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Part III

Department of Transportation

Federal Aviation Administration

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14 CFR Parts 121, 125, and 135

Filtered Flight Data; Proposed Rule

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 121, 125, and 135

[Docket No. FAA-2006-26135; Notice No. 06-16]
RIN 2120-AI79

Filtered Flight Data

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The FAA proposes to amend the digital flight data recorder (DFDR) regulations by prohibiting the filtering of some original parameter sensor signals. This proposed rule is based on recommendations issued by the National Transportation Safety Board, and is intended to improve the accuracy and quality of the data recorded on DFDRs and used during accident and incident investigations.

DATES: Send your comments on or before February 13, 2007.

ADDRESSES: You may send comments [identified by Docket Number FAA-2006-26135] using any of the following methods:

DOT Docket Web site: Go to http://dms.dot.gov and follow the instructions for sending your comments electronically.

Government-wide rulemaking Web site: Go to http://www.regulations.gov and follow the instructions for sending your comments electronically.

Mail: Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL-401, Washington, DC 20590-001.

Fax: 1-202-493-2251.

Hand Delivery: Room PL-401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For more information on the rulemaking process, see the SUPPLEMENTARY INFORMATION section of this document.

Privacy: We will post all comments we receive, without change, to http://dms.dot.gov, including any personal information you provide. For more information, see the Privacy Act discussion in the SUPPLEMENTARY INFORMATION section of this document.

Docket: To read background documents or comments received, go to http://dms.dot.gov at any time or to Room PL-401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions: Timothy W. Shaver, Avionics Systems Branch, Aircraft Certification Service, AIR-130, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 385-4686; facsimile (202) 385-4651; e-mail tim.shaver@faa.gov. For legal questions: Karen L. Petronis, Regulations Division, Office of Chief Council, AGC-200, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267-3073; facsimile (202) 267-7971; e-mail karen.petronis@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. We also invite comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking. The docket is available for public inspection before and after the comment closing date. If you wish to review the docket in person, go to the address in the ADDRESSES section of this preamble between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. You may also review the docket using the Internet at the Web address in the ADDRESSES section.

Privacy Act: Using the search function of our docket Web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the Federal Register published on April 11, 2000 (65 FR 19477-78) or you may visit http://dms.dot.gov.

Before acting on this proposal, we will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change this proposal in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it to you.

Proprietary or Confidential Business Information

Do not file in the docket information that you consider to be proprietary or confidential business information. Send or deliver this information directly to the person identified in the FOR FURTHER INFORMATION CONTACT section of this document. You must mark the information that you consider proprietary or confidential. If you send the information on a disk or CD ROM, mark the outside of the disk or CD ROM and also identify electronically within the disk or CD ROM the specific information that is proprietary or confidential.

Under 14 CFR 11.35(b), when we are aware of proprietary information filed with a comment, we do not place it in the docket. We hold it in a separate file to which the public does not have access, and place a note in the docket that we have received it. If we receive a request to examine or copy this information, we treat it as any other request

under the Freedom of Information Act (5 U.S.C. 552). We process such requests under the DOT procedures found in 49 CFR part 7.

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:
(1) Searching the Department of Transportation's electronic Docket Management System (DMS) Web page (http://dms.dot.gov/search); (2) Visiting the Office of Rulemaking's Web page at http://

http://www.faa.gov/regulations_policies/; or

(3) Accessing the Government Printing Office's Web page at http://www.gpoaccess.gov/fr/index.html
.

You can also get a copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267-9680. Make sure to identify the docket number, notice number, or amendment number of this rulemaking.

Authority for This Rulemaking

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code.

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Subtitle I, section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.
This rulemaking is promulgated under the authority described in subtitle VII, part A, subpart III, section 44701. Under that section, the FAA is charged with prescribing regulations providing minimum standards for other practices, methods and procedures necessary for safety in air commerce. This regulation is within the scope of that authority since flight data recorders are the only means available to account for aircraft movement and flight crew actions critical to finding the probable cause of incidents or accidents, including data that could prevent future incidents or accidents.

Background

Statement of the Problem

During several aircraft accident investigations, the National Transportation Safety Board (NTSB or Board) found that some flight data recorder (FDR) systems were filtering flight recorder parameter signals before they were recorded. As a result, the data being recorded did not accurately reflect the aircraft's performance or the movements of the flight control systems prior to and during the accident/incident being investigated. This signal filtering both hampered and delayed the investigations. In addition, the NTSB expended significant resources

and time attempting to recreate the performance and movements of the flight control systems of the affected aircraft.

Designers of the information sources that provide input to the DFDR system have their own reasons for filtering data, such as making it more aesthetically appealing for display in the cockpit. During the design of DFDR systems, it appears that convenience and a desire to reduce cost and complexity by eliminating multiple data paths have led to the DFDR recording filtered data rather than raw data from the sensors. The FAA understands that, in some cases, it may have been an error in the choice of data selection sources that resulted in filtered data being recorded. We have no reason to believe that filtering is being used to disguise data that are central to accident/incident investigations.

After its most recent experience with signal filtering, the NTSB issued three recommendations (NTSB Recommendations A-03-48/A-03-49/A-03-50, November 6, 2003). The NTSB recommended that the FAA require all aircraft have installed a DFDR system ``capable of recording values that meet the accuracy requirements through the full dynamic range of each parameter at a frequency sufficient to determine a complete, accurate, and unambiguous time history of parameter activity, with emphasis on capturing each parameter's dynamic motion at the maximum rate possible, including reversals of direction at the maximum rate possible.''

The FAA agrees with these NTSB recommendations and is proposing to prohibit signal filtering for specified recorded parameters.

History

First Encounter With Filtered Data

The NTSB's first encounter with filtered data that impeded an investigation occurred during its investigation of three similar Boeing 767 accidents. Two of these accidents occurred in 1992 and one in 1993 when, during landing, the nose gear contacted the runway with excessive force after normal touchdown on the main landing gear. In each case, the airplane fuselage structure and nose wheel wells were damaged, but there were no injuries or fatalities. During its investigation, the NTSB found that the Engine Instrument Crew Alert System (EICAS) was filtering flight control position data before it was sent to and recorded by the DFDR. A low sample rate (once per second) rendered the filtered data even less usable, making it impossible for the NTSB to determine the pilots' actions with precision.

At the same time the NTSB was investigating these three accidents, it was also investigating several alleged uncommanded rudder movements on Boeing 767s. In these cases, the NTSB found that the EICAS was also filtering rudder position data before being recorded by the DFDRs. An investigation disclosed that the discrepancy between the recorded rudder position and the actual rudder position could be greater than 20 degrees in some dynamic situations.

As a result of these findings, in June 1994 the NTSB recommended that the FAA:

(1) Require design modification to the Boeing 757 \1\ and 767 models so that flight control position data sent to the DFDR is accurate and not filtered by the EICAS (NTSB Recommendation A-94-120);

and

\1\ The Boeing 757 was included in the recommendation because it carried the same EICAS system as the 767. The filtering issue was resolved by modifications to the EICAS that were mandated in a rulemaking unrelated to data filtering.

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(2) Review other airplane designs to ensure that flight control position data to the DFDR are accurately recorded and that flight control position data filtered by systems such as EICAS are not substituted for accurate data (NTSB Recommendation A-94-121).

FAA Action: Recommendation A-94-120

The FAA addressed NTSB Recommendation A-94-120 in two ways. First, in 1997, the FAA revised the DFDR regulations to require that certain aircraft be equipped to accommodate additional DFDR parameters (Revisions to Digital Flight Data Recorder Rules; Final Rule (62 FR 38362, July 17, 1997)). The revised DFDR regulations prescribe that up to 88 data parameters be recorded on DFDRs, with the exact number of parameters determined by the date of airplane manufacture. The number of parameters that must be recorded range from 18 for a transport category airplane manufactured on or before October 11, 1991, to 88 for airplanes manufactured after August 19, 2002. The revised rule applies to certain turbine-engine-powered airplanes and rotorcraft having 10 or more passenger seats.

The purpose of the 1997 revision was to provide additional information to enable the investigative authority--the NTSB in the United States--to conduct more thorough investigations of accidents and incidents. Although the 1997 rule language did not specifically prohibit filtering, we believed that the technical accuracy required by the specifications in Appendix M of part 121 would preclude filtering as a design option. In addition, the preamble to the final rule included our reply to an NTSB comment in which we stated that including the ``dynamic condition'' language in Appendix M reflected our position that filtered data was not acceptable.

The FAA further addressed NTSB Recommendation A-94-120 by issuing Advisory Circular (AC) 20-141, Airworthiness and Operational Approval of Flight Data Recorder Systems, on August 4, 1998. This AC provided detailed guidance on recording filtered data. Section 7 of AC 20-141, titled ``Type Certification,'' states:

``(1) The applicant must identify any parameters that are filtered before they are recorded. For these parameters, the applicant must show, by test, that there is no significant difference between the recorded parameter data under both static and dynamic conditions.''

Based on the FAA's actions in response to NTSB Recommendation A-

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94-120, the NTSB classified NTSB Recommendation A-94-120 ``Closed-Acceptable Action'' on May 11, 2000.

FAA Action: Recommendation A-94-121

In response to NTSB Recommendation A-94-121, the FAA first reviewed the flight control position data sent to the FDR on the McDonnell Douglas MD-80/90 and MD-11 model airplanes. In an August 29, 1994 letter to the NTSB, we indicated that the flight control positions were recorded in accordance with the regulations in effect at the time.

We next reviewed the flight control position data sent to the FDR for aircraft manufactured by Aerospatiale, CASA, Cessna, Grumann, Gulfstream, Israel Aircraft Industries, Lockheed and SAAB. In a November 1996 letter to the NTSB, we indicated that we had concluded that the flight control position data being recorded was accurate. We also indicated our intent to conduct similar reviews for aircraft manufactured by several specified manufacturers.

In May 1997, the NTSB indicated that the language of then-proposed Appendix M to part 121 ``appear(s) to preclude the use of data filters,'' and agreed that ``EICAS-filtered data parameters, would not meet this proposed requirement * * *. The Board supports the FAA's proposal to eliminate filtered FDR data * * *.''

In February 1998, following the issuance of the 1997 regulatory revisions and the publication of AC 20-141, we informed the NTSB that we believed no further reviews of aircraft systems were necessary because the rule would ensure that accurate data were being recorded. The Board left its recommendation classified ``open-acceptable'' pending notification from the FAA on the reviews of other airplane designs.

In April 2000, we informed the NTSB that our review of Embraer and Dassualt (Falcon) aircraft indicated that the data were recorded accurately on these aircraft and representative of control surface positions. We stated that we considered our response to the recommendation complete and that no further action was planned.

In August 2000, the NTSB expressed disappointment that the FAA did not complete a review of all aircraft designs, but stated that it was pleased overall with the FAA's response to NTSB Recommendation A-94-121, and classified it as ``Closed-Acceptable Action.'' \2\

\2\ In 2002, the FAA did an informal survey of several manufacturers regarding data filtering, but it did not yield any meaningful results.

American Airlines Flight 587

On November 12, 2001, American Airlines Flight 587, an Airbus A300-600, crashed shortly after takeoff from John F. Kennedy Airport, Jamaica, New York. Flight 587 experienced an in-flight separation of the vertical fin and rudder assembly. During its investigation, the NTSB discovered a discrepancy between the recorded inputs to the rudder pedal position and the recorded rudder surface movement. The Board sought Airbus's input to explain the apparent discrepancies. Following further analysis, Airbus explained that the system data analog converter (SDAC), which supplies the flight control surface position data, digitized and then filtered the analog signals from the flight control surface position sensors before outputting the signals to the

FDR system. Subsequent aircraft performance evaluations conducted independently by the NTSB and Airbus confirmed that the filtered data recorded by the FDR did not reflect an accurate flight control surface position time history during the critical final seconds of Flight 587.

As a result of this discovery, NTSB investigators had to evaluate and validate the filtered flight control surface position data from the Flight 587 FDR against other A300 FDR and flight simulator data before they could analyze the critical performance parameters central to the investigation of the Flight 587 accident. The lack of unfiltered data delayed the analysis of the flight recorder data needed to determine the probable cause of the accident and to quickly identify necessary corrective actions.

NTSB Recommendations A-03-48/49/50

Following its investigation of Flight 587, on November 6, 2003, the NTSB recommended that the FAA:

(1) Require that all newly manufactured transport-category aircraft that are required to carry a flight data recorder be fitted with a flight data recorder system capable of recording values that meet the accuracy requirements through the full dynamic range of each parameter at a frequency sufficient to determine a complete, accurate, and unambiguous time history of parameter activity, with emphasis on capturing each parameter's dynamic motion at the maximum rate possible, including reversals of direction at the maximum rate possible. (NTSB Recommendation A-03-48).

(2) Require that all existing transport aircraft that are required to carry a flight data recorder be retrofitted with a flight data recorder system capable of recording values that meet the accuracy requirements through the full dynamic range of each parameter at a frequency sufficient to determine a complete, accurate, and unambiguous time history of parameter activity, with emphasis on capturing each parameter's dynamic motion at the maximum rate possible, including reversals of direction at the maximum rate expected. (NTSB Recommendation A-03-49).

(3) Require that, within 2 years, all Airbus A300-600/A310 and Boeing 747-400 \3\ airplanes and any other aircraft that may be identified as recording filtered data be retrofitted with a flight data recorder system capable of recording values that meet the accuracy requirements through the full dynamic range of each parameter at a frequency sufficient to determine a complete, accurate, and unambiguous time history of parameter activity, with emphasis on capturing each parameter's dynamic motion at the maximum rate possible, including reversals of direction at the maximum rate possible. (NTSB Recommendation A-03-50).

\3\ The Boeing 747-400 was included based on early data from Boeing that the airplane was filtering flight data.

Public Meeting

On July 7, 2004, the FAA hosted a public meeting to discuss NTSB Safety Recommendation A-03-50 and the issue of filtering flight data before it is recorded. The meeting was intended to gather information

from industry about current practices of processing data before they are recorded. We specifically sought answers to the following:

What if any data gets filtered before they are recorded, and how is the filtering accomplished?

How do individual manufacturers comply with the required ``method for readily retrieving'' the recorded data?

What equipment and procedures would need to be changed, and the costs involved, if the FAA were to adopt the NTSB recommendation (A-03-50) as written?

Representatives from the NTSB, Airbus, Boeing, the Allied Pilots Association, and the Air Line Pilots Association each made a presentation at the public meeting. During this meeting, Airbus confirmed that data filtering was also occurring on the rudder parameter

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for the A320 model airplane. In its presentation, Boeing noted that its original assessment was incorrect, as subsequent investigation revealed that no flight control parameter data were being filtered before being recorded on Boeing 747-400 aircraft.

Based on information received during the meeting, the FAA determined that the language of the existing regulations governing DFDRs needed to specifically address flight data filtering. While we recognize that some types of filtering are necessary (e.g., dampening noise to obtain a clear signal), data filtering that may obscure raw data to the extent it hampers an NTSB investigation has always been considered unacceptable. Accordingly, we are proposing this rule to amend the DFDR regulations by defining filtering in the regulation and prohibiting signal filtering for certain specified recorded parameters.

Alternatives Considered

Before deciding to promulgate this proposed rule, the FAA considered the following alternatives concerning data filtering:

(1) Take no action: In its recommendations following the Boeing 767 and Flight 587 accidents, and again at the 2004 public meeting, the NTSB described in great detail how its investigations were hampered by filtered data. When it finds filtered data, the NTSB must analyze it in an effort to approximate the actual control surface movement (in essence, unfilter the data), such as in the investigation of Flight 587. This processing requires detailed analysis and testing, which are time-consuming, costly, and for which techniques are not always readily available. Even after processing, the results retain a degree of uncertainty, as evidenced in the findings from Flight 587. As a result, the NTSB may be unable to determine the performance or flight control surface movements of an aircraft precisely enough to determine the probable cause of an incident or accident.

If the FAA decided to take no action on this issue, the NTSB would likely continue to encounter filtered data and have difficulty analyzing airplane incident and accident data. Thus, questions would remain over the industry's interpretation of regulatory requirements, thereby allowing filtering to continue or even increase as those

interpretations expand. Our conclusion that the recording of unfiltered data is necessary for aircraft incident and accident investigations leads to our rejecting this option.

(2) Address newly manufactured aircraft only: A regulatory alternative that is limited to future-manufactured aircraft is always less costly. It would fail, however, to address all of the aircraft in the U.S. airline fleet, and would allow filtering to continue on these airplanes or even increase as a result of future system modifications. Information we have gathered thus far indicates that flight data are being filtered on two models of Airbus aircraft currently in use. Filtering, as it is defined here, may be occurring on other aircraft in the fleet as well, despite the 1997 regulatory revisions. Experience with the Boeing 767 and the Airbus A300 has already demonstrated that filtering has occurred in the existing fleet, causing problems during investigations. Failing to address this problem on in-service aircraft is not an acceptable alternative.

(3) Enforce the current regulation on operators of individual aircraft that we know filter data before it is recorded: This option places the burden on the FAA to identify the specific aircraft affected with a problem we presumed was resolved by regulation in 1997, and take action through enforcement channels. It would bring into question each cited operator's interpretation of compliance with the regulation, and do nothing to resolve the issue for all manufacturers and operators. It could lead to selective, inconsistent enforcement and result in inconsistent regulatory compliance. We do not consider this an effective solution to a continuing issue.

Need for Regulatory Action

Our experience with Flight 587 and the NTSB's investigation of the accident all but demand that a more detailed regulatory solution be implemented. Following the loss of Flight 587, the FAA was intent on determining, as quickly as possible, whether there was anything wrong with the airplane that could be prevented from happening on other aircraft of that type. We expected that information needed to make that decision would be immediately available from the flight data recorder.

The initial analysis of Flight 587 DFDR data indicated that the airplane experienced an in-flight separation of the vertical stabilizer and rudder assembly. The first analysis of the recorded rudder motion indicated that the failure may have occurred at 1.24 times the prescribed limit load, well below the certification requirement that it be able to withstand 1.50 times the prescribed limit load (Sec. 25.303). If we had presumed the initial flight recorder information to be correct, we most likely would have taken more dramatic action to ensure the safety of the other A300s still operating, including grounding the rest of the fleet while an investigation into its airworthiness took place.

Once the NTSB discovered the inconsistent data, and learned that the rudder position signal had been filtered for display in the cockpit, however, NTSB staff began work to discern the actual motion of the rudder. The Board compared Flight 587 data with the data recorded by other A300 airplanes, and data from the A300 simulator. The NTSB's eventual conclusion was that Flight 587's vertical stabilizer separated

at almost 2 times the prescribed limit load. Although several analyses were performed, including an ``inverse filtering'' exercise with the manufacturer, and the FAA was satisfied with the underlying airworthiness of the A300-600 airplane, the NTSB has never been able to produce conclusive evidence of the actual motion and failure of the airplane's vertical stabilizer and rudder. This is exactly the kind of information we had intended be available under the 1997 requirements for digital flight data recorders.

When the FAA promulgated the 1997 regulatory revision, we had every expectation that the upgrades to the equipment and the more significant requirements for data sampling and accuracy would result in more reliable, usable data. What we have discovered is that some flight data systems are recording data that we know is inaccurate, and therefore not meeting the intent of the 1997 regulations. For these reasons, we have concluded that we must take action to clarify the regulations, specifically that filtering must be addressed as a defined term with a specific prohibition for certain critical parameters of flight data.

General Discussion of the Proposal

Proposed Rule Language

This section describes the rule language that would appear in part 121 and Appendix M. The same language is being proposed for parts 125 and 135 and the associated appendices, though the discussion has been abbreviated to reference only part 121 and Appendix M. We note that the language in part 135 has a more limited scope based on the applicability of portions of Sec. 135.152. We also note that operators of aircraft subject to Sec. 91.1045 may be affected by the changes to the other sections that are referenced in that operating rule.

Section 121.344(n)

Proposed new Sec. 121.344(n) has four parts. Paragraph (n) prohibits filtering of all parameters except those listed in

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paragraph (2). Paragraph (n)(1) defines filtering, including what does not constitute filtering. Paragraph (n)(2) lists those parameters that may be filtered. Paragraph (n)(3) presents the compliance times.

Proposed paragraph (n) states that no flight data sensor signal that is required to be recorded may be filtered, except for those parameters listed in proposed paragraph (n)(2). This regulation is designed to be prohibitive for all parameters unless specifically excepted in the regulation.

Proposed paragraph (n)(1) defines a filtered signal as one that is changed in any way, except that filtering does not include analog to digital conversion, reformatting for compatibility with a DFDR format, or elimination of a high frequency component that is outside the bandwidth of the sensor. All signals may, as necessary, receive any of these treatments and not be considered filtered.

Proposed paragraph (n)(2) contains the list of parameters that may be filtered beyond the limits of paragraph (n), as long as the recorded

signal still complies with the specifications of the applicable appendix.

Proposed paragraph (n)(3) presents the proposed compliance times. Aircraft that are manufactured up to 18 months after the effective date of the rule have 4 years from the date of the rule to comply. For aircraft manufactured on or after 18 months after the effective date of the rule, compliance is required at manufacture.

This compliance period is designed to permit operators to accomplish any required modifications during a regularly scheduled heavy maintenance visit, reducing potential impact on scheduled operations or additional out-of-service time. The four year compliance time is consistent with FAA actions in previous flight recorder regulations and has been supported by the industry as an adequate time for retrofit and for introducing new system design into aircraft being manufactured.

Our review of the 88 parameters listed in Sec. 121.344(a) resulted in a determination that some parameters are too critical to allow any filtering beyond the allowable stated signal conditioning. Those parameters include flight control surface position, control column position, control forces, and others that reflect sensitive system information.

We are also including discretes in the list of parameters that are not to be filtered. By definition, discretes show something is on or off; we know of no need for these data to be filtered.

The parameters listed in proposed Sec. 121.344(n)(2), the ones that may be filtered, are those from which a loss of raw information would not be critical. We do not, however, encourage the filtering of any original sensor signal, and the recorded signals for the parameters listed in proposed paragraph (n)(2) must continue to meet the range, resolution, rate, and accuracy requirements of the applicable appendices under all conditions. If a parameter proposed for inclusion in proposed paragraph (n)(2) is later found to be inappropriate for filtering because it impedes an investigation, it will be removed from that paragraph.

We request specific comment on the propriety of the items included in proposed paragraph (n)(2). As previously stated, the FAA acknowledges that some conditioning of data is necessary (e.g., dampening noise) and that recognized signal conditioning does not alter, change or manipulate the data in such a way as to affect the accuracy of the data recorded. We request specific comment on any parameter for which commenters have reason to include or exclude from the filtering prohibition.

Additional Language on Dynamic Condition

At the beginning of current Appendix M, the following language appears:

``The recorded values must meet the designated range, resolution, and accuracy requirements during dynamic and static conditions. All data recorded must be correlated in time to one second.''

When we proposed this language in 1996, the NTSB commented that it thought the FAA needed to include more explanation of what the testing language entailed. We responded that further explanation would appear in the Advisory Circular that was being developed in conjunction with the rule.

More notably, we also included the following in the final rule preamble, in response to the NTSB:

``The FAA added the requirement for a dynamic test condition to ensure accurate dynamic recording of aircraft performance. This requirement was necessary to preclude the presumption that information * * * may be obtained from filtered or modified signals.''

(62 FR 38371, July 17, 1997, emphasis added)

We maintain that this language should have been sufficient to stop the recording of filtered flight data, even before the advisory circular material was published. Since we are aware of at least one instance in which the meaning of ``dynamic and static conditions'' was not recognized, we are proposing an addition to that language in this rulemaking to further clarify what has been required.

``Static condition'' is generally understood to mean the part being tested is at rest or in a balanced, steady state. The term ``dynamic condition'' causes more debate, however, concerning the rate of change that is required for the test. In the case of control surfaces, for example, we mean the limits of motion and at what rate the surface must be traveling while meeting the operational performance requirements and accuracy required by Appendix M.

While most operators have interpreted the dynamic condition phrase as we do, Flight 587 served as notice that the understanding is not universal. While it appeared that the rudder surface parameter on Flight 587 was recorded correctly and reflected the airplane's movements within operational performance requirements, the final NTSB accident report revealed that the estimated actual surface movement was greater than the recorded movement (from filtered SDAC data) by more than 5 degrees. This margin of difference between actual and recorded rudder movement does not meet the requirement in Appendix M.

To further clarify the regulation regarding test conditions, we are proposing to add a phrase to the Appendix M language to include maximum rate of change. We are also expanding the discussion of dynamic testing in the next version of the advisory circular.

Effect of the Proposed Regulation

There are currently only two known aircraft models in the U.S. fleet that have flight data systems that filter data before they are recorded--the Airbus A300 and A310 series airplanes, and the Airbus A320 ``family'' of airplanes that includes the A318, A319, A320, and A321.

We asked Airbus for proposed solutions for each series of airplanes that would eliminate the filtering of flight data before the data are recorded.

The modification proposed by Airbus for the A300 and A310 airplanes

includes a modification of the System Digital Analog Converter (SDAC) and the Symbol Generator Unit (SGU). Simply stated, the modification would change what the digitized signals would be named by the SGU, allowing one set of signals to reach the recorder in an unfiltered state. The modification can be made regardless of how many other changes may have been made to the DFDR systems on these airplanes because it does not include modification of the flight data acquisition unit or the

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recorder itself, the equipment most often affected by changes to regulatory requirements or general system upgrades. The FAA's initial reaction to the proposed modification is that it is simple and effective. Our analysis indicates that the modification would cost approximately $16,025 per airplane.

The modification proposed by Airbus for the A320 family of airplanes, however, is neither straightforward nor inexpensive. Instead of a simple change to the SDAC and the SGU, Airbus is incorporating the change for filtering in the Electronic Instrument System (known as EIS2) master change modification. The EIS2 modification is an extensive system modification that includes new software in the SDAC and a complete replacement of the flight deck indication systems, including an upgrade from cathode ray tubes to liquid crystal displays and associated rewiring. This modification is designed to correct a variety of other issues with the existing flight deck instrumentation system on the A320 family of airplanes. Airbus's addition to the existing EIS2 modification will eliminate rudder data filtering by leaving the output data the same and changing the indication system that recognizes it. This differs from the A300/A310 solution, which captures the data before it is filtered and creates a new name for it when it is recorded.

In response to our inquiries why the rudder data filtering issue cannot be addressed alone in a manner similar to the A300/A310, Airbus indicated it would not provide another solution. In addition, Airbus did not break out the cost of the filtering solution from the rest of the EIS2 modification.

The proposed comprehensive EIS2 solution for the A320 family is far more expensive--$800,000 per airplane according to the Airbus service bulletin--than the A300/A310 solution. The FAA does not accept the implication that the only means of correcting the rudder filtering problem on the A320 family is the costly EIS2 modification, and we do not accept the EIS2 modification cost estimate in estimating costs to correct the problem.

In fact, we believe that this rule does not propose any known modification costs for which we have not accounted previously. When we wrote and analyzed the 1997 regulatory changes for flight recorders, we included the cost of equipment needed to meet the requirements of Appendix M (and its equivalent in other operating parts). As stated previously, we understood that compliance with Appendix M essentially eliminated filtering as an option, since filtered data would not meet the considerable technical specifications of the Appendix nor the requirement for dynamic testing. We replied to the NTSB's comment

indicating that the inclusion of the dynamic testing requirement was meant to preclude the use of filtered data.

To argue that filtered data is somehow acceptable under Appendix M is to argue that the FAA spent three years and imposed high costs in order to allow inaccurate (and unusable) data to be recorded. While we understand that the language of the 1997 regulation does not specifically define and prohibit filtering, we also know that the regulation had that intent, as was expressed in the preamble, and was written to be as performance-based as possible. We stated the data requirements in Appendix M but did not specify any exact equipment requirements as long as the qualitative data goals were met. We will not now accept an argument that we intended the regulation to permit the recordation of inaccurate or incomplete data, as Flight 587 demonstrated, when the sole purpose of flight recorder data is to collect accurate data to assist investigations of accidents and incidents. The experience of the NTSB and FAA during the investigation of Flight 587 has shown that the regulation needs clarification. But the regulatory goal of the 1997 revision remains unchanged--the recordation of accurate, usable flight data, described in Appendix M, and accounted for in the economic evaluation of the 1997 final rule. Data that do not accurately reflect the movement of an aircraft cannot be said to meet Appendix M or the goal of the flight recorder regulations overall. To the extent work is required to modify aircraft DFDR systems to provide accurate data, the costs of modifications or design changes were already accounted for in the 1997 final rule, even though they may have yet to be accomplished.

There are costs associated with this rule, but they are limited to operators confirming that the DFDR systems on their aircraft do not filter any parameter on the prohibited list. We are not aware of any aircraft that filters the prohibited parameters other than the Airbus airplanes already discussed. The estimated costs for confirming compliance are related to engineering evaluation of the systems installed on various models of airplanes, and are discussed in the regulatory evaluation for this rulemaking. The regulatory evaluation also includes a detailed estimate of the costs to retrofit the Airbus airplanes that we know are filtering the rudder movement data. As stated, we do not consider those to be a cost of this rule, but of ultimate compliance with the 1997 regulations.

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined that there are no new information collection requirements associated with this proposed rule.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has

determined that there are no ICAO Standards and Recommended Practices that correspond to these proposed regulations.

Regulatory Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Pub. L. 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96-39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act requires agencies to consider international standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $128.1 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of this proposed rule. We suggest readers seeking greater detail read the full regulatory

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evaluation, a copy of which we have placed in the docket for this rulemaking.

In conducting these analyses, FAA has determined this proposed rule has benefits that justify its costs, and is not a ``significant regulatory action'' as defined in section 3(f) of Executive Order 12866. The rulemaking is also not ``significant'' as defined in DOT's Regulatory Policies and Procedures. The proposed rule, if adopted, will not have a significant economic impact on a substantial number of small entities, will not create unnecessary obstacles to international trade and will not impose an unfunded mandate on state, local, or tribal governments, or on the private sector. These analyses, available in the draft regulatory evaluation supporting this NPRM, are summarized below.

Total Costs and Benefits of This Rule

The estimated cost of this proposed rule would be $675,000 ($571,592 in present value terms). This proposed rule would clarify the regulations to define and prohibit data filtering, which would ensure more accurate data for accident investigations. More detailed benefits and cost information will be provided below. The FAA seeks comments on these estimates.

Who Is Potentially Affected by This Rule

This proposed rule would affect all part 121 and part 125 aircraft,

and would also affect those part 135 aircraft having 10-30 passenger seats that are manufactured after August 2000 (in accordance with 14 CFR 135.152 (i) and (j)). Operators subject to Sec. 91.1045 may be affected if their aircraft are subject to one of the listed requirements.

Assumptions

Discount rate--7%. Sensitivity analysis was performed on 3% and 7%.

Period of Analysis--2007 through 2010.

Burdened labor rate for engineers and quality professionals--$75/hour.

Final rule will become effective 4 years after publication.

Benefits of This Rule

In 1994, the National Transportation Safety Board (NTSB) recommended a review of airplane designs to ensure flight control data to the DFDR are accurate and that filtered data are not substituted for accurate data. Beginning in 1994, the FAA conducted a review of several different aircraft and did not discover any filtered data being sent to the DFDR. In 1997, the Revisions to Digital Flight Data Recorder Regulations was published. Based on these FAA actions, NTSB classified that recommendation as ``Closed--Acceptable Action.'' Although the 1997 revision did not specifically define and prohibit filtering, the regulation had that intent as was expressed in the final rule preamble. The American Airlines Flight 587 accident involving an Airbus A300-600 demonstrated that this problem of filtered data still existed, and hampered the investigation. Filtered data has slowed and reduced the certainty of the Airbus A300-600 accident investigation. Unfortunately, some data filtering continues and has obscured key causal factors of an accident. (The FAA intends with this rule to specifically define and prohibit filtered data for NTSB accident investigations.)

Costs of This Rule

The costs of the proposed rule from 2007 through 2010 would be $571,592 in present value terms. Refer to the tables below for a more detailed breakdown of the costs. The FAA requests comments on the costs.

Relevant US fleet category	Aircraft	Cost
Part 121	6,573	$492,975
Part 125	628	47,100
Part 135 (overestimate)	1,799	134,925
Total affected aircraft (overestimate)	9,000	675,000

Sources: ACAS database by Flight, Federal Aviation Administration.

	Total Costs (Undiscounted and Discounted)				
	2007	2008	2009	2010	Total
Number of Planes	2,250	2,250	2,250	2,250	9,000
Undiscounted Costs	168,750	168,750	168,750	168,750	675,000
Costs Discounted at 7%	157,710	147,393	137,750	128,739	571,592
Costs Discounted at 3%	163,835	159,063	154,430	149,932	627,260

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (Pub. L. 96-354) (RFA) establishes ``as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation.'' To achieve that principle, the RFA requires agencies to consider flexible regulatory proposals, to explain the rationale for their actions, and to solicit comments. The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a proposed rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The FAA believes that this proposal would not have a significant impact on a substantial number of entities for the following reason: the individual airplane cost of $75 would not represent a significant economic burden on airplane operators. Therefore, the FAA certifies that this proposal would not have a significant economic impact on a substantial number of small entities. The FAA solicits comments regarding this finding.

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International Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96-39) prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has assessed the potential effect of this proposed rule and determined that it would respond to a domestic safety objective and would not be considered an unnecessary barrier to trade.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation with the base year 1995) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ``significant regulatory action.'' The FAA currently uses an inflation-adjusted value of $128.1 million in lieu of $100 million.

This proposed rule does not contain such a mandate. The requirements of Title II do not apply.

Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action would not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government, and therefore would not have federalism implications.

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this proposed rulemaking action qualifies for the categorical exclusion identified in Chapter 3, paragraph 312f, and involves no extraordinary circumstances.

Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA has analyzed this NPRM under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a ``significant energy action'' under the executive order because it is not a ``significant regulatory action'' under Executive Order 12866, and it is not likely to have a significant adverse effect on the

supply, distribution, or use of energy.

List of Subjects in 14 CFR Parts 121, 125, and 135

Air carriers, Aircraft, Aviation safety, Safety, Transportation.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend part 121 of Chapter I of Title 14, Code of Federal Regulations as follows:

PART 121--OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

1. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 40119, 44101, 44701-44702, 44705, 44709-44711, 44713, 44716-44717, 44722, 44901, 44903-44904, 44912, 46105.

2. Amend Sec. 121.344 by adding a new paragraph (n) to read as follows:

Sec. 121.344 Digital flight data recorders for transport category airplanes.

* * * * *

(n) For any parameter required by this section to be recorded, no flight data sensor signal may be filtered, except as provided in paragraph (n)(2) of this section.

(1) A signal is filtered when an original sensor signal has been changed in any way, other than changes necessary to:

(i) Accomplish analog to digital conversion of the signal;

(ii) reformat a digital signal into a DFDR-compatible format; or

(iii) eliminate a high frequency component of a signal that is outside the operational bandwidth of the sensor.

(2) The original sensor signals for the following parameters described in paragraph (a) of this section may be filtered, provided that each recorded signal continues to meet the requirements of Appendix M of this part: 1-7, 9, 11, 18, 20, 21, 24, 26-28, 32, 34, 37-39, 43, 45-54, 58, 59, 68, 70, 73, 77, and 82-85.

(3) Compliance with this paragraph is required as follows:

(i) For aircraft manufactured before [date 18 months from effective date of the final rule], compliance is required by [date 4 years from effective date of the final rule].

(ii) For aircraft manufactured on and after [date 18 months from effective date of the final rule], compliance is required at manufacture.

3. Amend Sec. 121.344a by adding a new paragraph (g) to read as follows:

Sec. 121.344a Digital flight data recorders for 10-19 seat airplanes.

* * * * *

(g) Compliance with the requirements of Sec. 121.344(n) of this part is required for all airplanes covered by this section.

4. Amend appendix M to part 121 by revising the introductory text immediately following the appendix title to read as follows:

Appendix M to Part 121--Airplane Flight Recorder Specifications

The recorded values must meet the designated range, resolution and accuracy requirements during static and dynamic conditions. Dynamic condition means the parameter is experiencing change at the maximum rate available, including the maximum rate of reversal. All data recorded must be correlated in time to within one second.

* * * * *

PART 125--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

5. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701-44702, 44705, 44710-44711, 44713, 44716-44717, 44722.

6. Amend Sec. 125.226 to add a new paragraph (m) to read as follows:

Sec. 125.226 Digital flight data recorders.

* * * * *

(m) For any parameter required by this section to be recorded, no flight data sensor signal may be filtered, except as provided in paragraph (m)(2) of this section.

(1) A signal is filtered when an original sensor signal has been changed in any way, other than changes necessary to:

(i) Accomplish analog to digital conversion of the signal;

(ii) reformat a digital signal into a DFDR-compatible format; or

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(iii) eliminate a high frequency component of a signal that is outside the operational bandwidth of the sensor.

(2) The original sensor signals for the following parameters described in paragraph (a) of this section may be filtered, provided that each recorded signal continues to meet the requirements of Appendix E of this part: 1-7, 9, 11, 18, 20, 21, 24, 26-28, 32, 34, 37-39, 43, 45-54, 58, 59, 68, 70, 73, 77, and 82-85.

(3) Compliance with this paragraph is required as follows:

(i) For aircraft manufactured before [date 18 months from effective date of the final rule], compliance is required by [date 4 years from effective date of the final rule].

(ii) For aircraft manufactured on and after [date 18 months from effective date of the final rule], compliance is required at manufacture.

7. Amend appendix E to part 125 by revising the introductory text immediately following the appendix title to read as follows:

Appendix E to Part 125--Airplane Flight Recorder Specifications

The recorded values must meet the designated range, resolution and accuracy requirements during static and dynamic conditions. Dynamic condition means the parameter is experiencing change at the maximum rate available, including the maximum rate of reversal. All data recorded must be correlated in time to within one second.

* * * * *

PART 135--OPERATING REQUIREMENTS: COMMUTER AND ON DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

8. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 106(g), 41706, 44113, 44701-44702, 44705, 44709, 44711-44713, 44715-44717, 44722.

9. Amend Sec. 135.152 by adding a new paragraph (l) to read as follows:

Sec. 135.152 Flight recorders.

* * * * *

(l) For aircraft subject to paragraph (i) or (j) of this section:

(1) For any parameter required by this section to be recorded, no flight data sensor signal may be filtered, except as provided by paragraph (l)(3) of this section.

(2) A signal is filtered when an original sensor signal has been changed in any way, other than changes necessary to:

(i) Accomplish analog to digital conversion of the signal;

(ii) reformat a digital signal into a DFDR-compatible format; or

(iii) eliminate a high frequency component of a signal that is outside the operational bandwidth of the sensor.

(3) The following original sensor signals for the parameters described in paragraph (h) of this section may be filtered, provided that each recorded signal continues to meet the requirements of Appendix F of this part: 1-7, 9, 11, 18, 20, 21, 24, 26-28, 32, 34, 37-39, 43, 45-54, 58, 59, 68, 70, 73, 77, and 82-85.

(4) Compliance with this section is required as follows:

(i) For aircraft manufactured before [date 18 months from effective date of the final rule], compliance is required by [date 4 years from effective date of the final rule].

(ii) For aircraft manufactured on and after [date 18 months from effective], compliance is required at manufacture.

10. Amend appendix F to part 135 by revising the introductory text immediately following the appendix title to read as follows:

Appendix F to Part 135--Airplane Flight Recorder Specifications

The recorded values must meet the designated range, resolution and accuracy requirements during static and dynamic conditions. Dynamic condition means the parameter is experiencing change at the maximum rate available, including the maximum rate of reversal. All data recorded must be correlated in time to within one second.
* * * * *

Issued in Washington, DC, on November 1, 2006.
Dorenda D. Baker,
Acting Director, Aircraft Certification Service.
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