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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2013-0974; Directorate Identifier 2013-NM-209-AD; Amendment 39-17675; AD 2013-24-01]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule; request for comments.

SUMMARY: We are adopting a new airworthiness directive (AD) for The Boeing Company Model 747-8 and 747-8F series airplanes and Model 787-8 airplanes powered by GEnx engines. This AD requires revising the airplane flight manual to advise the flight crew of potential ice crystal icing (ICI) conditions at high altitudes, and to prohibit operation in moderate and severe ICI conditions. This AD also requires inspecting the engine after any ICI event is detected by the flight crew. This AD was prompted by reports of engine damage and thrust loss events as a result of flying in high altitude ICI conditions. We are issuing this AD to ensure that the flight crews have operating instructions to avoid flight into ICI conditions that can lead to engine damage and thrust loss events; unrecoverable thrust loss on multiple engines can lead to a forced landing.

DATES: This AD is effective November 27, 2013.

We must receive comments on this AD by January 13, 2014.

ADDRESSES: You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to http://www.regulations.gov. Follow the instructions for submitting comments.
- Fax: 202-493-2251.
- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE., Washington, DC 20590.
- Hand Delivery: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE., Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Examining the AD Docket

You may examine the AD docket on the Internet at http://www.regulations.gov; or in person at the Docket Management Facility between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the regulatory evaluation, any comments received, and other information. The street address for the Docket Office (phone: 800-647-5527) is in the ADDRESSES section. Comments will be available in the AD docket shortly after receipt.

FOR FURTHER INFORMATION CONTACT: Sue Lucier, Aerospace Engineer, Propulsion Branch, ANM-140S, FAA, Seattle Aircraft Certification Office (ACO), 1601 Lind Avenue SW., Renton, Washington 98057-3356; phone: 425-917-6438; fax: 425-917-6590; email: suzanne.lucier@faa.gov.

SUPPLEMENTARY INFORMATION:

Discussion

Over the past decade, we have been aware of temporary engine thrust loss, and other engine-related events that occurred in ice crystal icing (ICI) conditions at high altitudes. These events have prompted the release of ADs on various airplane models equipped with General Electric (GE) CF6-80 series engines. Each event was in or near convective weather conditions that included ice crystal icing.

This type of icing does not appear on radar due to its low reflectivity, and neither the airplane ice detector nor visual indications reliably indicate the presence of icing conditions. Therefore, it is often undetected by the flight crew. Flight in these conditions can cause ice crystals to accumulate in the core gas flow path of the engine. In the events leading to those prior ADs, the ice has shed during throttle transients and in the descent phase of flight, causing temporary thrust loss.

Since the beginning of 2013, similar events have now occurred on Model 747-8 and 747-8F series airplanes powered by GEnx-2B engines and Model 787-8 airplanes powered by GEnx-1B engines. The new events that prompted this AD, however, have occurred during the cruise phase of flight and caused permanent damage (beyond maintenance manual limits) to the engine compressor. In all thrust loss events, data indicate that ice crystals entered and collected in the initial stages of the compressor. Engine temperature data indicate small ice accretions were shed through the core of the engine.

All of these ICI events occurred during cruise at 33,000 feet or above, either within or after the airplane traversed a large Mesoscale Convective System (MCS). MCSs are areas where several thunderstorms have merged, with a continuous cloud larger than 100 kilometers (62 miles) across.

Within or near MCSs, ICI events have occurred where convective activity has driven a significant quantity of moisture, in the form of ice crystals, to altitudes at or above the tropopause. ICI events tend to occur in warm geographic locations.

As of the date of this AD, there have been nine events on Model 747-8 airplanes and Model 787-8 airplanes.

During two events on Model 747-8F airplanes, two engines experienced thrust losses during the cruise phase of flight. In one of these events, one of the engines recovered to idle but would not accelerate and was left at idle for the rest of the flight. The other engine recovered and operated normally for the rest of the flight. In both airplane events, subsequent inspections of all four engines revealed compressor damage on both of the event engines as well as damage to a third engine that had not experienced a thrust loss.

In four other events–one on a Model 787-8 airplane and three on Model 747-8 airplanes–uncommanded engine decelerations (i.e., thrust losses) of approximately 20 seconds in duration occurred. All engines automatically recovered commanded thrust without crew action and operated normally for the rest of the flight.

In three other events on Model 747-8 airplanes, at least one engine showed elevated vibrations on the low-speed engine spool (N1) while in ICI conditions. The vibrations stopped after the airplanes exited the weather system, and the engines operated normally for the rest of the flight.

Unrecoverable thrust loss on multiple engines, due to operation in high altitude clouds containing ice crystals, could lead to a forced landing.

FAA's Determination

We are issuing this AD because we evaluated all the relevant information and determined the unsafe condition described previously is likely to exist or develop in other products of these same type designs.

AD Requirements

This AD requires revising the Certificate Limitations and Operating Procedures chapters of the AFM to advise the flight crew of potential ICI conditions at high altitudes, and to provide procedures to prohibit flight into those conditions.

This AD also requires engine inspections after any event where the flight crew reports the appearance of the "ENGINE THRUST" message on the engine indication and crew alert system (EICAS) for any engine. The intent of the inspection requirement is to verify the airworthiness of the airplane for future flights. Because of thrust requirements on the different airplane models, the inspection is required before further flight on a minimum of three engines on Model 747-8 and 747-8F series airplanes, and on both engines on Model 787-8 airplanes.

Interim Action

We consider this AD interim action. If final action is later identified, we might consider further rulemaking then.

FAA's Justification and Determination of the Effective Date

An unsafe condition exists that requires the immediate adoption of this AD. The FAA has found that the risk to the flying public justifies waiving notice and comment prior to adoption of this rule because flight in potential ICI at high altitudes could result in engine damage and loss of thrust and consequent forced landing. Therefore, we find that notice and opportunity for prior public comment are impracticable and that good cause exists for making this amendment effective in less than 30 days.

Comments Invited

This AD is a final rule that involves requirements affecting flight safety and was not preceded by notice and an opportunity for public comment. However, we invite you to send any written data, views, or arguments about this AD. Send your comments to an address listed under the ADDRESSES section. Include the docket number FAA-2013-0974 and Directorate Identifier 2013-NM-209-AD at the beginning of your comments. We specifically invite comments on the overall regulatory, economic, environmental, and energy aspects of this AD. We will consider all comments received by the closing date and may amend this AD because of those comments.

We will post all comments we receive, without change, to http://www.regulations.gov, including any personal information you provide. We will also post a report summarizing each substantive verbal contact we receive about this AD.

Costs of Compliance

We estimate that this AD affects 14 airplanes of U.S. registry. We estimate the following costs to comply with this AD:

Estimated Costs: AFM Revisions

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
AFM revisions	1 work-hour × $85 per hour = $85	$0	$85	$1,190

Estimated Costs: Inspection

Action	Labor cost	Parts cost	Cost per product
Inspection	2 work-hours × $85 per hour = $170 per engine	$0	$680 per airplane

We have received no definitive data that would enable us to provide cost estimates for the on-condition corrective actions specified in this AD.

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.

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) Is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),

(3) Will not affect intrastate aviation in Alaska, and

(4) 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):

2013-24-01 The Boeing Company: Amendment 39-17675; Docket No. FAA-2013-0974; Directorate Identifier 2013-NM-209-AD.

(a) Effective Date

This AD is effective November 27, 2013.

(b) Affected ADs

None.

(c) Applicability

This AD applies to The Boeing Company airplanes, certificated in any category, identified in paragraphs (c)(1) and (c)(2) of this AD.

(1) Model 747-8 and 747-8F series airplanes powered by GEnx-2B67 or GEnx-2B67B engines.

(2) Model 787-8 airplanes powered by GEnx-1B64, GEnx-1B67, GEnx-1B70, GEnx-1B64/P1, GEnx-1B67/P1, GEnx-1B70/P1, or GEnx-1B70/75/P1 engines.

Note 1 to paragraph (c)(2) of this AD: The engine nameplate may also include a suffix such as "G03," which is the applicable Bill of Materials (See FAA Type Certification Data Sheet T00021SE basic model identifier).

(d) Subject

Air Transport Association (ATA) of America Code 71, Power plant.

(e) Unsafe Condition

This AD was prompted by reports of engine damage and thrust loss events as a result of flying in high altitude ice crystal icing (ICI) conditions. We are issuing this AD to ensure that the flight crews have operating instructions to avoid flight into ICI conditions that can lead to engine damage and thrust loss events. We are also issuing this AD to ensure the airplane has a minimum number of airworthy engines following a potential high altitude ICI encounter. Operation with more than one engine having icing damage can lead to a common cause loss of thrust on multiple engines, which can lead to a forced landing.

(f) Compliance

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

(g) Revision of Airplane Flight Manual (AFM): Certificate Limitations

Within 7 days after the effective date of this AD, revise the Certificate Limitations chapter of the applicable Boeing AFM to include the statement provided in figure 1 to paragraph (g) of this AD. This may be done by inserting a copy of this AD into the AFM.

Figure 1 to Paragraph (g) of This AD–Certificate Limitations

AVOIDANCE OF ICE CRYSTAL ICING

(Required by AD 2013-24-01.)

In order to prevent loss of thrust and engine damage due to ice crystal icing, for operations at or above 30,000 feet, when approaching, or in, instrument meteorological conditions or visible moisture:

The flight crew must comply with the Avoidance of Ice Crystal Icing procedure contained in the Operating Procedures chapter of this manual.

When following the Avoidance of Ice Crystal Icing procedure, flight is prohibited within 50NM of amber or red radar returns that are displayed below the airplane's flight path.

Note 2 to figure 1 to paragraph (g), figure 2 to paragraph (h), and figure 3 to paragraph (i) of this AD: When statements identical to those in figures 1, 2, and 3 to paragraphs (g), (h), and (i) of this AD, respectively, have been included in the applicable chapters of the general revisions of the applicable AFM, the general revisions may be inserted into the AFM, and the copy of this AD may be removed from the AFM.

(h) AFM Revision: Model 747-8 and 747-8F Operating Procedures

For Model 747-8 (Intercontinental) and 747-8F (Freighter) series airplanes: Within 7 days after the effective date of this AD, revise the Operating Procedures chapter of the Boeing 747-8 AFM to include the statement provided in figure 2 to paragraph (h) of this AD. This may be done by inserting a copy of this AD into the AFM.

Figure 2 to Paragraph (h) of This AD–Model 747-8 Operating Procedures

AVOIDANCE OF ICE CRYSTAL ICING

(Required by AD 2013-24-01.)

This procedure is required by the AVOIDANCE OF ICE CRYSTAL ICING limitation contained in the Certificate Limitations chapter of this manual. The language below shall not be modified.

Operations in ice crystal icing can cause unrecoverable loss of thrust and engine damage due to ice crystal icing.

For operations at or above 30,000 feet, when approaching, or in, instrument meteorological conditions or visible moisture:

Operate weather radar in automatic mode and gain knob set to the 12 o'clock position, or if in manual mode adjust gain to maximum and set tilt between -1 and -3.

If areas of green, amber or red weather radar returns are observed along the flight path:

Use manual weather radar tilt control mode and vary the tilt between -3 and -5 degrees and set the gain knob to the 12 o'clock position to determine if amber or red returns are present below the airplane's flight path.

Flight is prohibited within 50NM of amber or red radar returns that are displayed below the airplane's flight path.

(i) AFM Revision: Model 787-8 Operating Procedures

For Model 787-8 airplanes: Within 7 days after the effective date of this AD, revise the Operating Procedures chapter of the Boeing 787 AFM to include the statement provided in figure 3 to paragraph (i) of this AD. This may be done by inserting a copy of this AD into the AFM.

Figure 3 to Paragraph (i) of This AD–Model 787-8 Operating Procedures

AVOIDANCE OF ICE CRYSTAL ICING

(Required by AD 2013-24-01.)

This procedure is required by the AVOIDANCE OF ICE CRYSTAL ICING limitation contained in the Certificate Limitations chapter of this manual. The language below shall not be modified.

Operations in ice crystal icing can cause unrecoverable loss of thrust and engine damage due to ice crystal icing.

For operations at or above 30,000 feet, when approaching, or in, instrument meteorological conditions or visible moisture:

Operate weather radar in automatic mode and 0 manual gain adjustment, or if in manual mode adjust gain to maximum and set tilt between -1 and -3.

If areas of green, amber or red weather radar returns are observed along the flight path:

Use manual weather radar tilt control mode and vary the tilt between -3 and -5 degrees and select 0 manual gain adjustment to determine if amber or red returns are present below the airplane's flight path.

Flight is prohibited within 50NM of amber or red radar returns that are displayed below the airplane's flight path.

(j) Post-Event Inspections

After any flight crew report of the appearance of an engine indicating and crew alerting system (EICAS) message that displays "ENG THRUST (L,R)" (for Model 787-8 airplanes) or "ENG (1, 2, 3, or 4) THRUST" (for Model 747-8 and 747-8F airplanes) during operation at or above 30,000 feet pressure altitude: Do borescope inspections of the first stage blade of the high pressure compressor of the engines to detect damage, as specified in paragraph (j)(1) or (j)(2) of this AD, as applicable. Correct any damage before further flight.

(1) For Model 747-8 and 747-8F series airplanes: Before further flight, inspect each engine for which an EICAS ENGINE THRUST message was displayed. A minimum total of 3 engines must be inspected before further flight. Within 5 flight cycles after the EICAS message was displayed, inspect the fourth engine, unless already accomplished as specified in this paragraph.

(2) For Model 787-8 airplanes: Before further flight, inspect both engines.

(k) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle Aircraft Certification Office (ACO), 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, send it to the attention of the person identified in paragraph (k) 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.

(l) Related Information

(1) For more information about this AD, contact Sue Lucier, Aerospace Engineer, Propulsion Branch, ANM-140S, FAA, Seattle Aircraft Certification Office (ACO), 1601 Lind Avenue SW., Renton, Washington 98057-3356; phone: 425-917-6438; fax: 425-917-6590; email: suzanne.lucier@faa.gov.

(2) Refer to the applicable information specified in paragraph (l)(2)(i) or (l)(2)(ii) of this AD for guidance on inspecting the engine and correcting damage.

(i) For Model 747-8 and 747-8F series airplanes: Refer to Task 72-00-00-290-801-G00, High Pressure Compressor Section (with a Borescope) Detailed Inspection, of Subject 72-00-00, Engine–Inspection/Check, of Chapter 72, Engine, of the Boeing 747-8 Aircraft Maintenance Manual.

(ii) For Model 787-8 airplanes: Refer to Data Module DMC-B787-A-G72-00-00-06B-280C-A, High Pressure Compressor Section (with a Borescope)–Special Detailed Inspection, of the Boeing 787-8 Aircraft Maintenance Manual.

(3) For Boeing service information identified in this AD that is not incorporated by reference, contact Boeing Commercial Airplanes, Attention: Data & Services Management, P. O. Box 3707, MC 2H-65, Seattle, WA 98124-2207; telephone 206-544-5000, extension 1; fax 206-766-5680; Internet https://www.myboeingfleet.com. You may view this service information at the FAA, Transport Airplane Directorate, 1601 Lind Avenue SW., Renton, WA. For information on the availability of this material at the FAA, call 425-227-1221.

(m) Material Incorporated by Reference

None.

Issued in Renton, Washington, on November 22, 2013.
Jeffrey E. Duven,
Manager, Transport Airplane Directorate,
Aircraft Certification Service.