Australian Government
Civil Aviation Safety Authority

AIRWORTHINESS BULLETIN

Helicopter Rotor Blade Stainless Steel Tension/Torsion (TT) Strap Failures

AWB 63-009 **Issue** : 1
Date : 2 December 2013

1. Effectivity

All helicopters with stainless steel tension/torsion (TT) straps where the primary load bearing elements are encapsulated in anaerobic urethane.

2. Purpose

Alert operators, pilots and maintenance personnel regarding the catastrophic failure of TT straps resulting from moisture / contaminants penetrating the protective urethane casing resulting in unanticipated rates of corrosion in the stainless steel wires and the loss of a main rotor blade.

3. Background

CASA has received defect reports describing cracks in the urethane casing of two brand new Airwolf Aerospace P/N AA-206-011-154-107 Rev B, S/N AA10856 (PMA) TT straps (see Fig. 1a and 1b) and an additional report of an unidentified brown paste in a time-expired Airwolf Aerospace TT strap which did not appear to be cracked.

Fig. 1a and 1b Showing penetration of a .015” Feeler gauge in the urethane casing of an Airwolf TT strap.

In relation to cracks in the protective casings of TT straps using the stainless steel wire encased in urethane design, note that BHT recently published Bell Alert Service Bulletin (ASB) 206-13-130 ‘Reduction of Airworthiness Limitation’; which applied a lower Airworthiness Limitation to a specific range of P/N and S/N TT straps, which were likely to develop cracks in the urethane protective coating and stating that this condition may lead to internal corrosion of the straps.

One of the data used by CASA to investigate similar problems with corroding stainless steel is found in *ASM Handbook Committee 1975, Failure Analysis and Prevention, Metals Handbook, 8th ed, Metals Park, Ohio*, which confirms that stainless steel must be in continual contact with the oxygen in the atmosphere in order to retain its corrosion resistant property.

Because stainless steel must be in continual contact with the oxygen in the atmosphere in order to develop and maintain the integrity of the chromic oxide film, lack of oxygen will cause breakdown in any area of the oxide film and allow localised corrosion cells to form in the presence of contamination which will enter the urethane case via cracks or leaks.

The unsafe condition posed by moisture and other contaminants penetrating the protective casing of a stainless steel wire-wound TT strap is further supported by details from the NTSB Investigation FTW99FA192 into a fatal crash of an MBB-BK 117–B2.

“Examination of the failed T-T strap revealed that the polyurethane protective coating had debonded from a portion of the strap allowing corrosive agents, including carbon, sulphur, and chlorine into the strap. The strap separated as a result of fatigue cracking of the wires making up the strap. The fatigue cracking emanated from corrosion pits and deposits that were introduced to the strap when the polyurethane protective coating debonded”.

On the 16th of January 2013, EASA issued AD No: 2013-0015 ‘Time Limits and Maintenance Checks – Airworthiness Limitations – Items Amendment’ for the BO-105 Series due to the similarity in design of the BO-105 main rotor head to the MBB-BK 117 main rotor head.

There are a large number of helicopter types and models which employ a TT strap design where the stainless steel wires in the TT strap are encapsulated in anaerobic urethane, (including Eurocopter, BHT and Airwolf TT straps) and which may not have instructions for continuing airworthiness to address the problem identified in this Airworthiness Bulletin (AWB).

4. Recommendations

CASA recommends that operators;

Inspect TT strap casings for cracks, or other evidence that the protective casing may be compromised, and

Withdraw from service any TT strap assembly which has cracks or other evidence that the protective coating has been breached.

5. Reporting

All defects in the tension/torsion straps of the type identified in this AWB should be reported to CASA via the SDR system.

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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