U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Airworthiness and Operational Approval of Cockpit Voice Recorder Systems

Date: 5/6/24
Initiated by: AFS-300

AC No: 20-186A
Change:

This advisory circular (AC) provides guidance for gaining airworthiness approval for cockpit voice recorder (CVR) systems. Specifically, when followed in its entirety, it provides an acceptable means for complying with the airworthiness regulations contained in Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, 29, 91, 121, 125, 129, and 135 when installing CVR systems in airplanes and rotorcraft. As CVR systems and technology advance, applicants are encouraged to propose alternative methods to their responsible Aircraft Certification Service office to integrate new and novel safety enhancing CVR systems and functions into their aircraft. The responsible Aircraft Certification Service office will evaluate alternative methods consistent with the Federal Aviation Administration's (FAA) safety continuum. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way, and the document is intended only to provide information to the public regarding existing requirements under the law or agency policies. This AC is not mandatory and does not constitute a regulation.



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CHAPTER 1. INTRODUCTION

1.1 Purpose of This Advisory Circular (AC).

1.1.1 A cockpit voice recorder (CVR) system records the aural environment of the cockpit and communications to, from, and between flight crewmembers and, in some cases, required data link messages to assist investigations of accidents and incidents. The objective is met by complying with the current requirements in Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, 29, 91, 121, 125, 129, and 135.

1.1.2 This AC provides guidance for compliance with applicable regulations for the airworthiness and operational approval for required CVR systems. Optional installations may use this guidance when installing a CVR system as a voluntary safety enhancement.

1.1.3 Applicants may propose alternate means. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way, and the document is intended only to provide information to the public regarding existing requirements under the law or agency policies.

1.1.4 As CVR systems and technology advance, applicants are encouraged to propose alternative methods to their responsible Aircraft Certification Service office to integrate new and novel safety enhancing CVR systems and functions into their aircraft. The responsible Aircraft Certification Service office will evaluate alternative methods consistent with the Federal Aviation Administration's (FAA) safety continuum.

1.2 Audience. The FAA is publishing this AC for aircraft manufacturers; CVR system manufacturers; aircraft operators; maintenance, repair, and overhaul (MRO) organizations; and Supplemental Type Certificate (STC) applicants.

1.3 Where You Can Find This AC. You can find this AC on the FAA's website at https://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

1.4 What This AC Cancels. AC 20-186, Airworthiness and Operational Approval of Cockpit Voice Recorder Systems, dated July 22, 2016, is canceled.

1.5 How to Use This Document.

1.5.1 Sections of parts 23, 25, 27, 29, 91, 121, 125, 129, and 135 detail design substantiation and operational approval requirements directly applicable to the CVR system. See Appendix B, Flowcharts, to determine the applicable regulations for your aircraft and type of operation. Listed below are the specific 14 CFR sections addressed in this AC (however, there may be additional sections related to this subject matter that should be considered):

1. Part 23:
   - Section 23.1457, Cockpit Voice Recorders.
   - Section 23.1529, Instructions for Continued Airworthiness.
   - Section 23.2505, Function and Installation.
2. Part 25:
   - Section 25.1301, Function and Installation.
   - Section 25.1457, Cockpit Voice Recorders.
   - Section 25.1529, Instructions for Continued Airworthiness.
3. Part 27:
   - Section 27.1301, Function and Installation.
   - Section 27.1457, Cockpit Voice Recorders.
   - Section 27.1529, Instructions for Continued Airworthiness.
4. Part 29:
   - Section 29.1301, Function and Installation.
   - Section 29.1457, Cockpit Voice Recorders.
   - Section 29.1529, Instructions for Continued Airworthiness.
5. Part 91:
   - Section 91.609, Flight Data Recorders and Cockpit Voice Recorders.
   - Section 91.1045, Additional Equipment Requirements.
6. Part 121, § 121.359, Cockpit Voice Recorders.
7. Part 125, § 125.227, Cockpit Voice Recorders.
8. Part 129, § 129.24, Cockpit Voice Recorders.
9. Part 135, § 135.151, Cockpit Voice Recorders.

1.5.2 In order to meet the CVR regulations in 14 CFR, equipment manufactured after December 19, 2013, must meet the minimum performance standards (MPS) qualification and documentation of EUROCAE Document (ED)-112A, Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems, as detailed in Technical Standard Order (TSO)-C123c, Cockpit Voice Recorder Equipment, and this AC.

1.5.3 The FAA is initiating the phasing out of magnetic tapes through both mandates and voluntary efforts to replace them with modern solid-state recorders. These new recorders not only enhance safety but also benefit the operator directly, as they avoid the high costs and technical problems of maintaining outdated recorders. Modern recorders do not require the hourly replacement of tapes and calendar weighing of thermal capsules.

1.5.4 This AC is based on the technical standards referenced in EUROCAE ED-112A and the Code of Federal Regulations (CFR).

1.5.5 When using documents referenced in this AC, the applicant should use the most current version of the document cited.

1.5.6 The material in this AC does not alter or subvert any regulatory requirements.

1.5.7 This AC describes CVR system performance.

1.5.8 Appendix B provides a set of flowcharts to aid the reader in determining if a CVR is required to be installed.

1.6 Definitions, Acronyms, and Related Documents. Definitions, acronyms, and related documents can be found in Appendix A, Acronyms and Related Documents.

1.7 AC Feedback Form. For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.

CHAPTER 2. TYPE CERTIFICATION

2.1 Purpose of This Chapter. This chapter provides information for type certification of a CVR system. The applicant must obtain FAA approval to install or retrofit a CVR and components. The applicant may apply for a type certificate (TC), amended TC, Supplemental Type Certificate (STC), or other manner of approval, and the applicant must demonstrate compliance with the applicable regulations included in the type certification basis for the aircraft. The applicant may use Appendix B, Flowcharts, as an aid to determine CVR certification requirements based on the operating rules under which the applicant's aircraft operates. An applicant must demonstrate compliance with the appropriate certification requirements.

2.2 CVR Substantiating Data. Technical Standard Order (TSO)-C123c, Cockpit Voice Recorder Equipment, describes a means to substantiate data needed to describe the CVR system. If TSO-C123c is not used, the applicant should provide a description that includes:

1. The make and model or part number of the CVR or combination CVR/flight data recorder (FDR);
2. A listing of each channel recorded and its duration;
3. A list of additional information recorded (image or data link);
4. Identification of power source or sources;
5. Description of independent power source;
6. Identification of components of the CVR system that meet TSO standards, including the TSO number and any authorized deviations from the TSO requirements;
7. Description of the bulk erasure function;
8. Method of compliance with any required underwater locating device (ULD) in accordance with §§ 23.1457(g)(3) and 25.1457(g)(3);

Note: Pursuant to International Civil Aviation Organization (ICAO) Annex 6, Operation of Aircraft, Appendix 8, Flight Records, Section 1, ULDs attached to CVRs are required to operate at 37.5 kilohertz (kHz). When flying in international airspace, operators should be familiar with ICAO Standards and Recommended Practices (SARPs).

9. Description of structural alterations associated with the installation;
10. A wiring diagram and system schematic that describes all dedicated wires and identifies all interfaces to other installed equipment and systems, including cockpit-mounted area microphones (CAM), summation amplifiers, and control unit;
11. Description of design for automatic switching to area microphone in the event of primary power source loss;

12. Instructions that would enable an accident investigation authority to obtain or manufacture any special tools or interface equipment required for the retrieval of the recorded information;
13. Details of the procedures to be followed for retrieval of the recorded information from an undamaged recorder;
14. Details of the procedures to be followed for retrieval of the recorded information from any memory device used within the crash-protected memory module removed from a crash-damaged recorder;
15. Detailed information and/or tools necessary to permit data recovery from individual memory chips (or equivalent);
16. Any special procedures related to an aircraft storage program where the CVR/ULD remains installed in the aircraft during storage;
17. Instructions for continued airworthiness (ICA);
18. Physical location of the CVR installation;

Note: The installer must locate and mount CVRs to minimize the probability of container rupture from crash impact and subsequent fire damage to the recorder. Where duplicate recording systems are installed, such as with two combination CVR/FDR systems, you may install the second system near the cockpit (refer to § 25.1459).

19. Description of the start and stop logic; and
20. Description of the means to synchronize the CVR recording with other flight recorder recordings (e.g., microphone keying).

2.3 Intended Function. The CVR system is an item of installed equipment that must be designed to perform its intended function, as required by § 23.2505, § 25.1301, § 27.1301, or § 29.1301.

2.3.1 Continuous Operation. The CVR system must operate continuously from the use of the checklist before the flight to completion of the flight to the final checklist at the end of flight as specified by § 91.609, § 121.359, § 125.227, § 129.24, or § 135.151.

2.3.2 Record Retention. The operator must retain recorded communication for at least 60 days or, if requested by the Administrator or the Board, for a longer period as required by § 91.609, § 121.359, § 125.227, § 129.24, or § 135.151.

2.3.3 Communication Sources. Pursuant to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, the CVR must record the following communication sources:

1. Voice communications transmitted from or received in the airplane or rotorcraft by radio to include the pilot and second pilot boom, mask, or handheld microphone, headset, or speaker if installed.
2. Voice communications of flight crewmembers on the flight deck using a CAM.

3. Voice communications of flight crewmembers on the flight deck using the airplane or rotorcraft interphone system.
4. Voice or audio signals identifying navigation or approach aids introduced into a headset or speaker.
5. Voice communications of flight crewmembers using the passenger loudspeaker system and if there is such a system, and if the fourth channel is available, each boom, mask, or handheld microphone, headset, or speaker used at the station for the third and fourth crewmembers; or if the stations are not required or if the signal at such a station is picked up by another channel, each microphone on the flight deck that is used with the passenger loudspeaker system, if its signals are not picked up by another channel.
6. Required data link communication (DLC) as the output signal from the communication unit that translates the signal to usable data when data link is installed.

2.3.3.1 Pursuant to § 23.1457 or § 25.1457, fixed-wing airplanes with CVR systems must record the following sources on separate dedicated channels:

- First pilot station audio;
- Second pilot station audio;
- CAM; and
- Passenger loudspeaker system and any third and fourth crewmember station's audio.

2.3.3.2 Pursuant to § 27.1457 or § 29.1457, rotorcraft with CVR systems must record the following sources on separate dedicated channels:

- First pilot station audio;
- Second pilot station audio;
- CAM or the continually energized or voice-actuated lip microphone at the first and second pilot stations; and
- Third and fourth crewmember stations, if applicable, and/or each microphone on the flight deck used with the passenger loudspeaker system.

2.3.4 Aircraft Installed Performance. The applicant should install the CVR system in accordance with EUROCAE Document (ED)-112A, Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems, dated September 2013, Chapters 2-5 and I-6.

2.4 Demonstrate Performance. The applicant must demonstrate the CVR system performs as intended pursuant to § 23.2505, § 25.1301, § 27.1301, or § 29.1301. A means to demonstrate this can be found in EUROCAE ED-112A, Chapters 2-5 and I-6.

EUROCAE ED-112A, Annex I-A, Post Flight Evaluations of Recordings, can be used for postflight evaluation of the flight test recordings.

Note: Using the flight test data, confirm the CVR operates continuously from the use of the checklist before the flight, to the completion of the final checklist at the end of the flight, as required by § 91.609, § 121.359, § 125.227, § 129.24, or § 135.151.

2.5 Equipment. The applicant must present evidence that the equipment is properly manufactured. The following applicable FAA-approved TSOs describe one means of demonstrating manufacturing compliance:

- TSO-C121b, Underwater Locating Devices (Acoustic) (Self-Powered). A ULD manufactured under TSO-C121b, or later revision, is FAA-approved.
- TSO-C123c, Cockpit Voice Recorder Equipment. A CVR meeting the requirements of TSO-C123c, or later revision, is FAA-approved.
- TSO-C155b, Recorder Independent Power Supply (RIPS). If applicable, a RIPS manufactured under TSO-C155b, or later revision, is FAA-approved.
- TSO-C177a, Data Link Recorder Equipment. If applicable, data link recorder (DLR) equipment manufactured under TSO-C177a, or later revision, is FAA-approved.

2.6 Combination CVR/FDR Systems. Operators may install a combination CVR/FDR.

2.6.1 Airplane Requirements. On airplanes that require two separate recorders, a single combination CVR/FDR may not serve as both the required CVR and the required FDR. An operator may use a combination FDR and CVR system for either the required FDR or CVR, and may install two combination FDR and CVR units in the airplane. The unit designated as the CVR must have an independent power source. Where duplicate recorders are installed, such as with two combination CVR/FDRs, one recorder should have the independent power source located as close as practicable to the CVR and be located near the cockpit. Refer to § 23.1457(d)(5).

2.6.2 Rotorcraft Requirements. On rotorcraft, one combination FDR and CVR unit may be installed to meet the requirement for an FDR and a CVR. Applicants must install the combination FDR and CVR unit such that no single electrical failure external to the recorder can disable both the CVR and the FDR functions.

2.7 DLR.

2.7.1 Compliance With 14 CFR. If a DLR is required to be installed pursuant to the operator's appropriate operating rules, the DLR must comply with §§ 23.1457(a)(6), 25.1457(a)(6), 27.1457(a)(6), and 29.1457(a)(6). Refer to §§ 91.609(j), 121.359(k), 125.227(i), 129.24, and 135.151(h). In applying these regulations, aircraft are divided into two groups: those manufactured on or after the effective date of the rule and those manufactured before that date.

2.7.1.1 Those airplanes or rotorcraft manufactured on or after the effective date identified in the appropriate operating rule must record messages that use the approved message set when both of the following conditions are met:

- The aircraft is required to have both a CVR and an FDR; and
- The aircraft has DLC equipment installed.

2.7.1.2 Those airplanes or rotorcraft manufactured before the effective date of the rule must record messages that use the approved message set when both of the following conditions are met:

- The aircraft is required to have both a CVR and an FDR; and
- No DLC equipment for the make, model, and series (M/M/S) of the aircraft was approved before the effective date of the rule.

2.7.2 Software Requirements. A DLR may be a standalone line replaceable unit (LRU), a function in a CVR, or combination CVR/FDR. If the CVR includes software, the software should be developed according to RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992, to at least the software level consistent with the failure condition classification defined in TSO-C123c. While TSO-C123c requires compliance with RTCA/DO-178B, the FAA published AC 20-115D, Airborne Software Development Assurance Using EUROCAE ED-12() and RTCA DO-178(), on July 21, 2017, encouraging applicants to use RTCA/DO-178C, Software Considerations in Airborne Systems and Equipment Certification, dated December 13, 2011.

2.7.3 Recording Requirements. Data link recordings must be retrievable in a readable format that translates the signal into usable data. Data link recordings should include a date and time stamp to allow the data to be aligned with the CVR and FDR. Refer to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, as applicable, for more information.

2.8 Weight and Balance (W&B). Installation or removal of equipment affects the aircraft W&B. Pursuant to 14 CFR part 43, § 43.5, "no person may approve for return to service any aircraft, airframe, aircraft engine, propeller, or appliance, that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless the maintenance record entry required by § 43.9 or § 43.11, as appropriate, has been made." If the installation results in changes to the W&B procedures in the flight manual, the operator should submit a flight manual supplement to the responsible Aircraft Certification Service office for approval and must adjust aircraft records to show such change.

2.9 Electrical Load Analysis (ELA). Installation or removal of equipment affects the electrical load to the aircraft power distribution system. A report must show the net change in the electrical load on each affected bus and how the change was computed. The net change to the load carrying capability of the essential bus must not result in interruption or otherwise adversely affect power distributed to other loads on that bus. Refer to § 25.1351, § 27.1351, or § 29.1351, as applicable, for more information. For

part 23 airplanes certified before August 30, 2017, refer to § 23.1351. For part 23 airplanes certificated after August 30, 2017, refer to §§ 23.2325, 23.2500, 23.2525, and 23.2605.

2.10 Electrical Power Sources. The CVR must receive its operating electrical power from the bus that allows maximum reliability for the CVR system. The CVR should be added to an essential or emergency bus unless the electrical load does not allow it. Refer to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, as applicable, for more information.

2.10.1 Connection to Power Source. The installer should connect the CVR and FDR to power buses that are separate and supplied by independent power sources. If the applicant cannot add the CVR system to the emergency or essential bus, the applicant should provide two separate and independent sources of electrical power for the CVR and FDR.

2.10.2 Power Sources. Separate aircraft power sources are required for installation of a single combination CVR/FDR system. If two combination units are installed and more than one electrical power input is available at each of the combination CVR/FDR units, then connection with a separate and independent electrical power bus is recommended.

2.10.3 Independent Power Source. Depending on the intended operation, see Appendix B for applicability. One CVR or combination CVR/FDR must have an independent power source that provides 10±1 minutes of electrical power to operate both the CVR and the CAM. If a RIPS is used to meet this requirement, then the RIPS must be located as close as practicable to the CVR.

2.11 Circuit Protection Devices. Circuit protection devices must handle anticipated loads for the CVR system. Refer to § 25.1357, § 27.1357, or § 29.1357, as applicable. For part 23 airplanes certificated before August 30, 2017, refer to § 23.1357. For part 23 airplanes certificated after August 30, 2017, refer to §§ 23.2500, 23.2505, 23.2510, and 23.2525. The circuit breaker (CB) rating, location, and name of CB label should be identified in the ICA and Airplane Flight Manual (AFM) or Rotorcraft Flight Manual (RFM) and supplements.

2.12 Preflight Monitoring. The installation must have an aural or visual means to check the recorder for proper operation. Refer to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, as applicable, for more information.

2.13 Flight Manual Applicability. The operator should review the AFM or RFM and supplements to determine whether they are compatible with the CVR system installation. If TSO-123c is followed, the operator must provide an approved AFM or RFM Supplement to eliminate incompatibilities. Refer to TSO-C123c, paragraph 5a for more information.

2.14 ICAs as Part of Substantiating Data. The operator must provide ICAs as part of the substantiating data. Under the requirements of § 23.1529, § 25.1529, § 25.1729, § 27.1529, § 29.1529, or 14 CFR part 26, § 26.11 and the latest FAA-published ICA guidance, these instructions must be included as a minimum and be provided to the

operator or maintainer. Details are immediately below and in Chapter 3, Continued Airworthiness Requirements.

2.14.1 Operational Check. The flightcrew must perform operational checks before the first flight of the day. The extent of this check is reliant on the system failure analysis conducted at initial application. System failure analysis must take into consideration all failure modes and effects. This requirement is satisfied if the applicant can demonstrate built-in test equipment (BITE) that can notify the flightcrew of a CVR LRU failure. BITE checks are limited to the CVR LRU and do not detect failures of other CVR system components (e.g., the CAM). These BITE check limitations must be noted in the ICA and AFM or RFM and supplements. Refer to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, as applicable, for more information.

2.14.2 System Functional Check. Pursuant to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, the applicant must develop ICA that include system functional checks that verify continued airworthiness of the entire CVR system, that may be part of a scheduled task, and should include:

1. Audio Quality: Verify the audio quality of all required input channels.
2. Duration: Verify the CVR recording duration meets the intended recording duration.
3. Self-Tests: Confirm that the CVR LRU BITE checks hidden functions related to fault notification.
4. Secondary Power: Ensure secondary or independent power sources perform as intended, including any automatic switching function.
5. Data Link: If installed, DLRs should be downloaded and the messages converted to a text-based format in English for legibility.

2.15 Removal and Replacement. The applicant must provide removal and replacement instructions for CVR system equipment and dedicated sensors and must include instructions for conducting a functional check of the equipment. Refer to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, as applicable, for more information. Operators should have procedures to retain CVR data of a CVR that is removed for maintenance or installed on another aircraft. This ensures that data from accident or incident investigations are maintained.

2.16 ULD Installation and Maintenance.

Note: In this document, a ULD means an underwater locating device that operates at 37.5 kHz and is installed on or adjacent to the CVR. This is not to be confused with a low frequency underwater locating device (LF-ULD) that operates at 8.8 kHz and is attached to the airframe of the aircraft. An LF-ULD is designed to locate the wreckage; a ULD is designed to locate the CVR or FDR.

2.16.1 CVR Attachment Hardware. The ULD to CVR attachment hardware must be designed to minimize the possibility of the ULD separating from the CVR during crash impact. Refer

to the current versions of TSO-C123 and EUROCAE ED-112 for more information on ULD attachment hardware and test requirements.

2.16.2 ULD Battery Maintenance. Provide instructions for periodically replacing the ULD battery, conducting operational checks, and cleaning of the ULD. The battery replacement period must be consistent with the battery manufacturer's life limit. Refer to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, as applicable, for more information.

2.16.2.1 If the ULD battery is not accessible, the instructions should be for replacement of the ULD itself.

2.16.2.2 ULD operational checks should be performed with test equipment model numbers specified by the ULD manufacturer.

Note: For battery requirements in other performance specification documents, refer to the appropriate specifications for the battery type used for the ULD, such as TSO-C142b, Non-Rechargeable Lithium Cells and Batteries.

2.17 Installation Design. CVRs may be designed and tested to work with multiple ULD models with varying part numbers. Also, ULDs may be designed and tested to work with multiple CVR models with varying part numbers. In these cases, the CVR or ULD manufacturer should provide a list of compatible models and part numbers the device may be paired with to ensure only approved CVR and ULD devices and systems are installed together.

2.18 Electrical Wiring Interconnection System (EWIS). For installation on certain part 25 aircraft of a CVR system requiring alteration or modification of EWIS components, the operator must assess whether EWIS ICA is required as part of the substantiating data. Under the requirements of §§ 25.1729 and 26.11, the manufacturer must provide these instructions, if required, to the operator or maintainer. As a minimum, they must include the procedures and intervals to inspect and maintain additional or modified EWIS components pertaining to the installation of the CVR system.

CHAPTER 3. CONTINUED AIRWORTHINESS REQUIREMENTS

3.1 Purpose of This Chapter. This chapter provides information for developing continued airworthiness requirements of a CVR system to ensure retention of intelligible recordings. During the certification process, a comprehensive system analysis must be conducted to identify functions that would not be readily apparent to flightcrew and maintenance personnel if they became defective. Applicants must provide the basic requirements for continued airworthiness of a CVR system as part of the data package submitted during type certificate (TC), amended TC, or Supplemental Type Certificate (STC) approval.

3.2 Continuous Airworthiness.

3.2.1 CVR System Inspection. Pursuant to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, periodically inspect the CVR system in accordance with the manufacturer's recommended procedures. In the absence of manufacturer's instructions, the CVR system should be inspected at least every 24 months pursuant to International Civil Aviation Organization (ICAO) Annex 6, Part I, International Commercial Air Transport—Aeroplanes, Section 6.3.5.3 and Appendix 8, Flight Records, Section 7.2. The inspection interval may be changed in accordance with the operator's reliability program. A typical maintenance program must include all the checks necessary at specified intervals to ensure the CVR system operates as certified.

3.2.2 Inspection Program. The program manager of an aircraft maintenance program should establish an Aircraft Inspection Program (AIP) for each make and model program aircraft and ensure each aircraft is inspected in accordance with that inspection program. The inspection program should include at least the following information:

1. Instructions and procedures for inspections, and include necessary tests and checks;
2. A schedule for performing the inspections that must be accomplished under the inspection program expressed in terms of the time in service, calendar-time, number of system operations, or any combination thereof; and
3. For equipment installed on transport category aircraft, the person or organization to which the airworthiness approval was granted shall make the related instructions for continued airworthiness (ICA) available to the operator of the aircraft to be incorporated in the Continuous Airworthiness Maintenance Program (CAMP). These ICAs cover in detail all the tasks required to ensure the continued serviceability of the flight recorder system. Refer to 14 CFR part 21, § 21.50.

3.2.3 Maintenance Program. The aircraft manufacturer or system designer/installer must provide the basic maintenance program recommendations (refer to §§ 121.367, 121.375, and 135.433). However, factors such as aircraft age, system design, and aircraft operation must be taken into account when developing the maintenance program. The following are typical parts found in a CVR system maintenance program:

3.2.3.1 Operational Self-Test. Prior to the first flight of the day, flightcrew members should activate and monitor the recorder system self-test or built-in-test function.

3.2.3.2 Operational Check. The operational check typically verifies that there are no CVR system fault indications. A comprehensive self-test and automatic fault report may be accomplished in lieu of an Operational Self-Test.

3.2.3.3 System Functional Check. This check includes but is not limited to verification of backup power performance, automatic termination, fault indication operation, and intelligibility of audio recordings from all sources. Pursuant to § 23.1457, § 25.1457, § 27.1457, or § 29.1457, sources can include:

1. Voice communications transmitted from or received in the airplane or rotorcraft by radio.
2. Voice communications of flight crewmembers on the flight deck.
3. Voice communications of flight crewmembers on the flight deck using the airplane or rotorcraft interphone system.
4. Voice or audio signals identifying navigation or approach aids introduced into a headset or speaker.
5. Voice communications of flight crewmembers using the passenger loudspeaker system, and the fourth channel, if installed.

3.2.3.4 Replay and Analysis. Replay and analysis of audio recordings should be conducted in accordance with manufacturer's instructions. In the absence of specific instruction, the following procedures can be followed:

3.2.3.4.1 Intelligibility of all recorded channels should be checked during all phases of flight (such as taxi, takeoff, cruise, and landing). Ensure that audio signals from alerting or warning devices on the flight deck, both fully integrated with the aircraft audio system and nonintegrated, can be heard. CVR system audio playback should be intelligible and undistorted on each channel. Ideally, maintenance personnel should perform audio quality tests with engines running to verify background noise, such as a 400 hertz (Hz) hum, is not degrading recording quality. If the system cannot be adequately checked on the aircraft, it should be removed and a portion of the recording (preferably from a flight portion) should be checked.

3.2.3.4.2 The replay facility should determine adequacy of the quality of the recording on all channels. Information recorded on each channel, such as voice, warning, and alerts, should be identifiable. In addition to subjective listening tests, proper signal recording level should be confirmed (i.e., the recording level is not too quiet, too loud, or signal clipping is noted).

3.2.3.4.3 Recording should be played back in an area where the privacy and confidentiality of the recorded voices are assured.

3.2.3.4.4 Dedicated tools to visualize the audio signal (e.g., over time, frequency domain, energy levels, etc.) may be employed to check if a part of the recording seems affected by an audio anomaly.

3.2.4 Underwater Locator Device (ULD) Subsystem Inspection.

3.2.4.1 Pursuant to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, periodically inspect the ULD and the ULD battery in accordance with the manufacturer's recommended procedures. In the absence of the manufacturer's instructions, the ULD and ULD battery should be inspected at least every 24 months pursuant to ICAO Annex 6, Part I, Section 6.3.5.3 and Appendix 8, Section 7.2. The inspection interval can be changed in accordance with the operator's reliability program.

3.2.4.2 The replacement period of the ULD battery should be consistent with the battery life limit determined by the manufacturer.

3.2.4.3 If the ULD battery is not accessible, the instructions should provide for replacement of the ULD itself. Historically, ULD batteries have been nonrechargeable and replaced at a specific time interval. If the battery or parts must be replaced, discard the batteries following manufacturer and local procedures.

3.2.5 Data Link Recorders (DLR). Pursuant to §§ 23.1457(a)(6), 25.1457(a)(6), 27.1457(a)(6), 29.1457(a)(6), 91.609(j), 121.359(k), 125.227(i), 129.24, and 135.151(h), data link communication (DLC) is not required on any aircraft. However, certain operating rules prescribe recording requirements if DLRs are installed. If DLC compatibility is installed, then periodically inspect the DLC in accordance with the manufacturer's recommended procedures. In the absence of the manufacturer's instructions, the DLR should be inspected at least every 24 months pursuant to ICAO Annex 6, Part I, Section 6.3.5.3 and Appendix 8, Section 7.2. The inspection interval can be changed in accordance with the operator's reliability program.

3.2.6 Retention of Data. Pursuant to § 91.609(g), following an accident or occurrence requiring immediate notification of the National Transportation Safety Board (NTSB), recorded information must be retained for a minimum of 60 days or, if requested by the Administrator or the Board, for a longer period. This could be accomplished by inclusion in flightcrew checklists or company standard operating/emergency procedures and simply removing recorder power.

3.3 Configuration Control. CVR recording medium is not interchanged between aircraft without close supervision. Operators' programs should include a requirement to erase stored data before installing a serviceable and previously used unit. Erasure of data should be included in any post-installation functional check.

Note: Data may need to be retained for up to 60 days or longer, if requested, following an accident or occurrence pursuant to § 91.609(g).

3.4 ICA. The operator must either follow the manufacturer's provided ICAs as part of your maintenance program or develop your own. The ICA must identify all requirements that would have been established at certification and any others subsequently identified by the FAA, such as those applicable under an Airworthiness Directive (AD). Refer to § 23.1529, § 25.1529, § 27.1529, or § 29.1529, as applicable, for more information.

3.5 Storage. While most CVRs and ULDs are shipped and stored using manufacturer instructions, the operator should consider the CVR and the ULD, if attached, in your aircraft storage program. Some ULD batteries may require special temperature control if placed in extended storage while installed on the aircraft.

APPENDIX A. DEFINITIONS, ACRONYMS, AND RELATED DOCUMENTS

A.1 Definitions.

A.1.1 Applicants. The term "applicant" in this advisory circular (AC) is intended to describe type certificate (TC), amended TC, or Supplemental Type Certificate (STC) applicants seeking approval of a required cockpit voice recorder (CVR) system.

A.1.2 Data Link Communication (DLC). A DLC system is defined as the components installed on the aircraft that are necessary to provide the DLC function. The DLC function uses an approved message set, as determined by AC 20-140, Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS), (e.g., Controller-Pilot Data Link Communication (CPDLC) application hosted in the flight management computer (FMC)), the datalink router (hosted in the Communication Management Unit (CMU)), the radios (e.g., very high frequency (VHF), high frequency (HF) Datalink, Satcom), and related antennas. Future Air Navigation System 1/A (FANS 1/A) and Aeronautical Telecommunications Network Baseline 1 (ATN B1) systems comprise DLC equipment. Refer to AC 20-140 for additional information. If required DLC is installed, it must be recorded on a data link recorder (DLR).

A.1.3 Operators. This AC uses the term "operator" to mean pilot in command (PIC), renter-pilot, operating certificate holder (CH), or air carrier CH. An operator must use an aircraft that complies with the CVR requirements of the applicable part (Title 14 of the Code of Federal Regulations (14 CFR) part 91, 121, 125, 129, or 135). The FAA has developed a series of flowcharts in Appendix B, Flowcharts, to assist in determining equipment requirements dependent on the applicable operating and aircraft certification rules. When using the charts in Appendix B, the operator should understand the initial certificate of airworthiness (IC of A) date also includes postdelivery equipment installations including a DLC system.

A.2 Acronyms.

14 CFR	Title 14 of the Code of Federal Regulations
AC	Advisory Circular
AD	Airworthiness Directive
AFM	Airplane Flight Manual
ATN B1	Aeronautical Telecommunication Network Baseline 1
BITE	Built-In Test Equipment
CAM	Cockpit-Mounted Area Microphone
CAMP	Continuous Airworthiness Maintenance Program
CB	Circuit Breaker
CFR	Code of Federal Regulations

CH	Certificate Holder
CMU	Communication Management Unit
CPDLC	Controller-Pilot Data Link Communication
CVR	Cockpit Voice Recorder
DLC	Data Link Communication
DLR	Data Link Recorder
ELA	Electrical Load Analysis
EUROCAE	EUROCAE (formerly known as the European Organisation for Civil Aviation Equipment)
EWIS	Electrical Wiring Interconnection System
FAA	Federal Aviation Administration
FANS 1/A	Future Air Navigation System Version 1/A
FDR	Flight Data Recorder
FMC	Flight Management Computer
FSDO	Flight Standards District Office
HF	High Frequency
ICA	Instructions for Continued Airworthiness
IC of A	Initial Certificate of Airworthiness
LF-ULD	Low Frequency Underwater Locating Device
LRU	Line Replaceable Unit
M/M/S	Make, Model, and Series
MPS	Minimum Performance Standards
MRO	Maintenance, Repair, and Overhaul
NTSB	National Transportation Safety Board
PIC	Pilot In Command
RFM	Rotorcraft Flight Manual
RIPS	Recorder Independent Power Supply
RTCA	RTCA (formerly known as the Radio Technical Commission for Aeronautics)
STC	Supplemental Type Certificate
TC	Type Certificate
TSO	Technical Standard Order

ULD	Underwater Locating Device
VHF	Very High Frequency
W&B	Weight and Balance

A.2.1 Related Documents.

A.2.1.1 Code of Federal Regulations (CFR). The following 14 CFR sections can be downloaded from the eCFR website at https://www.ecfr.gov/.

- Part 23, § 23.1457, Cockpit Voice Recorders.
- Part 25, § 25.1457, Cockpit Voice Recorders.
- Part 27, § 27.1457, Cockpit Voice Recorders.
- Part 29, § 29.1457, Cockpit Voice Recorders.
- Part 91, § 91.609, Flight Data Recorders and Cockpit Voice Recorders.
- Part 91, § 91.1045, Additional Equipment Requirements.
- Part 121, § 121.359, Cockpit Voice Recorders.
- Part 125, § 125.227, Cockpit Voice Recorders.
- Part 129, § 129.24, Cockpit Voice Recorders.
- Part 135, § 135.151, Cockpit Voice Recorders.

A.2.1.2 FAA ACs (current editions). A current list of ACs, including the following, can be found on the FAA website at https://www.faa.gov/regulations_policies/advisory_circulars/ or in the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

- AC 20-140, Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS).
- AC 20-141, Airworthiness and Operational Approval of Digital Flight Data Recorder Systems.
- AC 20-160, Onboard Recording of Controller Pilot Data Link Communication (CPDLC) in Crash Survivable Memory.

A.2.1.3 FAA Technical Standard Orders (TSO). A current list of TSOs, including the following, can be found in DRS at https://drs.faa.gov.

- TSO-C121b, Underwater Locating Devices (Acoustic) (Self-Powered), dated February 28, 2012.
- TSO-C123c, Cockpit Voice Recorder Equipment, dated December 19, 2013.

- TSO-C155b, Recorder Independent Power Supply (RIPS), dated April 21, 2015.
- TSO-C177a, Data Link Recorder Equipment, dated December 19, 2013.

A.2.1.4 EUROCAE. Copies of EUROCAE Documents (ED) from EUROCAE can be ordered at 9-23 rue Paul Lafargue, "Le Triangle" building, 93200 Saint-Denis, France, or from their website at https://eshop.eurocae.net/.

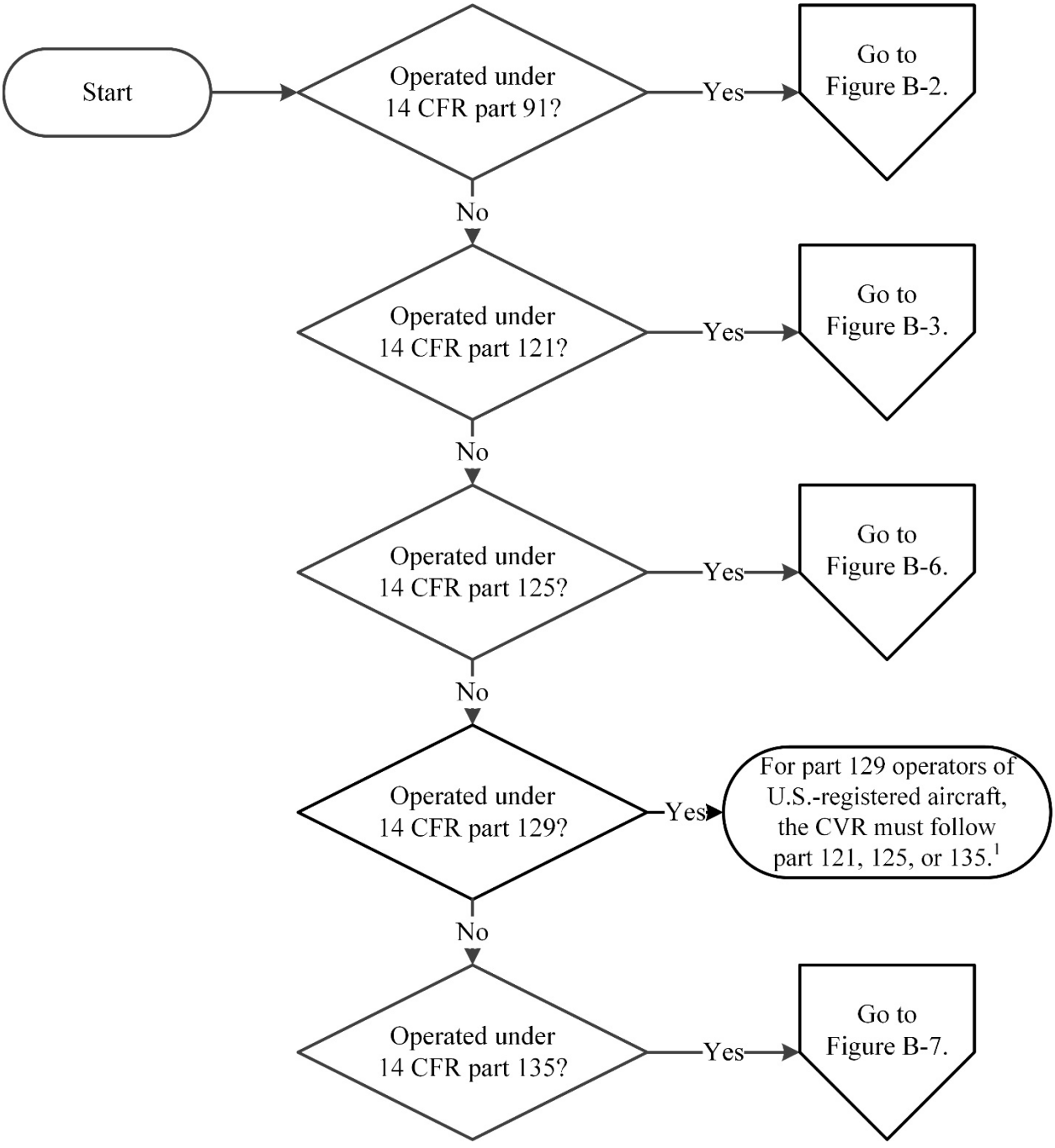
- EUROCAE ED-93, Minimum Aviation System Performance Specification for CNS/ATM Message Recording Systems, dated November 1998.
- EUROCAE ED-112A, Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems, dated September 2013.
- EUROCAE ED-155, Minimum Operational Performance Specification for Lightweight Flight Recording Systems, dated July 2009.

A.2.1.5 International Civil Aviation Organization (ICAO). Current copies of the following ICAO documents can be obtained from the ICAO website at https://www.icao.int/publications/Pages/default.aspx.

- Annex 6, Part I, International Commercial Air Transport—Aeroplanes.
- Annex 6, Part II, International General Aviation—Aeroplanes.
- Annex 6, Part III, International Operations—Helicopters.

APPENDIX B. FLOWCHARTS

Figure B-1. Aircraft by Operating Rules



[1] For part 129 operators of U.S.-registered aircraft operated solely outside of the United States in common carriage by a foreign person or a foreign air carrier, § 129.24 requires that the aircraft be equipped with an approved cockpit voice recorder (CVR) and record the information that would be required if the aircraft were operated under part 121, 125, or 135 and must be installed by the compliance times required by that operating part as applicable to the aircraft (refer to §§ 129.1(b) and 129.24).

Figure B-2. Part 91

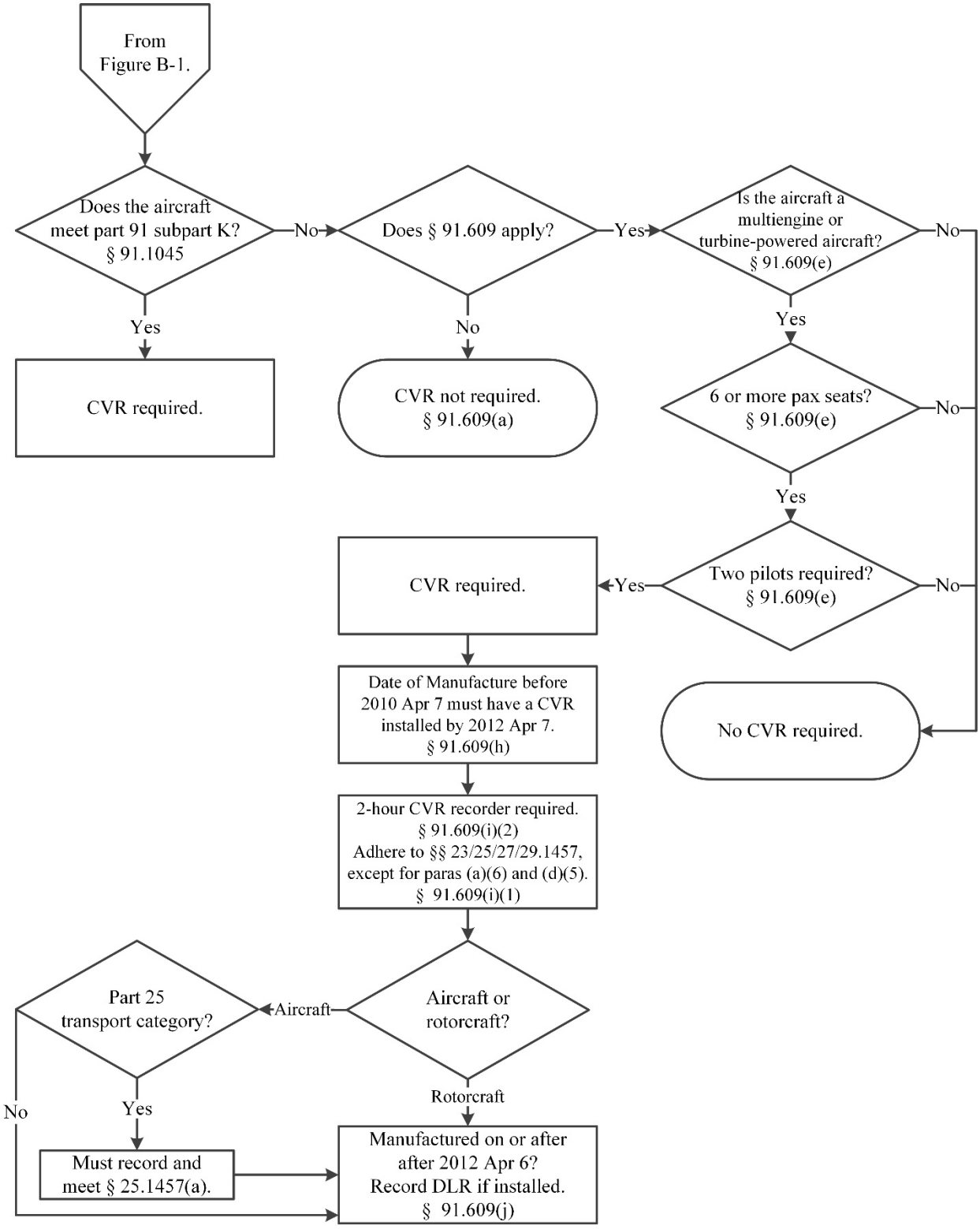
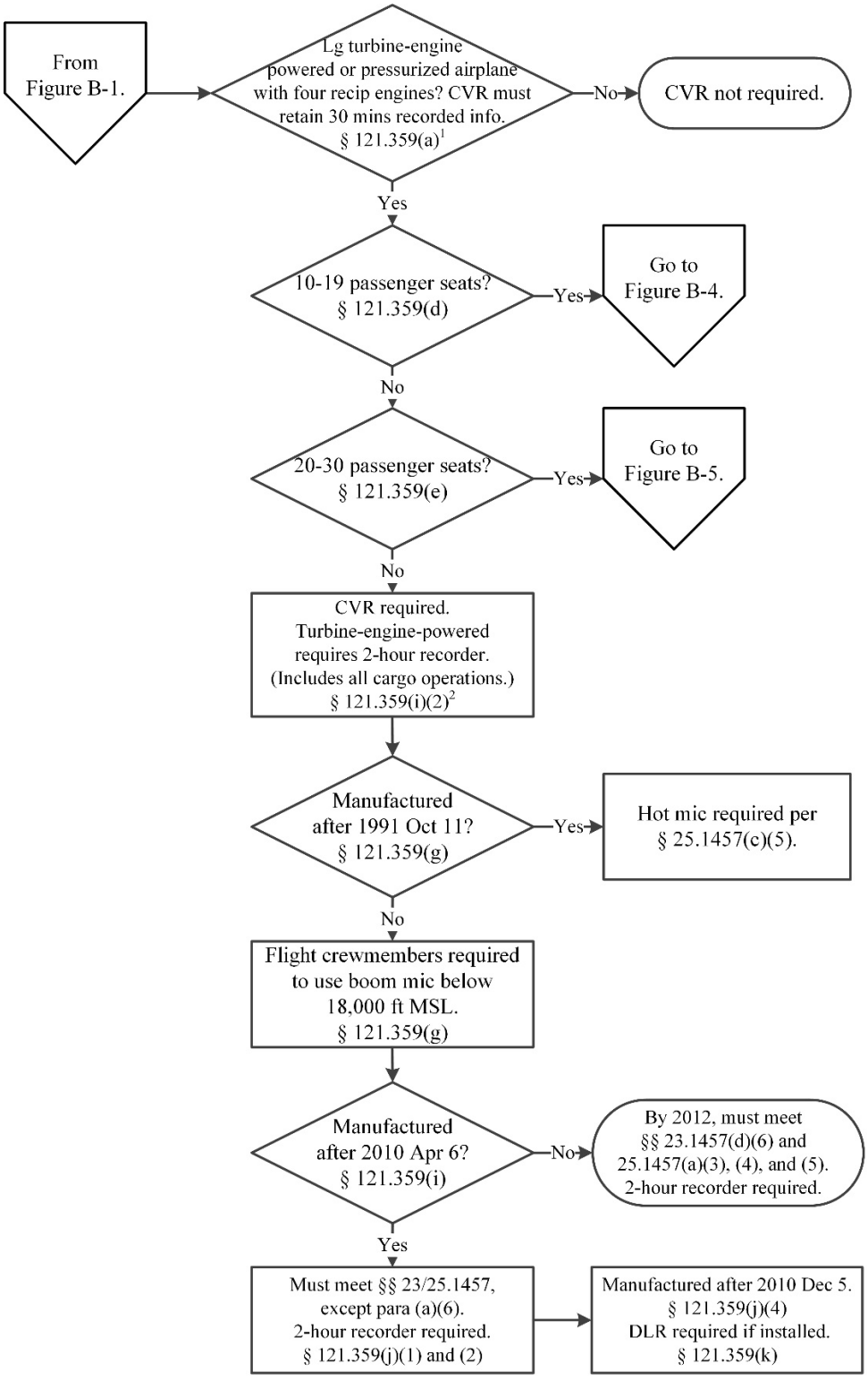
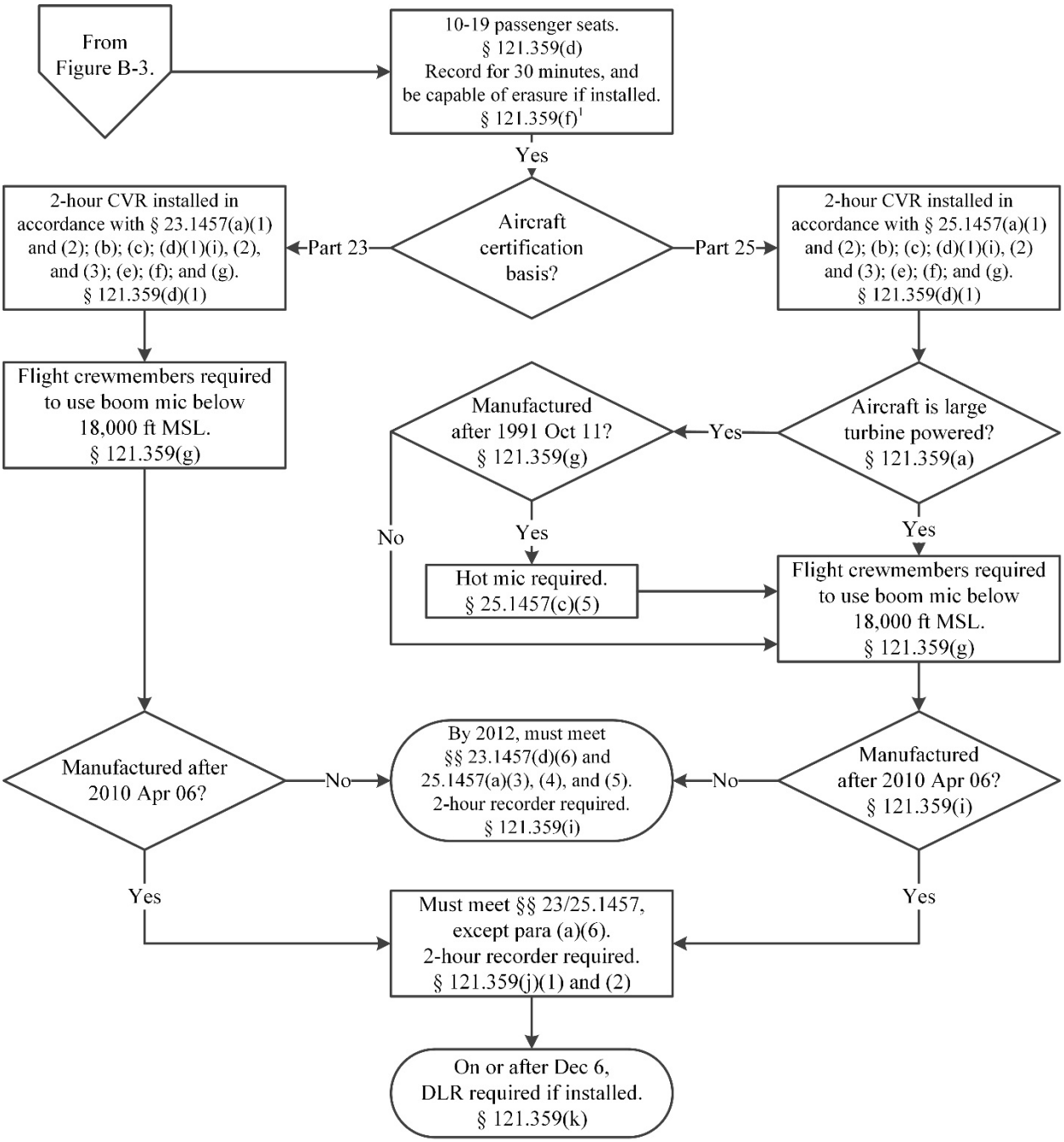


Figure B-3. Part 121



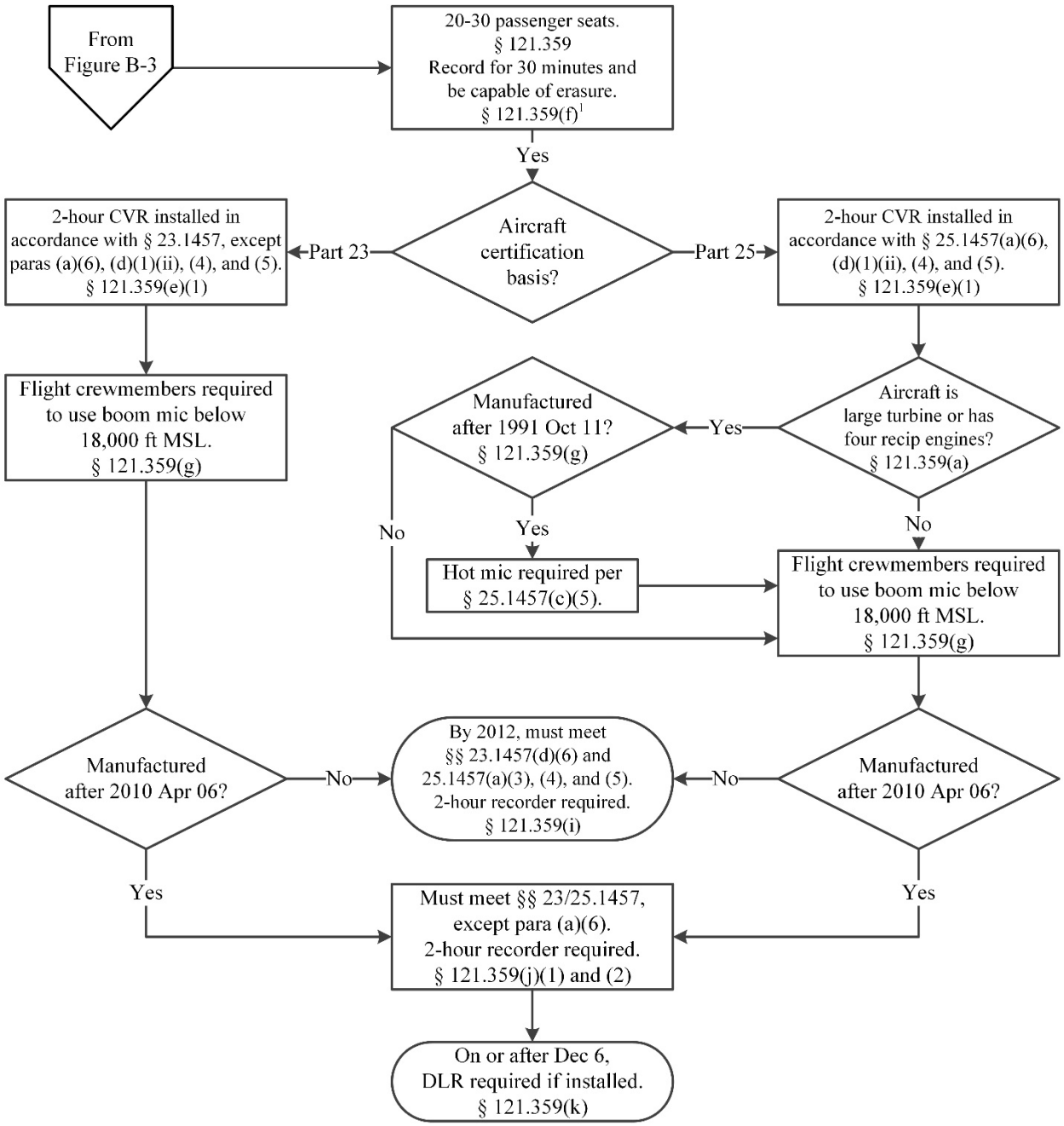
[1] For aircraft required to comply with part 121, § 121.359, the CVR must retain a minimum of 30 minutes of recorded information after activation of the "Erasure" feature, if installed.
[2] This includes all cargo operations.

Figure B-4. Part 121, 10–19 Passenger Seats



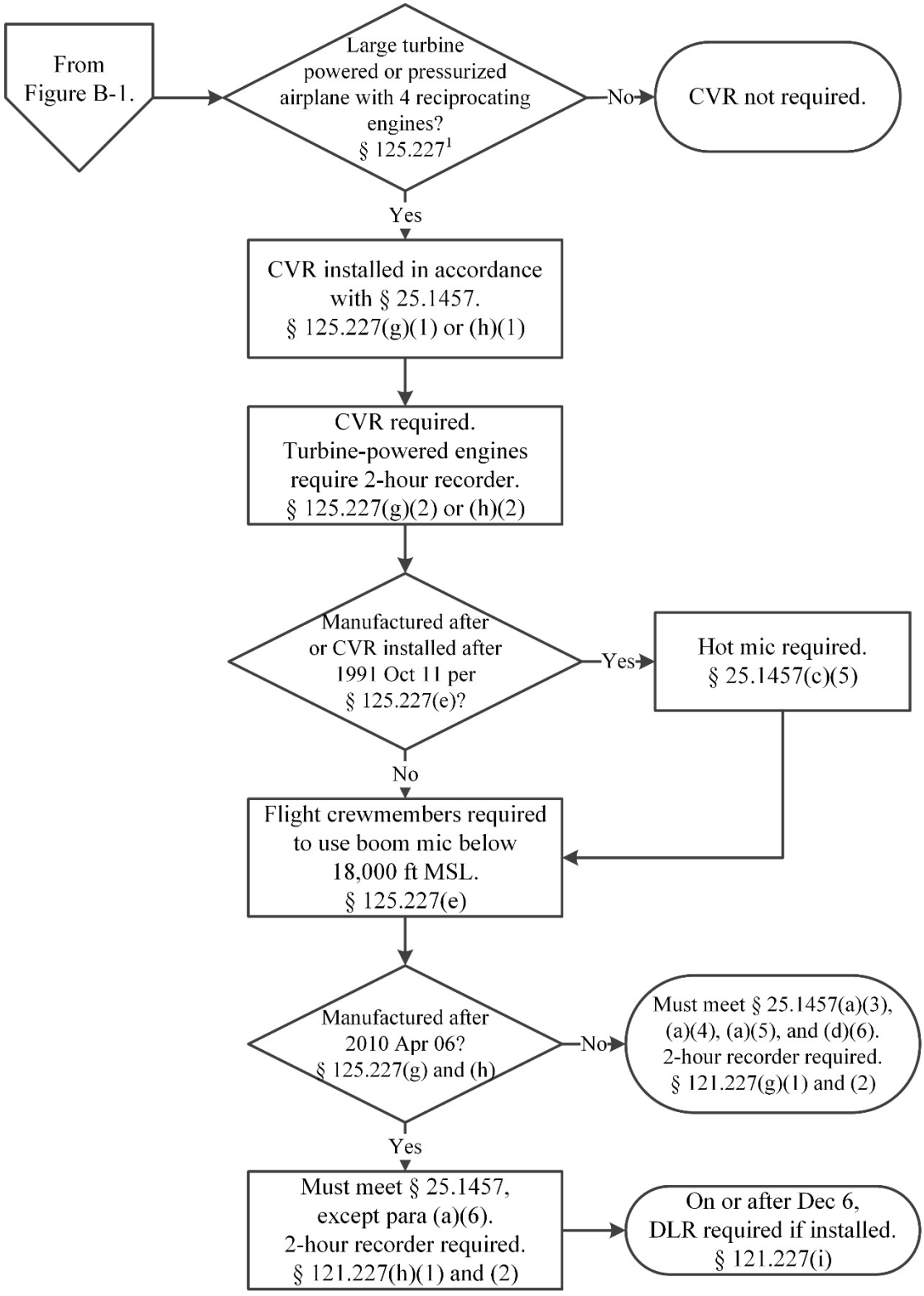
[1] For aircraft required to comply with § 121.359, the CVR must retain a minimum of 30 minutes of recorded information after activation of the "Erasure" feature, if installed.

Figure B-5. Part 121, 20–30 Passenger Seats



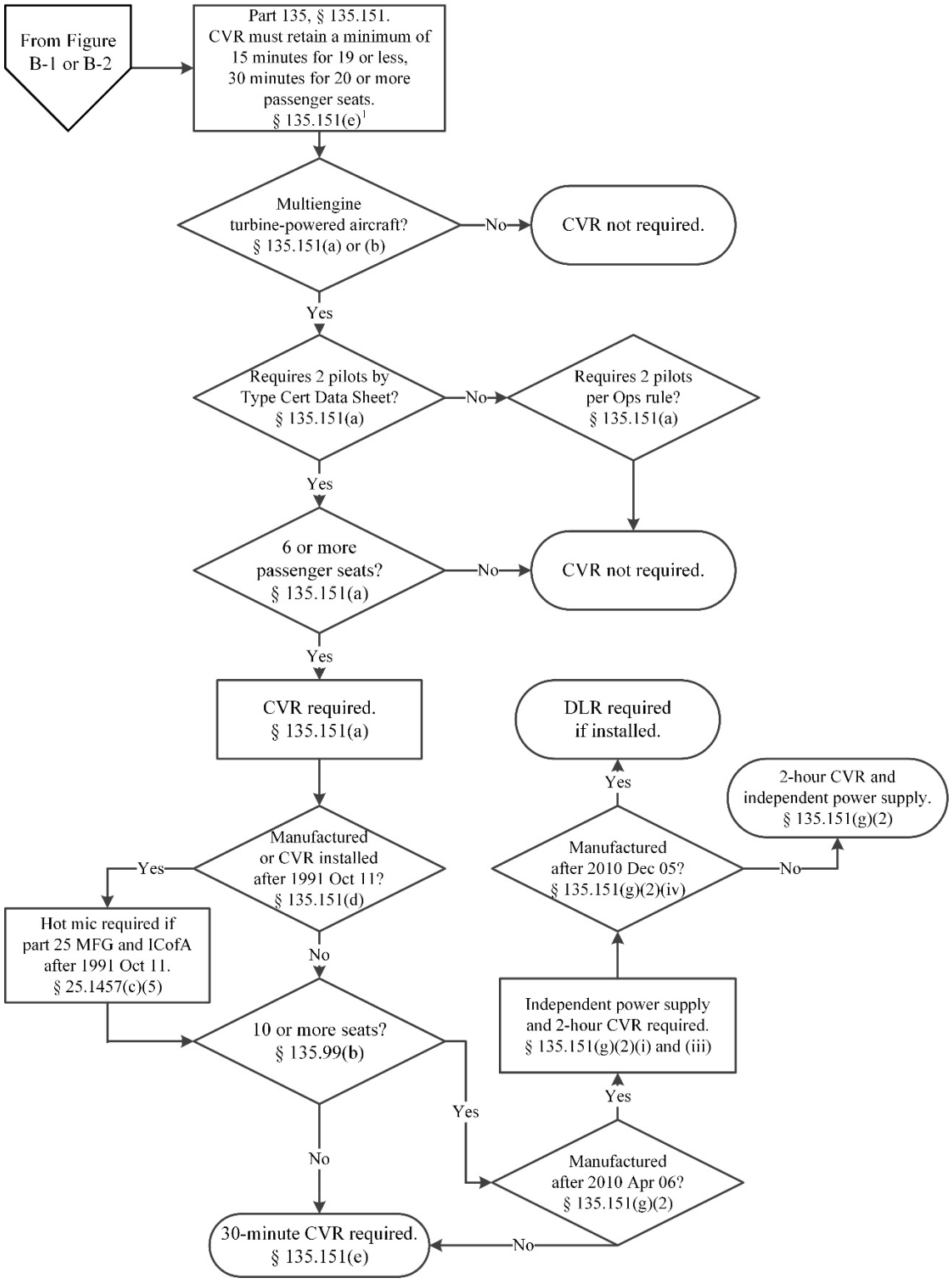
[1] For aircraft required to comply with § 121.359, the CVR must retain a minimum of 30 minutes of recorded information after activation of the "Erasure" feature, if installed.

Figure B-6. Part 125



[1] For aircraft required to comply with part 125, § 125.227, the CVR must retain a minimum of 30 minutes of recorded information after activation of the "Erasure" feature, if installed.

Figure B-7. Part 135



[1] For aircraft required to comply with part 135, § 135.151, the CVR must retain a minimum of 15 minutes for 19 or less passenger seats or 30 minutes for 20 or more passenger seats of recorded information after activation of the "Erasure" feature, if installed.

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 20-186A, Airworthiness and Operational Approval of Cockpit Voice Recorder Systems

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____