



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable John D. Rockefeller, IV  
Chairman, Committee on Commerce,  
Science, and Transportation  
United States Senate  
Washington, DC 20510

Dear Mr. Chairman:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairman Shuster and Smith; Senator Thune; Congressman Rahall; and Congresswoman Johnson.

Sincerely,

Michael P. Huerta  
Administrator



U.S. Department  
of Transportation

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Administration**

Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable Bill Shuster  
Chairman, Committee on Transportation  
and Infrastructure  
House of Representatives  
Washington, DC 20515

Dear Mr. Chairman:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairmen Rockefeller and Smith; Senator Thune; Congressman Rahall; and Congresswoman Johnson.

Sincerely,

Michael P. Huerta  
Administrator



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Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable John Thune  
Committee on Commerce,  
Science, and Transportation  
United States Senate  
Washington, DC 20510

Dear Senator Thune:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairmen Rockefeller, Shuster, and Smith; Congressman Rahall; and Congresswoman Johnson.

Sincerely,

Michael P. Huerta  
Administrator



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**Federal Aviation  
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800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable Nick J. Rahall, II  
Committee on Transportation  
and Infrastructure  
House of Representatives  
Washington, DC 20515

Dear Congressman Rahall:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairmen Rockefeller, Shuster and Smith; Senator Thune; Congresswoman Johnson.

Sincerely,

Michael P. Huerta  
Administrator



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable Lamar Smith  
Chairman, Committee on Science,  
Space, and Technology  
House of Representatives  
Washington, DC 20515

Dear Mr. Chairman:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairmen Rockefeller and Shuster, Congresswoman Johnson, Congressman Rahall, and Senator Thune.

Sincerely,

Michael P. Huerta  
Administrator



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

August 16, 2013

The Honorable Eddie Bernice Johnson  
Committee on Science, Space,  
and Technology  
House of Representatives  
Washington, DC 20515

Dear Congresswoman Johnson:

As required by the FAA Modernization and Reform Act of 2012, H.R. 658 (the Act), Section 917, the Federal Aviation Administration (FAA) is pleased to provide the enclosed report.

The Act tasked the FAA with implementing a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. I am pleased to share with you the results of our work.

We have sent identical letters to Chairmen Rockefeller, Shuster, and Smith;  
Congressman Rahall; and Senator Thune.

Sincerely,

Michael P. Huerta  
Administrator

**AVIATION SAFETY, AVS-1**

**REPORT TO CONGRESS**

**Pub. L. No. 112-95, 126 Stat. 11 (2012)  
FAA MODERNIZATION AND REFORM ACT OF 2012**

**SECTION 917**

**RESEARCH AND DEVELOPMENT OF EQUIPMENT TO CLEAN AND  
MONITOR THE ENGINE AND AUXILIARY POWER UNIT (APU) BLEED AIR  
SUPPLIED ON PRESSURIZED AIRCRAFT**

**PREPARED FOR: AQS  
IN RESPONSE TO AVS LEGISLATIVE IMPLEMENTATION PLAN – SEC 917**

**PREPARED BY: AVP-300**

## **1.0 Introduction**

The FAA Modernization and Reform Act of 2012, Section 917, Pub. L. No. 112-95, 112 Stat. 11 (2012), directed the FAA, to the extent practicable, to implement a research program for the identification or development of appropriate and effective air cleaning and sensor technology for the engine and auxiliary power unit (APU) bleed air supplied to the passenger cabin and flight deck of a pressurized aircraft. Since 2004, the FAA has sponsored numerous cabin air environment research projects. Section 917 is specific to the detection and removal of oil-based contaminants entering the cabin through the engine and auxiliary power unit bleed air.

This report provides a summary of related FAA cabin environment research, a safety assessment of oil-based bleed air contamination, and a summary of related air cleaning technologies identified to the FAA in response to a request for information notice issued in the Federal Register.

## **2.0 Background**

On February 14, 2012, H.R. 658 was enacted and included Section 917, as follows:

**SEC. 917. RESEARCH AND DEVELOPMENT OF EQUIPMENT TO CLEAN AND MONITOR THE ENGINE AND APU BLEED AIR SUPPLIED ON PRESSURIZED AIRCRAFT.**

(a) **IN GENERAL.**— Not later than 60 days after the date of enactment of this Act, the Administrator, to the extent practicable, shall implement a research program for the identification or development of appropriate and effective air cleaning technology and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of a pressurized aircraft.

(b) **TECHNOLOGY REQUIREMENTS.**— The technology referred to in subsection (a) shall have the capacity, at a minimum—

(1) to remove oil-based contaminants from the bleed air supplied to the passenger cabin and flight deck; and

(2) to detect and record oil-based contaminants in the portion of the total air supplied to the passenger cabin and flightdeck from bleed air.

(c) **REPORT.**— Not later than 1 year after the date of enactment of this Act, the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure and the Committee on Science, Space, and Technology of the House of Representatives a report on the results of the research and development work carried out under this section.

The remainder of this report describes the actions completed by the FAA in compliance with the requirements of Section 917.

## **3.0 Results**

In responding to Section 917, the FAA completed the following three activities:



- Summarized FAA research in the area of sensors and prognostics to mitigate bleed air contamination events.
- Reviewed and summarized available industry safety data related to engine and auxiliary power unit bleed air contamination events involving oil based contaminants.
- Conducted a request for information through the Federal Register seeking information on technologies for removing oil-based contaminants from the bleed air and detecting and recording oil-based contaminants in the portion of the total air supplied to passengers and flightdeck crews from bleed air.

The following three sections describe the results of each activity.

### **3.1 FAA Research Activities of Bleed Air Sensors and Prognostics**

The aircraft cabin air environmental control system is designed to use bleed air to pressurize the cabin, regulate temperature, provide fresh air to occupants, flush gaseous air contaminants overboard and to some extent, control humidity in the air supply. Air from the bleed air system is directed to air-conditioning packs where the air is cooled in air cycle machines and then directed to the mixing manifold to be combined with re-circulated air for distribution throughout the cabin. Re-circulated air is often cleaned with high-efficiency filters designed to operate at a 99.97% capture rate at a 0.3  $\mu\text{m}$  particulate size. Although outside air is clean during cruise conditions at flight altitudes, spurious air contamination events have been reported due to leaks from worn engine mechanical seals or overfilled oil and/or hydraulic fluid sumps.

There are commercially available air quality sensors that may have the capability for detecting various types of environmental control systems contamination, including – catalytic-bead sensors, metal-oxide semiconductor sensors and electrochemical sensors. Additionally, wireless sensor networks can provide the necessary coverage to effectively monitor air quality sensor systems in aircraft bleed air supplies and airliner cabins. A prototype of such a system has been successfully demonstrated in a Boeing 767 mock-up cabin. The wireless sensor network has shown the capability to monitor multiple environmental variables and provide real-time correlated data, and represents a tool that can improve the ability to characterize highly dynamic environmental control systems on aircraft. More information on these sensors and sensor networks is available in Appendix (A). Engine oil contamination of the air supply is of particular concern since some engine oils contain tricresyl phosphate, a wear-reduction additive and potential health hazard. Given the very high air flow rates and high temperatures in the upstream portion of the bleed air system, the specific nature and extent of potential decomposition reactions of engine oils and hydraulic fluids are largely unknown. Additionally, the resulting nature and potential toxicity of any contaminants in the aircraft cabin from such events are highly speculative at the present time.

The FAA has sponsored cabin air environment research since 2004, including research related to sensors and prognostics to mitigate bleed air contamination. In 2004 the FAA's Office of Regulation and Certification established a National Center of Excellence (COE) for Airliner Cabin Environment Research (ACER). The ACER COE brought together expertise in airliner cabin environment science and technology from academic, industry and government organizations. With this approach, the FAA's cabin air environment research was able to

leverage national resources to address issues of aircraft cabin air quality. The following is a summary of the key bleed air contamination research activities that have been undertaken by the FAA's ACER COE:

*Airliner Cabin Environment - Health and Safety:* The purpose of this research is to determine and evaluate the health and safety effects of the airline cabin environment on passengers and crewmembers. The data from this research will be evaluated to determine how the safety and health of traveling passengers and crewmembers may be improved while minimizing operational costs. The technical information, including experimental data, will enable development of appropriate policy, guidance and regulations, to maximize the safety and health of the cabin air quality environment and guide design of future environmental control system technologies.

*Purification of Environmental Control System Air Supplies:* The efficiency and effectiveness of aircraft environmental control systems have not kept pace with the increasing demands on air quality in modern air transportation. Bleed air contamination events have been attributed to engine oils and hydraulic fluids contaminating the fresh air from the bleed air system. In addition, the demand for bleed air could potentially be decreased if more efficient and effective recirculation air purification techniques could be identified and implemented. This research is supporting the assessment of new technical solutions for bleed air and cabin air recirculation purification and filtration. The results of this research will inform the assessment of potential policy, guidance and regulations, that may be needed to ensure that hazards and risks from bleed air contaminants are maintained at levels consistent with public health standards.

*Airliner Cabin Environment - Purification of Environmental Control System Air Supplies; Bleed Air Contamination:* Emerging technologies have the potential to eliminate bleed air contaminants and purify the aircraft air supplies. This research will assess the potential for newer generation technologies to improve air quality, develop air quality criteria, and determine methods to minimize the weight and volume of the unit while simultaneously minimizing its parasitic energy requirements through reduced pressure drops. The results of the research will inform the assessment of potential recommendations for policy, guidance and regulations that may be needed to ensure that hazards and risks from bleed air contaminants are maintained at levels consistent with public health standards.

### **3.2 FAA Safety Data Assessment of Engine and APU Bleed Air Contamination Events**

The FAA conducted an Aviation Safety Information Analysis and Sharing (ASIAS) database search and analysis of the major airline operators conducting business within 14 CFR Part 121

to assess bleed-air contamination event rates. The following describes the results from this analysis.

#### Data Search:

Reported events considered in this assessment were collected through the Service Difficulty Reporting System (SDRS), National Transportation Safety Board (NTSB), FAA Accident Incident System (AIDS), and the FAA Voluntary Disclosure Reporting Program (VDRP). Each of these data sources was searched, using a text mining concept (including the terms: fume, odor, smell, smoke, and bleed air), for air carrier events of cabin air contamination by hydraulic or oil particulates.

#### Search Summary:

A total of 69 events over a ten year period between 2002 through 2011 were found and reviewed. None of these reported events involved known injuries, fatalities, or damage as defined by 49 CFR Part 830<sup>1</sup>. These events are summarized as follows:

- Events involving oil contamination, 18.
- Events involving hydraulic oil contamination, 0.
- Events involving other contamination (smoke, fumes, other unknown), 51.

The 69 events represent the actual values obtained from this specific data search. While this data search may not represent all engine and APU bleed air contamination events in Part 121 operations, it does provide an accurate accounting of these events during the period from 2002 through 2011, on a search of the terms “*fume, odor, smell, smoke, and bleed air.*”

It is important to note that while there are reports of purported personal injury in news media, medical privacy laws such as the Health Insurance Portability and Accountability Act of 1996 prohibit FAA from obtaining corroborating data which could be used to determine a causative relationship between air contaminant events and associated risk to passenger and flightdeck crew health.

### 3.3 Federal Register Notice – Request for Information

The FAA issued a 60-day Federal Register Notice – Request for Information (RFI) specifically addressing the product market availability of bleed air environmental control technologies capable of contamination detection and removal. A copy of the RFI is provided in Appendix B. The FAA received responses to the RFI from the following six companies:

- Aerotoxic Association (United Kingdom)
- Air Water Systems (Germany)
- Honeywell Aerospace (Torrance, CA)
- National Aerospace Consulting (Russia)
- Pall Aeropower Corporation (New Port Richey, FL)

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<sup>1</sup> Per 49 CFR Part 830, Notification and Reporting of Aircraft Accidents or Incidents: Serious injury means any injury which: (1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received. Fatal injury means any injury which results in death within 30 days of the accident.

- The Boeing Company (Seattle, WA)

Only three companies – Honeywell Aerospace, Pall Aeropower Corp., and Air Water Systems provided specific product information responsive to the specific request and purpose of the RFI.

<b>Sec 917 RFI Companies / Product Capacity</b>	<b>Air Water Systems</b>	<b>Honeywell Aerospace</b>	<b>Pall Aeropower Corporation</b>
1. Design & operational description		<b>X</b>	<b>X</b>
2. Physical dimensions of the device(s), including weight			<b>X</b>
3. Power, interconnect, & other installation requirements			<b>X</b>
4. Operational dimensions for the technology/system	<b>X</b>		<b>X</b>
5. Maintenance needs to assure system performance	<b>X</b>	<b>X</b>	<b>X</b>
6. Safety mechanisms designed into the technology/ system to minimize or mitigate anticipated hazards	<b>X</b>		
7. Contaminants the device can detect & sensitivity for each			
8. Location of the detection device placed in the air distribution system	<b>X</b>	<b>X</b>	<b>X</b>
9. Contaminants the device can remove	<b>X</b>	<b>X</b>	<b>X</b>
10. Overall system capacity	<b>X</b>		<b>X</b>
11. Cleaning effectiveness for each contaminant	<b>X</b>	<b>X</b>	<b>X</b>

Responses to the notice provided product information that can inform further potential cabin air contamination research. Common across the RFI responses was a reference to the lack of contaminant standards for detection of cabin air contaminants. Common standards would

facilitate further commercial development and implementation of advanced detection and cleaning technologies.

Overall, the companies are conducting their own proprietary research activities into bleed air filtration and monitoring technologies. The various industry manufacturers' development of bleed air filtration/cleaning technology and airline environmental control unit products is promising; however, the sensor monitoring and detection technology has not been as easy to develop due to the absence of airborne detection sensitivity requirements and standards.

## **4.0 Summary**

The FAA Modernization and Reform Act of 2012 required the agency to establish a research program focused on aircraft engine/APU bleed air cleaning and monitoring technology. As described in this report, the FAA has been conducting airliner cabin air quality research since 2004. The ACER COE is identifying air contaminants that could be considered hazardous to both passengers and flight crew members. ACER is also conducting research on sensor technologies that can detect the hazardous contaminants. Initial insight into these research activities is due in the 2013— 2014 timeframe.

The FAA conducted a safety database assessment of airliner cabin air quality events involving Part 121 commercial airline operators. The results of the analysis indicate an extremely low occurrence involving bleed air contamination from engine oil or hydraulic fluid. While there are reports of purported personal injury in news media, medical privacy laws such as the Health Insurance Portability and Accountability Act of 1996 prohibit the FAA from obtaining corroborating data which could be used to determine a causative relationship between air contaminant events and associated risk to passenger and flightdeck crew health.

FAA solicited input from the public with a Federal Register Notice – RFI to determine the current product availability of engine bleed air detection and cleaning technology. Responses to the notice provided product information that can inform further potential cabin air contamination research. Common across the RFI responses was a reference to the lack of contaminant standards for detection of cabin air contaminants. Common standards would facilitate further commercial development and implementation of advanced detection and cleaning technologies.

As shown by the search summary, the occurrence of oil or hydraulic based contamination of bleed air is extremely low. In formulating the annual aviation safety research portfolio, the FAA evaluates the relative risk of aviation safety hazards and the potential for safety improvement. The FAA will continue to consider cabin safety risk and sponsor research in this area appropriate to the risk level.

## **Appendix (A)**

National Air Transportation Center of Excellence for Research in the Intermodal Transport Environment, Report No.RITE-ACER-CoE-2012-05, Sensors and Prognostics to Mitigate Bleed Air Contamination Events, 2012 Progress Report, April 27, 2012.

Web Link: <http://acer-coe.org/files/bleedairreport.pdf>

## **Appendix (B)**

Federal Register Notice – Request for Information / FR Vol 77, No.137, Docket No.: FAA-2012-0714, Posted: July 17, 2012

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2012-0714]

Bleed Air Cleaning and Monitoring Equipment and Technology

ACTION: Notice; request for information.

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SUMMARY: The FAA seeks information from industry developers, manufacturers, and the public related to effective air cleaning technology and sensor technology for the engine and auxiliary power unit bleed air supplied to the passenger cabin and flight deck of a pressurized aircraft. The information obtained will inform the agency of potential research and development plans.

DATES: Written comments must be received on or before September 17, 2012.

ADDRESSES: Send comments identified by docket number FAA-2012-0714 using any of the following methods:

**Federal eRulemaking Portal:** Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.

**Mail:** Send comments to Docket Operations, M-30; U.S. Department of Transportation (DOT), 1200 New Jersey Avenue SE., Room W12-140, West Building Ground Floor, Washington, DC 20590-0001.

**Hand Delivery or Courier:** Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**Fax:** Fax comments to Docket Operations at 202-493-2251.

**Privacy:** The FAA will post all comments it receives, without change, to <http://www.regulations.gov>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA dockets, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov>.

**Docket:** Background documents or comments received may be read at <http://www.regulations.gov> at any time. Follow the online instructions for accessing the docket or Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For questions concerning this action,



contact Jim Knight, Research Planning Division, AVP-300, Office of Accident Investigation and Prevention, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone (202) 493-5634, email [james.knight@faa.gov](mailto:james.knight@faa.gov).

#### SUPPLEMENTARY INFORMATION:

##### Background

Section 917 of the approved FAA Modernization and Reform Act of 2012, H.R. Bill 658, requires the FAA to identify bleed air purification technology. Specifically, the FAA seeks information about bleed air cleaning, and contaminant detection and recording technologies which are capable of removing oil-based contaminants from the bleed air supplied to the passenger cabin and flight deck, and detecting and recording oil-based contaminants in the total air supplied to the passenger cabin and flight deck from bleed air.

The FAA recognizes there are various design concepts used by both developers and manufacturers of cabin air environmental control units. Given the design and performance variation in these technologies, the FAA seeks information from the industry to assist in its evaluation of the types of air cleaning and monitoring technology that will successfully detect, remove and report on engine-produced, oil-based cabin air contaminants.

##### Request for Information

The FAA requests that the comments specifically address the following areas to this notice:

- Design and operational description
- Physical dimensions of the device(s), including weight
- Power, interconnect, and other installation requirements
- Operational dimensions for the technology/system
- Maintenance needs to assure system performance
- Safety mechanisms designed into the technology/system to minimize or mitigate anticipated hazards

For detection technologies, please identify:

- Contaminants the device can detect and sensitivity for each
- Location of the detection device placed in the air distribution system

For air cleaning technologies, please identify:

- Contaminants the device can remove
- Overall system capacity
- Cleaning effectiveness for each contaminant

Again, this information must be submitted by September 17, 2012.  
Comments Invited

The FAA invites interested persons to submit written comments, data, or views. The most helpful comments reference a specific area of concern, explain the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, commenters should send only one copy of written comments, or

if comments are filed electronically, commenters should submit only one time.

The FAA will file in the docket all comments it receives, as well as a report summarizing each substantive public contact with FAA personnel concerning this notice. The FAA will consider all comments it receives on or before the closing date for comments. The FAA will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay.

Proprietary or Confidential Business Information: Commenters should not file proprietary or confidential business information in the docket. Such information must be sent or delivered directly to the person identified in the

FOR FURTHER INFORMATION CONTACT section of this document, and marked as proprietary or confidential. If submitting information on a disk or CD-ROM, mark the outside of the disk or CD ROM, and identify electronically within the disk or CD-ROM the specific information that is proprietary or confidential.

Under 14 CFR 11.35(b), if the FAA is aware of proprietary information filed with a comment, the agency does not place it in the docket. It is held in a separate file to which the public does not have access, and the FAA places a note in the docket that it has received it. If the FAA receives a request to examine or copy this information, it treats it as any other request under the Freedom of Information Act (5 U.S.C. 552). The FAA processes such a request under Department of Transportation procedures found in 49 CFR part 7.

Issued in Washington, DC, on July 6, 2012.

Wendell L. Griffin,  
Deputy Director, Office of Accident Investigation and Prevention.

[FR Doc. 2012-17368 Filed 7-16-12; 8:45 am]  
BILLING CODE 4910-13-P