-49
FIG. 1


LOCKHEED 18 G202A
TAKE-OFF AND LANDING LIMITATIONS
CAR 42.81
ALTITUDE-FT.
S.L.
1000
2000
3000
4000
5000
6000
54
56
58
60
62
64
66
68
70
72
74
76
17900 LBS
16000 LBS
14000 LBS
BASED ON EFFECTIVE TAKE-OFF LENGTH
TAKE-OFF FIELD LENGTH - FT. X 100
CAR 42.83
ALTITUDE-FT.
S.L.
1000
2000
3000
4000
5000
6000
34
36
38
40
42
44
46
48
50
17900 LBS
16000 LBS
14000 LBS
BASED ON EFFECTIVE TAKE-OFF LENGTH
LANDING FIELD LENGTH - FT. X 100
JED 4-6-49
FIG. 2



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