Last copy

Advance copy pending issuance of revised pages for FAR Parts 25 and 121

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

[Docket No. 7976; Amdts. 25-26; 121-66]

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS, AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

Additional Flight Recorder Data and Other Requirements

The purpose of these amendments to Parts 25 and 121 of the Federal Aviation Regulations is to: (1) Increase the recorded flight data required by Part 121 for large airplanes, for which a type certificate is issued after September 30, 1969, that are turbine engine powered or certificated for operation above 25,000 feet altitude; (2) change the requirement for keeping the recorded data; (3) require a means to automatically prevent data erasure after crash impact on flight recorders which erase and re-use tape; (4) require a device to assist in the location of flight recorders under water; and (5) require a means to correlate the time of recorded data with the time of radio communications between the airplane and air traffic control.

These amendments are based on Advance Notice 67-6 (32 F.R. 3226) and Notice 69-3, which was issued on January 14, 1969, and published in the FEDERAL REGISTER (32 F.R. 941) on January 22, 1969.

The Air Line Pilots Association (ALPA) submitted a comment in qualified support of the proposal. The ALPA supports flight recorders for the single purpose of providing information in accident investigations to prevent similar accidents. The ALPA states it has become increasingly concerned with the misuse of information recorded aboard aircraft solely for accident investigation purposes, and further states that its support is given with the understanding that flight recorder information will be used for accident investigation purposes only and that the proposed rule will be amended to expressly prohibit the use of the information to discipline flight crewmembers.

The ALPA expresses the view that the amendment it recommends is consistent with its petition filed with the FAA on May 24, 1968, which recommends that the Federal Aviation Regulations be amended to preclude the use of information derived from cockpit voice recorders to discipline flight crewmembers. The FAA will consider the ALPA's recommendations concerning the use of the flight recorder information in connection with the ALPA's petition of May 24, 1968 concerning the use of cockpit voice recorder information.

The National Transportation Safety Board's comments support the proposal and recommend its application to new and existing type airplanes. The Board submitted information on specific cases to show how the proposed additional data might have increased the speed and accuracy of past accident investigations. The Board asserts that the additional data will enable the investigator, for the first time, to define the external or environmental forces exerted on the aircraft and the pilot's control forces exerted on the aircraft, and will display the aircraft's response to these forces. The Board further asserts that the utilization of the additional data is a great step forward and will give the Board the capability to study and analyze the "complex interactions between the man-machine environment, the capability for which, heretofore, has not been possible."

The Air Transport Association (ATA) opposed the retrofitting of existing type certificated airplanes and submitted comments concerning the need for additional data and the cost and other disadvantages of retrofitting airplanes in service. The ATA contends the usefulness of the additional data on existing airplanes is diminished by the fact that the mechanical and operational characteristics are well known for existing airplanes and that the useful life of existing fleets will be short after retrofit, which will take several years. The ATA's comments emphasize that the installation and maintenance costs are substantial and that there is a shortage of manpower skilled in the installation and maintenance of electronic equipment.

The ATA contends that the cost of retrofitting existing fleets is not justified by the benefit, considering that the useful life of existing fleets will be largely terminated by 1980, particularly in view of the cost of other new electronic safety equipment that is planned for these airplanes during the 1970's, such as altitude alerting, collision avoidance, area navigation, and automatic landing equipment. The ATA points out that retrofitting, which requires the installation of numerous transducers in the existing airplanes systems and extensive wiring in addition to multiplexer-digitizer equipment and recorders, would be an extremely difficult task. The ATA's comments cite serious development and reliability problems experienced by one air carrier in retrofitting and operating 16 airplanes with a recording system.

Under the notice, the requirement for recording the additional data would have applied to large airplanes that are certificated for operations above 25,000 feet altitude or are turbine engine powered regardless of type certification date. After consideration of all the information presented concerning the applicability of the proposal, the FAA has decided to limit the applicability of the proposal and require the recording of the additional data only on large airplanes for which a type certificate is issued after September 30, 1969, that are turbine engine powered or certificated for operation above 25,000 feet altitude.

The notice proposed changes in the data retention requirement in § 121.343 to permit the use of magnetic tape and data erasure and tape reuse techniques. Flight recorders presently in use retain more than 200 hours of information on foil tape that is not reused. These tapes are saved for 60 days, under present § 121.343(c), after removal from the airplane. Therefore, existing recorders can provide data for the duration of any flight that terminates in an accident and many hours of data on flights preceding an accident. In view of the need for recorded data for a sufficient period before an accident to reconstruct the flight and the need to limit the size of magnetic tape containers to permit adequate crash protection, the FAA proposed to require that the certificate holder retain at least 25 hours of recorded data for presently required information, and such a requirement is adopted herein.

With regard to the additional information, the FAA proposed to require that only 1 hour of data be retained. The shorter retention period for the additional data was proposed to allow the use of spare recording tracks on existing cockpit voice recorders to record the additional data. This method of recording the data would cost less than the cost of replacing the flight recorders on existing fleets of airplanes with entirely new flight recorder systems. Such use of voice recorders instead of new flight recorders, to record the additional data on existing airplanes was considered appropriate in view of the cost of retrofitting the large number of airplanes subject to the proposal.

Since the requirement for recording the additional data under the rule as adopted herein applies only to airplanes issued a type certificate after September 30, 1969, and such airplanes are expected to be equipped with flight recorders that retain all of the required data for at least 25 hours, it appears that the need for the shorter retention period for the additional data no longer exists. However, in view of the 1-hour retention period proposed in the notice for the additional data, the rule as adopted

(As published in the Federal Register /35 F.R. 13191/ on Aug. 19, 1970)

herein also contains a 1-hour retention requirement.

Notwithstanding the adoption of the 1-hour retention requirement in conformance with the notice, the FAA is considering further rule-making action to require retention of all of the recorded data for 25 hours. A 25-hour retention requirement is compatible with present flight recorder technology and will fulfill the need for as much operating history as possible to reconstruct flights subject to accident investigations. In addition, a 25-hour retention period will provide more useful information on the operating characteristics of new type airplanes and information on incidents or accidents that do not cause immediate termination of a flight. Pending the accomplishment of such rule-making action, the FAA encourages the development and use of flight recorders capable of retaining 25 hours of data.

The basis upon which the time of recorder operation is determined for retention purposes is changed from the notice. The retention period proposed in the notice was based on the flight recorder operating time specified in § 121.343(b), which is, "* * * from the instant the airplane begins the takeoff roll until it has completed the landing roll * * *." This amendment allows the retention period to be based on the cockpit voice recorder operating time specified in § 121.359(a), which is, "* * * from the start of the use of the checklist (before starting engines for the purpose of flight) to completion of the final checklist at the termination of the flight." This change in the retention requirement allows the operation of both flight and voice recorders during the same period and permits simplification of recorder controls and operating procedure. It should be recognized, however, that extra tape may be needed for ground operation, such as testing, that is not done during the period upon which the retention of flight recorder data is based. Further, it should be noted that although the retention of recorded data may be based on voice recorder operating time, the flight recorder need only be operated as specified in § 121.343(b).

Notice 69-3 stated that the FAA has the subject of the standardization of the method of recording and readout under continuing study. However, in view of the standardization work underway by industry, the FAA is now of the opinion that further rule-making action on this subject will be unnecessary.

In response to a comment, we wish to point out that any recording and readout technique may be used, including the data compression technique, if the information obtained thereby is equivalent to that specified in new Appendix B. However, regardless of the recording technique used, accurate and prompt readout of data must be available in the event of an accident.

Several comments indicate misunderstanding of the requirement for time correlation of the flight recorder and communications between the airplane and air traffic control. The intent of this provision is to require time correlation of either the communications to or from the airplane, but not both.

As a result of comments on the notice and several conferences with industry and NTSB representatives, certain changes have been made in § 121.343(a)(2), and Appendix B has been changed with respect to the nomenclature, range, system accuracy, and recording interval of the data which is to be recorded.

Roll rate, pitch rate, yaw rate, and angle of attack, which can be determined from other recorded data, and ambient air temperature have been deleted from § 121.343(a)(2) as adopted. However, for those operators who desire to furnish angle-of-attack data by recording it directly, appropriate specifications for angle-of-attack measurement are included in Appendix B.

The proposed engine thrust data range in Appendix B has been changed to require recording the full range of engine thrust in the forward direction only. With respect to reverse thrust, an indication of the stowed and the full reverse position of each thrust reverser is required.

In response to several comments requesting specific standards for the installation and operation of the underwater locating device, the FAA is preparing an advisory circular that will set forth one acceptable means of compliance. The agency plans to issue the advisory circular approximately 6 months after the effective date of these amendments. Accordingly, the date for compliance with § 121.343(f) has been changed from 3 to 3½ years after the effective date of these amendments to allow time for installing the device after issuance of the advisory circular.

In response to comments concerning the use of more than one flight recorder, the proposal is changed to require the underwater locating device to be secured only on or near the flight recorder that records time, altitude, airspeed, vertical acceleration, and heading. It will be noted that only one device for locating flight recorders underwater is required for each airplane.

One comment recommended that the data erasure prevention means required by proposed § 25.1459(a)(5) be limited to those recorders powered from the airplane battery or from an independent source. The FAA agrees that the requirement for a means to stop the recorder and prevent data erasure within 10 minutes after crash impact should not apply to recorders powered solely from the airplane electrical generator system, and § 25.1459(a)(5) is changed accordingly.

Interested persons have been afforded an opportunity to participate in the making of these amendments and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, and for the reasons stated in Advance Notice 67-6 and Notice 69-3, Parts 25 and 121 of the Federal Aviation Regulations are amended, effective September 18, 1970, as follows:

1. Section 25.1459(a) is amended by adding the following subparagraphs:

§ 25.1459 Flight recorders.

(a) * * *

(5) Except for recorders powered solely by the engine-driven electrical generator system, there is an automatic means to simultaneously stop a recorder that has a data erasure feature and prevent each erasure feature from functioning, within 10 minutes after crash impact.

(6) There is a means to record data from which the time of each radio transmission either to or from ATC can be determined.

(7) The underwater locating device, when required by the operating rules of this chapter, is on or adjacent to the container that records time, altitude, airspeed, vertical acceleration, and heading, and is secured in such a manner that they are not likely to be separated during crash impact.

* * * * *

2. Section 121.343 is amended to read as follows:

§ 121.343 Flight recorders.

(a) No person may operate a large airplane that is certificated for operations above 25,000 feet altitude or is turbine engine powered, unless it is equipped with one or more approved flight recorders that record data from which the following information may be determined within the ranges, accuracies, and recording intervals specified in Appendix B of this part—

(1) Time, altitude, airspeed, vertical acceleration, and heading; and

(2) After September 18, 1973, for airplanes having an original type certificate issued after September 30, 1969, pitch attitude, roll attitude, sideslip angle or lateral acceleration, pitch trim position, control column or pitch control surface position, control wheel or lateral control surface position, rudder pedal or yaw control surface position, thrust of each engine, position of each thrust reverser, trailing edge flap or cockpit flap control position, and leading edge flap or cockpit flap control position.

(b) Whenever a flight recorder required by this section is installed, it must be operated continuously from the instant the airplane begins the takeoff roll until it has completed the landing roll at an airport.

(c) Except as provided in paragraph (d) of this section, each certificate holder shall keep the recorded data specified in paragraph (a)(1) until the airplane has been operated for at least 25 hours of the operating time specified in § 121.359(a) and the data specified in paragraph (a)(2) until the airplane has been operated for at least 1 hour of the operating time specified in § 121.359(a). Except as provided in paragraph (d) of this section, no record need be kept more than 60 days.

(d) In the event of an accident or occurrence that requires immediate notification of the National Transportation Safety Board under Part 430 of its regulations and that results in termination of the flight, the certificate holder shall remove the recording media from the

airplane and keep the recorded data required by paragraph (a) of this section for at least 60 days and for a longer period upon the request of the Board or the Administrator.

(e) Each flight recorder required by this section must be installed in accordance with the requirements of § 25.1459 of this chapter. The correlation required by paragraph (c) of § 25.1459 need be established only on one airplane of any group of airplanes—

(1) That are of the same type;

(2) On which the model flight recorder and its installation are the same; and

(3) On which there is no difference in type design with respect to the installation of those first pilot's instruments associated with the flight recorder.

The most recent instrument calibration, including the recording medium from which this calibration is derived, and the recorder correlation, must be retained by each certificate holder.

(f) After March 18, 1974, each flight recorder required by this section that records the data specified in subparagraph (a)(1) of this section must have an approved device to assist in locating that recorder under water.

(g) After September 18, 1972, each flight recorder required by this section must record data from which the time of each radio transmission either to or from ATC can be determined.

3. By adding the following new Appendix B to Part 121:

APPENDIX B—*Aircraft Flight Recorder Specifications*

Information	Range	Accuracy, minimum (recorder and readout)	Recording interval, maximum (seconds)
Time		±0.125 percent per hour, except accuracy need not exceed ±4 seconds.	60.
Altitude	−1,000 ft. to maximum certificated altitude of aircraft.	±100 to ±700 ft. (see table I TSO–C51a; FAR section 37.150).	1.
Airspeed	100 to 450 KIAS or 100 KIAS to 1.0 v_D whichever is greater.	±10 knots at room temp. ±12 knots at low temp. (see table III, TSO–C51a; FAR section 37.150).	1.
Vertical acceleration	−3g to +6g	±0.2g stabilized, ±10 percent transient (see TSO–C51a).	0.25 (or 1 second) in which ± peaks are recorded).
Heading	360°	±2°	1.
Pitch attitude	±75°	±2°	1.
Roll attitude	±180°	±2°	1.
Lateral acceleration (in lieu of sideslip angle).	±1.0g	±.05g stabilized. ±10 percent transient.	0.25 (or 1 second in which ± peaks are recorded).
Sideslip angle (in lieu of lateral acceleration).	±30°	±2°	0.5.
Pitch trim position	Full range	±1° or ±3 percent whichever is greater.	2.
Control column or pitch control surface position.	Full range	±2°	1.
Control wheel or lateral control surface position.	Full range	±2°	1.
Rudder pedal or yaw control surface position.	Full range	±2°	0.5.
Thrust of each engine	Full range forward	±2 percent	4.
Position of each thrust reverser	Stowed and full reverse		4.
Trailing edge flap or cockpit flap control position.	Full range (or each discrete position).	±3°	2.
Leading edge flap or cockpit flap control position.	Each discrete position		2.
Angle of attack (if recorded directly).	−20° to +40°	±1	0.5.

(Secs. 313(a), 601, 603, Federal Aviation Act of 1958; 49 U.S.C. 1354(a), 1421, 1423; sec. 6(c), Department of Transportation Act; 49 U.S.C. 1655(c))

Issued in Washington, D.C., on August 12, 1970.

J. H. SHAFFER,
Administrator.