



National Transportation Safety Board

Vehicle Recorder Division

Flight Data Recorder Handbook for Aviation Accident Investigations

Office of Research and Engineering
Office of Aviation Safety
Washington, DC 20594

A Reference for Safety Board Staff

FOREWORD

This handbook provides general information to assist the investigator-in-charge, group chairmen, and other Safety Board staff who may encounter a flight data recorder during the course of an aviation accident investigation. It is intended to provide guidance on the procedures, laws and standard practice surrounding the flight data recorder and its recorded information during the course of an investigation.

The Vehicle Recorder Division will be responsible for keeping this handbook updated. The handbook's printing date will be indicated in the upper left corner of each page. While the intent of the handbook is to provide guidance for handling a flight data recorder and its recorded information, the handbook may not cover all situations, and any questions or concerns may be directed to the Chief of the Vehicle Recorder Division for immediate assistance.

This handbook is an NTSB staff product and is intended to provide information and guidance to NTSB employees who are involved in the flight data recorder portion of an aviation accident investigation. This handbook has not been adopted by the NTSB Board Members, is not regulatory in nature, is not a binding statement of policy, and is not all-inclusive. The recommended procedures are not intended to become obligations of the NTSB or to create any rights in any of the parties to an NTSB investigation. Deviation from the guidance offered in this handbook will at times be necessary to meet the specific needs of an investigation. However, such deviations from the guidance offered in this handbook shall be within the sole discretion of the appropriate NTSB employees and shall not be the prerogative of parties to the investigation or other individuals not employed by the NTSB.

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1 Applicable Recorded Flight Data

- 1.1. The term “FDR” (flight data recorder) includes digital flight data recorders (DFDRs), solid-state flight data recorders (SSFDRs) and Universal flight data recorders (UFDRs).
- 1.2. The laws and policies that govern the procedures regarding FDRs and recorded event data are generally applicable to any and all flight data that are recorded on board an aircraft. Any event data that are recovered from an aircraft following an accident or incident are given the same protection and security of an FDR or FDR data.
- 1.3. Devices that record flight event data include, but are not limited to Quick Access Recorders (QARs), flight test equipment, FADEC, PARs. Furthermore, any magnetic tape or digital memory chips found in the wreckage may contain flight data and shall be secured by Safety Board staff.
- 1.4. The protections pertaining to on-board recorders also apply to ground-based recorded flight data (CNS/ATM, AOC, ACARs, etc).
- 1.5. In the event that recorded media from other event-recording devices is recovered, the investigator-in-charge (IIC) shall immediately contact the Chief of the Vehicle Recorder Division for guidance.

2 FDR Data: Disclosure and Access

- 2.1. FDRs contain highly sensitive material and unauthorized release of information by Safety Board employees is grounds for disciplinary action.
- 2.2. The FDR specialist, the Chief of the Vehicle Recorder Division, the Directors of the Offices of Research and Engineering and Aviation Safety, and the IIC are the only staff automatically authorized access to the FDR data.
- 2.3. The FDR specialist assigned to the accident ordinarily has complete access to the FDR and data at all times. Additionally, any FDR specialist may assist with FDR data, when necessary, with the approval of the Chief of the Vehicle Recorder Division.
- 2.4. Other Safety Board staff is given access to the FDR data in a timely manner to aid in the on-scene portion of the investigation, in coordination with the IIC and the Directors of the Offices of Research and Engineering and Aviation Safety.
- 2.5. The FDR specialist shall keep the IIC apprised of information and activities concerning the FDR or FDR data. In particular, any observations that may be significant to the investigation shall be brought to the IIC’s attention.

3 FDR Recovery: From On Scene to the FDR Laboratory

- 3.1. Upon notification of an accident or incident in which an FDR is installed on the aircraft, the IIC considers whether the FDR might contain information relevant to the investigation (taking into consideration that the FDR can record a minimum of 25 hours of flight information). Consultation with the Chief of the Vehicle Recorder division may be necessary to determine the relevance of recorded information.
- 3.2. The Chief of the Vehicle Recorder Division assigns the FDR to an FDR specialist.
- 3.3. Preliminary accident information shall be sent/emailed to the Chief of the Vehicle Recorder Division and the FDR specialist, as soon as possible. Specifically, the following information is required to facilitate data readout:
 - Event description (phase of flight, type of event)
 - NTSB or KEYS number
 - Aircraft type
 - Flight number
 - Flight itinerary
 - Number of flights after event, if the recorder is not removed immediately.
 - Local altimeter setting at the time of the accident/incident.
 - Elevation of accident/incident site.
 - Location of previous takeoff, runway used, and field elevation.
 - Local altimeter setting at time of takeoff.
 - Time of departure, coordinated universal time (UTC)
 - Time of accident/incident (UTC)
 - Accident site conditions that may have cause damage to the recorder (fire duration, fuel type, etc)
- 3.4. Recorder information shall be sent/emailed to the Chief of the Vehicle Recorder Division and the FDR specialist, as soon as possible. This information can be obtained from the airline and/or the airframe manufacturer. Specifically, the following information is required to facilitate data readout:
 - FDR manufacturer/model (Fairchild, Sundstrand, Allied Signal, L3, etc)
 - FDR Part number and Serial Number
 - FDAU (flight data acquisition unit) manufacturer/model and part number
 - Parameters recorded
 - Word(s) and bit location(s) of each parameter
 - Conversion algorithm for each parameter
 - Parameter range
 - Original owner/upgraded retrofit history
 - Airline, recorder maintenance/readout facility contact phone number.

- 3.5. If there is any visible damage to the underwater locator beacon (ULB or “pinger”), it should be removed prior to shipping. Use caution when handling damaged beacons.
- 3.6. The FDR unit shall not be tampered with or opened, and the recording medium shall not be removed (i.e., the tape or memory module) until it reaches the recorder laboratory at Safety Board headquarters in Washington, D.C.
- 3.7. The FDR shall not be read out or downloaded on scene. The IIC shall caution the parties to the investigation that unauthorized readout or download of an FDR, following a reportable NTSB accident or incident, may result in loss of party status (refer to section 4 – *FDR Data: Non-Safety Board FDR Download*).
- 3.8. The FDR must be shipped to Safety Board headquarters in a manner that protects it from damage (i.e., inside a cardboard or wooden box, wrapped in either foam or bubble-wrap or in a container filled with foam peanuts).
- 3.9. If the FDR is recovered in water, it shall immediately be packed in water (fresh, if possible) and not be allowed to dry out. Packaging may be accomplished by sealing the recorder (in water) inside a plastic beverage container with silicon adhesive or a similar sealant. Contact the Chief of the Vehicle Recorder Division for further assistance.
- 3.10. The IIC shall contact the Chief of the Vehicle Recorder Division to coordinate the shipment of the FDR to headquarters.
- 3.11. The FDR may be sent to Washington on board a commercial airplane. This usually needs to be coordinated with the captain of the flight. The IIC shall also arrange and coordinate with headquarter staff to meet the arriving flight. If necessary, the FDR shall be packaged appropriately.
- 3.12. The FDR shall be labeled and identified appropriately, before shipment (including contact name and phone number).

4 FDR Data: Non-Safety Board FDR Download

- 4.1. The FDR shall not be read out or downloaded on scene. The IIC shall caution the parties to the investigation that unauthorized readout or download of an FDR, following a reportable NTSB accident or incident, may result in loss of party status.
- 4.2. Under exceptional circumstances, the Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the Chief of the Vehicle Recorder Division and IIC, may approve the owner/operator or a third party vendor to download the data from an undamaged FDR. Ordinarily, such downloads shall be supervised or observed by Safety Board staff, as designated by the IIC.
- 4.3. Downloaded FDR data provided to the Safety Board shall be provided in a recorder manufacturer format, in consultation with the Chief of the Vehicle Recorder Division.

5 FDR Arrival at the Safety Board Recorder Laboratory

- 5.1. The FDR's arrival and initial data download is not ordinarily a group activity.
- 5.2. The FDR specialist handles and secures the FDR and its original recording medium.
- 5.3. If the recorder is damaged, the damage is documented and the FDR specialist extracts the recording medium with the use of cutting tools or other special equipment. NOTE: The IIC shall provide the FDR specialist with the accident site conditions and environment that caused damage to the recorder, if possible.
- 5.4. The FDR specialist downloads the original tape or memory from the FDR. The pertinent data are transferred or downloaded from the original medium and are digitally stored.
- 5.5. The FDR specialist initially checks the recording to determine that information has been recorded.

6 Initial FDR Readout

- 6.1. Any critical information that might assist in the field phase of the investigation is relayed to the IIC and other appropriate on-scene Safety Board staff, by either (or both) Directors of the Offices of Aviation Safety and/or Research and Engineering (or their designees).
- 6.2. If the recording contains data pertinent to the investigation, the Directors of the Offices of Research and Engineering and Aviation Safety (or their designees), in consultation with the IIC, will make a determination as to whether it is necessary to establish an FDR group.
- 6.3. The data briefing shall be held over a secure landline telephone – not a portable mobile phone – and not routed through any conferencing facility.
- 6.4. The IIC shall coordinate the distribution of FDR information to parties on scene.
- 6.5. An electronic file containing preliminary plots and data may be emailed to the IIC and other NTSB staff, in consultation with the Chief of the Vehicle Recorder Division (see section 8 - *FDR Preliminary Data: Safety Board Staff and Official Use*).

7 FDR Preliminary Data: Release to the Parties

- 7.1. In consultation with the Chief of the Vehicle Recorder division, if an FDR group is not established, a preliminary set of plots and tabular data shall be sent to the IIC, who coordinates distribution to the party members, as necessary.

- 7.2. If an FDR group convenes, at the conclusion of the initial FDR group meeting, a preliminary set of plots and tabular data shall be sent to the IIC and may be provided to the group members (hardcopy or electronically), subject to the concurrence of the Directors of the Offices of Research and Engineering and Aviation Safety.
- 7.3. Updates and corrections to the preliminary data (plots and corresponding tabular data) may be released to the FDR group members during the course of the investigation. If an FDR group does not convene, updates shall be sent to the IIC for distribution to the party members.
- 7.4. Release of any additional FDR data (additional data/information not contained in the preliminary plots and corresponding data file) requires the express approval from the Directors of the Offices of Research and Engineering and Aviation Safety.
- 7.5. Release of ancillary data (FDRs from other aircraft, flight tests, etc), requires the express approval from the Directors of the Offices of Research and Engineering and Aviation Safety.
- 7.6. FDR parameter conversion information may be proprietary and any release to the parties requires written acknowledgement of responsibility (see attached: *Proprietary Information Release*).
- 7.7. A copy of the preliminary data, as released to the parties or IIC, shall be retained for Safety Board archive.
- 7.8. Animations, reconstructions or graphic simulations are not typically released with FDR data, unless authorized by Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the Chief of the Vehicle Recorder Division.
- 7.9. Preliminary data released to the parties or IIC may contain non-validated data, and shall bear notation to that effect. The final report shall contain finalized and validated data for the parameters and time periods used and deemed pertinent, but not necessarily for every parameter and data point recorded.
- 7.10. Copies of the waveform or binary data are generally not released, unless authorized by Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the Chief of the Vehicle Recorder Division.

8 FDR Preliminary Data: Safety Board Staff and Official Use

- 8.1. An electronic file containing preliminary plots shall be distributed to the IIC and the Chief of the Vehicle Recorder Division.
- 8.2. FDR data (hardcopy or electronic) may be distributed to other group chairman or staff at the request of the IIC. The IIC may distribute data to the party members, as necessary to aid in the investigation – group chairman and staff shall not release FDR data to unauthorized individuals.

- 8.3. FDR data shall not be released to the public, except through the official public docket of the accident investigation. Specifically, Safety Board staff, FDR group members, and other individuals with access to the FDR data (including party members) are prohibited from releasing FDR information to unauthorized individuals. However, the Safety Board may decide to publicly release information regarding FDR activity.
- 8.4. FDR plots may be overlaid with characterizations of CVR text or other events. Also, other data from the investigation (radar, etc.) may be correlated with FDR data. If applicable, the correlation between CVR events, FDR, and other data shall be coordinated between the CVR, Vehicle Performance and other pertinent group chairmen.
- 8.5. Timing and correlation between FDR and other data sources is not a group activity.
- 8.6. In the course of an investigation, other group chairman may use FDR data, as necessary (to create plots, simulations, etc.). However, it is the responsibility of the group chairman to coordinate with the FDR group chairman to ensure that the data and plots utilized are up-to-date and accurate before finalizing in a report.
- 8.7. The Directors of the Offices of Research and Engineering and Aviation Safety shall coordinate requests from Board Members to review FDR data, prior to public release.
- 8.8. With approval of the Directors of the Offices of Research and Engineering and Aviation Safety, generic FDR data with accident/incident-specific information removed may be released for aviation safety-related interests on a case-by-case basis.
- 8.9. FDRs contain highly sensitive material, and premature or unauthorized release of information by Safety Board employees is grounds for disciplinary action.

9 Planning the FDR Group Meeting

- 9.1. Not all FDRs that are sent to Safety Board headquarters result in the establishment of an FDR group. The Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the IIC, determine if a group is necessary.
- 9.2. The FDR specialist is the group chairman for the FDR portion of the investigation and shall be included in any correspondence and discussions that pertain to all group chairmen participating in the investigation.
- 9.3. The IIC shall coordinate through the Chief of the Vehicle Recorder Division to appoint FDR group members and to select a tentative date for an FDR group meeting at Safety Board headquarters. The group meeting does not necessarily occur immediately after the FDR is sent to headquarters and may last more than one day.
- 9.4. The IIC shall notify the party coordinators that an FDR group is convening.

- 9.5. The IIC must ensure that only parties appropriate to the FDR group are invited. Appropriate parties typically include: the FAA, manufacturer, pilot union, and owner/operator.
- 9.6. Party representatives that can provide a technical contribution may be assigned to the FDR group. Typically individuals seated on the FDR group include those familiar with the aircraft systems, aircraft performance, or FDR readouts. The party coordinator is not automatically qualified to be an FDR group member.
- 9.7. Ordinarily, only one representative per party is seated on the FDR group. Additional party representatives may be seated, at the discretion of the Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the IIC and the FDR group chairman.
- 9.8. Downloading and transcribing the FDR data can take several hours and the FDR group meeting may not convene immediately after FDR delivery to the Safety Board laboratory. The IIC finalizes a meeting time and date with the FDR group chairman, and notifies the group members.
- 9.9. The IIC shall forward the names of the authorized FDR group members to the FDR group chairman and the Chief of the Vehicle Recorder Division, prior to the FDR group's arrival.
- 9.10. The IIC shall advise FDR group members to go to the 6th floor reception area at the 490 L'Enfant Plaza office elevators and ask the receptionist to contact the FDR group chairman.

10 The FDR Group Meeting

- 10.1. At the designated meeting time, the FDR group members are met at the reception desk and escorted into the FDR laboratory by the FDR group chairman.
- 10.2. The FDR group chairman shall explain the FDR policies to the group and shall facilitate the group's effort to process and evaluate the FDR data.
- 10.3. Specifically with regard to FDR policies, FDR group members are prohibited from releasing FDR information to the public. However, the Safety Board may decide to publicly release information regarding FDR activity. FDR policy does not prohibit a party from implementing safety-of-flight related adjustments within their organization, as a result of their participation in a FDR group. See attached *49 CFR 831.13–Flow and dissemination of accident or incident information*.
- 10.4. The group members must sign the *FDR Group Attendance Sheet* and *Statement of Party Representatives to NTSB Investigation* (see attached). The FAA signs the attendance sheet but does not sign the party representative form.

- 10.5. The FDR group chairman, in coordination with the Directors of the Offices of Research and Engineering and Aviation Safety, may excuse any member who is disruptive to the process or is in violation of *49 CFR 831.11–Parties to the investigation*.
- 10.6. The Chief of the Vehicle Recorder Division shall keep the IIC and the Directors of the Offices of Research and Engineering and Aviation Safety apprised of the FDR group activities.
- 10.7. During the course of an investigation it may be necessary to obtain technical assistance from non-party organizations, such as the FDAU (flight data acquisition unit) manufacturer or the FDR manufacturer. The individuals providing technical assistance to the Safety Board shall not ordinarily be made members of the FDR group. The assistance shall be coordinated through the Chief of the Vehicle Recorder Division.

11 FDR Animations

- 11.1. Animations are not created for every accident/incident.
- 11.2. Animations may require additional Safety Board staff and resources.
- 11.3. Both the Vehicle Recorder and Vehicle Performance divisions have the capability of creating animations from FDR data.
- 11.4. The production of animations for Safety Board investigative use or in support of Board meetings and hearings shall be coordinated and approved through the Director of the Office of Research and Engineering, in consultation with the Chiefs of the Vehicle Recorder and Vehicle Performance divisions.
- 11.5. Animation source files shall not be released.
- 11.6. Animation videos may be released to the public (including parties to the investigation) when they are placed into the public docket.
- 11.7. The Director of the Office of Research and Engineering shall coordinate requests from staff and Board Members to review animations, prior to public release.

12 The FDR Factual Report

- 12.1. The FDR factual report typically contains information about the FDR type, operation, damage (with appropriate documentation), data extraction methods, quality and a summary of events.
- 12.2. If an FDR group convenes, the FDR group members shall have the opportunity to review and comment on the draft factual report.

- 12.3. The Chief of the Vehicle Recorder Division reviews and approves the final factual report.
- 12.4. CVR transcript-related sections (excluding timing information), or any CVR-related text shall not be distributed to any party coordinators, group members, unauthorized staff, or the general public prior to the public release of the CVR factual report with transcript. However, at times it may be necessary to use paraphrased CVR text with FDR data. The Directors of the Offices of Research and Engineering and Aviation Safety shall approve any CVR-related paraphrased text that is disseminated prior to the public release of the CVR transcript.
- 12.5. The FDR report, including plots and data, shall be released to the public at the time the docket is opened. Any plots included in the factual report submitted to the docket shall have an accompanying CSV file containing all data presented in the plots.

13 Release of the Recorder and Original Data Media

- 13.1. The IIC shall supply the FDR specialist with the recorder's return organization and address. Ordinarily with minor accidents and incidents, the owner/operator at the time of the accident or incident is the rightful return organization. However, there are instances when the rightful return organization is less apparent, such as when the insurance company has control of the wreckage, or there are fractional owners, or if the aircraft is leased. If there is uncertainty regarding the proper return organization, the IIC and FDR specialist shall contact the General Counsel, who can resolve any issues regarding who shall receive the FDR and original FDR media.
- 13.2. For tape-based FDRs from which the tape has been removed, the FDR unit may be returned to the owner (or authorized recipient) as soon as the FDR specialist determines that there are no issues related to its operation.
- 13.3. Although most subsequent data work is accomplished using the downloaded raw data or a digital copy of the original recorded data, the original recorded media may be used in the course of the investigation. The original media is returned to the authorized recipient only after the investigation is complete.
- 13.4. Typically with a solid-state FDR or a tape-based FDR containing the original tape, the entire FDR is considered "The Original Data" and shall not be released until the investigation is complete or otherwise authorized by the Directors of the Offices of Research and Engineering and Aviation Safety on a case-by-case basis.
- 13.5. Prior to returning any original FDR recording medium (solid state recorder or the original tape), the FDR specialist shall obtain specific permission from the Directors of the Offices of Research and Engineering and Aviation Safety, in coordination with the IIC.

14 Military Investigations or Other Federal Agencies

- 14.1. On occasion the Safety Board is asked to assist with the recovery and read-out of an FDR involved in a military/Federal investigation. The specific tasks requested by the DOD or Federal agency, and the extent of participation by the Safety Board FDR laboratory, is determined by the Directors of the Offices of Research and Engineering and Aviation Safety.
- 14.2. The investigating organization may require a report of FDR-related procedures performed.
- 14.3. Normally, the original and all copies of the data and reports are returned to the investigating agency. The Safety Board shall not retain any copies.

15 NTSB Investigation with Foreign Representatives

- 15.1. When the Safety Board conducts an investigation that involves a foreign operator/manufacturer, Safety Board FDR standard procedures and policies apply, in consultation with the foreign government's Accredited Representative.
- 15.2. Coordination between the governments is managed by the IIC with the Directors of the Offices of Research and Engineering and Aviation Safety, and the foreign government's Accredited Representative.
- 15.3. The IIC shall clearly identify the participants from the foreign government and their technical advisors to the FDR specialist, in order to avoid unauthorized access to the FDR data.
- 15.4. The Safety Board and the French Bureau Enquetes-Accidents have a Memorandum of Agreement that defines the cooperation between the two countries (see attached: *NTSB and BEA Memorandum of Agreement*).

16 Foreign Investigations with NTSB Participation or Assistance

- 16.1. Under ICAO Annex 13, when the Safety Board is asked to participate or assist in a non-U.S. investigation, the Safety Board FDR laboratory may be used for the FDR portion of the investigation.
- 16.2. The Safety Board's accredited representative must coordinate through the Chief of the Vehicle Recorder Division to select a date for FDR services at Safety Board headquarters.
- 16.3. If the Safety Board assists a foreign government in their accident investigation and the services of an FDR specialist are required, the Safety Board's Accredited Representative

shall coordinate the scope of the requested services through the Directors of the Offices of Research and Engineering and Aviation Safety. Assistance in the FDR portion of a foreign investigation may include: downloading the FDR, producing plots, preparing the data, or running an FDR group.

- 16.4. Any subsequent animations or performance analysis of the FDR data shall be arranged through the Safety Board's Accredited Representative in consultation with the Director of Research and Engineering and the Chief of the Vehicle Performance Division. Performance studies and animations may require additional Safety Board staff and resources, and it shall not be assumed that the work is automatically included as part of the FDR activities.
- 16.5. The Safety Board's accredited representative shall introduce the point of contact for the foreign investigation (the foreign government's IIC or designee). It shall be made clear to all participants involved with FDR activities that the FDR specialist shall only be coordinating with the foreign government through the individual designated as the point of contact.
- 16.6. Participants from the foreign government and their technical advisors shall clearly be identified to the FDR specialist to avoid unauthorized access to the FDR data.
- 16.7. The FDR specialist shall keep the Safety Board's accredited representative and the foreign government's IIC or designee apprised of any FDR activities or actions.
- 16.8. When assisting in a foreign government's investigation, the FDR specialist shall advise the investigating government's IIC or designee of the Safety Board's FDR policies and procedures. In the absence of specific guidance from the investigating government, pertinent Safety Board FDR standard practices and procedures apply.
- 16.9. Any issues or conflicts concerning FDR procedures shall immediately be brought to the attention of the Directors of the Offices of Research and Engineering and Aviation Safety, in consultation with the Safety Board's Accredited Representative, for immediate resolution.
- 16.10. Generally, the investigating government may require a brief report of procedures performed, along with plots, if applicable.
- 16.11. At the request of the foreign government's IIC or designee, data, plots and reports shall be distributed, in consultation with the Safety Board's Accredited Representative and the Directors of the Offices of Research and Engineering and Aviation Safety.
- 16.12. The original data and recorder shall be returned to the foreign government's IIC or designee.
- 16.13. During a foreign investigation, the foreign officials are guests of the Safety Board and shall be welcomed accordingly. During the FDR activities, coordination of daily events, such as meeting time, lunch and other breaks, shall be coordinated with the FDR specialist.

- 16.14. During the initial meeting after the arrival of the foreign officials, the role of the FDR specialist shall be relayed to the group participants in order to avoid unnecessary delays in completing the FDR activities.
- 16.15. The Safety Board and the French Bureau Enquetes-Accidents have a Memorandum of Agreement that defines the cooperation between the two countries (see attached: *NTSB and BEA Memorandum of Agreement*).
- 16.16. Foreign investigations with Safety Board participation or assistance are protected from FOIA requests for 2 years.

**ATTACHMENT A: Statement of Party Representatives to
NTSB Investigation**

ATTACHMENT B: FDR Group Attendance Sheet



FDR Group Attendance Sheet and Business Cards

Meeting Date: _____ NTSB#: _____

Accident/Incident Date: _____ Location: _____

Aircraft Registration: _____ Aircraft Type: _____

Operator/Owner: _____ FDR Type: _____

From 49 CFR 831.13—Flow and dissemination of accident or incident information.

(b) All information concerning the accident or incident obtained by any person or organization participating in the investigation shall be passed to the IIC through appropriate channels before being provided to any individual outside the investigation. Parties to the investigation may relay to their respective organizations information necessary for purposes of prevention or remedial action. However, no information concerning the accident or incident may be released to any person not a party representative to the investigation (including non-party representative employees of the party organization) before initial release by the Safety Board without prior consultation and approval of the IIC.

<i>Name</i>	<i>Signature</i>	<i>Party</i>
_____	_____	_____
_____	_____	_____
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Meeting Date: _____ NTSB #: _____ Accident/Incident Date: _____



National Transportation Safety Board

Office of Research and Engineering

Vehicle Recorder Division (RE-40)
490 L'Enfant Plaza East, SW
Washington, DC 20594-2000

Email: _____
Fax: 202.314.6599
Ph: 202.314 - _____

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ATTACHMENT C: Proprietary Information Release



Proprietary Information Release

Investigation:

NTSB# _____ Date of Accident: _____ Aircraft Type: _____

Aircraft registration #: _____ Operator: _____ Owner: _____

Investigative activity:

FDR Group ____ Other (specify): _____ Activity Date: _____

The following information is being distributed to the undersigned for the express purpose of aiding the Safety Board in the investigation.

Description: _____

Format: _____ Application: _____

Owner: _____ Contact Information: _____

By signing this form, the party receiving the information agrees to handle the information as proprietary and accepts responsibility for its protection.

Printed Name Signature Organization Date

Printed Name Signature Organization Date

Printed Name Signature Organization Date

Printed Name Signature Organization Date

Printed Name Signature Organization Date

ATTACHMENT D: Federal FDR Legislation and Regulations

Federal FDR Legislation and Regulations

The following codes are referenced in this section: 49 CFR 831.11, 49 CFR 831.13, 14 CFR 23.1459, 14 CFR 25.1457, 14 CFR 27.1457, 14 CFR 29.1457, 14 CFR 121.343, 14 CFR 121.344, 14 CFR 121.344a, 14 CFR 125.225, 14 CFR 125.226 14 CFR 129.20, 14 CFR 135.152, and 14 CFR 91.609. **Please check the appropriate sections and codes to obtain current regulations**.

From 49 CFR 831.11–Parties to the investigation

- (a) All Investigations, regardless of mode. (1) The investigator-in-charge designates parties to participate in the investigation. Parties shall be limited to those persons, government agencies, companies, and associations whose employees, functions, activities, or products were involved in the accident or incident and who can provide suitable qualified technical personnel actively to assist in the investigation. Other than the FAA in aviation cases, no other entity is afforded the right to participate in Board investigations.
- (2) Participants in the investigation (i.e., party representatives, party coordinators, and/or the larger party organization) shall be responsive to the direction of Board representatives and may lose party status if they do not comply with their assigned duties and activity proscriptions or instructions, or if they conduct themselves in a manner prejudicial to the investigation.
- (b) Aviation investigations. In addition to compliance with the provisions of paragraph (a) of this section, and to assist in ensuring complete understanding of the requirements and limitations of party status, all party representatives in aviation investigations shall sign "Statement of Party Representatives to NTSB Investigation" immediately upon attaining party representative status. Failure timely to sign that statement may result in sanctions, including loss of status as a party.

From 49 CFR 831.13–Flow and dissemination of accident or incident information

- (b) All information concerning the accident or incident obtained by any person or organization participating in the investigation shall be passed to the IIC through appropriate channels before being provided to any individual outside the investigation. Parties to the investigation may relay to their respective organizations information necessary for purposes of prevention or remedial action. However, no information concerning the accident or incident may be released to any person not a party representative to the investigation (including non-party representative employees of the party organization) before initial release by the Safety Board without prior consultation and approval of the IIC.

From 14 CFR 23.1459–Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes–Flight Recorders

- (a) Each flight recorder required by the operating rules of this chapter must be installed so that:
 - (1) It is supplied with airspeed, altitude, and directional data obtained from sources that meet the accuracy requirements of Secs. 23.1323, 23.1325, and 23.1327, as appropriate;

* Section is current, as of November 2001. Internet website addresses of complete and current regulations: *Code of Federal Regulations:* <http://www.access.gpo.gov/nara/cfr/index.html>
United States Code: <http://uscode.house.gov/uscode.htm>

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- (2) The vertical acceleration sensor is rigidly attached, and located longitudinally either within the approved center of gravity limits of the airplane, or at a distance forward or aft of these limits that does not exceed 25 percent of the airplane's mean aerodynamic chord;
- (3) It receives its electrical power from the bus that provides the maximum reliability for operation of the flight recorder without jeopardizing service to essential or emergency loads;
- (4) There is an aural or visual means for preflight checking of the recorder for proper recording of data in the storage medium.
- (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; and
- (b) Each nonejectable record container must be located and mounted so as to minimize the probability of container rupture resulting from crash impact and subsequent damage to the record from fire. In meeting this requirement the record container must be located as far aft as practicable, but need not be aft of the pressurized compartment, and may not be where aft-mounted engines may crush the container upon impact.
- (c) A correlation must be established between the flight recorder readings of airspeed, altitude, and heading and the corresponding readings (taking into account correction factors) of the first pilot's instruments. The correlation must cover the airspeed range over which the airplane is to be operated, the range of altitude to which the airplane is limited, and 360 degrees of heading. Correlation may be established on the ground as appropriate.
- (d) Each recorder container must:
 - (1) Be either bright orange or bright yellow;
 - (2) Have reflective tape affixed to its external surface to facilitate its location under water; and
 - (3) Have an underwater locating device, when required by the operating rules of this chapter, on or adjacent to the container, which is secured in such a manner, that they are not likely to be separated during crash impact.
- (e) Any novel or unique design or operational characteristics of the aircraft shall be evaluated to determine if any dedicated parameters must be recorded on flight recorders in addition to or in place of existing requirements. CITA<ls-thn-eq>[Amdt. 23-35, 53 FR 26143, July 11, 1988]

From 14 CFR 25.1459–Airworthiness Standards: Transport Category Airplanes–Flight Recorders

- (a) Each flight recorder required by the operating rules of this chapter must be installed so that--
 - (1) It is supplied with airspeed, altitude, and directional data obtained from sources that meet the accuracy requirements of Secs. 25.1323, 25.1325, and 25.1327, as appropriate;
 - (2) The vertical acceleration sensor is rigidly attached, and located longitudinally either within the approved center of gravity limits of the airplane, or at a distance forward or aft of these limits that does not exceed 25 percent of the airplane's mean aerodynamic chord;
 - (3) It receives its electrical power from the bus that provides the maximum reliability for operation of the flight recorder without jeopardizing service to essential or emergency loads;
 - (4) There is an aural or visual means for preflight checking of the recorder for proper recording of data in the storage medium.
 - (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; and
 - (6) There is a means to record data from which the time of each radio transmission either to or from ATC can be determined.
- (b) Each nonejectable record container must be located and mounted so as to minimize the probability of container rupture resulting from crash impact and subsequent damage to the

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record from fire. In meeting this requirement the record container must be located as far aft as practicable, but need not be aft of the pressurized compartment, and may not be where aft-mounted engines may crush the container upon impact.

- (c) A correlation must be established between the flight recorder readings of airspeed, altitude, and heading and the corresponding readings (taking into account correction factors) of the first pilot's instruments. The correlation must cover the airspeed range over which the airplane is to be operated, the range of altitude to which the airplane is limited, and 360 degrees of heading. Correlation may be established on the ground as appropriate.
- (d) Each recorder container must--
 - (1) Be either bright orange or bright yellow;
 - (2) Have reflective tape affixed to its external surface to facilitate its location under water; and
 - (3) Have an underwater locating device, when required by the operating rules of this chapter, on or adjacent to the container, which is secured in such a manner, that they are not likely to be separated during crash impact.
- (e) Any novel or unique design or operational characteristics of the aircraft shall be evaluated to determine if any dedicated parameters must be recorded on flight recorders in addition to or in place of existing requirements. [Amdt. 25-8, 31 FR 127, Jan. 6, 1966, as amended by Amdt. 25-25, 35 FR 13192, Aug. 19, 1970; Amdt. 25-37, 40 FR 2577, Jan. 14, 1975; Amdt. 25-41, 42 FR 36971, July 18, 1977; Amdt. 25-65, 53 FR 26144, July 11, 1988]

From 14 CFR 27.1459–Airworthiness Standards: Normal Category Rotorcraft–Flight Recorders

- (a) Each flight recorder required by the operating rules of Subchapter G of this chapter must be installed so that:
 - (1) It is supplied with airspeed, altitude, and directional data obtained from sources that meet the accuracy requirements of Secs. 27.1323, 27.1325, and 27.1327 of this part, as applicable;
 - (2) The vertical acceleration sensor is rigidly attached, and located longitudinally within the approved center of gravity limits of the rotorcraft;
 - (3) It receives its electrical power from the bus that provides the maximum reliability for operation of the flight recorder without jeopardizing service to essential or emergency loads;
 - (4) There is an aural or visual means for preflight checking of the recorder for proper recording of data in the storage medium;
 - (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 any crash impact; and
- (b) Each nonejectable recorder container must be located and mounted so as to minimize the probability of container rupture resulting from crash impact and subsequent damage to the record from fire.
- (c) A correlation must be established between the flight recorder readings of airspeed, altitude, and heading and the corresponding readings (taking into account correction factors) of the first pilot's instruments. This correlation must cover the airspeed range over which the aircraft is to be operated, the range of altitude to which the aircraft is limited, and 360 degrees of heading. Correlation may be established on the ground as appropriate.
- (d) Each recorder container must:
 - (1) Be either bright orange or bright yellow;
 - (2) Have a reflective tape affixed to its external surface to facilitate its location under water; and

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- (3) Have an underwater locating device, when required by the operating rules of this chapter, on or adjacent to the container which is secured in such a manner that they are not likely to be separated during crash impact. [Amdt. 27-22, 53 FR 26144, July 11, 1988]

From 14 CFR 29.1459–Airworthiness Standards: Transport Category Rotorcraft–Flight Recorders

- (a) Each flight recorder required by the operating rules of Subchapter G of this chapter must be installed so that:
 - (1) It is supplied with airspeed, altitude, and directional data obtained from sources that meet the accuracy requirements of Secs. 29.1323, 29.1325, and 29.1327 of this part, as applicable;
 - (2) The vertical acceleration sensor is rigidly attached, and located longitudinally within the approved center of gravity limits of the rotorcraft;
 - (3) It receives its electrical power from the bus that provides the maximum reliability for operation of the flight recorder without jeopardizing service to essential or emergency loads;
 - (4) There is an aural or visual means for perflight checking of the recorder for proper recording of data in the storage medium; and
 - (5) Except for recorders powered solely by the engine-drive 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 any crash impact.
- (b) Each nonejectable recorder container must be located and mounted so as to minimize the probability of container rupture resulting from crash impact and subsequent damage to the record from fire.
- (c) A correlation must be established between the flight recorder readings of airspeed, altitude, and heading and the corresponding readings (taking into account correction factors) of the first pilot's instruments. This correlation must cover the airspeed range over which the aircraft is to be operated, the range of altitude to which the aircraft is limited, and 360 degrees of heading. Correlation may be established on the ground as appropriate.
- (d) Each recorder container must:
 - (1) Be either bright orange or bright yellow;
 - (2) Have a reflective tape affixed to its external surface to facilitate its location under water; and
 - (3) Have an underwater locating device, when required by the operating rules of this chapter, on or adjacent to the container which is secured in such a manner that it is not likely to be separated during crash impact. [Amdt. 29-25, 53 FR 26145, July 11, 1988; 53 FR 26144, July 11, 1988]

From 14 CFR 121.343–Operating Requirements: Domestic, Flag, and Supplemental Operations–Flight Recorders

- (a) Except as provided in paragraphs (b), (c), (d), (e), and (f) of this section, 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 may be determined within the ranges, accuracies, and recording intervals specified in appendix B of this part:
 - (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading; and

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- (6) Time of each radio transmission either to or from air traffic control.
- (b) No person may operate a large airplane type certificated up to and including September 30, 1969, for operations above 25,000 feet altitude, or a turbine-engine powered airplane certificated before the same date, unless it is equipped before May 26, 1989 with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The following information must be able to be determined within the ranges, accuracies, and recording intervals specified in appendix B of this part:
 - (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading; and
- (6) Time of each radio transmission either to or from air traffic control.
- (c) Except as provided in paragraph (l) of this section, no person may operate an airplane specified in paragraph (b) of this section unless it is equipped, before May 26, 1994, with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The following information must be able to be determined within the ranges, accuracies and recording intervals specified in appendix B of this part:
 - (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading;
 - (6) Time of each radio transmission either to or from air traffic control;
 - (7) Pitch attitude;
 - (8) Roll attitude;
 - (9) Longitudinal acceleration;
 - (10) Control column or pitch control surface position; and
 - (11) Thrust of each engine.
- (d) No person may operate an airplane specified in paragraph (b) of this section that is manufactured after May 26, 1989, as well as airplanes specified in paragraph (a) of this section that have been type certificated after September 30, 1969, unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The following information must be able to be determined within the ranges, accuracies, and recording intervals specified in appendix B of this part:
 - (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading;
 - (6) Time of each radio transmission either to or from air traffic control;
 - (7) Pitch attitude;
 - (8) Roll attitude;
 - (9) Longitudinal acceleration;
 - (10) Pitch trim position;
 - (11) Control column or pitch control surface position;
 - (12) Control wheel or lateral control surface position;
 - (13) Rudder pedal or yaw control surface position;

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- (14) Thrust of each engine;
- (15) Position of each thrust reverser;
- (16) Trailing edge flap or cockpit flap control position; and
- (17) Leading edge flap or cockpit flap control position.

For the purpose of this section, manufactured means the point in time at which the airplane inspection acceptance records reflect that the airplane is complete and meets the FAA-approved type design data.

- (e) After October 11, 1991, no person may operate a large airplane equipped with a digital data bus and ARINC 717 digital flight data acquisition unit (DFDAU) or equivalent unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. Any parameters specified in appendix B of this part that are available on the digital data bus must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified.
- (f) After October 11, 1991, no person may operate an airplane specified in paragraph (b) of this section that is manufactured after October 11, 1991, nor an airplane specified in paragraph (a) of this section that has been type certificated after September 30, 1969, and manufactured after October 11, 1991, unless it is equipped with one or more flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The parameters specified in appendix B of this part must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified.
- (g) 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.
- (h) Except as provided in paragraph (i) of this section, and except for recorded data erased as authorized in this paragraph, each certificate holder shall keep the recorded data prescribed in paragraph (a), (b), (c), or (d) of this section, as appropriate, until the airplane has been operated for at least 25 hours of the operating time specified in Sec. 121.359(a). A total of 1 hour of recorded data may be erased for the purpose of testing the flight recorder or the flight recorder system. Any erasure made in accordance with this paragraph must be of the oldest recorded data accumulated at the time of testing. Except as provided in paragraph (i) of this section, no record need be kept more than 60 days.
- (i) In the event of an accident or occurrence that requires immediate notification of the National Transportation Safety Board under part 830 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), (b), (c), or (d) of this section, as appropriate, for at least 60 days or for a longer period upon the request of the Board or the Administrator.
- (j) Each flight recorder required by this section must be installed in accordance with the requirements of Sec. 25.1459 of this chapter in effect on August 31, 1977. The correlation required by Sec. 25.1459(c) of this chapter 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 the 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 the certificate holder.
- (k) Each flight recorder required by this section that records the data specified in paragraph (a), (b), (c), or (d) of this section, as appropriate, must have an approved device to assist in locating that recorder under water.
- (l) No person may operate an airplane specified in paragraph (b) of this section that meets the Stage 2 noise levels of part 36 of this chapter and is subject to Sec. 91.801(c) of this chapter

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unless it is equipped with one or more approved flight data recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The information specified in paragraphs (c)(1) through (c)(11) of this section must be able to be determined within the ranges, accuracies and recording intervals specified in appendix B of this part. In addition--

- (1) This flight data recorder must be installed at the next heavy maintenance check after May 26, 1994, but no later than May 26, 1995. A heavy maintenance check is considered to be any time an aircraft is scheduled to be out of service for 4 or more days.
- (2) By June 23, 1994, each carrier must submit to the FAA Flight Standards Service, Air Transportation Division (AFS-200), documentation listing those airplanes covered under this paragraph and evidence that it has ordered a sufficient number of flight data recorders to meet the May 26, 1995, compliance date for all aircraft on that list.
- (3) After May 26, 1994, any aircraft that is modified to meet Stage 3 noise levels must have the flight data recorder described in paragraph (c) of this section installed before operating under this part. [Doc. No. 24418, 52 FR 9636, Mar. 25, 1987, as amended by Amdt. 121-197, 53 FR 26147, July 11, 1988; Amdt. 121-238, 59 FR 26900, May 24, 1994]

From 14 CFR 121.344—Operating Requirements: Domestic, Flag, and Supplemental Operations— Digital Flight Data Recorders For Transport Category Airplanes

- (a) Except as provided in paragraph (l) of this section, no person may operate under this part a turbine-engine-powered transport category airplane unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The operational parameters required to be recorded by digital flight data recorders required by this section are as follows: The phrase ``when an information source is installed" following a parameter indicates that recording of that parameter is not intended to require a change in installed equipment:
 - (1) Time;
 - (2) Pressure altitude;
 - (3) Indicated airspeed;
 - (4) Heading--primary flight crew reference (if selectable, record discrete, true or magnetic);
 - (5) Normal acceleration (Vertical);
 - (6) Pitch attitude;
 - (7) Roll attitude;
 - (8) Manual radio transmitter keying, or CVR/DFDR synchronization reference;
 - (9) Thrust/power of each engine--primary flight crew reference;
 - (10) Autopilot engagement status;
 - (11) Longitudinal acceleration;
 - (12) Pitch control input;
 - (13) Lateral control input;
 - (14) Rudder pedal input;
 - (15) Primary pitch control surface position;
 - (16) Primary lateral control surface position;
 - (17) Primary yaw control surface position;
 - (18) Lateral acceleration;

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- (19) Pitch trim surface position or parameters of paragraph (a)(82) of this section if currently recorded;
- (20) Trailing edge flap or cockpit flap control selection (except when parameters of paragraph (a)(85) of this section apply);
- (21) Leading edge flap or cockpit flap control selection (except when parameters of paragraph (a)(86) of this section apply);
- (22) Each Thrust reverser position (or equivalent for propeller airplane);
- (23) Ground spoiler position or speed brake selection (except when parameters of paragraph (a)(87) of this section apply);
- (24) Outside or total air temperature;
- (25) Automatic Flight Control System (AFCS) modes and engagement status, including autothrottle;
- (26) Radio altitude (when an information source is installed);
- (27) Localizer deviation, MLS Azimuth;
- (28) Glideslope deviation, MLS Elevation;
- (29) Marker beacon passage;
- (30) Master warning;
- (31) Air/ground sensor (primary airplane system reference nose or main gear);
- (32) Angle of attack (when information source is installed);
- (33) Hydraulic pressure low (each system);
- (34) Ground speed (when an information source is installed);
- (35) Ground proximity warning system;
- (36) Landing gear position or landing gear cockpit control selection;
- (37) Drift angle (when an information source is installed);
- (38) Wind speed and direction (when an information source is installed);
- (39) Latitude and longitude (when an information source is installed);
- (40) Stick shaker/pusher (when an information source is installed);
- (41) Windshear (when an information source is installed);
- (42) Throttle/power lever position;
- (43) Additional engine parameters (as designated in Appendix M of this part);
- (44) Traffic alert and collision avoidance system;
- (45) DME 1 and 2 distances;
- (46) Nav 1 and 2 selected frequency;
- (47) Selected barometric setting (when an information source is installed);
- (48) Selected altitude (when an information source is installed);
- (49) Selected speed (when an information source is installed);
- (50) Selected mach (when an information source is installed);
- (51) Selected vertical speed (when an information source is installed);
- (52) Selected heading (when an information source is installed);
- (53) Selected flight path (when an information source is installed);
- (54) Selected decision height (when an information source is installed);
- (55) EFIS display format;
- (56) Multi-function/engine/alerts display format;
- (57) Thrust command (when an information source is installed);
- (58) Thrust target (when an information source is installed);
- (59) Fuel quantity in CG trim tank (when an information source is installed);
- (60) Primary Navigation System Reference;
- (61) Icing (when an information source is installed);
- (62) Engine warning each engine vibration (when an information source is installed);
- (63) Engine warning each engine over temp. (when an information source is installed);
- (64) Engine warning each engine oil pressure low (when an information source is installed);

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- (65) Engine warning each engine over speed (when an information source is installed);
 - (66) Yaw trim surface position;
 - (67) Roll trim surface position;
 - (68) Brake pressure (selected system);
 - (69) Brake pedal application (left and right);
 - (70) Yaw or sideslip angle (when an information source is installed);
 - (71) Engine bleed valve position (when an information source is installed);
 - (72) De-icing or anti-icing system selection (when an information source is installed);
 - (73) Computed center of gravity (when an information source is installed);
 - (74) AC electrical bus status;
 - (75) DC electrical bus status;
 - (76) APU bleed valve position (when an information source is installed);
 - (77) Hydraulic pressure (each system);
 - (78) Loss of cabin pressure;
 - (79) Computer failure;
 - (80) Heads-up display (when an information source is installed);
 - (81) Para-visual display (when an information source is installed);
 - (82) Cockpit trim control input position--pitch;
 - (83) Cockpit trim control input position--roll;
 - (84) Cockpit trim control input position--yaw;
 - (85) Trailing edge flap and cockpit flap control position;
 - (86) Leading edge flap and cockpit flap control position;
 - (87) Ground spoiler position and speed brake selection; and
 - (88) All cockpit flight control input forces (control wheel, control column, rudder pedal).
- (b) For all turbine-engine powered transport category airplanes manufactured on or before October 11, 1991, by August 20, 2001.
- (1) For airplanes not equipped as of July 16, 1996, with a flight data acquisition unit (FDAU), the parameters listed in paragraphs (a)(1) through (a)(18) of this section must be recorded within the ranges and accuracies specified in Appendix B of this part, and--
 - (i) For airplanes with more than two engines, the parameter described in paragraph (a)(18) is not required unless sufficient capacity is available on the existing recorder to record that parameter;
 - (ii) Parameters listed in paragraphs (a)(12) through (a)(17) each may be recorded from a single source.
 - (2) For airplanes that were equipped as of July 16, 1996, with a flight data acquisition unit (FDAU), the parameters listed in paragraphs (a)(1) through (a)(22) of this section must be recorded within the ranges, accuracies, and recording intervals specified in Appendix M of this part. Parameters listed in paragraphs (a)(12) through (a)(17) each may be recorded from a single source.
 - (3) The approved flight recorder required by this section must be installed at the earliest time practicable, but no later than the next heavy maintenance check after August 18, 1999 and no later than August 20, 2001. A heavy maintenance check is considered to be any time an airplane is scheduled to be out of service for 4 or more days and is scheduled to include access to major structural components.
- (c) For all turbine-engine powered transport category airplanes manufactured on or before October 11, 1991--
- (1) That were equipped as of July 16, 1996, with one or more digital data bus(es) and an ARINC 717 digital flight data acquisition unit (DFDAU) or equivalent, the parameters specified in paragraphs (a)(1) through (a)(22) of this section must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix M of this part by August

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- 20, 2001. Parameters listed in paragraphs (a)(12) through (a)(14) each may be recorded from a single source.
- (2) Commensurate with the capacity of the recording system (DFDAU or equivalent and the DFDR), all additional parameters for which information sources are installed and which are connected to the recording system must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix M of this part by August 20, 2001.
 - (3) That were subject to Sec. 121.343(e) of this part, all conditions of Sec. 121.343(e) must continue to be met until compliance with paragraph (c)(1) of this section is accomplished.
 - (d) For all turbine-engine-powered transport category airplanes that were manufactured after October 11, 1991--
 - (1) The parameters listed in paragraph (a)(1) through (a)(34) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix M of this part by August 20, 2001. Parameters listed in paragraphs (a)(12) through (a)(14) each may be recorded from a single source.
 - (2) Commensurate with the capacity of the recording system, all additional parameters for which information sources are installed and which are connected to the recording system must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix M of this part by August 20, 2001.
 - (e) For all turbine-engine-powered transport category airplanes that are manufactured after August 18, 2000--
 - (1) The parameters listed in paragraph (a)(1) through (57) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix M of this part.
 - (2) Commensurate with the capacity of the recording system, all additional parameters for which information sources are installed and which are connected to the recording system, must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix M of this part.
 - (f) For all turbine-engine-powered transport category airplanes that are manufactured after August 19, 2002 the parameters listed in paragraph (a)(1) through (a)(88) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix M of this part.
 - (g) Whenever a flight data recorder required by this section is installed, it must be operated continuously from the instant the airplane begins its takeoff roll until it has completed its landing roll.
 - (h) Except as provided in paragraph (i) of this section, and except for recorded data erased as authorized in this paragraph, each certificate holder shall keep the recorded data prescribed by this section, as appropriate, until the airplane has been operated for at least 25 hours of the operating time specified in Sec. 121.359(a) of this part. A total of 1 hour of recorded data may be erased for the purpose of testing the flight recorder or the flight recorder system. Any erasure made in accordance with this paragraph must be of the oldest recorded data accumulated at the time of testing. Except as provided in paragraph (i) of this section, no record need be kept more than 60 days.
 - (i) In the event of an accident or occurrence that requires immediate notification of the National Transportation Safety Board under 49 CFR 830 of its regulations and that results in termination of the flight, the certificate holder shall remove the recorder from the airplane and keep the recorder data prescribed by this section, as appropriate, for at least 60 days or for a longer period upon the request of the Board or the Administrator.
 - (j) Each flight data recorder system required by this section must be installed in accordance with the requirements of Sec. 25.1459 (a), (b), (d), and (e) of this chapter. A correlation must be established between the values recorded by the flight data recorder and the corresponding values being measured. The correlation must contain a sufficient number of correlation points to accurately establish the conversion from the recorded values to engineering units or discrete

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state over the full operating range of the parameter. Except for airplanes having separate altitude and airspeed sensors that are an integral part of the flight data recorder system, a single correlation may be established for any group of airplanes--

- (1) That are of the same type;
 - (2) On which the flight recorder system and its installation are the same; and
 - (3) On which there is no difference in the type design with respect to the installation of those sensors associated with the flight data recorder system. Documentation sufficient to convert recorded data into the engineering units and discrete values specified in the applicable appendix must be maintained by the certificate holder.
- (k) Each flight data recorder required by this section must have an approved device to assist in locating that recorder under water.
- (l) The following airplanes that were manufactured before August 18, 1997 need not comply with this section, but must continue to comply with applicable paragraphs of Sec. 121.343 of this chapter, as appropriate:
- (1) Airplanes that meet the State 2 noise levels of part 36 of this chapter and are subject to Sec. 91.801(c) of this chapter, until January 1, 2000. On and after January 1, 2000, any Stage 2 airplane otherwise allowed to be operated under Part 91 of this chapter must comply with the applicable flight data recorder requirements of this section for that airplane.
 - (2) General Dynamics Convair 580, General Dynamics Convair 600, General Dynamics Convair 640, deHavilland Aircraft Company Ltd. DHC-7, Fairchild Industries FH 227, Fokker F-27 (except Mark 50), F-28 Mark 1000 and Mark 4000, Gulfstream Aerospace G-159, Lockheed Aircraft Corporation Electra 10-A, Lockheed Aircraft Corporation Electra 10-B, Lockheed Aircraft Corporation Electra 10-E, Lockheed Aircraft Corporation Electra L-188, Maryland Air Industries, Inc. F27, Mitsubishi Heavy Industries, Ltd. YS-11, Short Bros. Limited SD3-30, Short Bros. Limited SD3-60. [Doc. No. 28109, 62 FR 38378, July 17, 1997; 62 FR 48135, Sept. 12, 1997]

From 14 CFR 121.344a—Operating Requirements: Domestic, Flag, and Supplemental Operations— Digital Flight Data Recorders For 10-19 Seat Airplanes

- (a) Except as provided in paragraph (f) of this section, no person may operate under this part a turbine-engine-powered airplane having a passenger seating configuration, excluding any required crewmember seat, of 10 to 19 seats, that was brought onto the U.S. register after, or was registered outside the United States and added to the operator's U.S. operations specifications after, October 11, 1991, unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. On or before August 20, 2001, airplanes brought onto the U.S. register after October 11, 1991, must comply with either the requirements in this section or the applicable paragraphs in Sec. 135.152 of this chapter. In addition, by August 20, 2001.
- (1) The parameters listed in Secs. 121.344(a)(1) through 121.344(a)(18) of this part must be recorded with the ranges, accuracies, and resolutions specified in Appendix B of part 135 of this chapter, except that--
 - (i) Either the parameter listed in Sec. 121.344 (a)(12) or (a)(15) of this part must be recorded; either the parameters listed in Sec. 121.344(a)(13) or (a)(16) of this part must be recorded; and either the parameter listed in Sec. 121.344(a)(14) or (a)(17) of this part must be recorded.

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- (ii) For airplanes with more than two engines, the parameter described in Sec. 121.344(a)(18) of this part must also be recorded if sufficient capacity is available on the existing recorder to record that parameter;
- (iii) Parameters listed in Secs. 121.344(a)(12) through 121.344(a)(17) of this part each may be recorded from a single source;
- (iv) Any parameter for which no value is contained in Appendix B of part 135 of this chapter must be recorded within the ranges, accuracies, and resolutions specified in Appendix M of this part.
- (2) Commensurate with the capacity of the recording system (FDAU or equivalent and the DFDR), the parameters listed in Secs. 121.344(a)(19) through 121.344(a)(22) of this part also must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix B of part 135 of this chapter.
- (3) The approved flight recorder required by this section must be installed as soon as practicable, but no later than the next heavy maintenance check or equivalent after August 18, 1999. A heavy maintenance check is considered to be any time an airplane is scheduled to be out of service for 4 more days and is scheduled to include access to major structural components.
- (b) For a turbine-engine-powered airplanes having a passenger seating configuration, excluding any required crewmember seat, of 10 to 19 seats, that are manufactured after August 18, 2000.
 - (1) The parameters listed in Secs. 121.344(a)(1) through 121.344(a)(57) of this part, must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix M of this part.
 - (2) Commensurate with the capacity of the recording system, all additional parameters listed in Sec. 121.344(a) of this part for which information sources are installed and which are connected to the recording system, must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix M of this part by August 20, 2001.
 - (c) For all turbine-engine-powered airplanes having a passenger seating configuration, excluding any required crewmember seats, of 10 to 19 seats, that are manufactured after August 19, 2002, the parameters listed in Sec. 121.344(a)(1) through (a)(88) of this part must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix M of this part.
 - (d) Each flight data recorder system required by this section must be installed in accordance with the requirements of Sec. 23.1459 (a), (b), (d), and (e) of this chapter. A correlation must be established between the values recorded by the flight data recorder and the corresponding values being measured. The correlation must contain a sufficient number of correlation points to accurately establish the conversion from the recorded values to engineering units or discrete state over the full operating range of the parameter. A single correlation may be established for any group of airplanes--
 - (1) That are of the same type;
 - (2) On which the flight recorder system and its installation are the same; and
 - (3) On which there is no difference in the type design with respect to the installation of those sensors associated with the flight data recorder system. Correlation documentation must be maintained by the certificate holder.
 - (e) All airplanes subject to this section are also subject to the requirements and exceptions stated in Secs. 121.344(g) through 121.344(k) of this part.
 - (f) For airplanes that were manufactured before August 18, 1997, the following airplane types need not comply with this section, but must continue to comply with applicable paragraphs of Sec. 135.152 of this chapter, as appropriate: Beech Aircraft-99 Series, Beech Aircraft 1300, Beech Aircraft 1900C, Construcciones Aeronauticas, S.A. (CASA) C-212, deHavilland DHC-6, Dornier 228, HS-748, Embraer EMB 110, Jetstream 3101, Jetstream 3201, Fairchild Aircraft SA-226. [Doc. No. 28109, 62 FR 38380, July 17, 1997; 62 FR 48135, Sept. 12, 1997; 62 FR 65202, Dec. 11, 1997]

From 14 CFR 125.225—Certification And Operations: Airplanes Having A Seating Capacity Of 20 Or More Passengers Or A Maximum Payload Capacity Of 6,000 Pounds Or More; And Rules Governing Persons On Board Such Aircraft—Flight Recorders

- (a) Except as provided in paragraph (d) of this section, after October 11, 1991, no person may operate a large airplane type certificated before October 1, 1969, for operations above 25,000 feet altitude, nor a multiengine, turbine powered airplane type certificated before October 1, 1969, unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The following information must be able to be determined within the ranges, accuracies, resolution, and recording intervals specified in appendix D of this part:
- (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading;
 - (6) Time of each radio transmission to or from air traffic control;
 - (7) Pitch attitude;
 - (8) Roll attitude;
 - (9) Longitudinal acceleration;
 - (10) Control column or pitch control surface position; and
 - (11) Thrust of each engine.
- (b) Except as provided in paragraph (d) of this section, after October 11, 1991, no person may operate a large airplane type certificated after September 30, 1969, for operations above 25,000 feet altitude, nor a multiengine, turbine powered airplane type certificated after September 30, 1969, unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The following information must be able to be determined within the ranges, accuracies, resolutions, and recording intervals specified in appendix D of this part:
- (1) Time;
 - (2) Altitude;
 - (3) Airspeed;
 - (4) Vertical acceleration;
 - (5) Heading;
 - (6) Time of each radio transmission either to or from air traffic control;
 - (7) Pitch attitude;
 - (8) Roll attitude;
 - (9) Longitudinal acceleration;
 - (10) Pitch trim position;
 - (11) Control column or pitch control surface position;
 - (12) Control wheel or lateral control surface position;
 - (13) Rudder pedal or yaw control surface position;
 - (14) Thrust of each engine;
 - (15) Position of each thrust reverser;
 - (16) Trailing edge flap or cockpit flap control position; and
 - (17) Leading edge flap or cockpit flap control position.
- (c) After October 11, 1991, no person may operate a large airplane equipped with a digital data bus and ARINC 717 digital flight data acquisition unit (DFDAU) or equivalent unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. Any

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parameters specified in appendix D of this part that are available on the digital data bus must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified.

- (d) No person may operate under this part an airplane that is manufactured after October 11, 1991, unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The parameters specified in appendix D of this part must be recorded within the ranges, accuracies, resolutions and sampling intervals specified. For the purpose of this section, "manufactured" means the point in time at which the airplane inspection acceptance records reflect that the airplane is complete and meets the FAA-approved type design data.
- (e) 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.
- (f) Except as provided in paragraph (g) of this section, and except for recorded data erased as authorized in this paragraph, each certificate holder shall keep the recorded data prescribed in paragraph (a), (b), (c), or (d) of this section, as applicable, until the airplane has been operated for at least 25 hours of the operating time specified in Sec. 125.227(a) of this chapter. A total of 1 hour of recorded data may be erased for the purpose of testing the flight recorder or the flight recorder system. Any erasure made in accordance with this paragraph must be of the oldest recorded data accumulated at the time of testing. Except as provided in paragraph (g) of this section, no record need be kept more than 60 days.
- (g) In the event of an accident or occurrence that requires immediate notification of the National Transportation Safety Board under 49 CFR part 830 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), (b), (c), or (d) of this section, as applicable, for at least 60 days or for a longer period upon the request of the Board or the Administrator.
- (h) Each flight recorder required by this section must be installed in accordance with the requirements of Sec. 25.1459 of this chapter in effect on August 31, 1977. The correlation required by Sec. 25.1459(c) of this chapter need be established only on one airplane of any group of airplanes.
 - (1) That are of the same type;
 - (2) On which the flight recorder models and their installations are the same; and
 - (3) On which there are no differences in the type design with respect to the installation of the 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 the certificate holder.
- (i) Each flight recorder required by this section that records the data specified in paragraphs (a), (b), (c), or (d) of this section must have an approved device to assist in locating that recorder under water. [Doc. No. 25530, 53 FR 26148, July 11, 1988; 53 FR 30906, Aug. 16, 1988]

From 14 CFR 125.226—Certification And Operations: Airplanes Having A Seating Capacity Of 20 Or More Passengers Or A Maximum Payload Capacity Of 6,000 Pounds Or More; And Rules Governing Persons On Board Such Aircraft—Digital Flight Data Recorders

- (a) Except as provided in paragraph (l) of this section, no person may operate under this part a turbine-engine-powered transport category airplane unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The operational parameters required to be recorded by digital flight data recorders required by this section are as follows: the phrase

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``when an information source is installed" following a parameter indicates that recording of that parameter is not intended to require a change in installed equipment:

- (1) Time;
- (2) Pressure altitude;
- (3) Indicated airspeed;
- (4) Heading--primary flight crew reference (if selectable, record discrete, true or magnetic);
- (5) Normal acceleration (Vertical);
- (6) Pitch attitude;
- (7) Roll attitude;
- (8) Manual radio transmitter keying, or CVR/DFDR synchronization reference;
- (9) Thrust/power of each engine--primary flight crew reference;
- (10) Autopilot engagement status;
- (11) Longitudinal acceleration;
- (12) Pitch control input;
- (13) Lateral control input;
- (14) Rudder pedal input;
- (15) Primary pitch control surface position;
- (16) Primary lateral control surface position;
- (17) Primary yaw control surface position;
- (18) Lateral acceleration;
- (19) Pitch trim surface position or parameters of paragraph (a)(82) of this section if currently recorded;
- (20) Trailing edge flap or cockpit flap control selection (except when parameters of paragraph (a)(85) of this section apply);
- (21) Leading edge flap or cockpit flap control selection (except when parameters of paragraph (a)(86) of this section apply);
- (22) Each Thrust reverser position (or equivalent for propeller airplane);
- (23) Ground spoiler position or speed brake selection (except when parameters of paragraph (a)(87) of this section apply);
- (24) Outside or total air temperature;
- (25) Automatic Flight Control System (AFCS) modes and engagement status, including autothrottle;
- (26) Radio altitude (when an information source is installed);
- (27) Localizer deviation, MLS Azimuth;
- (28) Glideslope deviation, MLS Elevation;
- (29) Marker beacon passage;
- (30) Master warning;
- (31) Air/ground sensor (primary airplane system reference nose or main gear);
- (32) Angle of attack (when information source is installed);
- (33) Hydraulic pressure low (each system);
- (34) Ground speed (when an information source is installed);
- (35) Ground proximity warning system;
- (36) Landing gear position or landing gear cockpit control selection;
- (37) Drift angle (when an information source is installed);
- (38) Wind speed and direction (when an information source is installed);
- (39) Latitude and longitude (when an information source is installed);
- (40) Stick shaker/pusher (when an information source is installed);
- (41) Windshear (when an information source is installed);
- (42) Throttle/power lever position;
- (43) Additional engine parameters (as designed in appendix E of this part);
- (44) Traffic alert and collision avoidance system;

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- (45) DME 1 and 2 distances;
 - (46) Nav 1 and 2 selected frequency;
 - (47) Selected barometric setting (when an information source is installed);
 - (48) Selected altitude (when an information source is installed);
 - (49) Selected speed (when an information source is installed);
 - (50) Selected mach (when an information source is installed);
 - (51) Selected vertical speed (when an information source is installed);
 - (52) Selected heading (when an information source is installed);
 - (53) Selected flight path (when an information source is installed);
 - (54) Selected decision height (when an information source is installed);
 - (55) EFIS display format;
 - (56) Multi-function/engine/alerts display format;
 - (57) Thrust command (when an information source is installed);
 - (58) Thrust target (when an information source is installed);
 - (59) Fuel quantity in CG trim tank (when an information source is installed);
 - (60) Primary Navigation System Reference;
 - (61) Icing (when an information source is installed);
 - (62) Engine warning each engine vibration (when an information source is installed);
 - (63) Engine warning each engine over temp. (when an information source is installed);
 - (64) Engine warning each engine oil pressure low (when an information source is installed);
 - (65) Engine warning each engine over speed (when an information source is installed);
 - (66) Yaw trim surface position;
 - (67) Roll trim surface position;
 - (68) Brake pressure (selected system);
 - (69) Brake pedal application (left and right);
 - (70) Yaw of sideslip angle (when an information source is installed);
 - (71) Engine bleed valve position (when an information source is installed);
 - (72) De-icing or anti-icing system selection (when an information source is installed);
 - (73) Computed center of gravity (when an information source is installed);
 - (74) AC electrical bus status;
 - (75) DC electrical bus status;
 - (76) APU bleed valve position (when an information source is installed);
 - (77) Hydraulic pressure (each system);
 - (78) Loss of cabin pressure;
 - (79) Computer failure;
 - (80) Heads-up display (when an information source is installed);
 - (81) Para-visual display (when an information source is installed);
 - (82) Cockpit trim control input position--pitch;
 - (83) Cockpit trim control input position--roll;
 - (84) Cockpit trim control input position--yaw;
 - (85) Trailing edge flap and cockpit flap control position;
 - (86) Leading edge flap and cockpit flap control position;
 - (87) Ground spoiler position and speed brake selection; and
 - (88) All cockpit flight control input forces (control wheel, control column, rudder pedal).
- (b) For all turbine-engine powered transport category airplanes manufactured on or before October 11, 1991, by August 20, 2001--
- (1) For airplanes not equipped as of July 16, 1996, with a flight data acquisition unit (FDAU), the parameters listed in paragraphs (a)(1) through (a)(18) of this section must be recorded within the ranges and accuracies specified in Appendix D of this part, and--

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- (i) For airplanes with more than two engines, the parameter described in paragraph (a)(18) is not required unless sufficient capacity is available on the existing recorder to record that parameter.
- (ii) Parameters listed in paragraphs (a)(12) through (a)(17) each may be recorded from a single source.
- (2) For airplanes that were equipped as of July 16, 1996, with a flight data acquisition unit (FDAU), the parameters listed in paragraphs (a)(1) through (a)(22) of this section must be recorded within the ranges, accuracies, and recording intervals specified in Appendix E of this part. Parameters listed in paragraphs (a)(12) through (a)(17) each may be recorded from a single source.
- (3) The approved flight recorder required by this section must be installed at the earliest time practicable, but no later than the next heavy maintenance check after August 18, 1999 and no later than August 20, 2001. A heavy maintenance check is considered to be any time an airplane is scheduled to be out of service for 4 or more days and is scheduled to include access to major structural components.
- (c) For all turbine-engine-powered transport category airplanes manufactured on or before October 11, 1991--
 - (1) That were equipped as of July 16, 1996, with one or more digital data bus(es) and an ARINC 717 digital flight data acquisition unit (DFDAU) or equivalent, the parameters specified in paragraphs (a)(1) through (a)(22) of this section must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix E of this part by August 20, 2001. Parameters listed in paragraphs (a)(12) through (a)(14) each may be recorded from a single source.
 - (2) Commensurate with the capacity of the recording system (DFDAU or equivalent and the DFDR), all additional parameters for which information sources are installed and which are connected to the recording system must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix E of this part by August 20, 2001.
 - (3) That were subject to Sec. 125.225(e) of this part, all conditions of Sec. 125.225(c) must continue to be met until compliance with paragraph (c)(1) of this section is accomplished.
- (d) For all turbine-engine-powered transport category airplanes that were manufactured after October 11, 1991--
 - (1) The parameters listed in paragraphs (a)(1) through (a)(34) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix E of this part by August 20, 2001. Parameters listed in paragraphs (a)(12) through (a)(14) each may be recorded from a single source.
 - (2) Commensurate with the capacity of the recording system, all additional parameters for which information sources are installed and which are connected to the recording system, must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix E of this part by August 20, 2001.
- (e) For all turbine-engine-powered transport category airplanes that are manufactured after August 18, 2000--
 - (1) The parameters listed in paragraph (a) (1) through (57) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix E of this part.
 - (2) Commensurate with the capacity of the recording system, all additional parameters for which information sources are installed and which are connected to the recording system, must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix E of this part.
- (f) For all turbine-engine-powered transport category airplanes that are manufactured after August 19, 2002 parameters listed in paragraph (a)(1) through (a)(88) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix E of this part.

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- (g) Whenever a flight data recorder required by this section is installed, it must be operated continuously from the instant the airplane begins its takeoff roll until it has completed its landing roll.
- (h) Except as provided in paragraph (i) of this section, and except for recorded data erased as authorized in this paragraph, each certificate holder shall keep the recorded data prescribed by this section, as appropriate, until the airplane has been operated for at least 25 hours of the operating time specified in Sec. 121.359(a) of this part. A total of 1 hour of recorded data may be erased for the purpose of testing the flight recorder or the flight recorder system. Any erasure made in accordance with this paragraph must be of the oldest recorded data accumulated at the time of testing. Except as provided in paragraph (i) of this section, no record need to be kept more than 60 days.
- (i) In the event of an accident or occurrence that requires immediate notification of the National Transportation Safety Board under 49 CFR 830 of its regulations and that results in termination of the flight, the certificate holder shall remove the recorder from the airplane and keep the recorder data prescribed by this section, as appropriate, for at least 60 days or for a longer period upon the request of the Board or the Administrator.
- (j) Each flight data recorder system required by this section must be installed in accordance with the requirements of Sec. 25.1459 (a), (b), (d), and (e) of this chapter. A correlation must be established between the values recorded by the flight data recorder and the corresponding values being measured. The correlation must contain a sufficient number of correlation points to accurately establish the conversion from the recorded values to engineering units or discrete state over the full operating range of the parameter. Except for airplanes having separate altitude and airspeed sensors that are an integral part of the flight data recorder system, a single correlation may be established for any group of airplanes--
 - (1) That are of the same type;
 - (2) On which the flight recorder system and its installation are the same; and
 - (3) On which there is no difference in the type design with respect to the installation of those sensors associated with the flight data recorder system. Documentation sufficient to convert recorded data into the engineering units and discrete values specified in the applicable appendix must be maintained by the certificate holder.
- (k) Each flight data recorder required by this section must have an approved device to assist in locating that recorder under water.
- (l) The following airplanes that were manufactured before August 18, 1997 need not comply with this section, but must continue to comply with applicable paragraphs of Sec. 125.225 of this chapter, as appropriate:
 - (1) Airplanes that meet the Stage 2 noise levels of part 36 of this chapter and are subject to Sec. 91.801(c) of this chapter, until January 1, 2000. On and after January 1, 2000, any Stage 2 airplane otherwise allowed to be operated under Part 91 of this chapter must comply with the applicable flight data recorder requirements of this section for that airplane.
 - (2) General Dynamics Convair 580, General Dynamics Convair 600, General Dynamics Convair 640, deHavilland Aircraft Company Ltd. DHC-7, Fairchild Industries FH 227, Fokker F-27 (except Mark 50), F-28 Mark 1000 and Mark 4000, Gulfstream Aerospace G-159, Lockheed Aircraft Corporation Electra 10-A, Lockheed Aircraft Corporation Electra 10-B, Lockheed Aircraft Corporation Electra 10-E, Lockheed Aircraft Corporation L-188, Maryland Air Industries, Inc. F27, Mitsubishi Heavy Industries, Ltd. YS-11, Short Bros. Limited SD3-30, Short Bros, Limited SD3-60. [Doc. No. 28109, 62 FR 38387, July 17, 1997; 62 FR 48135, Sept. 12, 1997]

From 14 CFR 129.20—Operating Requirements: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage—Digital Flight Data Recorders

No person may operate an aircraft under this part that is registered in the United States unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The flight data recorder must record the parameters that would be required to be recorded if the aircraft were operated under part 121, 125, or 135 of this chapter, and must be installed by the compliance times required by those parts, as applicable to the aircraft. [Doc. No. 28109, 62 FR 38396, July 17, 1997]

From 14 CFR 135.152—Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft—Flight Recorders

- (a) Except as provided in paragraph (k) of this section, no person may operate under this part a multi-engine, turbine-engine powered airplane or rotorcraft having a passenger seating configuration, excluding any required crewmember seat, of 10 to 19 seats, that was either brought onto the U.S. register after, or was registered outside the United States and added to the operator's U.S. operations specifications after, October 11, 1991, unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium. The parameters specified in either Appendix B or C of this part, as applicable must be recorded within the range, accuracy, resolution, and recording intervals as specified. The recorder shall retain no less than 25 hours of aircraft operation.
- (b) After October 11, 1991, no person may operate a multiengine, turbine-powered airplane having a passenger seating configuration of 20 to 30 seats or a multiengine, turbine-powered rotorcraft having a passenger seating configuration of 20 or more seats unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data, and a method of readily retrieving that data from the storage medium. The parameters in appendix D or E of this part, as applicable, that are set forth below, must be recorded within the ranges, accuracies, resolutions, and sampling intervals as specified.
 - (1) Except as provided in paragraph (b)(3) of this section for aircraft type certificated before October 1, 1969, the following parameters must be recorded:
 - (i) Time;
 - (ii) Altitude;
 - (iii) Airspeed;
 - (iv) Vertical acceleration;
 - (v) Heading;
 - (vi) Time of each radio transmission to or from air traffic control;
 - (vii) Pitch attitude;
 - (viii) Roll attitude;
 - (ix) Longitudinal acceleration;
 - (x) Control column or pitch control surface position; and
 - (xi) Thrust of each engine.
 - (2) Except as provided in paragraph (b)(3) of this section for aircraft type certificated after September 30, 1969, the following parameters must be recorded:

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- (i) Time;
 - (ii) Altitude;
 - (iii) Airspeed;
 - (iv) Vertical acceleration;
 - (v) Heading;
 - (vi) Time of each radio transmission either to or from air traffic control;
 - (vii) Pitch attitude;
 - (viii) Roll attitude;
 - (ix) Longitudinal acceleration;
 - (x) Pitch trim position;
 - (xi) Control column or pitch control surface position;
 - (xii) Control wheel or lateral control surface position;
 - (xiii) Rudder pedal or yaw control surface position;
 - (xiv) Thrust of each engine;
 - (xv) Position of each thrust reverser;
 - (xvi) Trailing edge flap or cockpit flap control position; and
 - (xvii) Leading edge flap or cockpit flap control position.
- (3) For aircraft manufactured after October 11, 1991, all of the parameters listed in appendix D or E of this part, as applicable, must be recorded.
- (c) Whenever a flight recorder required by this section is installed, it must be operated continuously from the instant the airplane begins the takeoff roll or the rotorcraft begins the lift-off until the airplane has completed the landing roll or the rotorcraft has landed at its destination.
- (d) Except as provided in paragraph (c) of this section, and except for recorded data erased as authorized in this paragraph, each certificate holder shall keep the recorded data prescribed in paragraph
- (a) of this section until the aircraft has been operating for at least 25 hours of the operating time specified in paragraph (c) of this section. In addition, each certificate holder shall keep the recorded data prescribed in paragraph (b) of this section for an airplane until the airplane has been operating for at least 25 hours, and for a rotorcraft until the rotorcraft has been operating for at least 10 hours, of the operating time specified in paragraph (c) of this section. A total of 1 hour of recorded data may be erased for the purpose of testing the flight recorder or the flight recorder system. Any erasure made in accordance with this paragraph must be of the oldest recorded data accumulated at the time of testing. Except as provided in paragraph (c) of this section, no record need be kept more than 60 days.
- (e) In the event of an accident or occurrence that requires the immediate notification of the National Transportation Safety Board under 49 CFR part 830 of its regulations and that results in termination of the flight, the certificate holder shall remove the recording media from the aircraft and keep the recorded data required by paragraphs (a) and (b) of this section for at least 60 days or for a longer period upon request of the Board or the Administrator.
- (f)(1) For airplanes manufactured on or before August 18, 2000, and all other aircraft, each flight recorder required by this section must be installed in accordance with the requirements of Sec. 23.1459, 25.1459, 27.1459, or 29.1459, as appropriate, of this chapter. The correlation required by paragraph (c) of Sec. 23.1459, 25.1459, 27.1459, or 29.1459, as appropriate, of this chapter need be established only on one aircraft of a group of aircraft:
- (i) That are of the same type;
 - (ii) On which the flight recorder models and their installations are the same; and
 - (iii) On which there are no differences in the type designs with respect to the installation of the 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 the certificate holder.

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- (f)(2) For airplanes manufactured after August 18, 2000, each flight data recorder system required by this section must be installed in accordance with the requirements of Sec. 23.1459 (a), (b), (d) and (e) of this chapter, or Sec. 25.1459 (a), (b), (d), and (e) of this chapter. A correlation must be established between the values recorded by the flight data recorder and the corresponding values being measured. The correlation must contain a sufficient number of correlation points to accurately establish the conversion from the recorded values to engineering units or discrete state over the full operating range of the parameter. Except for airplanes having separate altitude and airspeed sensors that are an integral part of the flight data recorder system, a single correlation may be established for any group of airplanes--
- (i) That are of the same type;
 - (ii) On which the flight recorder system and its installation are the same; and
 - (iii) On which there is no difference in the type design with respect to the installation of those sensors associated with the flight data recorder system. Documentation sufficient to convert recorded data into the engineering units and discrete values specified in the applicable appendix must be maintained by the certificate holder.
- (g) Each flight recorder required by this section that records the data specified in paragraphs (a) and (b) of this section must have an approved device to assist in locating that recorder under water.
- (h) The operational parameters required to be recorded by digital flight data recorders required by paragraphs (i) and (j) of this section are as follows, the phrase "when an information source is installed" following a parameter indicates that recording of that parameter is not intended to require a change in installed equipment.
- (1) Time;
 - (2) Pressure altitude;
 - (3) Indicated airspeed;
 - (4) Heading--primary flight crew reference (if selectable, record discrete, true or magnetic);
 - (5) Normal acceleration (Vertical);
 - (6) Pitch attitude;
 - (7) Roll attitude;
 - (8) Manual radio transmitter keying, or CVR/DFDR synchronization reference;
 - (9) Thrust/power of each engine--primary flight crew reference;
 - (10) Autopilot engagement status;
 - (11) Longitudinal acceleration;
 - (12) Pitch control input;
 - (13) Lateral control input;
 - (14) Rudder pedal input;
 - (15) Primary pitch control surface position;
 - (16) Primary lateral control surface position;
 - (17) Primary yaw control surface position;
 - (18) Lateral acceleration;
 - (19) Pitch trim surface position or parameters of paragraph (h)(82) of this section if currently recorded;
 - (20) Trailing edge flap or cockpit flap control selection (except when parameters of paragraph (h)(85) of this section apply);
 - (21) Leading edge flap or cockpit flap control selection (except when parameters of paragraph (h)(86) of this section apply);
 - (22) Each Thrust reverser position (or equivalent for propeller airplane);
 - (23) Ground spoiler position or speed brake selection (except when parameters of paragraph (h)(87) of this section apply);
 - (24) Outside or total air temperature;

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- (25) Automatic Flight Control System (AFCS) modes and engagement status, including autothrottle;
- (26) Radio altitude (when an information source is installed);
- (27) Localizer deviation, MLS Azimuth;
- (28) Glideslope deviation, MLS Elevation;
- (29) Marker beacon passage;
- (30) Master warning;
- (31) Air/ground sensor (primary airplane system reference nose or main gear);
- (32) Angle of attack (when information source is installed);
- (33) Hydraulic pressure low (each system);
- (34) Ground speed (when an information source is installed);
- (35) Ground proximity warning system;
- (36) Landing gear position or landing gear cockpit control selection;
- (37) Drift angle (when an information source is installed);
- (38) Wind speed and direction (when an information source is installed);
- (39) Latitude and longitude (when an information source is installed);
- (40) Stick shaker/pusher (when an information source is installed);
- (41) Windshear (when an information source is installed);
- (42) Throttle/power lever position;
- (43) Additional engine parameters (as designated in appendix F of this part);
- (44) Traffic alert and collision avoidance system;
- (45) DME 1 and 2 distances;
- (46) Nav 1 and 2 selected frequency;
- (47) Selected barometric setting (when an information source is installed);
- (48) Selected altitude (when an information source is installed);
- (49) Selected speed (when an information source is installed);
- (50) Selected mach (when an information source is installed);
- (51) Selected vertical speed (when an information source is installed);
- (52) Selected heading (when an information source is installed);
- (53) Selected flight path (when an information source is installed);
- (54) Selected decision height (when an information source is installed);
- (55) EFIS display format;
- (56) Multi-function/engine/alerts display format;
- (57) Thrust command (when an information source is installed);
- (58) Thrust target (when an information source is installed);
- (59) Fuel quantity in CG trim tank (when an information source is installed);
- (60) Primary Navigation System Reference;
- (61) Icing (when an information source is installed);
- (62) Engine warning each engine vibration (when an information source is installed);
- (63) Engine warning each engine over temp. (when an information source is installed);
- (64) Engine warning each engine oil pressure low (when an information source is installed);
- (65) Engine warning each engine over speed (when an information source is installed);
- (66) Yaw trim surface position;
- (67) Roll trim surface position;
- (68) Brake pressure (selected system);
- (69) Brake pedal application (left and right);
- (70) Yaw or sideslip angle (when an information source is installed);
- (71) Engine bleed valve position (when an information source is installed);
- (72) De-icing or anti-icing system selection (when an information source is installed);
- (73) Computed center of gravity (when an information source is installed);
- (74) AC electrical bus status;

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- (75) DC electrical bus status;
 - (76) APU bleed valve position (when an information source is installed);
 - (77) Hydraulic pressure (each system);
 - (78) Loss of cabin pressure;
 - (79) Computer failure;
 - (80) Heads-up display (when an information source is installed);
 - (81) Para-visual display (when an information source is installed);
 - (82) Cockpit trim control input position--pitch;
 - (83) Cockpit trim control input position--roll;
 - (84) Cockpit trim control input position--yaw;
 - (85) Trailing edge flap and cockpit flap control position;
 - (86) Leading edge flap and cockpit flap control position;
 - (87) Ground spoiler position and speed brake selection; and
 - (88) All cockpit flight control input forces (control wheel, control column, rudder pedal).
- (i) For all turbine-engine powered airplanes with a seating configuration, excluding any required crewmember seat, of 10 to 30 passenger seats, manufactured after August 18, 2000--
 - (1) The parameters listed in paragraphs (h)(1) through (h)(57) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix F of this part.
 - (2) Commensurate with the capacity of the recording system, all additional parameters for which information sources are installed and which are connected to the recording system must be recorded within the ranges, accuracies, resolutions, and sampling intervals specified in Appendix F of this part.
 - (j) For all turbine-engine-powered airplanes with a seating configuration, excluding any required crewmember seat, of 10 to 30 passenger seats, that are manufactured after August 19, 2002 the parameters listed in paragraph (a)(1) through (a)(88) of this section must be recorded within the ranges, accuracies, resolutions, and recording intervals specified in Appendix F of this part.
 - (k) For airplanes manufactured before August 18, 1997 the following airplane type need not comply with this section: deHavilland DHC-6. [Doc. No. 25530, 53 FR 26151, July 11, 1988, as amended by Amdt. 135-69, 62 FR 38396, July 17, 1997; 62 FR 48135, Sept. 12, 1997]

From 14 CFR 91.609—General Operating and Flight Rules—Flight Recorders and Cockpit Voice Recorders

- (a) No holder of an air carrier operating certificate or an operating certificate may conduct any operation under this part with an aircraft listed in the holder's operations specifications or current list of aircraft used in air transportation unless that aircraft complies with any applicable flight recorder and cockpit voice recorder requirements of the part under which its certificate is issued except that the operator may--
 - (1) Ferry an aircraft with an inoperative flight recorder or cockpit voice recorder from a place where repair or replacement cannot be made to a place where they can be made;
 - (2) Continue a flight as originally planned, if the flight recorder or cockpit voice recorder becomes inoperative after the aircraft has taken off;
 - (3) Conduct an airworthiness flight test during which the flight recorder or cockpit voice recorder is turned off to test it or to test any communications or electrical equipment installed in the aircraft; or
 - (4) Ferry a newly acquired aircraft from the place where possession of it is taken to a place where the flight recorder or cockpit voice recorder is to be installed.

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- (b) Notwithstanding paragraphs (c) and (e) of this section, an operator other than the holder of an air carrier or a commercial operator certificate may--
- (1) Ferry an aircraft with an inoperative flight recorder or cockpit voice recorder from a place where repair or replacement cannot be made to a place where they can be made;
 - (2) Continue a flight as originally planned if the flight recorder or cockpit voice recorder becomes inoperative after the aircraft has taken off;
 - (3) Conduct an airworthiness flight test during which the flight recorder or cockpit voice recorder is turned off to test it or to test any communications or electrical equipment installed in the aircraft;
 - (4) Ferry a newly acquired aircraft from a place where possession of it was taken to a place where the flight recorder or cockpit voice recorder is to be installed; or
 - (5) Operate an aircraft:
 - (i) For not more than 15 days while the flight recorder and/or cockpit voice recorder is inoperative and/or removed for repair provided that the aircraft maintenance records contain an entry that indicates the date of failure, and a placard is located in view of the pilot to show that the flight recorder or cockpit voice recorder is inoperative.
 - (ii) For not more than an additional 15 days, provided that the requirements in paragraph (b)(5)(i) are met and that a certificated pilot, or a certificated person authorized to return an aircraft to service under Sec. 43.7 of this chapter, certifies in the aircraft maintenance records that additional time is required to complete repairs or obtain a replacement unit.
 - (c) No person may operate a U.S. civil registered, multiengine, turbine-powered airplane or rotorcraft having a passenger seating configuration, excluding any pilot seats of 10 or more that has been manufactured after October 11, 1991, unless it is equipped with one or more approved flight recorders that utilize a digital method of recording and storing data and a method of readily retrieving that data from the storage medium, that are capable of recording the data specified in appendix E to this part, for an airplane, or appendix F to this part, for a rotorcraft, of this part within the range, accuracy, and recording interval specified, and that are capable of retaining no less than 8 hours of aircraft operation.
 - (d) Whenever a flight recorder, required by this section, is installed, it must be operated continuously from the instant the airplane begins the takeoff roll or the rotorcraft begins lift-off until the airplane has completed the landing roll or the rotorcraft has landed at its destination.
 - (e) Unless otherwise authorized by the Administrator, after October 11, 1991, no person may operate a U.S. civil registered multiengine, turbine-powered airplane or rotorcraft having a passenger seating configuration of six passengers or more and for which two pilots are required by type certification or operating rule unless it is equipped with an approved cockpit voice recorder that:
 - (1) Is installed in compliance with Sec. 23.1457(a) (1) and (2), (b), (c), (d), (e), (f), and (g); Sec. 25.1457(a) (1) and (2), (b), (c), (d), (e), (f), and (g); Sec. 27.1457(a) (1) and (2), (b), (c), (d), (e), (f), and (g); or Sec. 29.1457(a) (1) and (2), (b), (c), (d), (e), (f), and (g) of this chapter, as applicable; and
 - (2) Is operated continuously from the use of the checklist before the flight to completion of the final checklist at the end of the flight.
 - (f) In complying with this section, an approved cockpit voice recorder having an erasure feature may be used, so that at any time during the operation of the recorder, information recorded more than 15 minutes earlier may be erased or otherwise obliterated.
 - (g) In the event of an accident or occurrence requiring immediate notification to the National Transportation Safety Board under part 830 of its regulations that results in the termination of the flight, any operator who has installed approved flight recorders and approved cockpit voice recorders shall keep the recorded information for at least 60 days or, if requested by the Administrator or the Board, for a longer period. Information obtained from the record is used to assist in determining the cause of accidents or occurrences in connection with the investigation

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under part 830. The Administrator does not use the cockpit voice recorder record in any civil penalty or certificate action.

[Doc. No. 18334, 54 FR 34318, Aug. 18, 1989, as amended by Amdt. 91-226, 56 FR 51621, Oct. 11, 1991; Amdt. 91-228, 57 FR 19353, May 5, 1992]

ATTACHMENT E: NTSB and BEA Memorandum of Agreement

Guidelines for the Conduct of International Aviation Accident Investigations Between the National Transportation Safety Board and the Bureau Enquetes-Accidents

1. Purpose

On March 20, 1985, the Bureau Enquetes-Accident (BEA) and the National Transportation Safety Board (NTSB) signed a Memorandum of Agreement (MOA) to ensure that the investigating agencies coordinate their efforts closely during aircraft accident investigations that involve aircraft equipped with CFM 56 engines, which are jointly manufactured by SNECMA in France and General Electric Aircraft Engines in the United States.

France and the United States are today the major States of design and manufacture for the world's aircraft. As such, they are obligated to either conduct or participate in numerous investigations throughout the world in accordance with Annex 13 to the Convention on International Civil Aviation. In addition, France and the United States are often asked to provide technical assistance, particularly in the readout and analysis of flight recorders, even for investigations that do not meet the specific conditions of Annex 13. Further, in accordance with their international responsibilities, France and the United States must oversee operations and continuing airworthiness of aircraft, as stated in Annexes 6 and 8. This situation has led the NTSB and BEA to recognize the necessity of replacing the previous MOA with these broader guidelines that would extend to accidents and incidents involving aircraft of a maximum mass of more than 2250kg.

Article 26 of the Convention on International Civil Aviation, and Annex 13 to the latter, contain language pointing out the importance for the safety of world air transport that investigations be carried out with the greatest diligence and with the full cooperation of the concerned States.

The purpose of these guidelines is to reinforce the cooperation between the BEA and the NTSB to ensure maximum efficiency for the safety of world civil aviation. The guidelines are also intended to improve communication and exchanges of information between the two agencies.

2. Application of Annex 13

The text of Annex 13 referred to in this document is that of the eighth edition dated July 1994. France and the United States apply the standards and recommended practices contained in Annex 13 within the limits of the specific differences noted.

Insofar as the guidelines serve to reinforce joint work between the two investigating agencies, it is the spirit of Annex 13 that is to be applied. In particular, each agency intends to make its best efforts to overcome potential difficulties arising due to differences in languages, national cultures or geographic locations.

3. Definitions

For application of these guidelines, the definitions of the following words and phrases are to be those specified in or understood from Annex 13:

Accident
Incident
Serious incident
State of Occurrence
State of Design
State of Manufacture
State of Registration
State of the Operator
Investigator-in-charge
Accredited Representative
Adviser
Draft final report
Differences

For the purpose of these guidelines, “agencies” are defined as the BEA and the NTSB.

Along with the accredited representative, there may be a deputy accredited representative, who should be accorded the same rights, in accordance with Annex 13.

4. Purpose of Technical Investigations

The purpose of accident and incident investigations is to determine the facts, conditions and circumstances, to analyze and determine the probable causes of such accidents or incidents, to make recommendations to avoid their recurrence, and to safeguard human lives. It is not to impute fault or establish responsibility in terms of any person or agency or to exonerate any person or agency. Any safety recommendations produced by BEA/NTSB as a result of accident and incident investigations are intended as a means to improve safety and preclude recurrence.

5. Notification of Accidents and Incidents

When an agency becomes aware of an accident or incident that involves the direct interests of the other State, it is to inform the other agency by the most rapid means possible and provide the other agency with all available information consistent with Annex 13 and the laws of the notifying State. Both sides intend to follow the guidance contained in Annex 13 regarding serious incidents.

6. Procedures Relating to Investigations of Occurrences Wherein One State is the State of Manufacture, Design, Registration, or of the Operator, and the Other is the State of Occurrence

6.1 Participation in the Investigation

During investigations conducted by agencies of either State, domestic participants are to participate in the investigation in accordance with the organizational structure prescribed by the investigating agency.

During investigations conducted by agencies of either State, international participants are to participate in the investigation as advisers to the accredited representative of their State in accordance with the organizational structure prescribed in Annex 13.

Normal communication is to be conducted through accredited representative channels. The two agencies are to inform each other of any possible direct communications with a participant or an organization of the other State.

For public hearings and submissions, the organizational structure may be altered to provide participants with the ability to best represent themselves.

6.2 Access to Data From an Investigation

The States affected by the investigation, such as the State of Manufacture or the State of the Operator, have international duties, in accordance primarily with Annexes 6, 8, and 13. In order to fulfill these duties, they need to have access to the information. Therefore, the State responsible for conducting the investigation is to provide the accredited representative from the other State access to all available material, as cited in paragraph 5.25 of Annex 13. The accredited representative is to receive the material as soon as practicable. See paragraph 6.6 hereafter regarding proprietary or commercially sensitive information.

Such data is to include, but is not to be limited to:

- An electronic copy of the raw, unmanipulated data obtained from the flight data recorder(s)(FDR), including data from all previous flights.
- Computer printouts, data files and plots of the data, once the accuracy of the data files has been established and agreed to by all participants.
- Data obtained from Quick Access Recorders should be handled in the same manner as FDR data, if it is determined that these data are relevant to the investigation. (For example, if they provide more data than the FDR recording).

- A copy of the air traffic control voice recording and transcript of radio communications, and any other available recordings.
- Radar data obtained from civilian sources in prescribed format and authorized, available military sources.
- Plots of the time correlation between radar, FDR, air traffic control recordings, cockpit voice recorder (CVR) data, and other relevant information. These plots are to be produced in a way that does not disclose protected data from the CVR or image recorders.

To ensure confidentiality of the sensitive information contained in CVRs and image recorders, initial readout, examination and analysis of the data derived from these recorders are to be performed only in the laboratory selected by the State conducting the investigation, participants should be limited strictly to:

- the investigator in charge and/or personnel from his agency that he will designate, as well as technically qualified advisers that he will designate, based on the procedures of his agency,
- the accredited representative or his designee,
- technically qualified advisers designated by the accredited representative.

The distribution of transcripts or reports derived from analyses of CVRs and image recorders is to be prohibited until they have been released by the agency conducting the investigation. However, both agencies will proceed in a fully coordinated manner to provide timely and full access to the CVR recording and transcripts to the accredited representative or his designee and to selected advisers in the laboratory of the agency conducting the investigation. Notes are not to be removed from the laboratory.

6.3. Analysis, Conclusions, and Development of Safety Recommendations

6.3.1 Participation in the Analysis, Conclusions, and Development of Safety Recommendations

The two agencies intend to apply the provisions of paragraph 5.25 of Annex 13, particularly paragraphs g) and i), which state that participation shall confer entitlement to:

- (g) participation in off-scene investigation activities such as component examinations, technical briefings, tests, and simulation;
- (i) make submissions in respect of the various elements of the investigation.

Analysis, and determination of probable causes are the full responsibility of the investigating agency. However, it is strongly recommended that the other participants in the investigation provide their contribution on the study of the factual data and be

associated with the deliberations related to the analysis, findings, causes and safety recommendations. This can best be achieved by regular contacts and discussions between the investigator in charge and accredited representatives and by written submissions during the investigation process.

6.3.2 Drafting and Distribution of Safety Recommendations

Safety recommendations should be discussed throughout the investigation. Advisers should be part of this process. When the agency conducting the investigation plans to issue safety recommendations before the completion of the draft Final Report, that agency is to make every effort to share the content of the safety recommendations with the accredited representative of the other agency (and other agencies, if appropriate) as soon as practical. The accredited representative is to have the opportunity to comment on those recommendations and provide those comments to the investigating agency within a reasonable period of time based on the degree of urgency of the proposed recommendations. The length of the comment period is to be determined by the investigating agency. If the accredited representative or his designee is present, he will be associated with the drafting process.

6.3.3 Distribution of Safety Recommendations

Safety Recommendations are to be sent to the other agency, along with copies to both aviation authorities, the U. S. Federal Aviation Administration and France's Direction Generale de l'Aviation Civile (FAA and DGAC).

6.4. Exchanges of Correspondence

In the event that formal correspondence is necessary, each agency may choose the most appropriate method to transmit correspondence and documents consistent with prompt receipt. In order to facilitate record keeping and to avoid the loss of correspondence, the recipient will acknowledge receipt of the correspondence.

6.5 Consultation

Regarding consultations on the draft Final Report outlined in Annex 13, each agency should seek State comments from the other agency. In addition, the agency conducting the investigation may give participants an opportunity to review the draft Final Report and to provide observations through the accredited representative of their State.

6.6 Confidentiality

The agency that receives materials from the other agency should handle the materials according to their confidentiality or proprietary status, within the bounds of the respective laws of the two States. Drafts, internal, or working documents that have been transmitted,

except when explicitly indicated to the contrary, are to be considered as proprietary/confidential documents and treated as such.

6.7 Informing the News Media

The agency conducting the investigation is to be the sole organization that releases information about the investigation to the news media. After an accident or incident, the news media and relatives of the victims will be contacting their respective agencies. Therefore, the press officers of both agencies are to establish working procedures to ensure that information can be mutually developed and coordinated as much as possible. Also, whenever possible, such information is to be transmitted by the investigating agency to the other agency before it is made public. If there are differences of opinion, efforts are to be made to resolve them before the information is released.

7. Procedures Relating to Investigations of Occurrences Involving Aircraft Equipped with CFM56 Engines

The following provisions are to be applied to the investigations of occurrences involving CFM56 engines, which are jointly manufactured by France and the United States.

1. In the case of an investigation directed by either agency, the other agency is to be notified of the event that prompted the investigation, and may elect to designate an accredited representative and advisers to participate in the investigation in accordance with the provisions of Annex 13. If the other agency elects not to appoint an accredited representative, the other agency is to be provided timely updates on the progress of the investigation, safety issues developed, and conclusions that arise.
2. In the event that an accident or incident occurs in the territory of a third State and the United States or France is the State of Design or Manufacture of the aircraft, the other agency, which is not the State of Manufacture, the State of Registration or State of the Operator, is to provide notification of its plans for participation in the investigation. The other agency may then elect to designate an accredited representative and appoint advisers to the concerned agency. If the other agency elects not to take such action, it should be provided timely updates on the progress of the investigation, safety issues that are developed, and conclusions that arise.
3. In the event that there is an occurrence in the territory of a third State, for which neither of the two agencies is the State of Design or Manufacture of the aircraft, the two agencies together are to approach the State of occurrence to determine the most appropriate procedures for representation and participation in the investigation.

8. Cooperation Between the Two Agencies

8.1 Assistance in the Supervision of Examination of a Component Part

The agency that conducts the investigation may request that the other agency assist in supervising the examination, testing, or disassembling component parts that have been removed to the location of a manufacturer or other facility of the other State. The other agency is to provide such assistance to the extent possible. In all cases, the agency that conducts the investigation is to provide updates as soon as practicable to the other agency of all investigation activities being carried out in the territory of that State and is to invite the other agency to participate.

8.2 Training of Personnel

To the extent possible, the two agencies are to facilitate exchanges of personnel for training and development, including observer status at major investigation accident sites and subsequent off-scene investigative activities.

8.3 Exchange of Information

Either agency may request information on the progress of investigations by the other agency. The other agency is to do everything possible to provide the information. This information is then to be treated with the same rules of confidentiality as those to which the providing agency is itself bound, in accordance with the laws of the respective States.

8.4 Conduct of the Agency Invited to Assist a State of Occurrence

When one of the two agencies is requested by the State of occurrence to provide technical assistance for an investigation in which the other agency is participating, or should be participating, under the provisions of Annex 13, the response to the request should be coordinated with the other agency. The two agencies should work together to ensure that the investigation is conducted in accordance with the spirit and procedures of Annex 13. Specifically, all the data necessary to fulfill the responsibilities prescribed by Annexes 6 and 8, including FDR and CVR information and copies of the recordings, should be made available to the involved State as soon as practicable. Both agencies are to update and refine data as it becomes available and are to coordinate to ensure that the best data set is available as the investigation progresses.

8.5 Future Coordination and Planning

The agencies' representatives should meet at least annually and alternately at the facilities of the respective agencies to discuss current investigations and any other relevant issues.

9. Victims and Relatives

Both agencies are to work in a fully coordinated manner to better meet the expectations of the victims and their families to the extent provided for under the laws of each State.

10. Duration

To the extent consistent with their international obligations, participating agencies may cease following the procedures set forth in this document at any time, except that they should continue to follow such procedures for purposes of any investigations in progress at that time. Regarding investigations in progress, confidentiality of information previously provided under these guidelines should continue consistent with domestic law.

To take into account any changes to international or national rules or policies, these guidelines are to be reviewed periodically by both agencies.

Signed at _Washington D.C. _on November 16, 2000 _in duplicate in the English and French languages.

_____/s/ Paul Arslanian_____
 Director
 Bureau Enquetes-Accidents

_____/s/ Jim Hall_____
 Chairman
 National Transportation Safety Board