Technical Note

Title: USE OF GASKET LIKE MATERIALS IN SPLIT LINES AT CRANKCASE BEARING BOSSES AND UNDER CYLINDER FLANGES	T.N. No.: **09-1**
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	Issued: **01/19/2009**
Technical portions are approved by Airmotive Engineering Corp.	Revision: **0**

OEM SERVICE DATA COMPLIANCE RATIONALE

APPLICATION: The information in this TN is provided as a service to ECi customers to explain some of the reasons behind assembly details provided in the OEM Overhaul Manuals and Service Data (Instructions for Continued Airworthiness).

NOTE: Some engine builders have applied gasket-like sealants and silk thread around the thru-bolt holes in bearing bosses at the split line. Occasionally individuals have applied gasket-like materials under cylinder base flanges or paint under the thru-bolt and stud nuts. ***These practices do contribute to engine failure.***

EXPLANATION: Lycoming and Teledyne Continental instructions for continuing airworthiness establish locations where gasket-like materials (sealants, silk thread, etc.) may be applied to crankcases during engine build-up. The bearing bosses around the thru-bolt holes are specifically excluded. However, some engine builders, in an attempt to eliminate oil leaks at the thru-bolts use gasket materials and silk thread around the holes. Some have used this practice over a time period without apparent problems, but engines do fail because of this practice.

Some maintenance personnel that replace cylinders use gasket-like materials that end up between the flange of the cylinder barrel and the crankcase, or leave paint under the flange nuts.

The reason that this practice is unacceptable is because it can very easily destroy the clamp-up system of the thru-bolts, cylinder flange and crankcase, regardless of the torque value imposed. For any gasket material to function as a barrier to fluid leakage, it must provide some separation of the metallic surfaces it is installed between. John Bickford[1] states that "the stiffness of a gasketed joint tends to be dominated by the stiffness of the gasket". Even if the thickness of the gasket material is almost microscopic, it can change the overall stiffness of the system. This loss of stiffness has a significantly detrimental effect on bolted joints like the thru-bolts. Failure can occur in very few operating hours. Accidents and loss of life have resulted.

The loss of a cylinder assembly because of fatigue failure of the thru-bolts has often been miss-interpreted as a failure of the mechanic to properly torque the cylinder hold down hardware. This can happen, but more often than not, there was either gasket-like material introduced in the clamp-up structure, or some other contaminate prevented the structure from reaching proper clamp-up until during engine operation.

[1] Marcel Dekker, Inc. An Introduction to the Design and Behavior of Bolted Joints, by John H. Bickford

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To further cloud the issue, as the thru-bolts are experiencing fatigue failure, the relaxation of tension causes a prying action on the shorter deck studs. Because they are shorter and stiffer, the prying action accomplishes one of two things: 1) The stud yields the crankcase deck threads and loses tension and rapidly fatigues; or 2) the nut loosens and backs off. Often the nut is found in the cowling. The final sequence is loss of the cylinder assembly. Because it separates at the crankcase deck, the piston rings start impacting the end of the barrel skirt, and eventually the whole rod, piston, piston pin and ring assembly catastrophically fails.

Aircraft piston engines are reliable and perform great service. However, this is one root cause of engine failures that is easy to eliminate. Do not, under any circumstances apply gasket like materials except where specifically authorized on aircraft piston engine crankcases!