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## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 39**

**[Docket No. FAA-2018-0495; Product Identifier 2017-NM-089-AD; Amendment 39-19716; AD 2019-16-13]**

**RIN 2120-AA64**

#### **Airworthiness Directives; The Boeing Company Airplanes**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

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**SUMMARY:** We are adopting a new airworthiness directive (AD) for certain The Boeing Company Model 777-200 and -300 series airplanes. This AD was prompted by reports of unreliable performance of the water and fuel scavenge system; failure of the fuel scavenge function can cause trapped fuel, resulting in unavailable fuel reserves. This AD requires incorporating operating limitations; or modifying the water and fuel scavenge systems in the fuel tanks, modifying the fuel jettison system, making electrical changes in the main equipment center, modifying the wiring in certain panels, and installing new software. We are issuing this AD to address the unsafe condition on these products.

**DATES:** This AD is effective November 14, 2019.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of November 14, 2019.

**ADDRESSES:** For service information identified in this final rule, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; internet <https://www.myboeingfleet.com>. You may view this service information at the FAA, Transport Standards Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195. It is also available on the internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2018-0495.

#### **Examining the AD Docket**

You may examine the AD docket on the internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2018-0495; or in person at Docket Operations between 9 a.m. and 5

p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, the regulatory evaluation, any comments received, and other information. The address for Docket Operations (phone: 800-647-5527) is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT:** Kevin Nguyen, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3555; email: kevin.nguyen@faa.gov.

## **SUPPLEMENTARY INFORMATION:**

### **Discussion**

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to certain The Boeing Company Model 777-200 and -300 series airplanes. The NPRM published in the Federal Register on June 1, 2018 (83 FR 25405). The NPRM was prompted by reports of unreliable performance of the water and fuel scavenge system; failure of the fuel scavenge function can cause trapped fuel, resulting in unavailable fuel reserves. During flight, any water in the fuel can sink to the bottom of the fuel tank. This water can enter the fuel scavenge inlets and can then freeze as it travels from the body center fuel tank into the colder fuel scavenge tubes in the left and right cheek center fuel tanks (outboard of the side of body ribs). The flow of scavenge fuel from the center fuel tank to the main fuel tanks can then decrease or stop. When this occurs, as much as 700 pounds of fuel can remain unavailable during flight. If the fuel quantity decreases to the quantity of the unavailable fuel, then fuel exhaustion will occur, which could lead to subsequent power loss of all engines. The NPRM proposed to require incorporating operating limitations; or modifying the water and fuel scavenge systems in the fuel tanks, modifying the fuel jettison system, making electrical changes in the main equipment center, modifying the wiring in certain panels, and installing new software.

### **Comments**

We gave the public the opportunity to participate in developing this final rule. The following presents the comments received on the NPRM and the FAA's response to each comment.

### **Support for the NPRM**

The Air Line Pilots Association, International (ALPA) stated that it supported the intent of the NPRM.

### **Request To Reduce the Compliance Time**

ALPA requested that we reduce the compliance time in paragraph (g) of the proposed AD from “36 months after the effective date of this AD” to “12 months after the effective date of this AD,” for the action to revise the operating limits in the “Fuel System–Loading” section of the “Certificate Limitations” section of the FAA-approved Boeing Model 777 Airplane Flight Manual.

We do not agree with the request to shorten the compliance time. After considering all the available information, we have determined that the compliance time, as proposed, which is the same as the compliance time for the similar recently issued AD 2018-14-08, Amendment 39-19328 (83 FR 32198, dated July 12, 2018) (“AD 2018-14-08”), represents an appropriate interval of time in which the required actions can be performed within the affected fleet, while still maintaining an adequate level of safety. In developing an appropriate compliance time, we considered the safety implications and document update schedules for timely accomplishment of the required actions.

Also, to reduce the compliance time of the proposed AD would necessitate (under the provisions of the Administrative Procedure Act) reissuing the notice, reopening the period for public comment, considering additional comments subsequently received, and eventually issuing a final rule. That procedure could add unwarranted time to the rulemaking process. We have determined that further delay of this AD is not appropriate. However, most ADs, including this one, permit operators to accomplish the requirements of an AD at a time earlier than the specified compliance time. If additional data are presented that would justify a shorter compliance time, we may consider further rulemaking on this issue. We have not changed this AD in this regard.

### **Request To Clarify a Statement Referring to Fuel Available During Flight**

American Airlines (AAL) requested that we clarify the statement in the “Discussion” section of the proposed AD that says, “as much as 700 pounds of fuel can remain unavailable during flight.” AAL stated that it is unable to find any Boeing documentation that references 700 pounds of center tank fuel regarding the center tank pump or fuel scavenge system operation.

We agree to clarify. AD 2016-11-03, Amendment 39-18530 (81 FR 34867, dated June 1, 2016) (“AD 2016-11-03”) applies to certain Boeing Model 777 airplanes and has similar requirements to modify the scavenge system. Prior to issuance of AD 2016-11-03, Boeing informed the FAA that as much as 2,600 pounds of fuel could remain trapped in the center fuel tank after the center tank override/jettison pumps are shut off.

Subsequent to the issuance of AD 2016-11-03, Boeing requested an alternative method of compliance (AMOC) from the FAA and stated that if the center tank override/jettison pumps are turned on, most of that 2,600 pounds of fuel can be accessed by those pumps. Boeing stated that, if a flight is down to the last of its reserve fuel, fuel exhaustion is a far greater risk than fuel tank ignition and all fuel pumps should be operated to access as much fuel as possible.

We concurred with this assessment and asked Boeing to determine the greatest amount of fuel that would not be accessible by the center tank override/jettison pumps if they are run until their inlets uncover over the range of possible airplane attitudes in a low fuel situation. Boeing responded that up to 700 pounds above the original unusable fuel level could remain trapped in the center fuel tank. This was the basis for the 700 pound value specified in the AMOC for AD 2016-11-03, in AD 2018-14-08, and in this AD. We have not changed this AD in this regard.

### **Request To Clarify What Prompted the Proposed AD**

AAL requested that we clarify what prompted the proposed AD. AAL stated that the proposed AD, AD 2016-11-03 and AD 2018-14-08, included reports of unreliable performance of the float operated fuel scavenge system. AAL asked if the reports state that a “FUEL SCAVENGE SYS” engine-indicating and crew-alerting system (EICAS) message occurred or are these simply reports of center tank fuel remaining after flight. AAL also asked that if the “FUEL SCAVENGE SYS” EICAS message did occur, did the fuel scavenge system not perform to the intended design criteria, or if the reports are simply reports of the center tank fuel remaining after flight, do the reports state the amount of fuel in both the center and main tanks. AAL commented that it is important to differentiate between normal conditions and fuel scavenge system failure conditions.

We agree to clarify. Boeing has analyzed the reports referenced in AD 2016-11-03, AD 2018-14-08, and this AD, and provided that information to the FAA. Those reports indicated failures of the fuel scavenge system on Boeing Model 777 airplanes. Some of those reports included statements that the “FUEL SCAVENGE SYS” EICAS message had displayed. Some reports were from airplanes that had earlier airplane information management system (AIMS) versions installed that did not have that message included in the software. The flight times and fuel tank quantities remaining after flight were included in the information provided by Boeing. In all cases, the fuel remaining in the tank was evaluated by Boeing. In each case, Boeing determined that the fuel scavenge system had failed to function. We have not changed this AD in this regard.

## **Request To Clarify Certain Language Regarding Fuel Reserves in the Proposed AD**

AAL stated that the proposed AD said, “If the fuel quantity decreases to the quantity of the unavailable fuel, then fuel exhaustion will occur, which could lead to subsequent power loss of all engines.” AAL commented that while this is a true statement without context, it ignores existing Code of Federal Regulations (CFR) requirements for additional fuel reserves and existing FAA-approved 777 Airplane Flight Manual (AFM) procedures.

We infer that AAL is requesting that we clarify the statement provided. We recognize that, for each type of operation, there are specific detailed requirements in the applicable operating rules that dictate the amount of reserve fuel that must be loaded prior to flight. Those requirements for reserve fuel are intended to account for various anticipated scenarios requiring additional fuel that can occur due to environmental conditions or due to anticipated single failures.

For any given mission, one of the critical fuel scenarios in the operating rules will dictate the minimum reserve fuel that must be carried in addition to mission fuel. Because there is the potential for up to 700 pounds of that fuel to be trapped, it is necessary to include this amount to the fuel load calculation in addition to the minimum fuel reserves calculated in accordance with the operating rules requirements. The FAA considers operation of airplanes with available fuel reserve levels below what is required for safe operation by operating rules to be an unsafe condition. We have not changed this AD in this regard.

## **Request To Clarify the “FUEL SCAVENGE SYS” Message**

AAL stated that from the electrical load management system (ELMS) logic that sets the “FUEL SCAVENGE SYS” EICAS message, 500 pounds or less of unusable fuel in the center tank is within tolerance for normal airplane performance and does not trigger a flight crew notification or record it as a maintenance message according to system design. AAL stated that the FAA's claim of an unsafe condition is mutually opposed to the existing fault isolation procedures that state no maintenance action is necessary.

AAL also commented that if there is 700 pounds of unusable fuel in the center tank, then only the amount above the acceptable 500-pound limit, or 200 pounds, should be at issue with respect to the proposed AD's “safety” condition. AAL stated that fuel is consumed during cruise at 17,500 pounds/hour for a Model 777-200ER airplane at max cruise range and each 100 pound increment of fuel is consumed about every 21 seconds.

We infer that the commenter requests a revision to the additional amount of reserve fuel required by this AD. We do not agree with the request. We note that the intent of the “FUEL SCAVENGE SYS” EICAS message is to announce a failure condition rather than normal operation. Boeing selected the logic for the message with the intent of announcing failures that are likely to trap well over 500 pounds of fuel, while not creating nuisance messages from intermittent indications of center tank fuel quantity levels slightly above zero during normal operation. The fuel quantity indicating system (FQIS) is calibrated to indicate zero fuel at the unusable fuel level when the scavenge system functions as intended. In the absence of known system deficiencies, such as minimum equipment list (MEL) items, or other limitations, operators are allowed to take credit for all of the fuel in the center tank as usable fuel down to the zero indicated level.

As discussed previously, we have determined that up to 700 pounds of center tank fuel is potentially unusable. This AD is intended to ensure that operators are not operating with less available mission and reserve fuel than is required by the applicable operating rules by ensuring that an additional 700 pounds of fuel is loaded to account for this amount of fuel potentially being unusable. We have not changed this AD in this regard.

## **Request To Withdraw the NPRM Based on the Effectiveness of the CFR Reserve Fuel Requirements**

AAL stated that it analyzed Model 777-200 flights over the last 12 months to illustrate the effectiveness of the CFR reserve fuel requirements. AAL commented that out of 20,255 flights, no airplane landed with less than 10,500 pounds of fuel or approximately half of the CFR required fuel reserve. AAL stated that every flight had enough “insurance” fuel to fly (cruise) for at least 30 additional minutes. AAL also stated it has now flown more than 400,000 flights on affected airplanes since early 1999, without flight operational ramifications from the fuel scavenge system. AAL stated this proves that the existing CFR reserve fuel and AFM procedures are more than sufficient to address any potential fuel scavenge system shortfall, including complete fuel scavenge system failure resulting in up to 2,400 pounds of remaining center tank fuel.

We infer that AAL is requesting that we withdraw the NPRM based on the effectiveness of the CFR reserve fuel requirements. We do not agree with the request. The FAA would expect fleet experience to be as described by the commenter. The critical reserve fuel requirements in the operating rules account for failure scenarios that are anticipated to be rare, but for which the FAA has determined that fuel reserves must be carried. For example, the fuel reserve requirement that often is most critical in dictating the minimum reserve fuel is the requirement in 14 CFR 121.646 to carry sufficient fuel for a maximum length extended-operations (ETOPS) diversion with an engine failure that causes rapid depressurization of the airplane. That is a rare failure which was not likely encountered on the flights analyzed by the commenter during the service period cited. This AD addresses loss of capability to scavenge fuel in the center fuel tank during a critical fuel scenario, such as an ETOPS diversion, which could lead to fuel exhaustion and subsequent power loss of all engines. We have not changed this AD in this regard.

## **Request To Address the Accuracy of FQIS**

AAL stated that it consulted Ontic (the FQIS original equipment manufacturer) about the accuracy of the FQIS. AAL commented that under flight conditions, FQIS accuracy is plus/minus 1 percent at full scale (main tanks) and 0 to 0.5 percent below 10 percent (center tank). AAL also commented that the CFR reserve fuel requirements effectiveness analysis discussed previously used full main tanks and minimum center tank fuel to determine the maximum effect on flight operations for 700 pounds of unusable fuel. AAL stated that with full main tanks (63,800 pounds each), FQIS is only accurate plus or minus 1,276 pounds.

We infer that AAL requested that we address the accuracy of FQIS. The figures provided by the FQIS vendor are specification requirements for accuracy and do not reflect actual performance of the system. While the FQIS does have some amount of error, much of that error is accounted for in the calibration of the FQIS installed in individual tanks when the zero indicated value is adjusted to either match or be slightly above the actual unusable fuel level.

In addition, the fuel reserve requirements provide a level of safety margin that the FAA has determined is necessary to ensure safe operation in consideration of anticipated environmental and failure conditions. A very small number of flights with available fuel reserves slightly below the required level may occur due to non-latent system failures, and the FAA has determined this does not present an unacceptable risk. However, the FAA considers operation of airplanes with available fuel reserve levels below what is required for safe operation by operating rules to be an unsafe condition. We have not changed this AD in this regard.

## **Request To Revise Paragraph (g) of the Proposed AD To Allow Alternative Action**

AAL requested that we provide an alternative action to the revision required by paragraph (g) of the proposed AD, which proposed changes to the operating limitations by requiring an additional 700 pounds of reserve fuel when the center tank fuel is required. AAL proposed an alternative

requirement to add a statement to the Non-Normal section of the AFM that, in the event of a “FUEL SCAVENGE SYS” EICAS message, the flight crew should make an assessment of the remaining fuel reserves, and as an option, they can choose to turn on the center tank pump(s) until the message clears (center fuel tank quantity falls below 500 pounds) or until the pump low pressure light illuminates continuously, whichever occurs first. AAL stated that the Model 777 airplane has a “FUEL QTY LOW” EICAS caution message that will display when there is less than 4,500 pounds of fuel in the left or right main fuel tank. AAL commented that the AFM Non-Normal procedures call for, among other actions, turning all fuel pump switches ON. AAL also commented that turning on the center tank fuel pumps can draw the center tank fuel quantity “down to a fuel quantity as low as 300 lbs.”.

We infer that the commenter considers that, as long as the center fuel tank override/jettison pumps are operated beyond the point where the “FUEL SCAVENGE SYS” EICAS message is extinguished (due to less than 500 pounds fuel remaining in the center fuel tank) or until the center tank fuel pump low pressure lights are illuminated continuously, the amount of fuel for which usable fuel credit was taken, but which actually remains trapped, is so small it has no safety impact.

AAL commented that “carrying an additional 700 lbs. of dead weight each flight provides no safety benefit, provides no value to the operation, is redundant to existing AFM procedures during potential low fuel situations and results in a substantial annual fuel penalty for the fleet.”.

AAL also requests that, if the alternative requirement is added to the proposed AD, it also be allowed as a method of compliance for AD 2016-11-03 and AD 2018-14-08 via an AD revision.

We do not agree with the commenter's request. Regarding the “FUEL QTY LOW” EICAS caution message, the procedure described by the commenter does not ensure that the up to 700 pounds of fuel that remains trapped due to the scavenge system failure to function will still be available as usable fuel. As discussed previously, Boeing has informed the FAA that up to 700 pounds of fuel above the original unusable fuel level can remain trapped.

The FAA does not agree that the additional 700 pounds of fuel required by this AD provides no safety benefit. As previously explained, the fuel reserve operating requirements are necessary to ensure safe operation in consideration of environmental conditions such as head winds and icing conditions, and reasonably anticipated failure conditions that can significantly increase the amount of fuel needed to safely complete a flight. For example, the fuel reserve requirement in 14 CFR 121.646 to carry fuel to accommodate a maximum length ETOPS diversion, following an engine failure that causes a rapid depressurization, is often the critical requirement that dictates the minimum reserve fuel that must be carried. While such failures are rare, the FAA determined all ETOPS flights are required to carry that extra fuel even though the vast majority of those flights will not need it.

The FAA notes that, while the reported events did not occur during ETOPS flights, at least two engine failures causing rapid depressurization have occurred in the last two years on other transport airplanes. Also, engine failures that released high energy debris beyond the engine nacelle, which could cause a rapid depressurization, have occurred on the Boeing Model 777 airplane, including at least three events in the last five years. The FAA has determined an unsafe condition exists when an airplane design deficiency results in failure of the fuel system to provide access to the full amount of fuel, for which credit is taken by the operator as usable fuel to meet the operating rules.

The FAA also does not agree with the AAL proposal to instruct flight crews to turn on the center tank pumps if a “FUEL SCAVENGE SYS” EICAS message is displayed after those pumps are turned off in response to the “FUEL LOW CENTER” EICAS message. The fuel pumps are turned off when the “FUEL LOW CENTER” EICAS message is displayed to avoid dry running of the fuel pumps, which presents a potential fuel tank ignition risk. This message was included in the ELMS software installation specified in paragraph (i)(1) of AD 2011-09-05, Amendment 39-16667 (76 FR 22305, April 21, 2011) (“AD 2011-09-05”). The FAA agrees with Boeing, as discussed previously, that turning the center tank fuel pumps back on in a low fuel situation is appropriate because such cases would be rare and in those cases the risk of fuel exhaustion exceeds the risk of a fuel tank ignition event. However, we do not consider the fuel tank ignition risk that would be posed by

potentially running the center pumps to the point where they run dry every time the scavenge system fails, as proposed by the commenter, to be acceptable.

Therefore, we have not changed this AD in this regard.

### **Request To Exempt Operators From Certain Requirements in the Proposed AD**

AAL requested that we provide a statement in the proposed AD to exempt operators from accomplishing the requirements in paragraphs (g) and (h) of the proposed AD if an operator's normal flight plan requires a minimum of 700 pounds of fuel above and beyond existing CFR requirements.

We disagree with the commenter's request. This AD requires an operator to carry 700 pounds of fuel in addition to the amount of fuel required by the applicable operating rules due to that amount of fuel being considered unusable. While some operators may be currently voluntarily loading an extra 700 pounds of fuel, this AD requires changes to the operator manuals to ensure the appropriate amount of fuel is loaded for each flight. Therefore, we have not changed this AD in this regard.

### **Request To Address the CFR Basis for Applying Fuel Reserves**

AAL requested that the proposed AD should state the CFR basis for applying the additional 700-pound reserve fuel requirement for compliance verification purposes.

We agree to clarify. The requirements of this AD address the identified unsafe condition via an amendment to 14 CFR part 39, which applies in addition to the applicable operating rules. We do not intend for this AD to replace or revise the operating rule requirements for fuel reserves. Those requirements are defined in the various applicable operating rules, and they vary with the type of operation being performed. The intent of this AD is that, once the operator has determined the minimum mission and reserve fuel that are required by the applicable operating rules, an additional 700 pounds of fuel must be added to the minimum required fuel load to account for the potential of up to 700 pounds of unusable fuel in the center tank due to failure of the scavenge system. We have not changed this AD in this regard.

### **Request for Credit for Remote Certification Airplane**

Boeing requested that we give credit to a "remote certification airplane" that had accomplished Boeing Service Bulletin 777-28-0082 RC01, dated December 7, 2015. Boeing stated that as part of the Boeing Service Bulletin 777-28-0082 remote certification program, the change was completed on airplane WB035 using Boeing Service Bulletin 777-28-0082 RC01, dated December 7, 2015, which occurred before Boeing Special Attention Service Bulletin 777-28-0082, dated May 26, 2016, was issued, and is equivalent to Boeing Special Attention Service Bulletin 777-28-0082. Boeing commented that this remote certification airplane is referenced in Boeing Special Attention Service Bulletin 777-28-0082, dated May 26, 2016; and Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017.

We disagree with the commenter's request. Airplane WB035 completed the remote certification by completing Boeing Service Bulletin 777-28-0082 RC01, dated December 7, 2015, and several other necessary Boeing service information documents. At this time, based on the information submitted by the commenter, it is not clear to the FAA that the configuration of WB035 is equivalent to that called for by Boeing Special Attention Service Bulletin 777-28-0082. To show that the final configuration of airplane WB035 is equivalent to the Boeing Special Attention Service Bulletin 777-28-0082 configuration, the operator or Boeing may submit additional data to the FAA and request approval of an AMOC under the provisions of paragraph (j) of this AD. We have not changed this AD in this regard.

## **Request To Use Information Notices in the Proposed AD**

Boeing, Delta Airlines (DAL), and United Airlines (UAL) requested that we revise the proposed AD to allow the use of certain information notices to complete the actions specified in paragraph (h) of the proposed AD. Boeing, DAL, and UAL stated that this would avoid operators having to request an AMOC for the deviations allowed by these information notices.

Boeing stated that Boeing Information Notice 777-28-0082 IN 03, dated May 25, 2017; Boeing Information Notice 777-28-0082 IN 04, dated December 19, 2017; and Boeing Information Notice 777-28-0082 IN 05, dated January 30, 2018, provide clarifications, improvements, and deviations, concurred by Boeing authorized representatives where applicable.

UAL noted that the information notices affect steps and figures marked as “RC” (required for compliance) in the related service bulletin.

DAL stated the changes in the information notices are required for some airplanes and configurations in order to comply with Boeing Special Attention Service Bulletin 777-28-0082 (i.e., an operator would not be able to comply with Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017, as currently written). DAL commented that issuing a final rule that operators cannot comply with as written should be avoided and places additional burden on operators.

We agree with the commenters that the information notices provide clarifications, improvements, and deviations, which avoid the need to request an AMOC. We note that Boeing has released Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019, which incorporates the clarifications, improvements, and deviations in the information notices. We have revised paragraph (h) of this AD to refer to Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019. We have also revised paragraph (i) of this AD to provide credit for Boeing Special Attention Service Bulletin 777-28-0082, dated May 26, 2016, and Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017, along with the related information notices.

## **Request for AMOC Credit for AD 2011-09-15**

Boeing requested that the proposed AD be revised to make it an AMOC for paragraph (g) of AD 2011-09-15, Amendment 39-16677 (76 FR 24345, May 2, 2011) (“AD 2011-09-15”). Boeing stated that paragraph (g) of AD 2011-09-15 requires installation of new ELMS software, an addition of left and right jettison pump auto shutoff relays, installation of ground fault interrupter relays and making changes in the ELMS P110/P210 and P301/P302 equipment panels.

Boeing commented that Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017, also requires installation of new ELMS software and modification of the ELMS P110/P210 and P301/P302 equipment panels. Boeing also commented that accomplishment of the engine fuel feed system modification specified in paragraph (h) of the proposed AD for installing ELMS software and making changes in the equipment panels is an acceptable AMOC for paragraph (g) of AD 2011-09-15.

We agree to clarify. Boeing Special Attention Service Bulletin 777-28-0082 already states that the FAA approves the actions specified in the service bulletin as an AMOC to certain requirements of AD 2011-09-15. Therefore, we do not need to revise this AD to specify this information.

## **Request To Add Certain Language to This AD**

DAL requested that we add certain language to this AD that allows installing the ELMS software version specified in paragraph (h) of this AD without requiring AMOCs be requested for AD 2011-09-15 and AD 2014-11-01, Amendment 39-17851 (79 FR 31851, June 3, 2014) (“AD 2014-11-01”). DAL stated that they reviewed AD 2011-09-15 and AD 2014-11-01 because of the ELMS software changes that were required in those ADs. DAL stated that paragraph (g) of AD 2011-09-15 requires

the accomplishment of Boeing Service Bulletin 777-28A0037, Revision 2, dated September 20, 2010, which includes a requirement to install new ELMS software. DAL commented that paragraph (h)(5) of AD 2014-11-01 requires the accomplishment of Boeing Service Bulletin 777-24-0087, Revision 2, dated August 16, 2007; or Boeing Service Bulletin 777-28A0039, Revision 2, dated September 20, 2010, which also includes a requirement to install new ELMS software.

In addition, DAL stated that installing the ELMS software, as described in paragraph (h) of the proposed AD, will violate the ELMS software installation requirements of AD 2011-09-05 and AD 2014-11-01. DAL requested that a paragraph be added to this AD that allows the ELMS software installed in accordance with Boeing Special Attention Service Bulletin 777-28-0082, as required by paragraph (h) of this AD, to be accomplished without the need for operators to request an AMOC to the ELMS software installation requirements of AD 2011-09-05 and AD 2014-11-01. DAL proposed that this added paragraph contains language similar to paragraph (j)(5) in this AD, or language similar to that in paragraph (h)(5) of AD 2014-11-01 (see AD 2014-11-01 comment "Request to Allow Use of Later Revisions of ELMS Service Information").

We agree with the commenter's request because we have determined that the ELMS1 OPS software installation specified in paragraph (h) of this AD is acceptable for compliance with the ELMS OPS software installations required in AD 2011-09-15 and AD 2014-11-01. We have added paragraph (j)(6) of this AD that states the ELMS1 OPS software installation specified in paragraph (h) of this AD is acceptable for compliance with the ELMS OPS software requirement specified in paragraph (h)(5) of AD 2014-11-01, provided all provisions of AD 2014-11-01 that are not specifically described in paragraph (j)(6) of this AD are complied with accordingly. As discussed in the previous comment, an AMOC to AD 2011-09-15 is not needed in this AD because Boeing Special Attention Service Bulletin 777-28-0082 already received an AMOC approved for the ELMS software installation requirements in AD 2011-09-15.

### **Request To Clarify the Requirements of Paragraphs (g) and (h) of the Proposed AD**

DAL requested that we clarify the requirements in paragraphs (g) and (h) of the proposed AD. DAL asked the following questions:

Can operators only perform paragraph (g) of the proposed AD and be in compliance with the proposed AD?

Can operators only perform paragraph (h) within 36 months after the effective date of the proposed AD and be in compliance with the proposed AD?

Must operators perform paragraph (g) of the AD regardless of their intent to accomplish paragraph (h) and be in compliance with the proposed AD?

If paragraph (g) of the proposed AD is accomplished within 36 months after the effective date of the proposed AD, then if the operator performs paragraph (h) of the proposed AD, can figure 1 to paragraph (g) of this AD be removed from the referenced flight manuals and remain in compliance with the proposed AD?

We agree to clarify. Operators must either accomplish the actions required by paragraph (g) of this AD or the actions required by paragraph (h) of this AD, within 36 months after the effective date of this AD. An operator does not need to accomplish the actions required by paragraph (g) of this AD as long as the operator accomplishes the actions specified in paragraph (h) of this AD within the required compliance time (36 months after the effective date of this AD). If an operator accomplishes the actions required by paragraph (g) of this AD, and subsequently accomplishes the actions required by paragraph (h) of this AD on an airplane, then the requirements of paragraph (g) of this AD are terminated and figure 1 to paragraph (g) of this AD can be removed from the airplane's AFM and the weight and balance control and loading manual. We have not changed this AD in this regard.

## **Request To Revise the Costs of Compliance in the Proposed AD**

AAL requested that we revise the Costs of Compliance paragraph in the proposed AD. AAL stated that the Costs of Compliance paragraph neglects to list the cost of carrying the additional 700 pounds of reserve fuel. AAL commented that the labor cost estimate only reflects what is in the Boeing service information, but it does not account for actual labor expenditures. AAL also commented that the proposed AD generally addresses older airplanes, which eliminates any warranty coverage.

We partially agree with the commenter's request. We agree with adjusting the cost to reflect more accurate labor expenditures. We have revised the Costs of Compliance paragraph in this AD to reflect the labor cost for the fuel system modification of 850 work-hours based on the information submitted by the commenter. However, we do not agree to include the additional fuel costs in this AD. We recognize that, in doing the actions required by an AD, operators might incur operational costs in addition to the direct costs. The cost analysis in AD rulemaking actions typically does not include incidental or operational costs, such as additional fuel costs, time to gather materials and tools, etc. Those costs, which might vary significantly among operators, have not been included in this AD.

### **Conclusion**

We reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting this final rule with the changes described previously and minor editorial changes. We have determined that these minor changes:

Are consistent with the intent that was proposed in the NPRM for addressing the unsafe condition; and

Do not add any additional burden upon the public than was already proposed in the NPRM.

We also determined that these changes will not increase the economic burden on any operator or increase the scope of this final rule.

### **Related Service Information Under 1 CFR Part 51**

We reviewed Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019. This service information describes procedures for modifying the water and fuel scavenge systems in the fuel tanks on each side of the airplane, modifying the fuel jettison system, making electrical changes in the main equipment center, modifying the wiring in the ELMS P110 and P210 equipment panels, and installing new ELMS1 software. The FQIS wire bundle W8011 adjustment is intended to prevent the wire bundle from rubbing with a new fuel scavenge inlet tube. The electrical changes in the main equipment center include installing additional relays on the ELMS P301 and P302 equipment panels, and making wiring changes. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in the ADDRESSES section.

### **Costs of Compliance**

We estimate that this AD affects 111 airplanes of U.S. registry. We estimate the following costs to comply with this AD:

### Estimated Costs for Required Actions

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
Incorporation operating limitations	1 work-hour × \$85 per hour = \$85	\$0	\$85	\$9,435

### Estimated Costs for Optional Actions

Action	Labor cost	Parts cost	Cost per product
Fuel system modification	850 work-hours × \$85 per hour = \$72,250	\$85,572	\$157,822
P110 and P210 equipment panel changes	2 work-hours × \$85 per hour = \$170	0	170

According to the manufacturer, some of the costs of this AD may be covered under warranty, thereby reducing the cost impact on affected individuals. We do not control warranty coverage for affected individuals. As a result, we have included all costs in our cost estimate.

#### Authority for This Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. 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.

We are issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: "General requirements." Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

This AD is issued in accordance with authority delegated by the Executive Director, Aircraft Certification Service, as authorized by FAA Order 8000.51C. In accordance with that order, issuance of ADs is normally a function of the Compliance and Airworthiness Division, but during this transition period, the Executive Director has delegated the authority to issue ADs applicable to transport category airplanes and associated appliances to the Director of the System Oversight Division.

#### Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will 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.

For the reasons discussed above, I certify that this AD:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Will not affect intrastate aviation in Alaska, and
- (3) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

## **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

### **Adoption of the Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

#### **PART 39—AIRWORTHINESS DIRECTIVES**

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

#### **§ 39.13 [Amended]**

2. The FAA amends § 39.13 by adding the following new airworthiness directive (AD):



**2019-16-13 The Boeing Company:** Amendment 39-19716; Docket No. FAA-2018-0495; Product Identifier 2017-NM-089-AD.

**(a) Effective Date**

This AD is effective November 14, 2019.

**(b) Affected ADs**

This AD affects AD 2002-16-15, Amendment 39-12854 (67 FR 54333, August 22, 2002) (“AD 2002-16-15”) and AD 2014-11-01, Amendment 39-17851 (79 FR 31851, June 3, 2014) (“AD 2014-11-01”).

**(c) Applicability**

This AD applies to The Boeing Company Model 777-200 and -300 series airplanes, certificated in any category, as identified in Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019.

**(d) Subject**

Air Transport Association (ATA) of America Code 28, Fuel.

**(e) Unsafe Condition**

This AD was prompted by reports of unreliable performance of the water and fuel scavenge system; failure of the fuel scavenge function can cause trapped fuel, resulting in unavailable fuel reserves. We are issuing this AD to address loss of capability to scavenge fuel in the center fuel tank, which could lead to fuel exhaustion and subsequent power loss of all engines.

**(f) Compliance**

Comply with this AD within the compliance times specified, unless already done.

**(g) Revision to Operating Limitations**

Within 36 months after the effective date of this AD: Revise the operating limitations in the documents specified in paragraphs (g)(1) and (2) of this AD to include the text in figure 1 to paragraph (g) of this AD.

(1) “Fuel System–Loading” section of the “Certificate Limitations” section of the FAA-approved Boeing Model 777 Airplane Flight Manual.

(2) “Loading Limitations” section of the “Fuel Loading Procedures” section of the “Fuel Management” section of the FAA-approved Boeing Model 777 Weight and Balance Control and Loading Manual.

### **Figure 1 to paragraph (g) – Operating limitation**

When center tank fuel is required for the mission, an additional 700 lbs. (320 kg) of reserve fuel must be added to the center tank fuel load.

#### **(h) Optional Terminating Action to Paragraph (g) of This AD**

Modifying the fuel tank fuel and water scavenge systems, modifying the fuel jettison system, making electrical changes in the main equipment center, modifying the wiring in the electrical load management system (ELMS) P110 and P210 panels, and installing new ELMS1 software, by doing all applicable actions identified as “RC” (required for compliance) in, and in accordance with, the Accomplishment Instructions of Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019, is an optional terminating action to the requirements of paragraph (g) of this AD.

#### **(i) Credit for Previous Actions**

This paragraph provides credit for the actions specified in paragraph (h) of this AD, if those actions were performed before the effective date of this AD using the service information specified in any of paragraphs (i)(1) through (4) of this AD.

(1) Boeing Special Attention Service Bulletin 777-28-0082, dated May 26, 2016.

(2) Boeing Special Attention Service Bulletin 777-28-0082, dated May 26, 2016, in conjunction with Boeing Information Notice 777-28-0082 IN 01, dated May 27, 2016; and Boeing Information Notice 777-28-0082 IN 02, dated October 11, 2016.

(3) Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017.

(4) Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017, in conjunction with Boeing Information Notice 777-28-0082 IN 03, dated May 25, 2017; Boeing Information Notice 777-28-0082 IN 04, dated December 19, 2017; and Boeing Information Notice 777-28-0082 IN 05, dated January 30, 2018.

#### **(j) Alternative Methods of Compliance (AMOCs)**

(1) The Manager, Seattle ACO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the ACO branch, send it to the attention of the person identified in paragraph (k)(1) of this AD. Information may be emailed to: 9-ANM-Seattle-ACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

(3) An AMOC that provides an acceptable level of safety may be used for any repair, modification, or alteration required by this AD if it is approved by The Boeing Company Organization Designation Authorization (ODA) that has been authorized by the Manager, Seattle ACO, FAA, to make those findings. To be approved, the repair method, modification deviation, or alteration deviation must meet the certification basis of the airplane, and the approval must specifically refer to this AD.

(4) For service information that contains steps that are labeled as RC, the provisions of paragraphs (j)(4)(i) and (ii) of this AD apply.

(i) The steps labeled as RC, including substeps under an RC step and any figures identified in an RC step, must be done to comply with the AD. If a step or substep is labeled “RC Exempt,” then the RC requirement is removed from that step or substep. An AMOC is required for any deviations to RC steps, including substeps and identified figures.

(ii) Steps not labeled as RC may be deviated from using accepted methods in accordance with the operator's maintenance or inspection program without obtaining approval of an AMOC, provided the RC steps, including substeps and identified figures, can still be done as specified, and the airplane can be put back in an airworthy condition.

(5) For airplanes in Groups 1 through 4, and 7 through 14, as defined in Boeing Special Attention Service Bulletin 777-28-0082, Revision 1, dated May 1, 2017: Accomplishment of the engine fuel feed system modification specified in paragraph (h) of this AD is acceptable for compliance with the routing requirements of fuel quantity indicating system wire bundle W8011 in the left side of the body center fuel tank specified in paragraph (a)(2) of AD 2002-16-15, provided all provisions of AD 2002-16-15 that are not specifically described in this paragraph are complied with accordingly.

(6) Accomplishment of the ELMS1 OPS software installation specified in paragraph (h) of this AD is acceptable for compliance with the ELMS OPS software requirement specified in paragraph (h)(5) of AD 2014-11-01, provided all provisions of AD 2014-11-01 that are not specifically described in this paragraph are complied with accordingly.

#### **(k) Related Information**

(1) For more information about this AD, contact Kevin Nguyen, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3555; email: kevin.nguyen@faa.gov.

(2) Service information identified in this AD that is not incorporated by reference is available at the addresses specified in paragraphs (l)(3) and (4) of this AD.

#### **(l) Material Incorporated by Reference**

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) Boeing Special Attention Service Bulletin 777-28-0082, Revision 2, dated May 31, 2019.

(ii) [Reserved]

(3) For service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; internet <https://www.myboeingfleet.com>.

(4) You may view this service information at the FAA, Transport Standards Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195.

(5) You may view this service information that is incorporated by reference at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email [fedreg.legal@nara.gov](mailto:fedreg.legal@nara.gov), or go to: <http://www.archives.gov/federal-register/cfr/ibr-locations.html>.

Issued in Des Moines, Washington, on September 27, 2019.  
Michael Kaszycki,  
Acting Director, System Oversight Division,  
Aircraft Certification Service.