[4910-13-P]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2021-0962; Project Identifier AD-2021-00997-T; Amendment 39-21976; AD 2022-06-10]**

**RIN 2120-AA64**

**Airworthiness Directives; The Boeing Company Airplanes**

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

**ACTION:** Final rule.

**SUMMARY:** The FAA is 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 three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines ("fan blades" are also known as "1st-stage low-pressure compressor (LPC) blades" – these terms are used interchangeably in this AD). This AD requires installation of debris shields on the thrust reverser (T/R) inner wall at the left and right sides of the lower bifurcation, inspection of the fan cowl doors for moisture ingression, repetitive functional checks of the hydraulic pump shutoff valves to ensure they close in response to the fire handle input, and corrective actions if necessary. The FAA is issuing this AD to address the unsafe condition on these products.

**DATES:** This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The Director of the Federal Register approved the incorporation by reference of certain publications listed in this AD as of [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For Boeing service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminster Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet https://www.myboeingfleet.com. For Pratt & Whitney service information identified in this AD contact Pratt & Whitney Division, 400 Main Street, East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com; website: https://connect.prattwhitney.com. You may view this service information at the FAA, Airworthiness Products Section, Operational Safety 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 at https://www.regulations.gov by searching for and locating Docket No. FAA-2021-0962.

**Examining the AD Docket**

You may examine the AD docket at https://www.regulations.gov by searching for and locating Docket No. FAA-2021-0962; 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, any comments received, and other information. The address for Docket Operations 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:** James Laubaugh, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3622; email: james.laubaugh@faa.gov.

**SUPPLEMENTARY INFORMATION:**

**Background**

The FAA 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 December 28, 2021 (86 FR 73712). The NPRM was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines. In the NPRM, the FAA proposed to require installation of debris shields on the T/R inner wall at the left and right sides of the lower bifurcation, inspection of the fan cowl doors for moisture ingression, repetitive functional checks of the hydraulic pump shutoff valves to ensure they close in response to the fire handle input, and corrective actions if necessary. The FAA is issuing this AD to address the airplane-level implications of the unsafe condition of engine fan blade failure. Fan blade failures can cause fan rotor imbalance and result in fan blade fragments penetrating the inner and outer barrel of the inlet. This condition, if not addressed, could result in engine in-flight shutdown, and could result in separation of the inlet, the fan cowl doors, or the T/R cowl, or result in uncontrolled engine fire. Separation of the inlet, the fan cowl doors, or the T/R cowl could result in impact damage to the empennage and loss of control of the airplane, or to the fuselage or windows with potential injury to passengers; or it could result in significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude above terrain during extended operations (ETOPS) flights, either of which could result in a forced off-airport landing and injury to passengers. Uncontrolled engine fire could result in loss of control of the airplane.

**Discussion of Final Airworthiness Directive**

**Comments**

The FAA received comments from The Air Line Pilots Association, International (ALPA) who supported the NPRM without change.

The FAA received additional comments from five commenters, including All Nippon Airways (ANA), Boeing, Japan Airlines (JAL), United Airlines (UAL), and an

individual. The following presents the comments received on the NPRM and the FAA's response to each comment.

**Request to Clarify Certain Sentences in the "Background" Paragraph**

Boeing requested that the "Background" paragraph in the NPRM be revised to clarify that the failed hydraulic pump shutoff valve was not the direct cause of the uncontained engine fire. Boeing stated that flight data indicates that while the hydraulic pump shutoff valve failed to close, no hydraulic fluid was leaked from the system until well after the engine fire initiated.

Boeing proposed that two sentences in the "Background" paragraph of the NPRM be revised to, "Several flammable fluid lines, the engine accessory gearbox, and T/R structure were fractured *and an uncontained engine fire occurred*. The hydraulic pump shutoff valve failed to close when the fire handle was pulled, contributing additional flammable fluid to the *T/R area*." Boeing commented that the proposed wording recognizes that the failure may have contributed additional flammable fluid to the T/R area, but that it did not directly cause the uncontained fire.

The FAA agrees with the commenter's clarification and did not intend to imply that the failed hydraulic pump shutoff valve was the direct cause of the uncontained engine fire. However, the detailed background information, which includes the sentences that the commenter proposed for the "Background" paragraph, are not carried over into the final rule. The FAA has not changed this final rule in this regard.

**Request to Use Certain Service Information as a Method of Compliance**

ANA requested clarification on whether Boeing Alert Service Bulletin 777-71A0092, dated January 13, 2022, and Boeing Alert Service Bulletin 777-78A0103 will be allowed as an alternative method of compliance for the requirements in the proposed AD.

In addition, for the actions in paragraph (g) of the proposed AD, Boeing and UAL requested the use of Boeing Alert Service Bulletin 777-78A0103 for installing debris shields on the T/R inner wall at the left and right sides of the lower bifurcation. Boeing and UAL also proposed the use of Boeing Alert Service Bulletin 777-71A0092, dated January 13, 2022, for inspecting the fan cowl doors for moisture ingression. Boeing stated that the description of the modification in the proposed AD is vague.

The FAA agrees to allow the use of Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022, for the inspection of the fan cowl doors for moisture ingression. The FAA has revised the "Related Service Information under 1 CFR Part 51" paragraph and paragraph (g)(2) of this AD accordingly. The FAA disagrees with allowing the use of Boeing Alert Service Bulletin 777-78A0103 for the actions specified in paragraph (g)(1) of this AD because the service bulletin is not yet an FAA-approved service bulletin.

**Request to Add Certain Exceptions for Ferry Flights**

JAL requested that the FAA revise the AD to include certain exceptions for ferry flights. JAL stated it is planning to ferry affected airplanes to a storage point in the United States. JAL commented that although the local authority in Japan provides regulatory requirements for special flight permissions which are similar to 14 CFR 21.197, Special flight permits, the Japanese regulatory requirements do not include "to a point of storage" language for the purpose of the flights. JAL proposes to add the following wording to paragraphs (c) and (g) of the proposed AD, "except for ferry flights, without passenger and cargo, of the airplanes on which the actions specified in paragraphs (h)(1) and (2) of this AD have been done."

The FAA disagrees with revising paragraph (c) Applicability or paragraph (g) Required Actions of this AD in response to JAL's comment. Paragraph (i), Special Flight Permit, provides that special flight permits, as described in 14 CFR 21.197 and 21.199,

are permitted provided that the actions in paragraphs (h)(1) and (2) of this AD have first been accomplished. 14 CFR 21.197(a)(1) provides, in relevant part, that a special flight permit may be issued for flying the aircraft to a base where repairs, alterations, or maintenance are to be performed, or to a point of storage. The requested change is already permitted by this AD. The FAA did not change this AD as a result of this comment.

**Request to Change the Initial Compliance Time to Before Revenue Flight**

ANA requested that in paragraph (g) of the proposed AD, the FAA update the initial compliance time of "before further flight after the effective of this AD" to "before the next revenue flight" to clarify the ferry flight requirement.

Similarly, JAL requested that in paragraph (g) of the proposed AD, the FAA update the initial compliance time of "before further flight after the effective of this AD" to "before the next revenue flight" or "before further flight except the ferry flight without passenger and cargos."

The FAA disagrees with revising the initial compliance in paragraph (g) of this AD as requested by ANA and JAL. The FAA has determined it is necessary to require certain actions prior to any flight, except as permitted in paragraph (h), Special Flight Permit, of this AD.

**Request to Add a Note for Airplanes Under Storage or Heavy Check**

JAL requested that the FAA add a note to paragraph (g)(3) of the proposed AD to clarify that the repetitive functional checks are not applicable to airplanes under storage or heavy check.

The FAA partially agrees with the commenter. The FAA did not intend for the repetitive functional checks of the left and right hydraulic pump shutoff valves to be performed every 10 days when the airplane is not flown. The FAA has revised the compliance time in paragraph (g)(3) of this AD to specify that the repetitive functional

check is only required within 10 days prior to each flight. The FAA disagrees that a note is necessary to specify that the functional check is not applicable to airplanes under storage or heavy check because of the previously discussed revisions to paragraph (g)(3) of this AD.

**Request to Clarify the Use of Revised Non-Destructive Inspection Procedure (NDIP) Documents**

JAL requested clarification for the use of revised NDIP documents for the flow path ultrasonic (UT) inspection of the 1st-stage LPC blades specified in paragraph (h)(1) of the proposed AD. JAL commented that Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, references the UT inspection procedures in NDIP-1238, NDIP-1240, and NDIP-1241, which are currently at the original version. JAL asked if the submission of an alternative method of compliance (AMOC) request is necessary if the NDIPs are later revised to meet the requirements in paragraph (h)(1) of the proposed AD.

The FAA acknowledges that Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, requires the latest FAA-approved revision of NDIP-1238, NDIP-1240, and NDIP-1241 at the time the inspection is accomplished. Furthermore, the FAA has provided credit for accomplishment of the flow path UT inspection identified in paragraph (h)(1) of this AD using the service information specified in paragraph (i) of this AD.

**Request to Provide a Threshold for the Special Flight Permit**

JAL and UAL requested that the FAA provide a threshold in paragraph (h)(1) of the proposed AD for the last flow path UT inspection. JAL suggested a threshold of 275 flight cycles since the last flow path UT inspection for 1st-stage LPC blades that have zero cycles since new and also for 1st-stage LPC that have accumulated any number of cycles since new greater than zero.

UAL stated that omitting a compliance time in paragraph (h) of the proposed AD for the special flight permits creates ambiguity regarding when and how often the flow path UT inspection is required for special flight permits. UAL suggested a threshold of 275 flight cycles since the last flow path UT inspection.

The FAA agrees to add a threshold of 275 cycles to paragraph (h)(1) of this AD, which is specified in Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021. This allows airplanes with 1st-stage LPC blades that have accumulated 275 cycles since new or fewer to be eligible for a special flight permit.

**Request to Add Aircraft Maintenance Manual Task to Special Flight Permit**

ANA, JAL, and UAL requested that paragraph (h)(2) of the proposed AD include Task 29-11-00-710-806 of the Boeing 777-200/300 Aircraft Maintenance Manual as an acceptable method for accomplishing the functional check of the left and right hydraulic pump shutoff valves.

The FAA agrees with the commenter's request and has added Task 29-11-00-710-806 of Boeing 777-200/300 Aircraft Maintenance Manual to the "Other Related Service Information" paragraph and to Note (1) to paragraph (g)(3) of this AD as guidance for accomplishing the actions required by paragraphs (g)(3) and (h)(2) of this AD.

**Request to Clarify Requirements in the NPRM**

ANA requested that the FAA provide clarification of why affected operators will have to conduct required periodic testing [repetitive functional checks of the left and right hydraulic pump shutoff valves] even though Boeing recommends similar testing to be performed as a one-time check before return-to-service per Boeing MOM-MOM-21-0398-01B. ANA also requested clarification whether the repetitive 10 day interval continues until a terminating action has been found.

The FAA infers that ANA considers the low average failure rate per flight hour of the hydraulic pump shutoff valve in service to justify the performance of the one-time

check of the hydraulic pump shutoff valve described in the Boeing MOM-MOM-21-0398-01B, combined with the existing maintenance program recommendation to check the function of the hydraulic pump shutoff valve at 18,000 flight hour intervals, as providing an acceptable level of safety. The FAA does not agree. Investigation of the February 2021 incident, as specified in the proposed AD, revealed that the hydraulic pump shutoff valve, which is remotely controlled by electrical switches, does not have an indication to the flightcrew to indicate when the hydraulic pump shutoff valve has failed to move to the commanded position. The hydraulic pump shutoff valve failed to close when commanded via the engine fire handle in that incident. Failure of this hydraulic pump shutoff valve to close in response to commands in the event of an engine fire could lead to flammable fluid continuing to be supplied to an engine fire for a prolonged period, potentially resulting in an uncontained fire that jeopardizes flight safety. The FAA has determined that this issue is an unsafe condition requiring corrective action.

For transport airplanes, the determination that an unsafe condition exists is based on several criteria, and the failure to meet one or more of the criteria could lead the FAA to determine that corrective action is warranted.

For each identified potential safety issue on a transport airplane, the FAA examines the risk on the worst reasonably anticipated flights (flights actually predicted to occur) to ensure that each flight provides an acceptable level of safety (identified as "individual flight risk" in FAA risk analysis policy). That acceptable level of safety consists of three basic expectations:

• That each flight begins in a fail-safe state (including consideration of latent failure conditions and allowed dispatch states under the minimum equipment list (MEL)),

meaning that a foreseeable single failure on any anticipated flight should not have a significant likelihood of causing a catastrophic event.

• That each flight does not have a numerical risk of a catastrophic event due to the issue being examined that is excessively (an order of magnitude or more) greater than the risk of a catastrophic event on an average transport airplane.

• That safety features that were prescriptively required due to lessons learned from past incidents and accidents are not excessively reduced in their effectiveness or availability.

Failure to meet any of these three criteria can lead to a determination that an unsafe condition exists and AD action is necessary, because the level of safety on the affected flights does not meet the FAA's thresholds for an acceptable level of safety on individual flights.

For each identified potential safety issue, the FAA also assesses the total cumulative risk of an event occurring at any time in the remaining life of the fleet of affected airplanes (identified as “total fleet risk” in FAA risk analysis policy). The FAA may determine that corrective action is needed to limit total fleet risk even when the assessed individual flight risk does not violate any of the three individual flight risk criteria discussed above. Total fleet risk is typically assessed by multiplying the average probabilities of each of the failures or other factors that contribute to the occurrence of an event, the total number of airplanes affected, the average utilization of those airplanes, and the average remaining life for those airplanes. The FAA also considers the number of occupants of an aircraft in assessing fleet risk, and applies total fleet risk guideline thresholds expressed in terms of both aircraft accidents and number of fatalities.

Either excessive individual flight risk or excessive total fleet risk, or both, can lead the FAA to determine that an unsafe condition exists that requires corrective action. The FAA does not use or accept calculations of acceptable total fleet risk, or acceptable

average per-flight-hour risk, as a justification for taking no action on issues where an excessive individual flight risk is determined to exist on flights that are anticipated to occur.

In this case, the FAA determined that corrective action is necessary under the individual flight risk guideline above to minimize the occurrence of flights that are not fail safe for an engine fire due to latent failure of the hydraulic pump shutoff valve. The repetitive functional check will minimize the number of flights that occur with a latent failure of the hydraulic pump shutoff valve. The FAA determined that the 10-day interval for the inspections required by paragraph (g) of this AD is practical and provides an acceptable level of safety.

Additionally, regarding the commenter's request as to whether the repetitive 10-day interval continues until a terminating action has been found, the FAA has determined that the repetitive functional check of the left and right hydraulic pump shutoff valves is required until an alternative corrective action is approved.

**Request for Credit for Previous Actions**

UAL requested that Boeing Alert Service Bulletin 777-71A0092, dated January 13, 2022, and Boeing Alert Service Bulletin 777-78A0103 be added to paragraph (i) of the proposed AD as credit for actions that were previously accomplished in paragraph (g)(1) and (2) of the proposed AD. UAL also requested that credit be given in paragraphs (i)(2) and (3) of the proposed AD for doing a mid span UT inspection, in addition to providing credit for doing a flow path UT inspection.

The FAA partially agrees with the commenter's requests. The FAA has not yet approved a method of compliance for paragraph (g)(1) of this AD using a specific service bulletin, and therefore, credit cannot be provided. As previously mentioned the FAA has revised paragraph (g)(2) of this AD allowing for accomplishment of the inspection using Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022 (original

revision), and therefore, credit is not necessary. Although Pratt & Whitney Special Instruction No. 130F-21, dated July 1, 2021, and Pratt & Whitney Special Instruction No. 130F-21, Revision A, dated July 28, 2021, include instructions for a mid span UT inspection, the special flight permit paragraph in this AD does not include a requirement for the mid span UT inspection, and therefore, credit is not necessary. However, the FAA has retained the credit specified in paragraph (i) of this AD for doing the flow path UT inspection.

**Request to Delegate AMOCs**

UAL requested that if Boeing Alert Service Bulletin 777-71A0092, dated January 13, 2022, and Boeing Alert Service Bulletin 777-78A0103 become a FAA-approved method of compliance, the FAA should delegate The Boeing Company Organization Designation Authorization (ODA) authority to approve structural related AMOCs when deviations to the service documents are required.

The FAA partially agrees with the commenter. For Boeing service bulletins that are not yet FAA-approved, the ODA authority is not granted at this time. However, for Boeing service bulletins that are FAA-approved, the FAA has added a provision in paragraph (j)(3) of this AD for delegation to The Boeing Company ODA for approval of certain AMOCs. This provision allows Boeing to propose to the FAA the types of AMOCs that may be approved by The Boeing Company ODA.

**Request for an Additional Person to Conduct the Inspection**

An individual commenter stated that there are only 54 airplanes flying in the United States that need inspections and believes that someone who is involved in the professional side of the NPRM should be required to be present while the airplane is being inspected to ensure it is being done correctly. The commenter believes this will allow the airplane to be inspected the same across the board rather than each operator

inspecting it differently. The commenter also believes that the NPRM has been needed since the first account of the fan blade failure.

The FAA infers that the commenter is suggesting additional FAA oversight is necessary for the fan cowl door moisture ingression inspections required by this AD. The FAA has reviewed the service information for the fan cowl door moisture ingression inspections and has determined that the FAA's existing oversight activity for operators performing such inspections provide an acceptable level of safety. The FAA has not changed this final rule in this regard.

**Additional Change Made to This AD**

In the process of preparing this final rule, the FAA noticed that the unsafe condition statement could be improved regarding the initial effects of the fan blade failure and the airplane level unsafe outcomes that could result from each of those initial effects. Therefore, the FAA has updated the unsafe condition statement in this AD to clarify the specific causes and hazardous effects.

**Conclusion**

The FAA reviewed the relevant data, considered any comments received, and determined that air safety requires adopting this AD as proposed. Except for minor editorial changes, and any other changes described previously, this AD is adopted as proposed in the NPRM. None of the changes will increase the economic burden on any operator.

**Related Service Information under 1 CFR Part 51**

The FAA has reviewed Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022. This service information specifies procedures for inspecting the fan cowl doors for moisture ingression. The FAA also reviewed Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021. This service information specifies procedures for performing thermal acoustic image and ultrasonic testing

inspections of 1st-stage LPC blades. 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 ADDRESSES.

**Other Related Service Information**

The FAA also reviewed Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022, and Task 29-11-00-710-806, of Boeing 777-200/300 Aircraft Maintenance Manual, dated September 5, 2021. The service information specifies procedures for performing a functional check of the engine-driven pump shutoff valve.

**Interim Action**

The FAA considers this AD to be an interim action. The manufacturer is currently developing other actions that will address the unsafe condition identified in this AD. Once these actions are developed, approved, and available, the FAA might consider additional rulemaking.

**Costs of Compliance**

The FAA estimates that this AD affects 54 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

**Estimated costs**

| Action | Labor cost | Parts cost | Cost per product | Cost on U.S. operators |
|---|---|---|---|---|
| Installation of T/R debris shields | 115 work-hour X $85 per hour = $9,775 | $4,300 | $14,075 | $760,050 |
| Inspection of fan cowl doors | 64 work-hours X $85 per hour = $5,440 | $0 | $5,440 | $293,760 |
| Functional checks of the hydraulic pump shutoff valves | 1 work-hour X $85 per hour = $85 per inspection cycle | $0 | $85 per inspection cycle | $4,590 per inspection cycle |

The FAA has received no definitive data on which to base the cost estimates for the on-condition corrective actions (i.e. repair) 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.

The FAA is 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) 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.

**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:

**2022-06-10 The Boeing Company**: Amendment 39-21976; Docket No. FAA-2021-0962; Project Identifier AD-2021-00997-T.

**(a) Effective Date**

This airworthiness directive (AD) is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**(b) Affected ADs**

None.

**(c) Applicability**

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

(1) Model 777-200 series airplanes equipped with Pratt & Whitney PW4074, PW4074D, PW4077, PW4077D, PW4084D, PW4090, and PW4090-3 model turbofan engines.

(2) Model 777-300 series airplanes equipped with Pratt & Whitney PW4090 and PW4098 model turbofan engines.

**(d) Subject**

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

**(e) Unsafe Condition**

This AD was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines. The FAA is issuing this AD to address engine fan blade failure, which could result in engine in-flight shutdown, and could result in separation of the inlet, the fan cowl doors, or the thrust reverser (T/R) cowl, or result in uncontrolled engine fire. Separation of the inlet, the fan cowl doors, or the T/R cowl could result in impact damage to the empennage and loss of control of the airplane, or to the fuselage or windows with potential injury to passengers; or it could result in significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude above terrain during extended operations (ETOPS) flights, either of which could result in a forced off-airport landing and injury to passengers. Uncontrolled engine fire could result in loss of control of the airplane.

**(f) Compliance**

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

**(g) Installation and Inspections**

Before further flight after the effective date of this AD, do the actions specified in paragraphs (g)(1) through (3) of this AD. Repeat the functional check specified in paragraph (g)(3) of this AD within 10 days prior to each flight.

(1) Install debris shields on the T/R inner wall at the left and right sides of the lower bifurcation, in accordance with a method approved by the Manager, Seattle ACO Branch, FAA.

(2) Inspect the fan cowl doors for moisture ingression in accordance with paragraphs (g)(2)(i) or (ii) of this AD, as applicable.

(i) Do the inspection in accordance with a method approved by the Manager, Seattle ACO Branch, FAA. If any moisture ingression is found, repair before further

flight, in accordance with a method approved by the Manager, Seattle ACO Branch, FAA.

(ii) Do all applicable actions identified in, and in accordance with, the Accomplishment Instructions of Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022, except where Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022, specifies to report inspection findings, this AD does not require any report, and where Boeing Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022, specifies to contact Boeing for a repair, this AD requires the repair to be accomplished in accordance with a method approved by the Manager, Seattle ACO Branch, FAA.

(3) Do a functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the corresponding engine fire handle input. If any hydraulic pump shutoff valve does not close, before further flight perform corrective actions until it closes in response to the corresponding engine fire handle input.

Note (1) to paragraph (g)(3): Guidance for accomplishing the actions required by paragraphs (g)(3) and (h)(2) of this AD can be found in the "Engine-Driven Pump (EDP) Shutoff Valve Check" (Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022; or Task 29-11-00-710-806) of Boeing 777-200/300 Aircraft Maintenance Manual.

**(h) Special Flight Permit**

Special flight permits, as described in 14 CFR 21.197 and 21.199, are permitted provided that the actions in paragraphs (h)(1) and (2) of this AD have first been accomplished.

(1) A flow path ultrasonic testing (UT) inspection of the 1st-stage low-pressure compressor (LPC) blades for cracking has been done within the last 275 cycles, as specified in the Accomplishment Instructions, Part A – Initial Inspection of All LPC Fan

Blades Prior to their Return to Service, paragraph 1.A., of Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, and the 1st-stage LPC blades have been found serviceable. This inspection is not required for 1st-stage LPC blades with 275 cycles since new or fewer.

(2) A functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the corresponding engine fire handle input and all applicable corrective actions (i.e., repair) within 10 days prior to flight.

**(i) Credit for Previous Actions**

This paragraph provides credit for the actions specified in paragraph (h)(1) of this AD, if those actions were performed before the effective date of this AD using the service information specified in paragraph (i)(1), (2), or (3) of this AD.

(1) Paragraph 2. of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 85F-21, dated May 12, 2021, for a flow path UT inspection.

(2) Paragraph 1.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, dated July 1, 2021, for a flow path UT inspection.

(3) Paragraph 2.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, Revision A, dated July 28, 2021, for a flow path UT inspection.

**(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 responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the certification office, 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 responsible Flight Standards 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 Branch, 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.

**(k) Related Information**

(1) For more information about this AD, contact James Laubaugh, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3622; email: james.laubaugh@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 Alert Requirements Bulletin 777-71A0092 RB, dated January 13, 2022.

(ii) Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021.

(3) For Boeing service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminster Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet https://www.myboeingfleet.com. For Pratt & Whitney service information identified in this AD contact Pratt & Whitney Division, 400 Main Street, East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com; website: https://connect.prattwhitney.com.

(4) You may view this service information at the FAA, Airworthiness Products Section, Operational Safety 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, fr.inspection@nara.gov, or go to: https://www.archives.gov/federal-register/cfr/ibr-locations.html.

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Lance T. Gant, Director,
Compliance & Airworthiness Division,
Aircraft Certification Service.
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