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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

**[Docket No. FAA–2022–0891; Project Identifier AD–2022–00585–A,E,R;
Amendment 39–22432; AD 2023–09–09]**

RIN 2120–AA64

Airworthiness Directives; Various Airplanes, Helicopters, and Engines

AGENCY:

Federal Aviation Administration (FAA), DOT.

ACTION:

Final rule.

SUMMARY:

The FAA is adopting a new airworthiness directive (AD) for turbocharged, reciprocating engine-powered airplanes and helicopters and turbocharged, reciprocating engines with a certain v-band coupling installed. This AD was prompted by multiple failures of spot-welded, multi-segment v-band couplings at the tailpipe to the turbocharger exhaust housing flange (also referred to as “spot-welded, multi-segment exhaust tailpipe v-band coupling”). This AD establishes a life limit for the spot-welded, multi-segment exhaust tailpipe v-band coupling and requires repetitively inspecting the spot-welded, multi-segment exhaust tailpipe v-band coupling. The FAA is issuing this AD to address the unsafe condition on these products.

DATES:

This AD is effective July 17, 2023.

ADDRESSES:

AD Docket: You may examine the AD docket at *regulations.gov* by searching for and locating Docket No. FAA–2022–0891; 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:

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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 turbocharged, reciprocating engine-powered airplanes and helicopters and turbocharged, reciprocating engines with a certain v-band coupling installed. The NPRM published in the **Federal Register** on July 27, 2022 ([87 FR 45036](#)). The NPRM was prompted by multiple failures of spot-welded, multi-segment v-band couplings at the tailpipe to the turbocharger exhaust housing flange. In the NPRM, the FAA proposed to establish a life limit for the spot-welded, multi-segment exhaust tailpipe v-band coupling and require repetitively inspecting the spot-welded, multi-segment exhaust tailpipe v-band coupling.

Since the mid-1970s, failures of v-band couplings that attach the exhaust tailpipe to the turbocharger exhaust outlet have resulted in a significant number of incidents and accidents (fatal and non-fatal) on both airplanes and helicopters. Since 1974, National Transportation Safety Board (NTSB) accident and incident investigations have led to the issuance of 7 NTSB Safety Recommendations concerning exhaust systems and/or exhaust v-band couplings; 20 FAA ADs to address the unsafe condition with exhaust systems and/or exhaust v-band couplings; and 10 FAA Special Airworthiness Information Bulletins (SAIBs). Industry has also taken action to raise awareness of the concerns associated with v-band coupling failures.

NTSB Safety Recommendations Affecting V-Band Couplings

NTSB safety recommendation	Description	Make/model
A-90-166	Exhaust system	Piper PA-32RT-300T, PA-32R-301T.
A-90-165	Exhaust system	Piper PA-32RT-300T, PA-32R-301T.
A-90-164	Exhaust system	Piper PA-32RT-300T, PA-32R-301T.

NTSB safety recommendation	Description	Make/model
A-88-151	Exhaust system	Piper PA-32RT-300T.
A-88-150	Exhaust system	Piper PA-32RT-300T.
A-88-147	Exhaust system	Piper PA-32RT-300T.
A-74-099	V-band engine exhaust clamp failures	Textron (Cessna) turbocharged 300/400 series.

You may examine these NTSB Safety Recommendations in the AD docket at *regulations.gov* by searching for and locating Docket No. FAA-2022-0891.

ADs on V-Band Couplings

AD	Make/model
AD 2018-06-11, Amendment 39-19231 (83 FR 13383 , March 29, 2018)	Textron Aviation Inc. Model A36TC and B36TC airplanes, all serial numbers, equipped with a turbocharged engine; Textron Aviation Inc. Model S35, V35, V35A, and V35B airplanes, all serial numbers, equipped with the Continental TSIO-520-D engine with AiResearch turbocharger during manufacture; and Textron Aviation Inc. Model S35, V35, V35A, and V35B airplanes, all serial numbers, equipped with Standard Aero Supplemental Type Certificate (STC) SA1035WE.
AD 2014-23-03, Amendment 39-18019 (79 FR 67340 , November 13, 2014)	Piper Aircraft, Inc. Model PA-31P airplanes, serial numbers 31P-1 through 31P-80 and 31P-7300110 through 31P-7730012.
AD 2013-10-04, Amendment 39-17457 (78 FR 35110 , June 12, 2013; corrected September 5, 2013 (78 FR 54561))	Piper Aircraft, Inc. Model PA-31, PA-31-325, and PA-31-350 airplanes, all serial numbers.

AD	Make/model
AD 2010–13–07, Amendment 39–16338 (75 FR 35619 , June 23, 2010; corrected July 26, 2010 (75 FR 43397))	Piper Aircraft, Inc. Model PA–32R–301T airplanes, serial numbers 3257001 through 3257311; and Model PA–46–350P airplanes, serial numbers 4622001 through 4622200 and 4636001 through 4636341.
AD 2004–23–17, Amendment 39–13872 (69 FR 67809 , November 22, 2004)	Mooney Airplane Company Inc. (currently Mooney International Corporation) Model M20M airplanes, serial numbers 27–0001 through 27–0321.
AD 2001–08–08, Amendment 39–12185 (66 FR 20192 , April 20, 2001)	Raytheon Aircraft Company (previously The Beech Aircraft Corporation; currently Textron Aviation Inc.) Model 35–C33A, E33A, E33C, F33A, F33C, S35, V35, V35A, V35B, 36, and A36 airplanes, all serial numbers, with Tornado Alley Turbo, Inc. STC SA5223NM and STC SE5222NM incorporated and with a Teledyne Continental engine equipped with a turbonormalizing system.
AD 2000–11–04, Amendment 39–11752 (65 FR 34941 , June 1, 2000)	Commander Aircraft Company Model 114TC airplanes, serial numbers 20001 through 20027.
AD 2000–01–16, Amendment 39–11514 (65 FR 2844 , January 19, 2000)	Cessna Aircraft Company (currently Textron Aviation Inc.) Model T310P, T310Q, T310R, 320, 320A, 320B, 320C, 320D, 320E, 320F, 320–1, 335, 340, 340A, 321 (Navy OE–2), 401, 401A, 401B, 402, 402A, 402B, 402C, 404, 411, 411A, 414, 414A, 421, 421A, 421B, and 421C airplanes, all serial numbers.
AD 91–21–01 R1, Amendment 39–9470 (61 FR 29003 , June 7, 1996; corrected September 6, 1996 (61 FR 47051))	Textron Lycoming Model TIO–540–S1AD reciprocating engines installed on, but not limited to, Piper Aircraft, Inc. PA–32 series airplanes.
AD 81–23–03 R2, Amendment 39–4491 (47 FR 51101 , November 12, 1982)	Cessna (currently Textron Aviation Inc.) Model P210N airplanes, serial numbers P21000001 through P21000811.

These ADs require v-band coupling replacements (life limit) and/or repetitive inspections, or changing the type design of the v-band coupling. This AD does not apply to airplanes that have complied with one of these ADs. You may examine these ADs in the AD docket at *regulations.gov* by searching for and locating Docket No. FAA–2022–0891.

SAIBs on V-Band Couplings

SAIB	Subject
CE– 18– 21	Exhaust Turbochargers; Announce the availability of the “Best Practices Guide for Maintaining Exhaust System Turbocharger to Tailpipe V-band Couplings/Clamps.”
CE– 18– 07	Exhaust Turbocharger; V-band Couplings Used in Engine Exhaust Systems on Turbocharged Reciprocating Engine Powered Aircraft.
CE– 13– 45	Engine Exhaust; Tailpipe V-band Couplings [for turbocharged, reciprocating engine-powered airplanes].
CE– 13– 07R1	Engine Exhaust; Tailpipe V-band Couplings [for Cessna Aircraft Company (currently Textron Aviation Inc.) Model T206H airplanes].
CE– 13– 07	Engine Exhaust; Tailpipe V-band Couplings [for Cessna Aircraft Company (currently Textron Aviation Inc.) Model T206H airplanes].
CE– 10– 33R1	Engine Exhaust [for reciprocating engine-powered airplanes].
CE– 10– 33	Engine Exhaust [for reciprocating engine-powered airplanes].
CE– 09– 11	Turbocharged Engines [for turbocharged engine-powered airplanes].
CE– 05– 13	Alternative method of compliance (AMOC) to AD 91–03–15, Amendment 39–6870 (56 FR 3025 , January 28, 1991) for Mooney Aircraft Corporation Model M20M airplanes.
CE– 04– 22	Exhaust System Components for reciprocating engine-powered airplanes.

SAIB	Subject
CE– 03– 46	Mooney Model M20M airplanes with turbocharged engines using V-band clamps.

You may examine these SAIBs in the AD docket at *regulations.gov* by searching for and locating Docket No. FAA–2022–0891.

In spite of these efforts, failures continue to occur and the number of significant safety events continues to increase. As a result, the General Aviation Joint Steering Committee (GA–JSC), which is comprised of both the FAA and industry, developed a working group to study v-band coupling failures associated with turbocharged reciprocating engine-powered aircraft and develop recommended corrective actions. This v-band coupling working group was comprised of aviation industry manufacturers, type/user groups, and government entities. The working group was tasked to examine the turbocharger to tailpipe interface and develop recommendations to enhance the safety of the fleet.

The working group recommended mandatory corrective actions that are tailored to each specific coupling type (spot-welded, riveted, or single piece), thereby minimizing the impact to owner/operators. The working group recommended a mandatory coupling replacement time (life limit) and annual inspection. The working group also recommended non-mandatory actions to aid and educate maintenance personnel in appropriate v-band coupling removal, installation, and inspection practices. Finally, the working group recommended actions for new designs, which incorporate lessons learned from review of the in-service fleet. For new designs incorporating a v-band coupling immediately downstream of the turbocharger exhaust discharge, the working group recommended that a replacement interval (500 hours for spot-welded and 2,000 hours for riveted and single-piece) be incorporated in the Airworthiness Limitations sections of the maintenance manual.

In January 2018, the working group published a final report titled “Exhaust System Turbocharger to Tailpipe V-band Coupling/Clamp Working Group Final Report” (final report). Appendix B of the final report contains the Best Practices Guide. The final report may be found in the AD docket at *regulations.gov* by searching for and locating Docket No. FAA–2022–0891.

The final report concluded that the common denominator in the incidents and accidents reviewed is the spot-welded, multi-segment exhaust tailpipe v-band coupling (see Figure A). These couplings come in either two or three segment varieties. The segments are the number of v-retainer segments, which are attached to the outer band via spot welds. Although multi-segment exhaust tailpipe couplings can also be riveted, the riveted couplings do not create an unsafe condition.

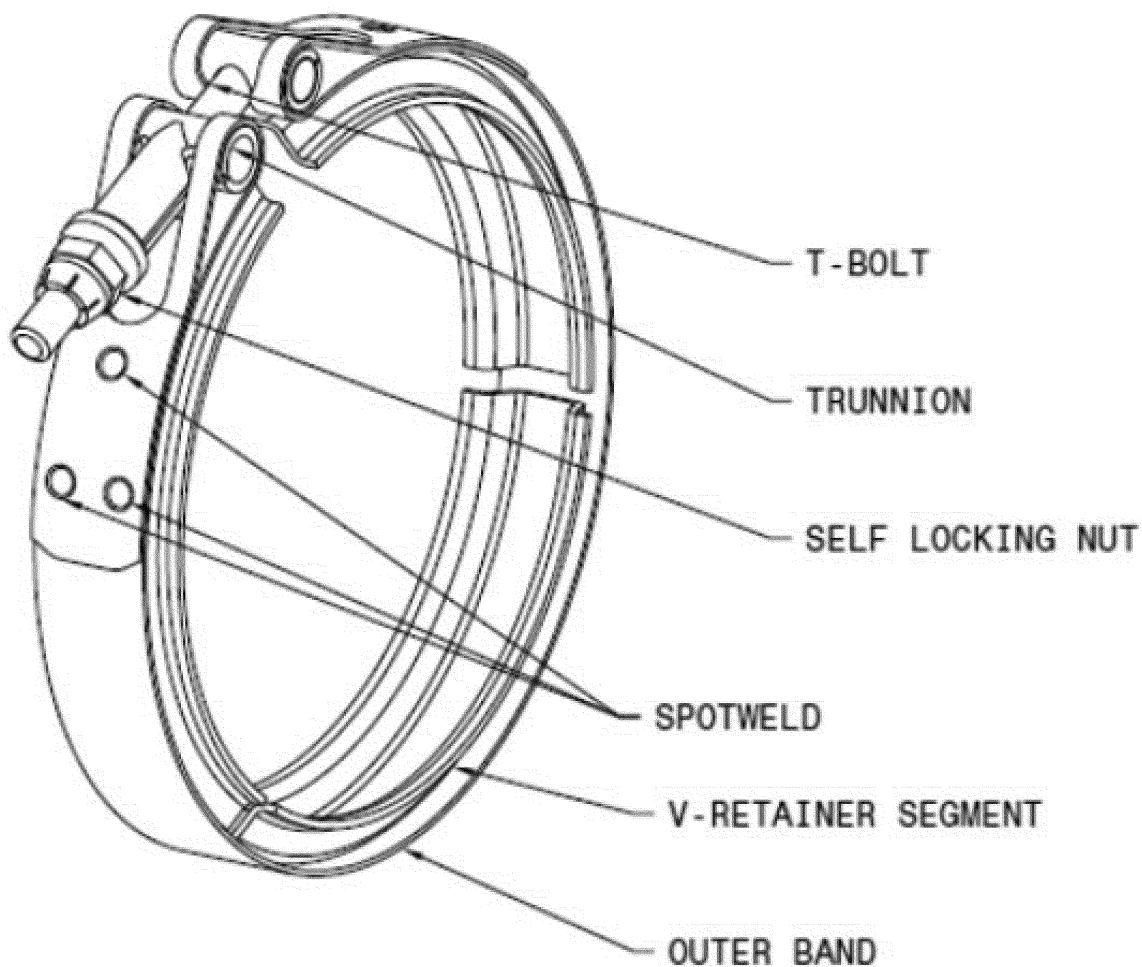


Figure A

Spot-welded, multi-segment exhaust tailpipe v-band coupling

The majority of the events studied by the working group indicated fatigue failure of spot-welded, multi-segment exhaust tailpipe v-band couplings as a result of stress corrosion cracking that originated at or near a spot weld. This is the same unsafe condition identified in the other v-band coupling AD actions previously referenced. The data studied by the working group contained evidence of pre-existing cracking of the couplings, known embrittlement at the spot weld locations simply due to that manufacturing method, and outer band cupping on the multi-segment couplings (which is the result of age, over-use, and potential over-torqueing). The working group also found that many of the couplings had safety wire across the bolt end. The safety wire could be helpful if there was a bolt or nut failure (extremely rare events) or the nut was missing. However, the safety wire was of no value when the failure was transverse band cracking and total separation at the spot weld. The data studied by the working group indicated many accidents were due to v-band couplings that were of the multi-segment, spot-welded design, when used in a specific location (the tailpipe to the turbocharger exhaust housing flange on turbocharged reciprocating engine-powered aircraft).

After the working group published the final report, the FAA issued SAIB CE-18-21, dated July 13, 2018. This SAIB announced the availability of the Best Practices Guide from the final report and

recommended the public apply the best practices in the maintenance of turbocharged reciprocating engine powered aircraft. The FAA also assessed the recommendations contained in the final report and determined an unsafe condition exists in turbocharged reciprocating engine-powered aircraft with a spot-welded, multi-segment v-band coupling installed. Because these v-band couplings are widely used by many design approval holders on various models (engines and aircraft), several Aircraft Certification Office Branches were involved in the decision to propose a single AD. The FAA also determined that the corrective actions recommended in the final report were appropriate to address this unsafe condition.

This condition, if not addressed, could lead to failure of the spot-welded, multi-segment exhaust tailpipe v-band coupling, leading to detachment of the exhaust tailpipe from the turbocharger and allowing high-temperature exhaust gases to enter the engine compartment. This could result in smoke in the cockpit, in-flight fire, and loss of control of the aircraft. 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 32 commenters. The commenters were Aerostar Aircraft Corporation (Aerostar), European Union Aviation Safety Agency (EASA), NTSB, Vulcanair S.p.A, and 28 individuals. The NTSB and four individual commenters supported the AD without change. Aerostar, EASA, Vulcanair S.p.A., and 19 individual commenters do not necessarily oppose the NPRM but recommended certain changes. Five individual commenters oppose the proposal in its entirety. The following presents the comments received on the NPRM and the FAA's response to each comment.

A. Requests Regarding Withdrawing the NPRM

Three individual commenters stated that current inspections are adequate and implied that they opposed the NPRM. Two other individual commenters stated that they opposed the NPRM. One of the commenters implied current inspections were sufficient and stated inspections of the v-band clamp at each oil change and on-condition replacement would be enough. One of the commenters who opposed the NPRM in its entirety also requested that information regarding exhaust couplers be added to FAA Advisory Circular (AC) 43.13–1B, *Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair*, dated September 8, 1998 (AC 43.13–1B). The FAA infers that these commenters are requesting that the NPRM be withdrawn.

The FAA disagrees. This AD requires specific inspections that are not included in current inspections. The accident and incident failure data and existing ADs that are included in paragraphs (d) (1) through (10) of this AD demonstrate that a 500-hour time-in-service (TIS) life limit is appropriate for this type of multi-segment coupling. Regarding the request to revise AC 43.13–1B, that change is outside the scope of this AD and actions in an advisory circular provide guidance but are not mandatory.

The FAA has not changed this AD as a result of these comments.

B. Requests Regarding Estimated Costs

1. Increase Work-Hour Rate

Three individual commenters requested that the FAA increase the cost per work-hour specified in the NPRM. These commenters stated that \$85 per work-hour is too low and does not reflect the true rate charged by their local maintenance facilities, which ranges from \$100 to \$140 per work-hour. One of these commenters also reported that the estimated records review rate of \$42.50 was not supported by industry practice and should be increased.

The FAA disagrees. The FAA Office of Aviation Policy and Plans provides the labor rate of \$85 per work-hour used when estimating the labor costs for complying with AD requirements. The estimate for the records review rate was based on 1/2 hour at \$85 per work-hour.

The FAA has not changed this AD as a result of these comments.

2. Increase V-Band Coupling Removal and Replacement Costs

Two individual commenters requested changes regarding the estimated costs in the NPRM for removal and replacement of v-band couplings. One of those commenters stated that there could be a discrepancy in the estimated costs per owner/operator. This commenter stated that the estimated figures did not appear to be unduly expensive in the interest of preventing a potential in-flight fire. The FAA infers that this commenter is requesting a revision to the estimated costs for removal and replacement of a v-band coupling based on the requested review of the cost estimates.

The other individual commenter encouraged the FAA to increase the estimated cost in the NPRM for replacement of a v-band coupling and provided a cost of over \$700 for the Piper Model PA-28R-201 airplane v-band coupling. The FAA infers that the commenter is referring to the estimated parts cost of \$400 for a single-engine aircraft.

The FAA acknowledges that there may be discrepancies in the estimated costs among owners/operators for removing and replacing a v-band coupling. The FAA's estimated number of work-hours were based on the actions required in AD 2018-06-11 and the parts costs were based on current pricing. Additional labor and parts costs were added for twin-engine aircraft. In the NPRM, the FAA estimated costs in single-engine and twin-engine aircraft. The FAA disagrees that the cost of the v-band coupling needs to be increased. The estimated v-band coupling cost of \$400 for a single-engine aircraft was based on a sampling of a range of parts costs for different aircraft. The FAA determined that \$400 was an accurate parts cost for a single-engine aircraft.

The FAA has not changed this AD as a result of these comments.

C. Requests Regarding Life Limit

1. Clarification of Mitigation for Installation of a V-Band Coupling That Exceeds 500-Hours TIS

EASA suggested that there should be a mitigation of risk in place if a v-band coupling having 500 or more hours TIS as of the effective date of the final rule is installed on an aircraft. EASA noted that

paragraph (l)(1) of the proposed AD would allow the installation of a used v-band coupling of any age (*i.e.*, more than 500 hours TIS) within the first two years after the effective date of the final rule. EASA asked if requiring the repetitive inspections specified in paragraph (i)(2) of the proposed AD would mitigate this risk or, alternatively, if there should be a prohibition of the installation of a v-band coupling that has accumulated 500 or more hours TIS as of the effective date of the final rule.

The FAA does not agree. The FAA provides mitigation for the risk associated with installing a v-band coupling having 500 or more hours TIS by requiring inspections every 6 months or every 100 hours TIS, whichever occurs first, for two years after the effective date of this AD. The inspections and inspection criteria are the same for the v-band couplings regardless of the inspection time interval. Paragraph (i)(2) of this AD was provided to allow compliance with the requirements of this AD with regards to hardware availability.

2. Justification for 500-Hour TIS Life Limit

An anonymous commenter requested justification for the v-band coupling 500-hour TIS life limit specified in the NPRM and stated that the 500-hour TIS life limit seemed low. In regards to the study of accident rates where failure of the v-band coupling was determined to be at fault, the commenter asked how many hours the v-band coupling had accumulated since its initial installation. The commenter also inquired about the failure rate of higher grade material v-band couplings and asked if higher grade v-band coupling material would have an effect on the failure rate.

The FAA determined the 500-hour TIS v-band coupling replacement time is necessary to correct the unsafe condition. The FAA based this determination on past precedence of some of the existing ADs that are included in paragraphs (d)(1) through (10) of this AD. The v-band couplings addressed in this AD are of similar steel material. The FAA has an obligation to issue an AD to address an unsafe condition. This AD addresses the unsafe condition through repetitive inspections and replacements. The FAA would consider any future design improvements as an AMOC following the procedures outlined in paragraph (n) of this AD.

The FAA has not changed this AD in regard to this comment.

3. Replacement of V-Band Coupling Solely Based on Hours TIS

Two commenters did not agree with the replacement of the v-band coupling based solely on flight hours (v-band coupling hours TIS). One commenter asserted the inspections specified in the proposed AD were adequate to uncover defects that would require replacing a v-band coupling and stated if a v-band clamp continuously passes inspection, there is no reason to discard it based on TIS. The other commenter stated that v-band couplings on its helicopters are already inspected for cracking, and the surrounding area is inspected for signs of cracking or soot, as part of pre-flight inspections. This commenter also stated that Enstrom Helicopter Corporation issued Service Directive Bulletin 0122 (Enstrom SDB 0122) that addresses inspections for cracks.

The FAA disagrees with removing the requirement in paragraph (i) of this AD to replace a v-band coupling before it accumulates 500 hours TIS and instead allowing on-condition replacement based

upon inspection results. The accident/incident failure rate and existing ADs that are included in paragraphs (d)(1) through (10) of this AD demonstrate that a 500-hour TIS life limit is appropriate for this type of multi-segment v-band coupling. Regarding Enstrom SDB 0122, the FAA has not issued an AD that mandates using that service information.

The FAA has not changed this AD in regard to these comments.

D. Requests Regarding V-Band Coupling Serialization

Two individual commenters recommended serialization of the v-band coupling.

One of those commenters stated it would be difficult to determine the total hours TIS unless these parts are serialized. The other commenter recommended serialization by vibro-etching the tailpipe v-band coupling to differentiate it from v-band couplings in other locations of an aircraft.

The FAA disagrees that determination of a v-band coupling's hours TIS cannot be done without serialization either by vibro-etching or other means. Existing ADs that are included in paragraphs (d)(1) through (10) of this AD, regarding a v-band coupling with life limits have not required serialization. Once the hours TIS of a v-band coupling is established, subsequent maintenance actions will be based on hours TIS.

The FAA has not changed this AD in regard to these comments.

E. Requests Regarding V-Band Coupling: Type Design and Manufacturing

One individual commenter stated that instead of being spot-welded, the rings (v-band couplings) should be solid state welded. This commenter researched spot-welded couplings that revealed if the heat and pressure on the metal prior to the spot-weld is not consistent, the spot-weld will fail. Another individual commenter stated that spot-welds are good in tension and not in shear. The commenter further explained that as the v-band coupling is tightened, the spot-weld is in shear, and that adding dynamic loads reduces the spot-weld's life even further. This commenter suggested that a different type of attachment be used such as a braze joint or a laser weld.

Regarding the type design changes, an individual commenter asked if the installation of a riveted clamp would terminate the 500-hour TIS replacement schedule. Another individual commenter recommended using the v-band coupling information in Navair Technical Manual 1-1A-8, "Engineering Manual Series Aircraft and Missile Repair, Structural Hardware," which is used by the military, and adding this information to AC 43.13-1B. Another individual commenter stated that additional information on v-band couplings can be found in military specifications MS27116C, "Coupling, Clamp, Grooved, V Band 1.750 To 14.250 Flange OD (Minus 320 Deg. To Plus 1500 Deg. F)," and MIL-DTL-27536C, "Coupling, Clamp, Grooved, V-Band." A different individual commenter suggested that by allowing a small [tungsten inert gas] TIG weld on the edges of the clamp, the concern regarding the spot welds holding would be addressed. An additional individual commenter referenced an unspecified photo linked to the NPRM and said it was not representative of current v-band coupling design.

An individual commenter stated that during manufacturing, the single spot-welds might be placed too close to the trunnions, thereby causing failure points. This commenter suggested using a total of four spot-welds instead of two spot-welds. The FAA infers that the commenter is requesting a change to the manufacturing of the v-band coupling.

The FAA has determined that inspections, in combination with life limits, are sufficient to mitigate the risk. The FAA would consider any future design improvements as an AMOC request following the procedures outlined in paragraph (n) of this AD. Regarding the proposed revision to AC 43.13-1B, that change is outside the scope of this AD and actions in an advisory circular are recommendations, not mandatory.

The FAA has not changed this AD in regard to these comments.

F. Request for Clarification Regarding the Number/Percentage of In-Flight Smoke and/or Fire Events

An individual commenter requested clarification regarding the number or percentage of in-flight smoke and/or fire events related to the NPRM.

The FAA does not have data indicating the specific number or percentage of incidents/accidents in which the v-band coupling failure caused a smoke event or an in-flight fire. At least one fatal accident and two non-fatal accidents involving a v-band coupling failure had occurrences of a fire. Smoke or fire could occur due to a separation of the v-band coupling or loss of the tailpipe because of the hot exhaust gases impinging on surrounding surfaces. This information was included in the FAA's determination that an unsafe condition existed to justify issuing this AD.

The FAA has not changed this AD as a result of this comment.

G. Requests Regarding Applicability

1. Remove Airplanes With STC SA4976NM Installed

Aerostar explained that airplanes with STC SA4976NM installed have eliminated the v-band coupling at the tailpipe to turbocharger connections and are not affected by the unsafe condition described in the proposed AD. Aerostar stated that STC SA4976NM was approved as an AMOC for the repetitive inspections required by AD 90-01-02, Amendment 39-6517, January 5, 1990 (issued as a priority letter), that required repetitive dismantling inspections of the exhaust tailpipe assembly at intervals not to exceed 50-hours TIS. The FAA infers that Aerostar requested a change to the Applicability in the proposed AD to remove airplanes with STC SA4976NM installed.

The FAA agrees. The installation of STC SA4976NM on Aerostar Model PA-600, -601, -601P, -602P and -700P airplanes eliminates the v-band coupling at the tailpipe to turbocharger connection. Paragraph (d), Applicability, of this AD was revised to add STC SA4976NM to the list of airplanes excepted from the applicability.

2. Remove Vulcanair S.p.A Model P.68B From the Applicability

Vulcanair requested that Vulcanair S.p.A Model P.68B airplanes be removed from the Applicability Table in paragraph (d) of the proposed AD. The commenter stated Vulcanair S.p.A Model P.68B airplanes are equipped with two normally aspirated reciprocating engines.

The FAA agrees and revised Table 1 to paragraph (d) of this AD to remove Vulcanair S.p.A Model P.68B airplanes. FAA Type Certificate Data Sheet A31EU lists the Model P.68B airplane as equipped with two Lycoming IO-360-A1B or Lycoming IO-360-A1B6 engines, which are normally aspirated. If the airplane is modified after certification by an STC, parts manufacturer approval, or field approval, with a turbocharged reciprocating engine with a spot-welded, multi-segment v-band coupling installed at the tailpipe to turbocharger exhaust housing flange, this AD is applicable.

3. Add Textron Aviation Inc. Model T182 and TR182 Airplanes Equipped With Lycoming O-540-L3C5D Engines

An individual commenter asked why Model T182 and TR182 airplanes equipped with Lycoming O-540-L3C5D engines were not included in the applicability of the proposed AD. The FAA infers that this commenter is requesting that these airplane and engine combinations be added to the applicability of the proposed AD.

The FAA agrees that these airplane models are affected by the requirements of this AD but a change to this AD is not necessary because Table 1 to paragraph (d) of this AD already includes Model T182 and TR182 airplanes.

The FAA has not changed this AD in regard to this comment.

4. Add Mooney Model M20F Airplanes With Aftermarket Installation

An individual commenter asked if Model M20F airplanes with an aftermarket RayJay normalizing turbocharger are included in the applicability of the proposed AD. The FAA infers that this commenter is requesting that the applicability of the proposed AD be revised to include these airplane models.

The FAA disagrees with adding the Mooney Model M20F airplanes equipped with an aftermarket RayJay normalizing turbocharger to the applicability of this AD because the FAA could not determine the STC that was being referred to. However, based on the way the final rule is written with language of “as installed, but not limited to the following aircraft”, this AD would still apply to all turbocharged, reciprocating engine-powered airplanes and helicopters and turbocharged, reciprocating engines with a spot-welded, multi-segment v-band coupling installed at the tailpipe to turbocharger exhaust housing flange, except for airplanes that are in compliance with an AD listed in paragraphs (d)(1) through (10) of this AD or have STC SA4976NM installed. These ADs are available in the AD docket at *regulations.gov* by searching for and locating Docket No. FAA-2022-0891. These v-band couplings are installed on, but not limited to, the products listed in Table 1 to paragraph (d) of this AD. This AD would apply regardless of whether the turbocharger is installed as part of the type certificate, or under an STC, parts manufacture approval, or field approval. Outside of type certification, it is the responsibility of the owner working with a licensed mechanic

to determine if the configuration of the aircraft includes the spot-welded multi segment v-band coupling installed at the tailpipe to the turbocharger exhaust housing.

The FAA has not changed this AD in regard to this comment.

5. Add Turbine Helicopters With V-Band Clamps

An individual commenter asked if the NPRM needed to address v-band couplings installed on turbine helicopters. The FAA infers that the commenter requested to add turbine helicopters to the applicability of the proposed AD.

The FAA disagrees. The use of the v-band couplings on turbine helicopters is not addressed in this AD. This AD addresses the unsafe condition for spot-welded, multi-segment v-band coupling installed at the tailpipe to turbocharger exhaust housing flange for turbocharged, reciprocating engine-powered airplanes and helicopters and turbocharged, reciprocating engines. The vibratory environment for turbine engines on helicopters is different and as such is not part of the identified unsafe condition.

The FAA has not changed this AD in regard to this comment.

6. No Justification for Mooney Model M20K Airplanes

An individual commenter stated that there is not enough information to justify an AD for a Mooney Model M20K airplane. The commenter cited FAA SAIB CE-18-07, "Exhaust Turbocharger; V-band Couplings Used in Exhaust Systems on Turbocharged Reciprocating Engine Powered Aircraft," dated December 14, 2017 (SAIB CE-18-07), which states the "concern [was] not considered an unsafe condition that would warrant AD action." The commenter also stated that a review of the FAA's Aviation Safety Information Analysis and Sharing System and the NTSB's Accident Database could not find any serious incidents involving defective v-band couplings on Mooney Model M20K airplanes. The commenter supported an inspection regime and includes it in the pre-flight check and does an unspecified inspection of the v-band coupling at each oil change when the turbo is easily accessible. The commenter explained that there is a difference between "big block" 520-550 cubic-inch engines and smaller 360 turbocharged engines, and that the NTSB safety recommendations referred to in the NPRM refer to the "big block" engines. The commenter also pointed out that all of the ADs specified in the proposed AD apply to larger displacement turbocharged reciprocating engines.

The FAA disagrees that there is not enough justification to include Mooney Model M20K airplanes in the applicability of this AD. When SAIB CE-18-07 was issued, the FAA was still evaluating this issue and had not determined that there was an unsafe condition warranting AD action. The v-band couplings that are the subject of this AD are used on both larger and smaller engines, and the inspections proposed in the NPRM are not part of current inspection criteria. The accident/incident failure data and existing AD actions demonstrate that a 500-hour TIS life limit is appropriate for this type of multi-segment coupling and that an unsafe condition exists.

The FAA has not changed this AD in regard to this comment.

H. Requests Regarding Inspections

1. Revise Paragraph (j) of the Proposed AD To Separate Compliance Times From Inspection Procedures

EASA requested that paragraph (j) of the proposed AD, “Inspections Without Removal of the V-Band Coupling,” be separated into two paragraphs with one paragraph containing the requirement for an annual inspection with references to both an inspection with the v-band coupling removed and an inspection with the v-band coupling installed, and the other paragraph containing the inspection procedure. The commenter stated that having the inspection timeline and the inspection procedures in the same paragraph may cause confusion.

The FAA agrees that having the inspection compliance times and inspection procedures in the same paragraph could cause confusion. The FAA added paragraph (j), “V-band Coupling Inspections,” in this AD to specify only the inspection compliance times and re-designated the subsequent paragraphs accordingly. Paragraph (i)(2) of this AD still provides an alternative to initially removing the v-band coupling from service by doing the inspections required by paragraphs (k)(1) through (7) or (l) of this AD.

2. Remove Paragraph (j) of the Proposed AD

EASA requested that paragraph (j) of the proposed AD, “Inspections Without Removal of the V-Band Coupling,” be removed because it is not possible to do a thorough inspection with the v-band coupling installed.

The FAA disagrees. The procedures that the FAA included for the inspection of an installed v-band coupling were tested and it was determined that these procedures are adequate to verify the condition of the v-band coupling. If any of the inspection criteria for an installed v-band coupling are not met, the v-band coupling is required to either be replaced or undergo additional inspections with the v-band coupling removed. These procedures have been used with success in existing ADs that are included in paragraphs (d)(1) through (10) of this AD.

The FAA has not changed this AD in regard to this comment.

3. Request To Revise Paragraph (j)(3) of the Proposed AD

An individual commenter requested that paragraph (j)(3) of the proposed AD be moved to paragraph (k) of the proposed AD. The commenter stated that it could not be determined if the v-segments are loose with respect to the outer band with the outer band T-bolt torqued to specification. The commenter requested this inspection be moved to paragraph (j) after the v-band coupling is removed.

The FAA disagrees with moving this inspection from paragraph (j)(3) of the proposed AD to paragraph (k) of this AD. Looseness of the v-band coupling may occur if the coupling is not properly installed. Looseness of the outer band may occur if the outer band has separated from the v-band retainer segment or if the spot weld attachment is in the process of failing or has failed. Therefore, this inspection must be done without removing the v-band coupling.

The FAA has not changed this AD in regard to this comment.

4. Include a Non-Destructive Inspection

An individual commenter requested the FAA consider adding a requirement for a non-destructive inspection (NDI). The commenter stated the clamps are constantly stressed even in the absence of heat cycling.

The FAA disagrees with adding a requirement for an NDI to this AD. Due to the various v-band couplings, an NDI would have to be determined by the v-band coupling manufacturer and the FAA has determined that the visual inspections along with replacements will mitigate the unsafe condition. However, additional inspections are acceptable as long as they do not conflict with the visual inspection requirements, replacement, and life limit requirements of this AD.

The FAA has not changed this AD in regard to this comment.

5. Insufficient Justification for Paragraph (j) of the Proposed AD

An individual commenter believed that there is not enough data to justify an AD, specifically for paragraph (j) of the proposed AD regarding repetitive inspections of v-band couplings. The commenter cited multiple examples where root cause analysis was determined in other AD actions. The commenter stated that the FAA has not made a determination of what the root cause is for the proposed AD.

The FAA disagrees that there is no root cause for this AD. The FAA issues an AD when an unsafe condition is found. The unsafe condition addressed by this AD is fatigue failure of spot-welded, multi-segment exhaust tailpipe v-band couplings as a result of stress corrosion cracking that originated at or near a spot weld. As stated in the Background, the data studied by the working group contained evidence of pre-existing cracking of the couplings, known embrittlement at the spot weld locations simply due to that manufacturing method, and outer band cupping on the multi-segment couplings (which is the result of age, over-use, and potential over-torqueing). These are the root causes of the unsafe condition. Current inspection procedures are inadequate to detect these cracks in a timely manner. Accordingly, the FAA is mandating inspection procedures and a life limit to protect the fleet. The life limit and inspections directly address the unsafe condition, have been used in previous ADs, and therefore are appropriate for this type of multi-segment coupling.

The FAA has not changed this AD in regard to this comment.

I. Request To Use Generic Terms in Paragraph (k) of the Proposed AD

EASA suggested that generic terms be used in paragraph (k)(1)(i) of the proposed AD, such as “fine abrasive cloth and mineral spirits” instead of “crocus cloth and mineral spirits or Stoddard solvent” because the current terminology in the proposed AD might not be recognized outside of the United States.

The FAA partially agrees. The term “crocus cloth” is a general term and not specific. The term “Stoddard solvent” refers to the original developer of the solvent. This AD already includes the term “mineral spirits.” The FAA revised paragraph (l)(1)(i) of this AD to include “crocus cloth or fine abrasive cloth and mineral spirits or Stoddard solvent.”

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 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 up to 41,058 airplanes, helicopters, and engines (products of U.S. registry). The FAA has no way of determining the number of these products that could have an affected spot-welded, multi-segment v-band coupling installed. The FAA's estimated cost on U.S. operators reflects the maximum possible cost based on the 41,058 products of U.S. registry. Based on this, the FAA estimates the following costs to comply with this AD:

The FAA estimates the following costs to comply with this AD:

Estimated Costs

Action	Labor cost	Parts cost	Cost per product	Number of U.S. products	Cost on U.S. operators
Aircraft records review	0.5 work hour × \$85 = \$42.50	N/A	\$42.50	41,058	\$1,744,965.
Removal of the coupling from service and replacement (single-engine aircraft)	2 work-hours × \$85 per hour = \$170	\$400	\$570	31,248	\$17,811,360.
Removal of the couplings from service and replacement (twin-engine aircraft)	4 work-hours × \$85 per hour = \$340	800	\$1,140	9,810	\$11,183,400.
Inspection of the coupling without removal (single-engine aircraft)	0.5 work-hour × \$85 per hour = \$42.50	N/A	\$42.50 per inspection cycle	31,248	\$1,328,040 per inspection cycle.

Action	Labor cost	Parts cost	Cost per product	Number of U.S. products	Cost on U.S. operators
Inspection of the couplings without removal (twin-engine aircraft)	1 work-hour × \$85 per hour = \$85	N/A	\$85 per inspection cycle	9,810	\$833,850 per inspection cycle.

On-Condition Costs

Action	Labor cost	Parts cost	Cost per product
Inspection of the coupling, including removal and reinstallation (single-engine aircraft)	1.5 work-hours × \$85 per hour = \$127.50	N/A	\$127.50
Inspection of the couplings, including removal and reinstallation (twin-engine aircraft)	3 work-hours × \$85 per hour = \$255	N/A	255

This AD provides operators the option of performing an inspection with the coupling removed from the aircraft instead of an inspection of the coupling without removing it from the aircraft. In some cases, an inspection with the coupling removed may be required.

A coupling may need to be removed from service before it reaches its 500-hour TIS life limit if it does not meet all of the inspection criteria at each inspection. The FAA has no way of determining the number of products that may need to remove the coupling from service before reaching its 500-hour TIS life limit.

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:

2023–09–09 Various Airplanes, Helicopters, and Engines: Amendment 39 22432;
Docket No. FAA–2022–0891; Project Identifier AD–2022–00585–A,E,R.

(a) Effective Date

This airworthiness directive (AD) is effective July 17, 2023.

(b) Affected ADs

None.

(c) Definitions

(1) For purposes of this AD, a “v-band coupling” means a spot-welded, multi-segment v-band coupling installed at the tailpipe to turbocharger exhaust housing flange.

(2) For purposes of this AD, “new” means zero hours time-in-service (TIS).

(d) Applicability

This AD applies to all turbocharged, reciprocating engine-powered airplanes and helicopters and turbocharged, reciprocating engines, certificated in any category, with a spot-welded, multi-segment v-band coupling installed at the tailpipe to turbocharger exhaust housing flange, except for airplanes that are in compliance with an AD listed in paragraphs (d)(1) through (10) of this AD, or have the supplemental type certificate (STC) listed in paragraph (d)(11) of this AD installed. These v-band couplings are installed on, but not limited to, the products listed in Table 1 to paragraph (d) of this AD.

(1) AD 2018–06–11, Amendment 39–19231 ([83 FR 13383](#), March 29, 2018).

(2) AD 2014–23–03, Amendment 39–18019 ([79 FR 67340](#), November 13, 2014).

(3) AD 2013–10–04, Amendment 39–17457 ([78 FR 35110](#), June 12, 2013; corrected September 5, 2013 ([78 FR 54561](#))).

(4) AD 2010–13–07, Amendment 39–16338 ([75 FR 35619](#), June 23, 2010; corrected July 26, 2010 ([75 FR 43397](#))).

(5) AD 2004–23–17, Amendment 39–13872 ([69 FR 67809](#), November 22, 2004).

(6) AD 2001–08–08, Amendment 39–12185 ([66 FR 20192](#), April 20, 2001).

(7) AD 2000–11–04, Amendment 39–11752 ([65 FR 34941](#), June 1, 2000).

(8) AD 2000–01–16, Amendment 39–11514 ([65 FR 2844](#), January 19, 2000).

(9) AD 91–21–01 R1, Amendment 39–9470 ([61 FR 29003](#), June 7, 1996; corrected September 6, 1996 ([61 FR 47051](#))).

(10) AD 81–23–03 R2, Amendment 39–4491 ([47 FR 51101](#), November 12, 1982).

(11) STC Number SA4976NM for Type Certificate Number: A17WE, Make: Aerostar, Model: PA–60–600, –601, –601P, –602P, and –700P.

Table 1 to Paragraph (d)—Applicability Includes, But Is Not Limited to, the Following Airplanes, Helicopters, and Engines When Turbocharged

Type certificate holder	Model
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Type certificate holder	Model
Aerostar Aircraft Corporation	PA-60-600 (Aerostar 600), PA-60-601 (Aerostar 601), PA-60-601P (Aerostar 601P), PA-60-602P (Aerostar 602P), and PA-60-700P (Aerostar 700P).
B-N Group Ltd. (formerly Pilatus Britten-Norman Limited)	BN-2, BN-2A, BN-2A-6, BN-2A-8, and BN-2A-9.
Cirrus Design Corporation	SR22, SR22T.
Commander Aircraft Corporation (formerly CPAC, Inc.; Commander Aircraft Company; Gulfstream Aerospace Corporation; Gulfstream American Corporation; and Rockwell International, Commander Aircraft Division)	112TC, 112TCA, and 114TC.
Continental Aerospace Technologies, Inc. (formerly Continental Motors, Inc., and Teledyne Continental Motors)	LTSIO-360-E, LTSIO-360-EB, LTSIO-360-KB, LTSIO-360-RB; TSIO-360-E, TSIO-360-EB, TSIO-360-F, TSIO-360-FB, TSIO-360-KB, TSIO-360-LB, TSIO-360-MB, TSIO-360-RB, TSIO-360-SB; TSIO-520-BE, TSIO-520-L, TSIO-520-LB, TSIO-520-T, TSIO-520-WB; TSIO-550-A, TSIO-550-B, TSIO-550-C, TSIO-550-E, TSIO-550-G, TSIO-550-J, TSIO-550-K, TSIO-550-N; TSIOF-550-D, TSIOF-550-J, IO-520-B, IO-520-BA, IO-520-BB, IO-520-D, IO-550-B, IO-550-E, and IO-550-N.
Costruzioni Aeronautiche Tecnam S.P.A	P2012 Traveller.
Daher Aerospace (formerly SOCATA and SOCATA—Groupe AEROSPATIALE)	TB 21.

Type certificate holder	Model
Diamond Aircraft Industries Inc. (formerly Diamond Aircraft Industries GmbH)	DA 40.
The Enstrom Helicopter Corporation	F-28C, F-28C-2, F-28C-2R, F-28F, F-28F-R, 280C, 280F, and 280FX.
Helio Aircraft LLC	500.
Helio Alaska, Inc	H-295 (USAF U-10D) and H-395 (USAF L-28A or U-10B).
The King's Engineering Fellowship (formerly Evangel-Air)	4500-300 and 4500-300 Series II.
Lycoming Engines (formerly Textron Lycoming)	IO-540-AA1A5, IO-540-AG1A5, IO-540-S1A5, TIO-540-AE2A, TIO-540-AH1A, TIO-540-J2BD, TO-360-C1A6D, TO-360-E1A6D, LTO-360-A1A6D, LTO-360-E1A6D, and LTIO-540-J2BD.
Maule Aerospace Technology, Inc. (formerly Maule Aircraft Corporation)	M-5-210TC.
Merlyn Products, Inc	IO-540-MX1.
Mooney International Corporation (formerly Mooney Aviation Company, Inc.; Mooney Airplane Company, Inc.; Mooney Aircraft Corporation; Aerostar Aircraft Corporation of Texas; and Mooney Aircraft Inc.)	M20J, M20K, M20M, M20TN, and M20V.
Piper Aircraft, Inc. (formerly The New Piper Aircraft, Inc.)	PA-23, PA-23-160, PA-23-235, PA-23-250, PA-23-250 (Navy UO-1), PA-E23-250, PA-24-250, PA-24-260, PA-24-400, PA-28-201T, PA-28R-201T, PA-28RT-201T, PA-30, PA-31, PA-31-325, PA-31-350, PA-31P, PA-31P-350, PA-32-260, PA-32R-300, PA-32RT-300T, PA-32R-301(SP), PA-32-301T, PA-32R-301T, PA-34-200, PA-34-200T, PA-34-220T, PA-39, PA-44-180T, PA-46-310P, and PA-46-350P.

Type certificate holder	Model
Revo, Incorporated (formerly Global Amphibians, LLC; Consolidated Aeronautics, Inc.; Lake Aircraft Corporation; and Colonial Aircraft Company)	Lake Model LA-4, Lake Model LA-4A, Lake Model LA-4-200, and Lake Model 250.
Scott's-Bell 47, Inc. (formerly Bell Helicopter Textron Inc.)	47G-3B, 47G-3B-1, 47G-3B-2, and 47G-3B-2A.
Siam Hiller Holdings, Inc. (formerly Rogerson Hiller Corporation; Hiller Helicopters; Rogerson Aircraft Corporation; Hiller Aviation; Heli-Parts, Inc.; Fairchild Industries, Inc.; and Hiller Aircraft Corporation)	UH-12L and UH-12L4.
SST FLUGTECHNIK GmbH (formerly Extra Flugzeugproduktions- und Vertriebs-GmbH and Extra Flugzeugbau GmbH Flugplatz)	EA 400.
Textron Aviation Inc. (formerly Beechcraft Corporation, Hawker Beechcraft Corporation, Raytheon Aircraft Company, and Beech Aircraft Corporation)	35-33, 35-A33, 35-B33, 35-C33, 35-C33A, E33, E33A, E33C, F33, F33A, F33C, H35, J35, K35, M35, N35, P35, S35, V35, V35A, V35B, 36, A36, A36TC, B36TC, D55, E55, 56TC (Turbo Baron), A56TC (Turbo Baron), 58, G58, 60 (Duke), A60 (Duke), B60 (Duke), 95, 95-C55, B95, B95A, D95A, and E95.

Type certificate holder	Model
Textron Aviation Inc. (formerly Cessna Aircraft Company)	185, 185A, 185B, 185C, 185D, 185E, A185E, A185F, A188, A188A, A188B, A188C, T182, T182T, TR182, T188C, 206, P206, P206A, P206B, P206C, P206D, P206E, T206H, TP206A, TP206B, TP206C, TP206D, TP206E, TU206A, TU206B, TU206C, TU206D, TU206E, TU206F, TU206G, U206, U206A, U206B, U206C, U206D, U206E, U206F, U206G, T207, T207A, 210, 210A, 210B, 210C, 210-5 (205), 210-5A (205A), P210N, T210G, T210H, T210J, T210K, T210L, T210M, T210N, T240, T303, 310, 310B, 310C, 310D, 310E (USAF U-3B), 310F, 310G, 310H, 310I, 310J, T310P, T310Q, T310R, 320, 320A, 320B, 320C, 320D, 320E, 320F, 320-1, 321, 335, 340, 340A, LC40-550FG, LC41-550FG, LC42-550FG, FT337E, FT337F, FT337GP, FT337HP, P337H, T337B, T337C, T337D, T337E, T337F, T337G, T337H, T337H-SP, 401, 401A, 401B, 402, 402A, 402B, 402C, 404, 411, 411A, 414, 414A, 421, 421A, 421B, 421C.
Triton Aerospace LLC (formerly Triton America LLC; AAI Acquisition, Inc.; and Adam Aircraft)	A500.
Twin Commander Aircraft LLC (formerly Twin Commander Aircraft Corporation; Gulfstream Aerospace Corporation; Gulfstream American Corporation; Rockwell-Standard & Associates; and Aero Design and Engineering Company, also known as Aero Commander Aircraft)	500, 500A, 500B, 500S, 500U, 560A, 560E, and 685.
Vulcanair S.p.A. (formerly Partenavia Costruzioni Aeronautiche S.p.A.)	P.68C-TC, and P.68TC "Observer".

(e) Subject

Joint Aircraft System Component (JASC) Code 8100, Exhaust Turbine System (Recip).

(f) Unsafe Condition

This AD was prompted by multiple failures of spot-welded, multi-segment v-band couplings installed at the tailpipe to turbocharger exhaust housing flange. The FAA is issuing this AD to prevent failure of the spot-welded, multi-segment exhaust tailpipe v-band coupling. The unsafe condition, if not addressed, could lead to detachment of the exhaust tailpipe from the turbocharger and allow high-temperature exhaust gases to enter the engine compartment. This could result in smoke in the cockpit, in-flight fire, and loss of control of the aircraft.

(g) Compliance

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

(h) Review of the Maintenance Records

Within 50 hours TIS after the effective date of this AD, review the aircraft maintenance records to determine the number of hours TIS accumulated on each v-band coupling.

(i) V-Band Coupling Life Limit

(1) Within the compliance times specified in paragraph (i)(1)(i) or (ii) or (i)(2) of this AD, remove the v-band coupling from service and install a new v-band coupling. Apply correct torque as necessary to the v-band coupling nut.

(i) If the v-band coupling has accumulated less than 500 hours TIS: Initially remove the v-band coupling from service before it accumulates 500 hours TIS or within 50 hours TIS after the effective date of this AD, whichever occurs later. Thereafter, remove the v-band coupling from service before it accumulates 500 hours TIS.

(ii) If the v-band coupling has accumulated 500 or more hours TIS or if the hours TIS of the v-band coupling cannot be determined: Initially remove the v-band coupling from service within 50 hours TIS after the effective date of this AD. Thereafter, remove the v-band coupling from service before it accumulates 500 hours TIS.

(2) As an alternative to initially removing the v-band coupling from service as required by paragraph (i)(1) of this AD, you may perform the inspections required by paragraphs (k)(1) through (7) or (l) of this AD. Do the initial inspections at the time the v-band coupling would have been removed from service and thereafter at intervals not to exceed 6 months or 100 hours TIS, whichever occurs first, for a period not to exceed 2 years after the effective date of this AD. If the v-band coupling fails to meet any inspection criteria in paragraphs (k)(1) through (7) or (l) of this AD, it must be removed from service before further flight. Removing the v-band coupling from service and installing a new v-band coupling does not terminate the requirement to do these repetitive inspections.

Note 1 to paragraph (i): Instructions for installing a v-band coupling can be found in Appendix B: Best Practices Guide, paragraph 3.1, of the “Exhaust System Turbocharger to Tailpipe V-band Coupling/Clamp Working Group Final Report,” dated January 2018.

(j) V-Band Coupling Inspections

At the next annual inspection after the effective date of this AD or within the next 12 months after the effective date of this AD, whichever occurs first, and repetitively thereafter at intervals not to exceed 12 months, visually inspect the v-band coupling as required by paragraphs (k)(1) through (7) of this AD. Removing the v-band coupling from service and installing a new v-band coupling does not terminate the requirement to do these repetitive inspections.

(k) Inspections Without Removal of the V-Band Coupling

- (1) Inspect the v-band coupling and area around the v-band coupling for exhaust stains, sooting, and discoloration. If any of those conditions are found, remove the coupling and, instead of the inspections in paragraphs (k)(2) through (7) of this AD, do the inspections in paragraph (l) of this AD.
- (2) Inspect the v-band coupling outer band for cracks, paying particular attention to the spot weld areas. If there is a crack, before further flight, remove the v-band coupling from service and install a new v-band coupling.
- (3) Inspect the v-band coupling for looseness and for separation of the outer band from the v-retainer segments at all spot welds. If there is any looseness or separation of the outer band from any retainer segment, before further flight, remove the v-band coupling from service and install a new v-band coupling.
- (4) Inspect the v-band coupling outer band for cupping, bowing, and crowning as depicted in figure 1 to paragraph (l)(1)(iii) of this AD. If there is any cupping, bowing, or crowning, before further flight, remove the coupling and, instead of the inspections in paragraphs (k)(5) through (7) of this AD, do the inspections in paragraph (l) of this AD.
- (5) Inspect the area of the v-band coupling, including the outer band, opposite the t-bolt for damage and distortion. If there is any damage or distortion, before further flight, remove the v-band coupling from service and install a new v-band coupling.
- (6) Using a mirror, inspect the v-band coupling to determine whether there is a space between the two v-retainer coupling segments next to the t-bolt. If there is no space between the two v-retainer coupling segments next to the t-bolt, before further flight, remove the v-band coupling from service and install a new v-band coupling.
- (7) Determine whether the v-band coupling nut is properly torqued and apply correct torque as necessary.

(l) Inspections With the Spot-Welded, Multi-Segment Exhaust Tailpipe V-Band Coupling Removed

- (1) Remove the v-band coupling and do the inspections in paragraphs (l)(1) and (2) of this AD if required by paragraph (k)(1) or (4) of this AD or as an alternative to the inspections required by paragraph (k) of this AD. Removing the v-band coupling from service and installing a new v-band

coupling does not terminate the requirement to repeat the inspections in paragraph (k) or (l) of this AD.

(i) Using crocus cloth or fine abrasive cloth and mineral spirits or Stoddard solvent, clean the outer band of the v-band coupling. Pay particular attention to the spot weld areas on the v-band coupling. If there is corrosion that cannot be removed by cleaning or if there is pitting, before further flight, remove the v-band coupling from service and install a new v-band coupling.

(ii) Using a 10X magnifying glass, visually inspect the outer band for cracks, paying particular attention to the spot weld areas. If there is a crack, before further flight, remove the v-band coupling from service and install a new v-band coupling.

(iii) Visually inspect the flatness of the outer band using a straight edge. Lay the straight edge across the width of the outer band as depicted in figure 1 to paragraph (l)(1)(iii) of this AD. If the gap between the outer band and the straight edge exceeds 0.062 inch, before further flight, remove the v-band coupling from service and install a new v-band coupling.

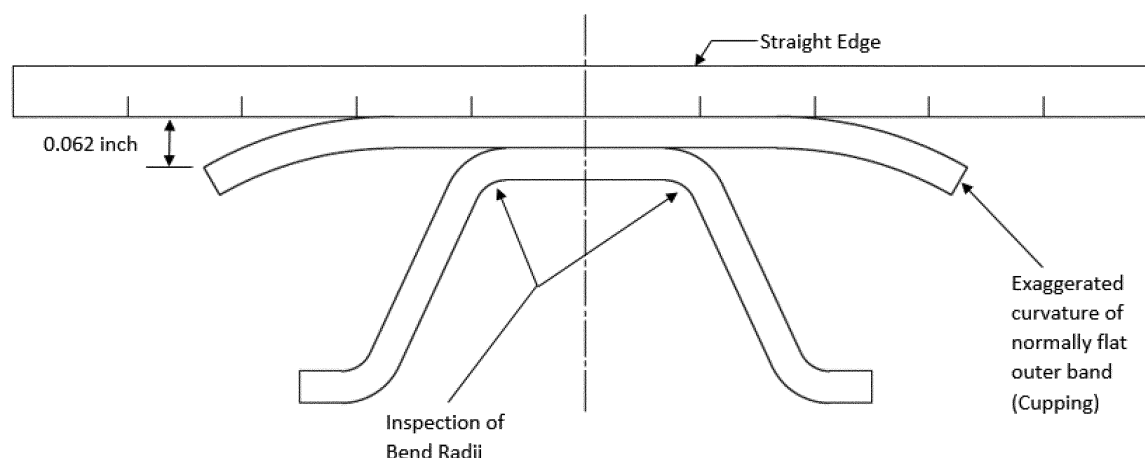


Figure 1 to paragraph (l)(1)(iii) – Inspection Depiction

(iv) With the t-bolt in the 12 o'clock position, visually inspect the attachment of the outer band to the v-retainer coupling segments for gaps between the outer band and the v-retainer coupling segments from the 1 o'clock through 11 o'clock positions. If there are any gaps between the outer band and the v-retainer coupling segments, before further flight, remove the v-band coupling from service and install a new v-band coupling.

Note 2 to paragraph (l)(1)(iv): You may use backlighting to see gaps.

(v) Visually inspect the bend radii of the v-retainer coupling segments, throughout the length of the segment, as depicted in figure 1 to paragraph (l)(1)(iii) of this AD, for cracks. If there are any cracks, before further flight, remove the v-band coupling from service and install a new v-band coupling.

(vi) Visually inspect the outer band opposite the t-bolt for damage (distortion, creases, bulging, or cracks) caused by excessive spreading of the coupling during installation or removal. If there is any damage, before further flight, remove the v-band coupling from service and install a new v-band coupling.

(2) If the v-band coupling passes all of the inspections in paragraphs (l)(1)(i) through (vi) of this AD, it may be re-installed.

(i) Apply correct torque as necessary to the v-band coupling nut.

(ii) Inspect the v-band coupling to determine whether there is space between the two v-retainer coupling segments next to the t-bolt. If there is no space between the two v-retainer coupling segments next to the t-bolt, before further flight, remove the v-band coupling from service and install a new v-band coupling.

(m) Installation Prohibitions

(1) From the effective date of this AD until two years after the effective date of this AD, do not install a v-band coupling that has accumulated more than zero hours TIS on any turbocharged airplane, helicopter, or engine, unless it has passed all inspections required by paragraph (k) or (l) of this AD.

(2) As of two years after the effective date of this AD, do not install a v-band coupling that has accumulated more than zero and less than 500 hours TIS on any turbocharged airplane, helicopter, or engine, unless it has passed all inspections required by paragraph (k) or (l) of this AD.

(3) As of two years after the effective date of this AD, do not install a v-band coupling that has accumulated 500 or more hours TIS on any turbocharged airplane, helicopter, or engine.

(n) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Operational Safety 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 Operational Safety Branch, send it to the attention of Tom Teplik, add this AD number AD 2023-09-09 to the subject line, and email to: AMOC@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.

(o) Related Information

(1) For more information about this AD, contact Thomas Teplik, Aviation Safety Engineer, Central Certification Branch, FAA, 1801 S Airport Road, Wichita, KS 67209; phone: (316) 946-4196; email: thomas.teplik@faa.gov or Wichita-COS@faa.gov.

(2) The “Exhaust System Turbocharger to Tailpipe V-band Coupling/Clamp Working Group Final Report,” dated January 2018, may be found in the AD docket at [regulations.gov](https://www.regulations.gov) by searching for and locating Docket No. FAA-2022-0891.

(p) Material Incorporated by Reference

None.

Issued on May 9, 2023.

Gaetano A. Sciortino,

Acting Director, Compliance & Airworthiness Division, Aircraft Certification Service.

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