AIRWORTHINESS BULLETIN

TPE331 Fuel Manifolds PN 3102469-2 and PN 3102469-1

AWB 73-006 **Issue** : 1
Date : 24 August 2011

1. Effectivity

All TPE331 engines equipped with fuel manifolds PN 3102469-2 and PN 3102469-1.

2. Purpose

To inform operators and maintainers about specific issues related to fuel manifolds PN 3102469-2 and PN 3102469-1 and to recommend specific maintenance, inspection and maintenance program actions.

3. Background

CASA has received, from an Australian operator, a Service Difficulty Report (SDR) in relation to a crack originated fuel leak of the TPE331 fuel manifold PN 3102469-2. A search of the CASA SDR database has identified 3 related SDRs, with one of these events, in 2002, related to an engine fire. A further search of FAA and Transport Canada SDR databases provided the following results: 14 cases of fuel leaks and 3 cases of an engine fire due to fuel leaks from 1990, with all cases directly related to PN 3102469-1 or PN 3102469-2 manifolds.

Further review of the engine OEM documentation, including the MM and Inspection / Repair Manual, indicated that these PN manifolds do not have a defined life limit. They are however subject to removal every 250 or 450 operating hours (depending on the engine model) for fuel nozzle inspection. This frequent removal / installation of the manifolds may further contribute to the reduction of the fatigue life expectancy of the manifolds and especially the fatigue life of the flare and B-nuts due to maintenance induced damage that can create crack initiation points. Furthermore, the flexible portion of the manifold is concealed underneath a silicone (fire) sleeve cover thus making a visual inspection impossible.

The engine OEM has indicated to CASA that they believe as long as these fuel manifolds are manufactured by their authorised agents, installed and removed in accordance with the MM procedures and inspected and, if necessary, repaired or rejected as per their Inspection/Repair Manual they should not develop any fatigue life related issues. The repairs are limited to silicone (fire) sleeve covers only and no repair or replacement of fittings or hoses should be attempted. The engine OEM recommendation is based on engineering analyses combined with operational feedback available to them.

CASA has conducted an investigation into maintenance practices and experience of some of the Australian TPE331 maintenance providers. These maintenance providers have indicated that they could recall at least 7 manifolds rejected for fuel leak during the bench testing in the last 10 years. They have also indicated that they either provided various Australian operators with, or replaced themselves, more than 55 manifolds since 2002.

Unfortunately, due to the fact that these manifolds are not life limited and there is no requirement to keep records of their utilisation, CASA was not able to obtain any statistical data related to the date of manufacture, flight hours or reason for removal for any of the removed manifolds except those reported through the SDR system. This in turn, made further analysis difficult and inconclusive.

It appears, from the aforementioned, that the number of replaced fuel manifolds PN 3102469-2 and PN 3102469-1 is much higher than the number of related SDRs. It should also be noted that the majority of scheduled removals and installations of these manifolds are performed by the operators and that TPE331 maintenance providers usually only receive the fuel nozzles for inspection. The majority of interviewed TPE331 maintenance providers indicated that they do not receive more than 10% of fuel nozzles with the manifolds attached. This also means that not more than 10% of all fuel manifolds PN 3102469-2 and PN 3102469-1, in the Australian fleet, are bench tested on regular basis.

4. Recommendations

It appears that the existing maintenance practices for the TPE331 fuel manifolds PN 3102469-2 and PN 3102469-1 are not comprehensive enough to provide early detection of fatigue cracks and other damage of flares, B-nuts and the flexible hoses that could lead to an unexpected fuel leak. A fuel leak in the engine compartment and especially in the hot section of the engine represents a potential and serious fire hazard.

It is recommended that operators apply the following maintenance practices to their TPE331 fuel manifolds PN 3102469-2 and PN 3102469-1:

1) Every time the manifolds are removed, regardless of the reason, they should be inspected in accordance with the manufacturer's published procedures. Special attention should be given to the condition of the B-nut threads , fittings and flexible hoses, (no damage is allowed). Cracks are never acceptable for any part of the manifold.

   CASA AWB 02-6 (Flexible Hose Assemblies - Maintenance Practices) can be used for additional information and guidance regarding the general inspection and testing techniques and standards.

2) Every time the manifolds are installed they should be leak tested with the engine operated at take off power. The leak inspection should also include a Detailed Visual Inspection (DVI) of the manifolds, immediately after engine shutdown and as soon as access to the hot section of the engine is possible.

3) When the manifolds are removed for a scheduled fuel nozzle inspection (every 250 or 450 operating hours depending on the engine model) it is

highly recommended that they are sent to the maintenance provider together with the nozzles, as a set, for inspection and testing. Regular bench testing of the manifolds and their inspection in an authorized repair shop environment will significantly increase the probability of timely crack / leak detection.

4) Operators should examine the number of removals of these fuel manifolds in their fleet and investigate if any retirement and individually imposed life limit maintenance policy should be applied in order to improve the safety and reliability records of their operations.

5) Operators and maintainers should pay special attention to the removal and installation practices, the use of proper tools and torque values as indicated in the applicable manufacturer's published procedures. Improper removal and installation practices are potentially the most probable contributing factor to the crack initiation type of damage.

6) Operators and maintainers are reminded that the only engine OEM authorized repair for these manifolds is the silicone (fire) sleeve cover repair. In any other case the manifold must be rejected and discarded. Only manifolds manufactured by one of the engine OEM authorised manufacturers are acceptable.

5. Reporting

In order to collect more data for further statistical analysis, Australian operators are encouraged to report all rejected TPE331 fuel manifolds PN 3102469-2 and PN 3102469-1 through the normal Service Difficulty Reporting (SDR) system. The SDR reports should include information about the utilisation of the rejected manifolds, such as the date of manufacture and installation, flight hours in operation, reason for removal, etc.

6. Enquiries

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

AirworthinessBulletin@casa.gov.au

or in writing, to:

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