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UNITED STATES OF AMERICA
CIVIL AERONAUTICS BOARD
WASHINGTON, D. C.

Civil Air Regulations Amendment 04-1
(of Part 04 as promulgated on
November 9, 1945)
Effective: November 1, 1946

FIRE PREVENTION IN AIR CARRIER AIRCRAFT

A study of air carrier aircraft accidents in which fires have been one of the causes shows that there is a need for a change in the airworthiness requirements with respect to transport category airplanes. The investigation shows that the changes needed are not confined to any particular component of the airplane but extend to all parts of the airplane which may create a fire hazard. The requirements hereinafter set forth are intended to aid in preventing any fire from starting, to detect at the outset any fire which has started, to prevent the spread of any fire, and to extinguish any fire.

It appearing to the Board that fire prevention regulations have been under consideration for several months; that proposed regulations were circulated in February and April of this year to the manufacturers of aircraft and to the air carrier operators; that many detailed discussions have been held with the representatives of the aircraft manufacturers and the air carrier operators; that in view of the foregoing sufficient public procedure has been afforded with regard to such rules and further notice or public procedure would serve no useful purpose; and that any further proceedings would serve only to delay the regulations which it is in the public interest to adopt at this time;

The Civil Aeronautics Board finds that the notice and public procedure provided for in section 4(a) of the Administrative Procedure Act is unnecessary with respect to the Civil Air Regulations hereinafter set forth.

Now, therefore, effective November 1, 1946, Part 04 of the Civil Air Regulations is amended as follows:

1. By adding the following to § 04.00:

All aircraft certificated under the transport category, the manufacture of which is completed after September 30, 1947, shall comply with the following sections of this Part: §§ 04.075, 04.38210, 04.38230, 04.3824, 04.38251, 04.38252, 04.4113, 04.4211, 04.4231(c), 04.425 through 04.4251, 04.4320, 04.4321, 04433, 04.434, 04.441 and subsections, 04.470 through 04.472, 04.49 through 04.4902, 04.491(a) and (c), and 04.4910 through 04.493.

2. By adding a new § 04.075 to read as follows:

04.075 Susceptibility of materials to fire.

Where necessary for the purpose of determining compliance with any of the following definitions, the Administrator shall prescribe the heat conditions and testing procedures which any specific material or individual part must meet.

(a) Fireproof. "Fireproof" material means a material which will withstand heat equally well or better than steel in dimensions appropriate for the purpose for which it is to be used. When applied to material and parts used to confine fires in designated fire zones "fireproof" means that the material or part will perform this function under the most severe conditions of fire and duration likely to occur in such zones.

(b) Fire-resistant. When applied to sheet or structural members, "fire-resistant" material shall mean a material which will withstand heat equally well or better than aluminum alloy in dimensions appropriate for the purpose for which it is to be used. When applied to fluid-carrying lines, this term refers to a line and fitting assembly which will perform its intended protective functions under the heat and other conditions likely to occur at the particular location.

(c) Flame-resistant. "Flame-resistant" material means material w ill not support combustion to the point of propagating, beyond safe li a flame after removal of the ignition source.

(d) Flash-resistant. "Flash-resistant" material means material which will not burn violently when ignited.

(e) Inflammable. "Inflammable" fluids or gases mean those which will ignite readily or explode.

3. By adding a new § 04.38210 to read as follows:

04.38210 Internal doors. Where internal doors are equipped with louvres or other ventilating means, provision convenient to the crew shall be made for closing the flow of air through the door when such action is found necessary.

4. By adding to § 04.38230 the following:

Where partitions between compartments are equipped with louvres or other means allowing air to flow between such compartments, provision convenient to the crew shall be made for closing the flow of air through the louvres or other means when such action is found necessary.

5. By deleting §§ 04.3824, 04.38240, and 04.3825, and inserting in lieu thereof the following:

04.3824 Cabin interiors. All compartments occupied or used by the crew or passengers shall comply with the following provisions:

(a) Materials shall in no case be less than flash-resistant.

(b) The wall and ceiling linings, the covering of all upholstering, floors, and furnishings shall be flame-resistant.

(c) Compartments where smoking is to be permitted shall be equipped with ash trays of the self-contained type which are completely removable. All other compartments shall be placarded against smoking.

(d) All receptacles for used towels, papers, and waste shall be of fire-resistant material, and shall incorporate covers or other provisions for containing possible fires started in the receptacles.

04.3825 Cargo and baggage compartments.

04.38250 General. Each cargo and baggage compartment shall be designed for the placarded maximum weight of contents and critical load distributions at the appropriate maximum load factors corresponding to all specified flight and ground load conditions, excluding the emergency landing conditions of § 04.26. Provisions shall be made to prevent the contents of such compartments from becoming a hazard by shifting under these loads. The provisions also shall be adequate to protect the passengers and crew from injury by the contents of any compartment when the ultimate inertia force acting forward is 6 g.

04.38251 Fire precautions. Each compartment shall be designed so that, when used for the purpose of storing cargo or baggage, it shall comply with all the requirements prescribed for cargo or baggage compartments. It shall include no controls, wiring, lines, equipment, or accessories, the damage or failure of which would affect the safe operation of the airplane, unless such item is adequately shielded, isolated, or otherwise protected so that it cannot be damaged by movement of cargo in the compartment, and so that any breakage or failure of such item would not create a fire hazard in the compartment. Provisions shall be made to prevent cargo or baggage from interfering with the functioning of the fire-protective features of the compartment. All materials used in the construction of cargo or baggage compartments, including tie-down equipment, shall be flame-resistant or better.

In addition, all cargo and baggage compartments shall include provisions for safeguarding against fires according to the following classifications:

(a) Cargo and baggage compartments shall be classified in the "A" category, if presence of a possible fire therein can be readily discernible

to a member of the crew while at his station, and if all parts of the compartment are easily accessible in flight. A hand fire extinguisher shall be available for such compartment.

(b) Cargo and baggage compartments shall be classified in the "B" category, if sufficient access is provided while in flight to enable a member of the crew to move by hand all contents and to reach effectively all parts of the compartment with a hand fire extinguisher. Furthermore, the design of the compartment shall be such that, when the access provisions are being used, no hazardous quantity of smoke, flames, or extinguishing agent will enter any compartment occupied by the crew or passengers. Each compartment in this category shall be equipped with a separate system of an approved type smoke detector or fire detector other than heat detector to give warning at the pilot or flight engineer station. Hand fire extinguishers shall be readily available for use in all compartments of this category. Compartments in this category shall be completely lined with fire-resistant material, except that additional service lining of flame-resistant material may be employed.

(c) Cargo and baggage compartments shall be classified in the "C" category, if they do not conform with the requirements for the "A" or "B" categories. Each compartment of the "C" category shall be equipped with: (1) a separate system of an approved type smoke detector or fire detector other than heat detector to give warning at the pilot or flight engineer station, and (2) an approved built-in fire-extinguishing system controlled from the pilot or flight engineer station. Means shall be provided to exclude hazardous quantities of smoke, flames, or extinguishing agent from entering into any compartment occupied by the crew or passengers. Ventilation and drafts shall be further controlled within each such cargo or baggage compartment to the extent that the extinguishing agent provided can control any fire which may start within the compartment. All cargo and baggage compartments of this category shall be completely lined with fire-resistant material, except that additional service lining of flame-resistant material may be employed.

04.38252 Proof of compliance. Compliance with those provisions of § 04.38251 which refer to the compartment accessibility, the entry of hazardous quantities of smoke or extinguishing agent into compartments occupied by the crew or passengers, and the dissipation of the extinguishing agent in category "C" compartments shall be demonstrated by tests in flight. It shall also be demonstrated during these tests that no inadvertent operation of smoke or fire detectors in adjacent or other compartments within the airplane would occur as a result of fire contained in any one compartment, either during or after extinguishment, unless the extinguishing system floods such compartments simultaneously.

6. By inserting the following paragraph in § 04.4113:

If combustible fluid is used for propeller de-icing, the provisions of §§ 04.49 to 04.4902, inclusive, shall be complied with.

7. By deleting § 04.4231 (c), and inserting in lieu thereof the following:

(c) Location of fuel tanks shall comply with the provisions of § 04.490. In addition, no portion of engine nacelle skin which lies immediately behind a major air egress opening from the engine compartment shall act as the wall of an integral tank. Fuel tanks shall be isolated from personnel compartments by means of fume and fuel proof enclosures.

8. By deleting §§ 04.4250 and 04.4251, and inserting in lieu thereof the following:

04.4250 Lines and fittings in designated fire zones. Fuel lines and fittings in all designated fire zones (see § 04.49) shall comply with the provisions of § 04.4901.

04.4251 Fuel valves. In addition to the requirements contained in § 04.4900 for shut-off means, all fuel valves shall be provided with positive stops or suitable index provisions in the "on" and "off" positions and shall be supported in such a manner that loads resulting from their operation or from accelerated flight conditions are not transmitted to the lines connected to the valve.

9. By inserting at the ends of §§ 04.426 and 04.43122 the following:

(See also § 04.4902.)

10. By deleting §§ 04.4320 and 04.4321, and inserting in lieu thereof the following:

04.4320 Lines and fittings in designated fire zones. Oil lines and fittings in all designated fire zones (see § 04.49) shall comply with the provisions of § 04.4901.

04.4321 Oil valves. Requirements of § 04.4900 for shut-off means shall be complied with. Closing of oil shut-off means shall not prevent feathering the propeller, unless equivalent safety provisions are incorporated.

All oil valves shall be provided with positive stops or suitable index provisions in the "on" and "off" positions, and shall be supported in such a manner that loads resulting from their operation or from accelerated flight conditions are not transmitted to the lines attached to the valve.

11. By inserting at the ends of §§ 04.433 and 04.434 the following:

(See also § 04.4902.)

12. By inserting the following paragraph in § 04.441:

No inflammable coolant shall be used.

13. By deleting § 04.44110, and inserting in lieu thereof the following:

04.44110 Fire-resistant coolant lines and fittings. If the coolant used will ignite and burn under the conditions of power-plant fires, all lines and fittings located within designated fire zones shall comply with the provisions of § 04.4901.

14. By deleting §§ 04.470 and 04.4700, and inserting in lieu thereof the following:

04.470 Fire walls. All engines, auxiliary power units, fuel burning heaters, and other combustion equipment which are intended for operation in flight shall be isolated from the remainder of the airplane by means of fire walls or shrouds, or other equivalent means.

04.4700 Fire wall construction. Fire walls and shrouds shall be constructed in such a manner that no hazardous quantity of air, fluids, or flame can pass from the engine compartment to other portions of the airplane. All openings in the fire wall or shroud shall be sealed with close-fitting fireproof grommets, bushings, or fire wall fittings.

Fire walls and shrouds shall be constructed of fireproof material and shall be protected against corrosion. The following materials have been found to comply with this requirement:

(a) heat and corrosion resistant steel 0.015 inch thick;

(b) low carbon steel, suitably protected against corrosion, 0.018 inch thick.

15. By deleting the second paragraph of § 04.471, and inserting in lieu thereof the following:

Cowling, unless otherwise specified by these regulations, shall be constructed of fire-resistant material. Those portions of the cowling which are subjected to high temperatures due to their proximity to exhaust system parts or exhaust gas impingement shall be constructed of fireproof material.

16. By deleting from § 04.4804, "(See § 04.4251 (c).)" and inserting in lieu thereof, "(See § 04.4251.)"

17. By deleting §§ 04.49 and 04.490, and inserting in lieu thereof the following:

04.49 Power-plant fire protection. Engine accessory sections, installations where no isolation is provided between the engine and accessory compartment, also regions wherein lie auxiliary power units, fuel burning heaters, and other combustion equipment shall be referred to as designated fire zones. Such zones shall be protected from fire by compliance with the following requirements.

04.490 Inflammable fluids. No tanks or reservoirs which are a part of a system containing inflammable fluids or gases shall be located in designated fire zones, except where the fluid contained, the design of the system, the materials used in the tank, the shut-off means, all connections, lines, and controls are such as to provide equivalent safety. Not less than 1/2 inch of clear air space shall be provided between any tank or reservoir and a fire wall or shroud isolating a designated fire zone.

04.4900 Shut-off means. Means for each individual engine shall be provided for shutting off or otherwise preventing hazardous quantities of fuel, oil, de-icer, and other inflammable fluids from flowing into, within, or through any designated fire zone, except that means need not be provided to shut off flow in lines forming an integral part of an engine. In order to facilitate rapid and effective control of fires such shut-off means shall permit an emergency operating sequence which is compatible with the emergency operation of other equipment, such as feathering the propeller. Shut-off means shall be located outside of designated fire zones, unless equivalent safety is provided, (see § 04.490) and it shall be shown that no hazardous quantity of such inflammable fluid will drain into any designated fire zone after shutting-off has been accomplished.

Adequate provisions shall be made to guard against inadvertent operation of the shut-off means and to make it possible for the crew to reopen the shut-off means after it has once been closed.

04.4901 Lines and fittings. All lines and fittings for same located in designated fire zones which carry inflammable fluids or gases and which are under pressure or which attach directly to the engine or are subject to relative motion between components, exclusive of those lines and fittings forming an integral part of the engine, shall be flexible, fire-resistant lines with fire-resistant factory-fixed detachable or other approved fire-resistant ends. Lines and fittings which are not subject to pressure or to relative motion between components shall be of fire-resistant materials.

04.4902 Vent and drain lines. All vent and drain lines and fittings for same located in designated fire zones and which carry inflammable fluids or gases shall comply with the provisions of § 04.4901, if the Administrator finds that rupture or breakage of a particular drain or vent line may result in a fire hazard.

18. By amending § 04.491 to designate the present paragraphs (a) and (b) as (b) and (c), respectively; by inserting a new paragraph (a); and amending new paragraph (c) to read as follows:

(a) Unless it can be demonstrated that equivalent protection against destruction of the airplane in case of fire is provided by the use of fireproof materials in the nacelle and other components which would be subjected to flame, fire extinguishing systems shall be provided to serve all designated fire zones.

(c) Materials in the fire extinguishing system shall not react chemically with the extinguishing agent so as to constitute a hazard.

19. By deleting § 04.4913, and inserting in lieu thereof the following:

04.4913 Fire extinguishing system materials. All components of fire extinguishing systems located in designated fire zones shall be constructed of fireproof materials, except for connections which are subject to relative motion between components of the airplane, in which case they shall be of flexible fire-resistant construction so located as to minimize the possibility of failure.

20. By deleting from the last sentence of § 04.4920 the following:

. . . . in potential fire zones.

21. By deleting § 04.493, and inserting in lieu thereof the following:

04.493 Protection of other airplane components against fire. All airplane surfaces aft of the nacelles, in the region of one nacelle diameter on both sides of the nacelle center line, shall be constructed of fire-resistant material. This provision need not be applied to tail surfaces lying behind nacelles unless the dimensional configuration of the aircraft is such that the tail surfaces could be affected readily by heat, flames, or sparks emanating from a designated fire zone or engine compartment of any nacelle.

22. By deleting §§ 04.5612 and 04.5613, and inserting in lieu thereof the following:

04.5612 Lines. Hydraulic lines and fittings in all designated fire zones (see § 04.49) shall comply with the provisions of § 04.4901.

04.5613 Reservoirs and accumulators. Location of hydraulic reservoirs and accumulators shall comply with the provisions of § 04.490, except when they are an integral part of the engine or propeller.

By the Civil Aeronautics Board:

(Signed) M. C. Mulligan

(SEAL)

M. C. Mulligan
Secretary