



## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 39

[Docket No. FAA-2023-1050; Project Identifier AD-2022-00602-E; Amendment 39-22620; AD 2023-24-04]

RIN 2120-AA64

#### Airworthiness Directives; Honeywell International Inc. Engines

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

**ACTION:** Final rule.

**SUMMARY:** The FAA is adopting a new airworthiness directive (AD) for all Honeywell International Inc. (Honeywell) Model AS907-1-1A and AS907-2-1G engines. This AD was prompted by reports of compressor surge, including a dual engine compressor surge, during takeoff climb out through a steep temperature inversion, causing a loss of engine thrust control. This AD requires either the replacement of a certain electronic control unit (ECU) software version installed on AS907-1-1A engines with updated software or the replacement of certain ECUs installed on AS907-1-1A engines with ECUs eligible for installation. This AD also requires the replacement of certain ECUs installed on AS907-2-1G engines. 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].

#### ADDRESSES:

*AD Docket:* You may examine the AD docket at [regulations.gov](https://www.regulations.gov) under Docket No. FAA-2023-1050; 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:** Joseph Costa, Aviation Safety Engineer, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712; phone: (562) 627-5246; email: joseph.costa@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 all Honeywell Model AS907-1-1A and AS907-2-1G engines. The NPRM published in the *Federal Register* on May 23, 2023 (88 FR 32980). The NPRM was prompted by several reports that Honeywell Model AS907-1-1A and AS907-2-1G engines experienced compressor surge, including an AS907-1-1A dual engine compressor surge, during takeoff climb out through a steep temperature inversion, which resulted in loss of engine thrust control. The FAA determined that the installed ECU software version logic locked the engine inlet total temperature (Tt2) at 60 knots on a takeoff roll and that reference Tt2 remained locked until the aircraft reached 400 feet above ground level (AGL) or the pilot moved the throttle before reaching 400 AGL. The locked Tt2 is mathematically adjusted by the ECU software for altitude and Mach number changes as the takeoff progresses. During a climb to 400 feet AGL with a thermal inversion, the actual engine Tt2 can increase above the Tt2 that is being calculated by the ECU, which causes the compressor guide vanes' (CGVs) and surge bleed valves' (SBVs) positions to be off-schedule for the actual ambient conditions. Significant off-scheduling of the CGVs and the SBVs can lead to a compressor surge event. The compressor surge margin is decreased when scheduling is based on a colder Tt2 temperature than what the engine is actually running. Engine deterioration impacts compressor surge margin and can increase the likelihood of a dual engine compressor surge as the AS907-1-1A and AS907-2-1G engine fleets age. Dual engine power loss due to a temperature inversion may result in significant loss of airplane thrust, which could reduce the climb gradient and result in the airplane's inability to clear obstacles. As a result, the manufacturer updated the software.

In the NPRM, the FAA proposed to require either the replacement of a certain ECU software version installed on AS907-1-1A engines with an updated software version eligible for installation or the replacement of certain ECUs installed on AS907-1-1A engines with ECUs eligible for installation. The NPRM also proposed to require the replacement of certain ECUs installed on AS907-2-1G engines with ECUs eligible for installation. The FAA is issuing this AD to address the unsafe condition on these products.

## **Discussion of Final Airworthiness Directive**

### **Comments**

The FAA received comments from three commenters. The commenters were Bombardier Inc. (Bombardier), Duncan Aviation, and Honeywell. All three commenters requested changes to the proposed AD. The following presents the comments received on the NPRM and the FAA's response to each comment.

#### **Request to Update Software Update Language**

Bombardier requested that the FAA update the NPRM so that references to software are consistent. Bombardier noted that in the NPRM SUMMARY section, the phrase “updated software” was used, while other portions of the AD refer to the “software version eligible for installation.”

The FAA acknowledges the inconsistency and has provided detail about the updated software in the Background of this final rule.

#### **Request to Clarify Background**

Bombardier requested that the FAA include language in the Background paragraph of this AD to explain the effect of Tt2 locking on the SBVs.

The FAA agrees. As a result, the FAA has added language to the Background paragraph of this AD to explain the effect of Tt2 locking and clarify the surge bleed valves that affect surge margin.

#### **Request to Update Unsafe Condition Description**

Bombardier requested that the FAA update the language in the unsafe condition of the NPRM Background and paragraph (e) of the proposed AD to the following: “may result in significant loss of overall airplane thrust which can lead to inability of the

airplane to clear the AFM OEI net flight path (risk of obstacle collision).”

The FAA partially agrees. The unsafe condition description in Background of this final rule was clarified to include “which could reduce the climb gradient and result in the airplane’s inability to clear obstacles.” However, paragraph (e) of this AD was not changed as a result of this comment because the consequence remains consistent with the end-level effect if the unsafe condition is not addressed.

#### **Request to Correct the Costs of Compliance**

Honeywell suggested a change to the second sentence of the Cost of Compliance to remove an erratum.

The FAA agrees and has changed the second sentence of the Costs of Compliance of this final rule to refer to AS907-2-1G engines installed on airplanes of U.S. registry.

#### **Request to Update Labor Cost**

Bombardier questioned why the work-hours for removing the ECU for the AS907-1-1A engine are less than the work-hours for removing the ECU for the AS907-2-1G engine.

The FAA acknowledges that the estimated work-hours should be the same for removing an ECU from both engine models. However, the FAA estimated one ECU will need to be replaced in the AS907-1-1A fleet. Therefore, the FAA estimated 1 work-hour to replace the ECU and 1 work-hour to complete the power assurance run for one engine. The FAA did not change this AD as a result of this comment.

#### **Request to Clarify Estimated Costs Table**

Honeywell noted that the structure of the Estimated Costs table is such that the total or individual engine model fleet cost to the U.S. registered operators is not clearly presented.

The FAA agrees and has clarified the Costs of Compliance of this final rule. The cost per product columns reflect the estimated costs per engine. The AS907-1-1A cost to replace ECU software was moved to the Estimated Costs table to show a total fleet cost assuming all ECUs receive the software upgrade. The cost to replace the AS907-1-1A ECU remains unchanged. The FAA has no way of knowing how many AS907-1-1A

engine operators will replace the ECU instead of the software.

### **Request to Change the Expression of Compliance Times**

Duncan Aviation and Honeywell requested that the FAA change the expression of compliance times throughout Tables 1 and 2 of the NPRM to be more concise. Each of the two commenters suggested slightly different phrasing of compliance times. Each suggested removal of the terms “before exceeding” and “hours time-in-service (TIS).” Duncan Aviation and Honeywell requested the order of “whichever occurs first” and “after the effective date of this AD” be reversed. Duncan Aviation stated that “hours TIS” could be misinterpreted as time since new.

The FAA agrees that the expression of compliance times should be clear. The FAA clarifies that “hours TIS” is equivalent to flight hours. The FAA changed the compliance times in Table 1 to paragraph (g)(1) and Table 2 to paragraph (g)(2) of this AD to read as follows: Within X months/years or Y flight hours after the effective date of this AD, whichever occurs first.

### **Request to Correct ECU Software Version Number**

Honeywell requested that the FAA change the ECU software version number in paragraph (g)(1) of the proposed AD from “AS907\_1011” to “AS907\_1001.”

Bombardier requested that the FAA change the ECU software part version number in paragraph (g)(1) of the proposed AD from “AS907\_1011” to “AS907-1001.”

The FAA agrees with changing the ECU software version number in paragraph (g)(1) to “AS907\_1001” because “AS907\_1001” is the correct nomenclature.

### **Request to Update Definitions**

Bombardier requested that the FAA change the part/version numbers defined as eligible for installation. Bombardier requested that the definitions change from excluding certain part/version numbers to requiring certain part/version numbers because older versions of software will not address the unsafe condition.

The FAA partially agrees. While these items may be the only items currently eligible for installation, the definitions also allow future approved items. This mitigates the need for an alternative method of compliance (AMOC) for future software versions or ECU P/Ns. There is no version of software older than AS907\_1001 for the AS907-1-1A

engine. The FAA did not change this AD as a result of this comment.

### Conclusion

The FAA reviewed the relevant data, considered any comments received, and determined that air safety requires adopting this AD as proposed. Accordingly, the FAA is issuing this AD to address the unsafe condition on these products. 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.

### Costs of Compliance

The FAA estimates that this AD affects a total of 853 engines installed on airplanes of U.S. registry. The FAA estimates that 175 AS907-2-1G engines installed on airplanes of U.S. registry will require replacing two ECUs per engine.

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
Replace AS907-2-1G ECUs (2 per engine)	5 work-hours × \$85 per hour = \$425	\$109,044	\$109,469	\$19,157,075
Replace AS907-1-1A ECU software (2 per engine)	5 work-hours x \$85 per hour = \$425	\$0	\$425	\$288,150*

\*The FAA assumes that all 678 AS907-1-1A engines installed on airplanes of U.S. registry will replace the software in two ECUs per engine. Honeywell Model AS907-1-1A operators may replace the ECU instead of replacing the software to comply with this AD. For replacing the ECU, the FAA estimates the following costs:

Action	Labor Cost	Parts Cost	Cost per product
Replace AS907-1-1A ECU (per ECU, per engine)	2 work-hours × \$85 per hour = \$170	\$61,162	\$61,332

The FAA has included all known costs in its cost estimate. According to the manufacturer, however, some of the costs of this AD may be covered under warranty, thereby reducing the cost impact on affected operators.

### **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:

**2023-24-04 Honeywell International Inc.:** Amendment 39-22620; Docket No. FAA-2023-1050; Project Identifier AD-2022-00602-E.

#### **(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 Honeywell International Inc. (Honeywell) Model AS907-1-1A and AS907-2-1G engines.

#### **(d) Subject**

Joint Aircraft System Component (JASC) Code 7300, Engine Fuel and Control.

#### **(e) Unsafe Condition**

This AD was prompted by reports of compressor surge, including a dual engine compressor surge, during takeoff climb out through a steep temperature inversion, which caused a loss of engine thrust control. The FAA is issuing this AD to prevent loss of engine thrust control. The unsafe condition, if not addressed, could result in reduced controllability of the airplane, loss of control of the airplane, reduced ability of the flight crew to maintain the safe flight and landing of the airplane, and loss of the airplane.

#### **(f) Compliance**

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

#### **(g) Required Actions**

(1) For AS907-1-1A engines with an electronic control unit (ECU) having part number (P/N) 2119576-1011 and software version AS907\_1001 installed, before exceeding the applicable compliance time in Table 1 to paragraph (g)(1) of this AD,

either replace software version AS907\_1001 with a software version eligible for installation; or replace the ECU with an ECU eligible for installation. Either the software or ECU must be replaced for all four ECUs installed in both airplane engines at the same time.

Note 1 to paragraph (g)(1): Guidance for removing and replacing the ECU software or removing and replacing the ECU may be found in Honeywell Service Bulletin (SB) AS907-76-9031, Revision 2, dated May 15, 2022.

Table 1 to Paragraph (g)(1) - Model AS907-1-1A Engines

<b>Engine time since new (TSN)</b>	<b>Compliance time</b>
Greater than 5,000 hours TSN	Within 12 months or 400 flight hours (FH) after the effective date of this AD, whichever occurs first.
3,000 to 5,000 hours TSN	Within 18 months or 600 FH after the effective date of this AD, whichever occurs first.
Fewer than 3,000 hours TSN	Within 24 months or 800 FH after the effective date of this AD, whichever occurs first.

(2) For AS907-2-1G engines with serial numbers (S/N) P130101 through P130240 that have not incorporated Honeywell SB AS907-72-9063, and for AS907-2-1G engines with S/Ns P130241 through P130336, and S/Ns P130101 through P130240 that have incorporated Honeywell SB AS907-72-9063, before exceeding the applicable compliance time in Table 2 to paragraph (g)(2) of this AD, replace any installed ECU having P/N 2119576-3001 or P/N 2119576-3002 with an ECU eligible for installation. All four ECUs installed in both airplane engines must be replaced at the same time.

Note 2 to paragraph (g)(2): Guidance for removing and replacing the ECU may be found in Honeywell SB AS907-76-9014, Revision 6, dated October 10, 2022.

Note 3 to paragraph (g)(2): Guidance for converting a standard flow compressor to a high flow compressor for improving surge margin may be found in Honeywell SB AS907-72-9063, Revision 1, dated July 31, 2019.

Table 2 to Paragraph (g)(2) - Model AS907-2-1G Engines

Engine type	Compliance time
Standard Flow Compressor AS907-2-1G engines (engine S/Ns P130101 through P130240 that have not incorporated Honeywell SB AS907-72-9063)	Within 2 years or 800 FH after the effective date of this AD, whichever occurs first.
High Flow Compressor AS907-2-1G engines (engine S/Ns P130241 through P130336 and engines that have incorporated Honeywell SB AS907-72-9063)	Within 7 years or 2,800 FH after the effective date of this AD, whichever occurs first.

**(h) Installation Prohibition**

(1) After the effective date of this AD, do not install an ECU having P/N 2119576-1011 and software version AS907\_1001 in any AS907-1-1A engine.

(2) Do not install an ECU having P/N 2119576-3001 or P/N 2119576-3002 in any AS907-2-1G engine if the ECU has exceeded the compliance time specified in Table 2 to paragraph (g)(2) of this AD.

**(i) Definitions**

(1) For the purpose of this AD, for the AS907-1-1A engine, a “software version eligible for installation” is a software version that is not software version AS907\_1001.

(2) For the purpose of this AD, for the AS907-1-1A engine, an “ECU eligible for installation” is an ECU that does not have P/N 2119576-1011.

(3) For the purpose of this AD, for the AS907-2-1G engine, an “ECU eligible for installation” is an ECU that does not have P/N 2119576-3001 or P/N 2119576-3002.

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

(1) The Manager, West Certification 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 West Certification Branch, send it to the attention of the person identified in paragraph (k) of this AD and email to: 9-ANM-LAACO-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.

**(k) Additional Information**

For more information about this AD, contact Joseph Costa, Aviation Safety Engineer, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712; phone: (562) 627-5246; email: joseph.costa@faa.gov.

**(l) Material Incorporated by Reference**

None.

Issued on November 29, 2023.

Victor Wicklund,  
Deputy Director, Compliance & Airworthiness Division,  
Aircraft Certification Service.

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