



**FAA
Aviation Safety**

SPECIAL AIRWORTHINESS INFORMATION BULLETIN

SUBJ: Exhaust Turbocharger; V-band Couplings Used in Exhaust Systems on Turbocharged Reciprocating Engine Powered Aircraft **SAIB:** CE-18-07
Date: December 14, 2017

This is information only. Recommendations aren't mandatory.

Introduction

This Special Airworthiness Information Bulletin alerts owners, operators, maintenance technicians, and inspectors of an airworthiness concern, specifically failure of v-band couplings used in exhaust systems on turbocharged aircraft. Cracks originating out of a spot weld, on multi-segment, spot welded, v-band couplings have led to separation of the outer band and failure of the v-band coupling to retain the tailpipe or exhaust inlet pipe on **all turbocharged, reciprocating engine powered aircraft, including rotorcraft.**

The FAA issued airworthiness directives (AD) in the past concerning v-band couplings for numerous aircraft models. The existing ADs remain in effect where applicable. At this time, this airworthiness concern is not considered an unsafe condition that would warrant AD action under part 39 of Title 14 of the Code of Federal Regulations (14 CFR part 39), except for those models already affected by an existing AD. The information and recommendations provided herein are intended to again raise awareness of an issue that has a long history and can lead to serious incidents and fatal accidents if proper maintenance and inspections are not accomplished.

Background

The basic design used by manufacturers to attach the tailpipe or exhaust inlet pipe to the turbocharger housing by means of a v-band coupling is common to over 150 different models of single-engine and multi-engine airplanes and rotorcraft. All turbocharger exhaust tailpipe v-band couplings are intended to couple and retain the exhaust tailpipe to the turbocharger housing, exhaust flange. Typical multi-segment, spot welded v-band couplings are shown below.

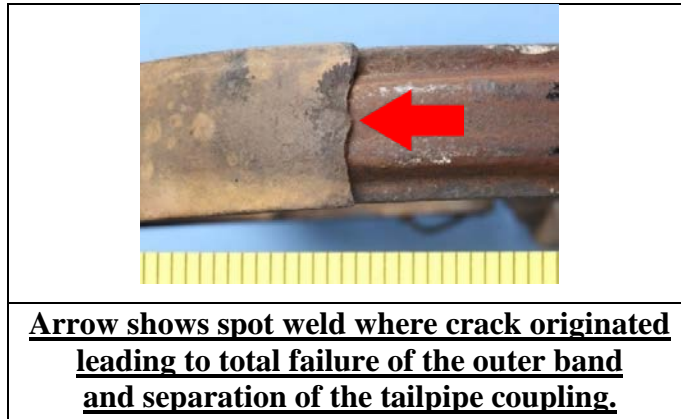


2 segment, coupling, new

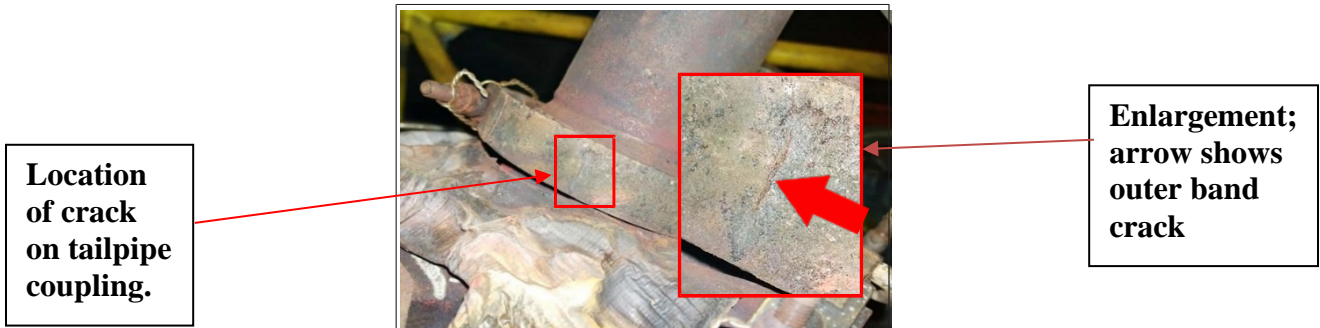


3 segment, coupling removed from service

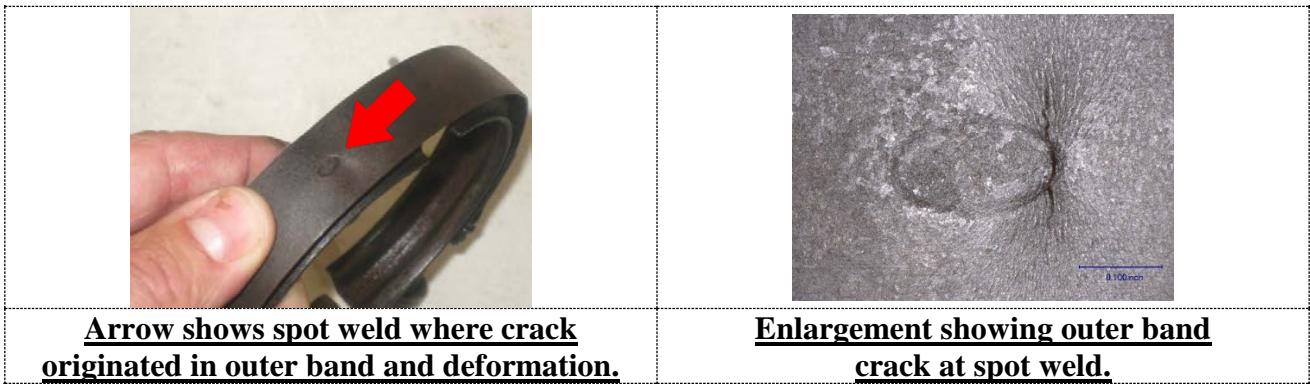
The FAA is aware of three recent accidents/incidents, involving cracked and/or separated multi-segment, spot welded, v-band couplings, which resulted in four fatalities. The failed and cracked v-band couplings pictured below are from the accident/incidents noted above.



Reference: turbocharger to tailpipe interface



Reference: turbocharger to tailpipe interface



Reference: turbocharger exhaust inlet

Since the mid-1970's, the National Transportation Safety Board (NTSB) wrote numerous recommendations, and the FAA undertook numerous mandatory and recommended actions concerning v-band couplings/clamps on many different models of aircraft and engines. In addition to and in support of the government efforts, industry design approval holders (e.g., type certificate (TC), supplemental type certificate (STC), or holders of FAA parts manufacturer approval (PMA)) have published numerous instructions for continued airworthiness (ICA) procedures and recommendations for periodic (e.g., 25-, 50- and 100-hour) inspections to ensure proper installation of the exhaust system and the continued integrity of its components for their respective aircraft/engine models. The

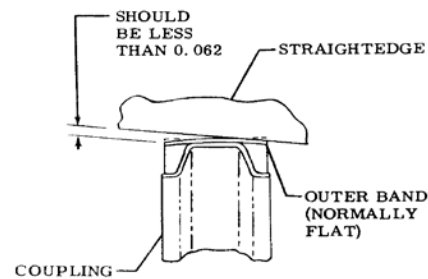
three recent events, including four fatalities show that even with the actions taken and the available historic information, v-band coupling failures continue to occur. Often these failures occur shortly after an annual inspection, which brings to question the adequacy of the attention given to v-band couplings during the typical inspection. Failure of a turbocharger exhaust v-band coupling leads to liberation of high temperature exhaust gases (1600°F +), which then impinge on systems, structures, flammable fluid carrying lines, and other materials. There are numerous well-documented cases in which a fractured v-band coupling and leaking exhaust gases have led to inflight fires, smoke in the cockpit, and loss of control of the aircraft.

The main issues identified with failed v-band couplings include:

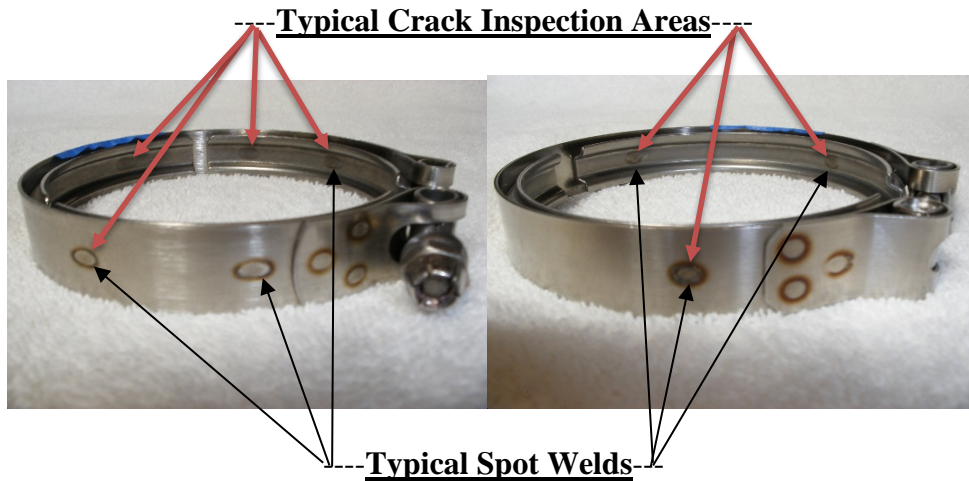
- cracks in the outer flat band at or near a spot weld;
- signs of over opening of the coupling or excessive twisting;
- misuse of the coupling(s) to bring exhaust system components together and into alignment;
- over-torquing, outer band material stretching and deformity; and
- exhaust gas leakage, overheating, heavy accumulation of oxides, and corrosion.

Recommendations

1. The FAA recommends at the next scheduled inspection and at each annual or 100-hour inspection thereafter that you perform a detailed visual inspection of the turbocharger exhaust v-band coupling(s) for signs of:
 - a. Cracks in the coupling outer band (flat) material, primarily at or near a spot-weld.
 - b. Cupping or bowing of the coupling outer band beyond 0.062 inches in depth as shown below.



- c. Cracks in the coupling v-retainer segment interior or exterior surface, e.g. at bend radii.
- d. Looseness, separation of the outer band to v-retainer segment(s) at any spot-weld.
- e. Gaps between the v-retainer segments and the outer band at or between spot-welds.
- f. Corrosion that is not easily removed from any component of the coupling.
- g. Deformity, including but not limited to, out of round, twisted, re-formed by any method.
- h. Physical damage, including but not limited to, cracks, gouges, tears, bulges, fractures.
- i. Repairs or any indications of past repairs, as no repair process is known to be effective.



If any of the above conditions are found, the v-band coupling is considered unairworthy and should be removed and replaced before further flight with a new, zero time in service (TIS), FAA-approved coupling according to the instructions and procedures found in the airframe or engine ICA's, as applicable. All v-band couplings removed from service should be permanently destroyed and not used on any other aircraft or aircraft application.

NOTE: Based on your inspection findings, removal of the coupling may be necessary for you to thoroughly assess the couplings condition further (i.e. Items c & e above). Be careful to not twist or open the coupling more than necessary because over opening or excessive flexing can lead to physical damage and subsequent failure.

2. The FAA does not recommend the use of a powered tool to install the v-band coupling. Powered tools used in the installation process may be misused to gain alignment of exhaust system components. Additionally, use of a powered tool may result in self-locking nuts overheating, which may preclude proper final torque of the coupling.

3. The FAA recommends the establishment of a life-limit for exhaust system v-band couplings of 500 hours TIS, unless the design approval holder recommends or FAA regulations (e.g., AD) require a different replacement interval. Record the v-band coupling part number, date, and airplane hours TIS in the airplane log book for future assistance in maintenance activities.

4. As part of any pre-flight inspection of the airplane with a cold engine, the FAA recommends you include a check of the turbocharger exhaust tail pipe for security in its mounting. A loose or easily displaced tail pipe should be brought to the attention of maintenance personnel before further operations.

5. The FAA recommends adherence to the applicable design approval holder's (TC, STC, or PMA) current ICA documentation including the illustrated parts catalog, service or maintenance manual, and other service publications as applicable for all inspection intervals, and replacement procedures for exhaust system v-band couplings, unless FAA regulations require a different inspection interval.

6. The FAA recommends the use of .032 stainless steel safety wire across the bolt end of the coupling using acceptable methods. Though this does not address outer band failures, it can be beneficial if the bolt fails, the nut becomes loose, falls off, or is missing.

Ultimately, owners and operators should be aware that failure of the turbocharger v-band coupling(s) can lead to detachment of the exhaust pipe from the turbocharger exhaust inlet/outlet and allow high-temperature exhaust gases to enter the engine compartment, which could result in an inflight fire, loss of control of the aircraft, serious injury, and/or fatalities.

For Further Information, Contact

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For Related Service Information Contact

The applicable aircraft or engine type certificate (TC) holder, the supplemental type certificate (STC) holder or the holder of FAA parts manufacturer approval (PMA) as applicable to your particular aircraft configuration directly.