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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2018-1077; Project Identifier 2018-NE-40-AD; Amendment 39-21354; AD 2020-25-12]

RIN 2120-AA64

Airworthiness Directives; Superior Air Parts, Inc. Engines and Lycoming Engines Reciprocating Engines With a Certain SAP Crankshaft Assembly

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The FAA is adopting a new airworthiness directive (AD) for all Superior Air Parts, Inc. (SAP) Model IO-360-series and O-360-series reciprocating engines and certain Lycoming Engines (Lycoming) Model AEIO-360-, IO-360-, and O-360-series reciprocating engines with a certain SAP crankshaft assembly installed. This SAP crankshaft assembly is installed as original equipment on the affected SAP engines and as a replacement part under parts manufacturer approval (PMA) on the affected Lycoming engines. This AD was prompted by three crankshaft assembly failures that resulted in the loss of engine power and immediate or emergency landings. This AD requires the removal from service of all affected crankshaft assemblies. The FAA is issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective January 15, 2021.

Examining the AD Docket

You may examine the AD docket at https://www.regulations.gov by searching for and locating Docket No. FAA-2018-1077; 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: Justin Carter, Aviation Safety Engineer, Fort Worth ACO Branch, FAA, 10101 Hillwood Parkway, Fort Worth, TX 76177; phone: (817) 222-5146; fax: (817) 222-5245; email: justin.carter@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 SAP Model IO-360-series and O-360-series reciprocating engines and certain Lycoming Model AEIO-360-, IO-360-, and O-360-series reciprocating engines with a certain SAP crankshaft assembly installed. The NPRM published in the Federal Register on January 29, 2020 (85 FR 5173). The NPRM was prompted by three crankshaft assembly failures that resulted in the loss of engine power and immediate or emergency landings. The FAA determined that the crankshaft assembly failures resulted from the manufacturing process at SAP's crankshaft vendor during 2012 and 2014 causing excessive residual white layer of iron nitride forming on the assemblies. This white layer is brittle and can lead to spalling or fatigue cracking of the crankshaft assembly as a result of the normal mechanical loads during engine operation. The FAA's analysis concluded that all three SAP crankshaft assembly failures were the result of this fatigue cracking. In the NPRM, the FAA proposed to require the removal from service of all affected crankshaft assemblies. The unsafe condition, if not addressed, could result in failure of the engine, in-flight shutdown, and loss of the airplane.

Discussion of Final Airworthiness Directive Comments

The FAA received comments from seven commenters. The commenters were SAP, the Aircraft Owners and Pilots Association (AOPA), and five individual commenters. Three commenters requested that the FAA extend the comment period. One commenter requested the withdrawal of the AD. Two commenters asked the FAA to release more information. One commenter asked for the status of the AD and if the crankshaft assembly is safe to fly. The following presents the comments received on the NPRM and the FAA's response to each comment.

Request To Withdraw the NPRM: White Layer Does Not Contribute to Fracture

SAP stated that data from an independent laboratory test does not support the statement in the NPRM that the crankshaft failures were a result of residual white layer formation, also known as a compound layer, on certain crankshaft assemblies as a result of improper manufacturing by a third-party vendor. SAP stated that the fractured crankshafts were all within specifications. SAP found both the material and the heat treatment to be within all engineering requirements and consistent with other crankshafts in general aviation piston aircraft engines. SAP noted that these requirements were consistent with the engineering testing conducted by SAP in pursuit of FAA PMA certification. Additionally, SAP stated the fractures were not consistent with fatigue fractures due to excessive white layer, and that no manufacturing or material defect was found in independent metallurgical laboratory analysis. The FAA infers from this comment that SAP is requesting that the FAA withdraw the NPRM.

The FAA disagrees with SAP's analysis. BakerRisk Project No. 01-05929-003-17, dated August 15, 2017, for SAP crankshaft assembly S/N SP14-0202, which failed on March 6, 2017, found that there was a continuous white layer at the surface of the radius, extending up to the location of the fracture, and that the white layer may have contributed to early crack initiation.[1] The continuous white layer at the origin was 0.0007 inch. BakerRisk Project No. 01-05929-006-17, Rev. 1, dated May 8, 2018, for SAP crankshaft assembly S/N SP14-0194, which failed on August 3, 2017, found that the continuous white layer at the surface of the forward journal radius, extending up to the location of the fracture, was 0.0006 inch. According to the report, this indicates that the process being

[1] See pp. 2-3 of BakerRisk Project No. 01-05929-003-17.

used to remove the white layer was not removing the entire white layer. Because it found that the presence of the white layer can lower fatigue resistance and result in premature fatigue crack initiation, the report included recommendations to review the material and the processes that define the crankshaft journals, especially the nitride case hardening and white layer removal process.[2]

SAP's comment cited Hurst Metallurgical Research Laboratory, Inc., (Hurst) Report No. 73900, dated February 22, 2019, for SAP crankshaft assembly S/N SP13-0150, which failed on October 31, 2018. This Hurst report found that the continuous white layer of iron nitride at the surface of the forward journal radius was 0.0001 inch. The FAA, however, disagrees with the reported thickness of the white layer. The report includes two scaled photographs (photographs No. 11 and 12), magnified 100 times and 500 times, respectively. Using the scaling bar provided in the photographs, the FAA determined that the white layer is 0.0009 inch. Although SAP stated a white layer of up to 0.001 inch is allowed, SAP based this figure on an SAE Aerospace Material specification and not on the original equipment manufacturer's (OEM) specifications. A white layer of 0.0009 inch exceeds the amount allowed by the OEM.

As supported by the reports, the FAA finds that white layer contributed to the early crack initiation and, on all failed crankshaft assemblies, exceeded OEM specifications. Based on the foregoing, the FAA finds no basis to withdraw the NPRM.

Request To Withdraw the NPRM: White Layer Does Not Increase Fatigue Resistance

SAP stated that the presence of a white layer does not reduce the fatigue resistance of material at the surface, but rather increases the fatigue resistance of that same material. SAP cited a study by Major, Jakl, and Hubálovsky for the observation that the application of plasma carburizing can lead to about a 25% increase in fatigue resistance.[3] SAP stated a study by Hiraoka and Ishida[4] shows a marked increase in fatigue limit in a specimen with a 10 μm thick white layer as opposed to a specimen without a white layer, with a slight increase in the fatigue limit in a specimen with a 20 μm thick white layer as compared to the specimen with a 10 μm thick white layer. The FAA infers from this comment that SAP is requesting that the FAA withdraw the NPRM.

The FAA disagrees with the applicability of these studies to the unsafe condition identified in this AD. Although the application of plasma carburizing can lead to an increase in the fatigue resistance, the affected crankshaft assemblies were not plasma carburized. Therefore, the Major, Jakl, and Hubálovsky study is not relevant here. Although the Hiraoka and Ishida study did reveal an increase in fatigue limit of gas nitrided steel with a white layer over one without a white layer, the study's test environment did not replicate the conditions applicable to an engine crankshaft as identified in Advisory Circular No. 33.19-1, "Guidance Material for 14 CFR § 33.19, Durability, for Reciprocating Engine Redesigned Parts," dated September 27, 2004 (AC 33.19-1). A crankshaft is a part whose primary fatigue mechanism is a forced vibratory response in combination with a resonant vibratory response that occurs at any engine speed at which the natural frequency of the part (or assembly that includes the part) coincides with the frequency of a combustion or inertia harmonic. AC 33.19-1 recommends 300 hours of engine tests, including a vibration test at peak torsional resonance conditions, to test the fatigue strength of the crankshaft.

The white layer is well-established to be problematic in that it is brittle. The OEM removes the white layer during the manufacturing process. As a PMA holder, 14 CFR 21.303 requires that SAP

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[2] See pp. 4-5 of BakerRisk Project No. 01-05929-006-17, Rev. 1.

[3] Stepán Major, Vladimir Jakl, & Stepán Hubálovsky, Effect of carburizing on fatigue life of high-strength steel specimen under push-pull loading, Advances in Engineering Mechanics and Materials, 143 (2014).

[4] Yaushi Hiraoka & Akihiro Ishida, Effect of Compound Layer Thickness Composed of γ'-Fe4N on Rotated-Bending Fatigue Strength in Gas-Nitrided JIS-SCM435 Steel, 58 MATERIALS TRANSACTIONS 993 (2017).

produce a part that is equivalent to the OEM part. Based on the foregoing, the FAA finds no basis to withdraw the NPRM.

Request To Withdraw the NPRM: Operation Outside of Normal Conditions

SAP stated the fractures of the crankshaft assemblies cited in the NPRM were due to misuse, abuse, or lack of lubrication. In support, SAP cited Hurst Report No. 73614, Rev. 1, dated December 7, 2018, for SAP crankshaft assembly S/N SP14-0202 and Hurst Report No. 73617, Rev. 1, dated December 7, 2018, for SAP crankshaft assembly S/N SP14-0194, which indicate that the fractures were likely initiated by abnormal service conditions, such as a propeller strike and a start-up of the engine in a low-temperature (below optimal performing temperature) environment. SAP also cited Hurst Report No. 73900 for SAP crankshaft assembly S/N SP13-0150, which indicates that likely contributors of the failure include rod sliding bearing failure due to insufficient lubrication, misalignment of the crankshaft, and improper engine performance from inadequate operation procedure resulting in high bending moment at the radius locations from excessive force from the piston assembly. SAP stated that all three of these crankshafts were operated in a flight school environment. The FAA infers from this comment that SAP is requesting that the FAA withdraw the NPRM.

The FAA disagrees that the fracture was initiated by the operation of the engines outside of "normal" conditions or parameters. With respect to Hurst Report No. 73614 for SAP crankshaft assembly S/N SP14-0202 and Hurst Report No. 73617 for SAP crankshaft assembly S/N SP14-0194, none of the engines exhibited evidence of propeller strikes, and none were started below optimal performance temperature. According to Lycoming,[5] cold weather requiring the use of pre-heat to avoid a cold engine start-up is 10 degrees Fahrenheit or below. Two of the incidents occurred in August (Canada) and October (Florida), making cold engine start-up unlikely. The third incident occurred in March (Massachusetts), which had a low of 16 degrees Fahrenheit at 6 a.m. and proceeded to a high of 41 degrees Fahrenheit in the afternoon.

With respect to Hurst Report No. 73900 for SAP crankshaft assembly S/N SP13-0150, the pilot and mechanic separately reported the engine had good oil pressure, indicating that the engine did not suffer from a lack of proper lubrication at the time of the crankshaft assembly failure. The report identifies possible contributors of single origin fatigue failure, including the misalignment of the crankshaft assembly or improper engine performance from inadequate operation procedure resulting in high bending moment at the radius locations from excessive force from the piston assembly. However, the report does not provide evidence to support these contributors. Based on the foregoing, the FAA declines to withdraw the NPRM.

Request To Review National Transportation Safety Board (NTSB) Reports

An individual commenter requested to review the NTSB reports on the accidents mentioned in the NPRM. The commenter was unable to locate anything in the NTSB database concerning engine stoppage in aircraft powered by Lycoming or SAP O-360 or IO-360 engines.

The NTSB did not generate reports for the three incidents that resulted from the crankshaft failures discussed in the NPRM. Therefore, the FAA did not rely on NTSB reports and is not in possession of any report generated as a result of the three incidents.

[5] Lycoming Service Instruction No. 1505, dated July 1, 2002: "The use of pre-heat will facilitate starting during cold weather, and is required when the engine has been allowed to drop to temperatures below +10 °F/-12 °C."

Request To Add Metallurgical Analyses to the Docket

An individual commenter requested that the FAA add its metallurgical analyses to the docket. The commenter stated that it was his understanding from discussions with the FAA that the FAA has shared its metallurgical analyses with SAP.

The FAA agrees and has uploaded the BakerRisk and Hurst metallurgical reports provided by SAP to the AD docket, as SAP has agreed to release these reports to the public. The FAA, however, did not perform its own metallurgical testing. The FAA instead relied on metallurgical testing performed by BakerRisk and Hurst for SAP.

Request To Release Pertinent Information

An individual commenter requested that the FAA release information it has on this issue, including the circumstances of the crankshaft assembly failures, the cost of crankshaft assembly replacement, and the scope of the proposed action.

The FAA agrees to provide additional information about the circumstances of the failures. In each incident, the crankshaft assembly broke into two pieces. The March 6, 2017, incident resulted in the crankshaft separating at journal #2 while the August 3, 2017, and October 31, 2018, incidents both resulted in a separation of the crankshaft at journal #4. All of the incidents involved flight-training aircraft. Additionally, as discussed previously, the FAA has uploaded the metallurgical reports to the AD docket.

Both the NPRM and this final rule adequately explain the scope of the AD and contain a detailed estimate of the costs of compliance within this AD, including the cost of the crankshaft assembly replacement, labor cost, and total estimated cost to U.S. operators. This final rule also discusses the net benefit of this AD.

Request To Consider Costs of Implementing This AD

An individual commenter requested that the FAA consider the financial costs and unintended consequences of this AD, such as decreased aircraft value. The commenter estimates that the value of his aircraft has been reduced by at least $15,000 since the publication of the NPRM.

The FAA disagrees. The cost analysis in AD rulemaking actions typically includes only the costs associated with complying with the AD and does not include indirect costs such as loss of aircraft value. The FAA acknowledges that the general obligation of the operator to maintain its aircraft in an airworthy condition is sometimes expensive. However, and as discussed in more detail in the Benefits section, the FAA estimates that the benefits of this AD greatly exceed its cost.

Request To Clarify Applicability

An individual commenter asked if SAP crankshaft assemblies earlier than 2012 are affected by this AD.

The first affected SAP crankshaft assembly was shipped on July 31, 2012. SAP crankshaft assemblies assembled before July 31, 2012, are not affected by this AD.

Request To Extend Comment Period

SAP and AOPA requested that the FAA extend the comment period by 60 days to enable SAP to gather more information. SAP asked for more time to research, gather, and respond appropriately to the NPRM. AOPA similarly requested an extension to review the costs and overall scope, and to gather information to respond to the NPRM. SAP, AOPA, and an individual commenter requested the FAA extend the comment period because of delays due to the COVID-19 pandemic, such as the closure of laboratories for further testing and the reduction in aircraft operations.

The FAA disagrees. At SAP's request, the FAA met with SAP and AOPA in April 2020 to discuss the NPRM. During that meeting, the participants discussed certain aspects of the NPRM, including the white layer and metallurgical reports, the three failed crankshaft assemblies, and SAP's request for a 60-day extension to the comment period. A summary of the meeting is available in the AD docket. None of the information provided by SAP or AOPA justifies an extension of the comment period. If investigations by SAP or others reveal information that changes the FAA's determination regarding the unsafe condition, the FAA will consider future rulemaking.

Request for a Status Update

An individual commenter requested information regarding the FAA's progress on issuing this AD. The commenter stated that based on feedback from SAP, the crankshaft assembly is safe and that a metallurgy company inspected one of the affected crankshaft assemblies and did not find any issues.

The FAA disagrees with the assessment from SAP. The FAA reviewed the metallurgical reports from the incidents of failed crankshaft assemblies and determined that an unsafe condition exists in other crankshaft assemblies of the same type design. In each incident, the crankshaft assembly broke into two pieces, leading to loss of engine power. The crankshaft assemblies involved in the three incidents were found to have excessive white layer. As a result, this AD requires removing all affected crankshaft assemblies from service within 25 engine operating hours after the effective date of this AD.

Conclusion

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

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (Pub. L. 96-354, codified as amended at 5 U.S.C. 601-612) (RFA) establishes “as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration.” Public Law 96-354, 2(b), September 19, 1980. The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions. Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

The FAA published an Initial Regulatory Flexibility Analysis (IRFA) in the proposed rule to aid the public in commenting on the potential impacts to small entities. The FAA considered the public comments in developing the final rule and this Final Regulatory Flexibility Analysis (FRFA).

Benefits

The FAA found that SAP, the manufacturer of the crankshaft assemblies, sold 192 SAP crankshaft assemblies to date: 115 of these crankshaft assemblies are estimated to be installed on type certificated airplanes and the remaining 77 crankshaft assemblies are estimated to be installed on experimental aircraft. The FAA's risk analysis indicates that 100 percent of crankshaft assembly failures will destroy the engine. Using the historical incident data (2000-2014), the FAA assumes that

24.4 percent of crankshaft assembly failures will result in aircraft hull loss while 22 percent of crankshaft assembly failures will result in fatalities. There would be an average of 2.1 fatalities per each crankshaft assembly accident. Applying these probabilities to the estimated 115 crankshaft assemblies installed on type certificated airplanes, the FAA estimates that if these crankshaft assemblies are not replaced and continue to be used in these airplanes, this will result in 53 fatalities (2.1 fatalities per crankshaft accident x 22 percent probability of a crankshaft assembly failure resulting in fatalities x 115 crankshaft assemblies) and 28 aircraft losses (24.4 percent probability of a crankshaft assembly failure destroying the airplane). This AD will prevent all 53 fatalities and 28 aircraft losses.

Using an average price of $50,000 for a small single engine airplane, an average price of $30,000 for a 360-series engine and the Department of Transportation's $9.6 million estimate for the Value of Statistical Life (VSL) from the "Revised Departmental Guidance on Valuation of a Statistical Life in Economic Analysis," [6] the FAA estimated this AD final rule will result in monetized benefits of $512.8 million.[7]

Costs of Compliance

The costs of compliance with this AD consist of the cost to remove and replace a crankshaft assembly. The FAA estimates that this AD will affect 115 crankshaft assemblies installed on airplanes of U.S. registry. This cost estimate does not include 77 SAP crankshaft assemblies installed on experimental engines since this AD does not apply to these engines. The estimated compliance cost per crankshaft assembly is identified below.

Labor cost = 61 hours per crankshaft assembly replacement x $85 Hourly Wage = $5,185.

Equipment costs per crankshaft assembly replacement = $9,636 (Source: Average of the two vendors).

$5,185 labor per crankshaft assembly + $9,636 equipment costs per crankshaft assembly replacement = $14,821 compliance cost per engine.

The total costs to U.S. operators is $1,704,415 ($14,821 x 115), or $119,309 in annualized costs in perpetuity using a 7 percent discount rate. There are no additional costs after removing and replacing the crankshaft assembly.

Therefore, the FAA estimates that the net benefit of this final rule will be $511.1 million ($512.8 million benefits -$1.7 million costs), or $35.77 million in annualized net benefits using a 7 percent discount rate in perpetuity.

Final Regulatory Flexibility Analysis

Under § 604(a) of the RFA, the final analysis must contain the following:

(1) A statement of the need for, and objectives of, the rule;

(2) A statement of the significant issues raised by the public comments in response to the IRFA, a statement of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments;

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[6] https://www.transportation.gov/office-policy/transportation-policy/revised-departmental-guidance-on-valuation-of-a-statistical-life-in-economic-analysis.

[7] 53 preventable fatalities will amount to $508.8 million in benefits of this rule. (53 x $9.6 million). The value of 28 airplane losses is $1.4 million (28 x $50,000). The remaining 75.6 percent of crankshaft failures (100 percent-24.4 percent crankshaft failure destroying the airplane) will result in $2.6 million in engine damages. (115 x 0.756 probability of crankshaft failure damaging an airplane engine x $30,000 value of 360 engine). Therefore, the total estimated benefits are $512.8 million ($508.8 million preventable fatalities + $1.4 million avoidable airplane loss + $2.6 million preventable engine damages).

(3) The response of the agency to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA) in response to the proposed rule, and a detailed statement of any change made to the proposed rule in the final rule as a result of the comments;

(4) A description of and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available;

(5) A description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or record;

(6) A description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

1. Need for and Objectives of the Rule

This final rule AD was prompted by three crankshaft assembly failures that resulted in the loss of engine power and immediate or emergency landings. The FAA is issuing this AD to prevent failure of the crankshaft assembly by requiring the removal of all affected crankshaft assemblies from service. Failure of a crankshaft assembly, if not addressed, could result in failure of the engine, in-flight shutdown, and loss of the airplane.

2. Significant Issues Raised in Public Comments

An individual commenter noted that some owners of affected aircraft may not be in a position to absorb the $15,000 cost of the crankshaft assembly replacement. The commenter proposed that the financial costs of this AD would exceed the FAA estimates in some cases and, therefore, the unintended consequences of this AD would destroy value out of proportion to the preservation of the safety of the national airspace system and the general public.

The FAA estimates the cost of replacing a single crankshaft assembly at $14,821. The risk of not replacing the crankshaft is not insignificant, and the crankshaft failure could cause engine loss, airplane loss, or fatality valued at $30,000, $50,000, and $9.6 million, respectively. When these potentially substantial losses and risks of fatality to each airplane owner and operator are considered, the $14,821 compliance cost per airplane is minimal. Further, the FAA estimates the benefits of this AD to be $512.8 million, which greatly exceeds its cost of $1.7 million, justifying this final rule.

Based on the risk and benefits analysis above, the FAA determined that no changes are necessary to the final rule as a result of this individual comment.

3. Response to SBA Comments

The Chief Counsel for Advocacy of the SBA did not file any comments in response to the proposed rule.

4. Small Entities to Which the Rule Will Apply

This AD applies to all SAP Model IO-360-series and O-360-series reciprocating engines and certain Lycoming Model AEIO-360-, IO-360-, and O-360-series reciprocating engines with a certain SAP crankshaft assembly installed. This SAP crankshaft assembly is installed as original equipment on the affected SAP engines and as a replacement part under PMA on the affected Lycoming engines. These engines are installed on airplanes performing various activities including, but not limited to, flight training, charter flights, and agriculture.

Under the RFA, the FAA must determine whether a final rule significantly affects a substantial number of small entities. The FAA uses the SBA criteria for determining whether an affected entity is small. For aircraft and engine manufacturers, aviation operators, and any business using an aircraft, the SBA criterion is 1,500 or fewer employees. The FAA estimates that this AD affects 115 crankshaft assemblies installed on airplanes of U.S. registry. The FAA does not have any information or data on whether these entities are small businesses according to the definition established by the SBA. Although in the NPRM the FAA requested comments and data that would allow the agency to more accurately assess the number of employees and sales revenues of the affected entities, no such comments or data was received. Accordingly, the FAA assumes for purposes of this final rule that some of the affected entities are small businesses.[8] The FAA determines that the estimated $14,821 compliance cost per aircraft due to this rule will have a significant impact on a substantial number of small entities.

5. Projected Reporting, Record-Keeping, and Other Compliance Requirements

There are no record-keeping costs or other compliance costs associated with this final rule.

6. Significant Alternatives Considered

As part of the FRFA, the FAA is required to consider regulatory alternatives that may be less burdensome. The FAA considered the following alternatives:

Do nothing: This option is not acceptable because the risk of additional failures of these crankshaft assemblies constitutes a known unsafe condition. The FAA estimates that this AD will prevent 53 fatalities and 28 aircraft losses, and monetized benefits of $512.8 million.

Periodic inspections: This option is not possible as the crankshaft assembly cannot be inspected without destroying it.

There is no direct safety alternative to the replacement of the crankshaft assembly. The replacement addresses a safety issue aimed at preventing the failure of the crankshaft assembly.

Therefore, the FAA rejected these two regulatory alternatives and determined that this rulemaking may have a significant economic impact on a substantial number of small entities.

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.

[8] The FAA recognizes that many of these affected airplanes are recreational. The 2016 GAMA Databook shows that of 141,141 active General Aviation piston aircraft, 104,669 are used for personal or recreational purposes (74 percent), Using this distribution, only 30 of the 115 crankshaft assemblies would be installed in airplanes operated for business use.

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, and

(2) Will not affect intrastate aviation in Alaska.

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:

2020-25-12 Superior Air Parts, Inc.: Amendment 39-21354; Docket No. FAA-2018-1077; Project Identifier 2018-NE-40-AD.

(a) Effective Date

This airworthiness directive (AD) is effective January 15, 2021.

(b) Affected ADs

None.

(c) Applicability

This AD applies to the reciprocating engine models identified in paragraphs (c)(1) and (2) of this AD with a Superior Air Parts, Inc. (SAP) crankshaft assembly, part number (P/N) SL36500-A20 or P/N SL36500-A31, with serial numbers 82976-01; 82976-02; SP12-0003 through SP12-0089, inclusive; SP13-0034 through SP13-0150, inclusive; or SP14-0151 through SP14-0202, inclusive; installed.

(1) With SAP crankshaft assembly, P/N SL36500-A20, installed:

(i) SAP Model IO-360-series and O-360-series reciprocating engines.

(ii) Lycoming Engines (Lycoming) Model IO-360-B2F, IO-360-L2A, O-360, O-360-A2A, O-360-A2D, O-360-A2E, O-360-A2F, O-360-A2G, O-360-B2A, O-360-C2A, O-360-C2C, O-360-C2D, O-360-C2E, O-360-D2A, and O-360-D2B reciprocating engines.

(2) With SAP crankshaft assembly, P/N SL36500-A31, installed:

(i) SAP Model IO-360-series and O-360-series reciprocating engines.

(ii) Lycoming Model AEIO-360-H1A, IO-360-B1A, IO-360-B1B, IO-360-B1D, IO-360-B1E, IO-360-B1F, IO-360-M1A, O-360, O-360-A1A, O-360-A1C, O-360-A1D, O-360-A2A, O-360-C1A, O-360-C1G, O-360-C1C, O-360-C1E, and O-360-C1F reciprocating engines.

Note 1 to paragraph (c): This SAP crankshaft assembly may be installed as a replacement part under parts manufacturer approval on the affected Lycoming engines.

(d) Subject

Joint Aircraft System Component (JASC) Code 8520, Reciprocating Engine Power Section.

(e) Unsafe Condition

This AD was prompted by three crankshaft assembly failures that resulted in the loss of engine power and immediate or emergency landings. The FAA is issuing this AD to prevent failure of the crankshaft assembly. The unsafe condition, if not addressed, could result in failure of the engine, in-flight shutdown, and loss of the airplane.

(f) Compliance

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

(g) Required Action

Within 25 engine operating hours after the effective date of this AD, remove the crankshaft assembly from service.

(h) Special Flight Permit

A one-time special flight permit may be issued to fly the aircraft to a maintenance facility to perform the actions of this AD with the following limitations: No passengers, visual flight rules (VFR) day conditions only, and avoid areas of known turbulence.

(i) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Fort Worth 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 certification office, send it to the attention of the person identified in Related Information.

(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.

(j) Related Information

For more information about this AD, contact Justin Carter, Aviation Safety Engineer, Fort Worth ACO Branch, FAA, 10101 Hillwood Parkway, Fort Worth, TX 76177; phone: (817) 222-5146; fax: (817) 222-5245; email: justin.carter@faa.gov.

(k) Material Incorporated by Reference

None.

Issued on December 3, 2020.
Lance T. Gant,
Director, Compliance & Airworthiness Division, Aircraft Certification Service.
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