Australian Government
Civil Aviation Safety Authority

AIRWORTHINESS BULLETIN

Piston Engine Rocker Shaft Boss Failures

AWB 85-016 **Issue** : 1
Date : 2 August 2013

1. Applicability

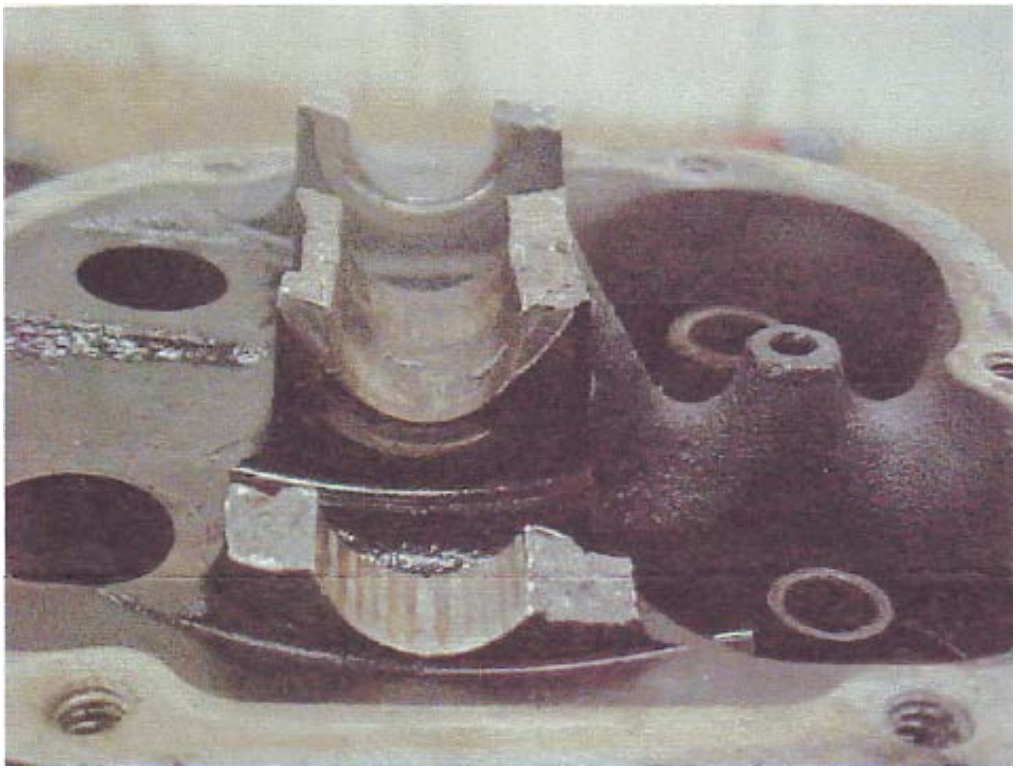
All reciprocating engines.

2. Purpose

Alert operators and maintainers to the hazard of loss of power and in-flight engine failures resulting from rocker shaft boss failures.

3. Background

Service Difficulty Reports continue to be received describing in flight failures of cylinder rocker shaft bosses. The outer boss or lug typically breaks off at the base first, overstressing the centre boss leading to the rocker shaft breaking through the top of the centre lug or boss as the engine continued to operate. This type of failure results in a rough running engine which will not develop full RPM and power and, in some cases, may result in total engine failure.



Many failures may be attributed to not following the engine manufacturer's overhaul and maintenance instructions and / or not following good overhauling component handling practices. The bosses are cast into the head and are susceptible to any shock loading.

Overhaul

Some lug or boss failures have been attributed to improper NDT processes during overhaul which has failed to detect fatigue cracks developed during the previous time in service. In some cases cylinders have simply fallen over during handing for cleaning, etc., and the outside bosses have received a severe impact which has initiated undetected cracking, particularly post NDT / inspection.

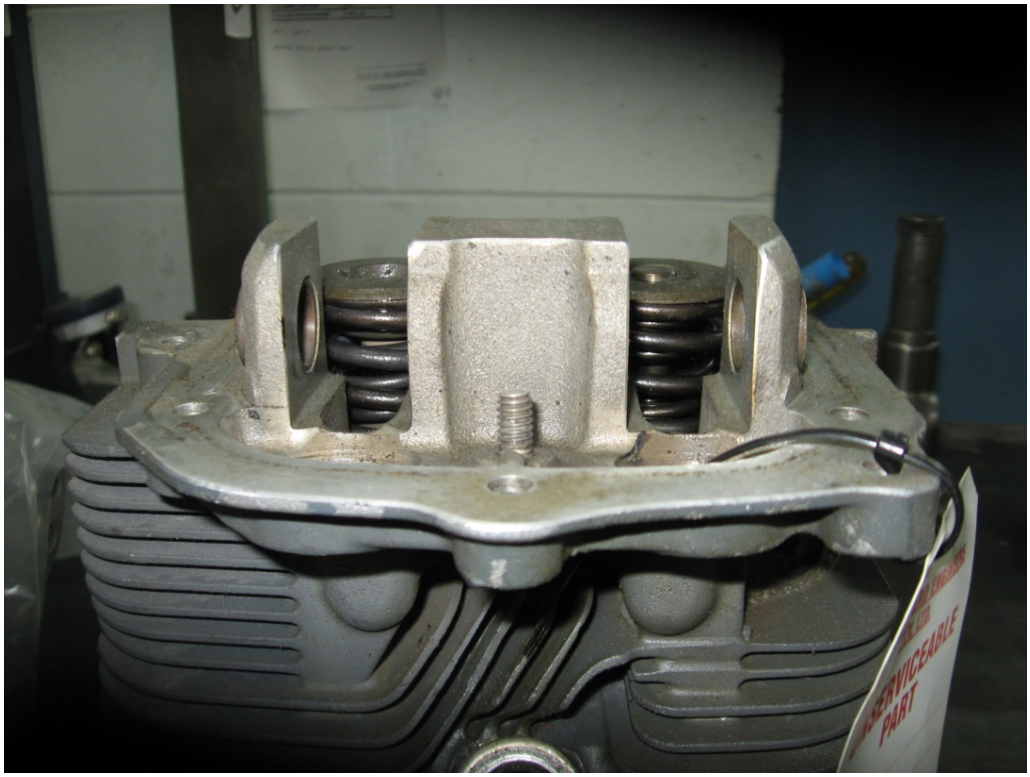
Improper repair by oversize reaming rocker boss bores has caused boss lugs to become too thin and unable to withstand operational normal stresses.

Operation

Sticking valves result in the valve train delivering shock loading to the rocker shaft bosses via push rods and valve rockers. Corrective maintenance following operation with sticking valves should include an inspection of the cylinder rocker shaft lugs for cracking.

Maintenance

When removing or installing a valve rocker shaft without removing the cylinder from the engine, ensure that any valve spring pressure transmitted to the rocker shaft and boss through the rocker arm is relieved.



Driving a rocker shaft out of the shaft bosses (with a soft drift pin and hammer) without first relieving all valve spring pressure may result in overload shocks being delivered to the cast rocker bosses, possibly causing cracks which could remain undetected during initial routine maintenance. In addition, if the metal drift should contact the internal diameter of the boss during rocker shaft removal, it can nick or gouge it, causing a stress riser and introduce a potential failure point.

When inserting a rocker shaft into the bosses and the rockers, first remove varnish build-up on the pin or in the boss internal diameter. Test-fit the rocker shaft into the bosses and rocker by hand before final assembly with the rockers and thrust washers and push rods. Lubricate generously to assure smooth final assembly, which should be carried out without any valve spring pressure.

Never tap a shaft into a boss to start it, as having to do so is an indication that it is not properly lined up with the boss bore, or may have excess varnish, etc.

Investigate

Should any rocker bosses fail on one cylinder, it is suggested that the valve rocker covers be removed from the other cylinders on the same engine and that the rocker bosses on the other cylinders be inspected for cracks using a 10X glass, focussing attention around the base of the bosses or lugs. The FAA AD 94-05-05 R1 provides for a dye penetrant inspection procedure for certain Teledyne Continental Motor cylinder rocker bosses which could be carried at any time between overhauls.

A small crack in any one of the cast rocker shaft bosses indicates that the boss or lug is failing and is cause for cylinder removal.

4. References

1. FAA General Aviation Alerts, FAA AC43-16 dated 16 February 1990

2. NZ CAA Continuing Airworthiness Notice – 85-006 Teledyne Continental Motors (TCM) Cylinder Assembly Rocker Shaft Bosses. 26 March 2010

3. TCM SB 73-13 Inadequate centre lug dimensions

4. FAA AD 94-05-05 R1 TELEDYNE CONTINENTAL ENGINES AND ROLLS-ROYCE, PLC Model C75, C85, C90, C125, C145, O-200, O-300, and GO-300 Series and Rolls-Royce, plc. (R-R) C90, O-200 and O-300 Series Engines

5. Recommendation

CASA recommends that that anyone performing maintenance on the upper valve train of engines use the proper tools and procedures necessary to preclude overloading and shock loading any part of the valve train, including the rocker shaft lugs.

6. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

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