

Continuing Airworthiness Notice – 14-001



MS 21042 and NAS 1291 Series Nuts – Cracks due to Hydrogen Embrittlement

2 December 2011

Issued by the Civil Aviation Authority of New Zealand in the interests of aviation safety. A Continuing Airworthiness Notice (CAN) is intended to alert, educate, and make recommendations to the aviation community. A CAN contains non-regulatory information and guidance that does not meet the criteria for an Airworthiness Directive (AD). The inspections and practices described in this CAN must still be carried out in accordance with the applicable NZCAR Parts 21, 43 and 91.

The contents of this notice are ADVISORY ONLY and are NOT MANDATORY.

CAN numbering is by ATA Chapter followed by a sequential number for the next CAN in that ATA Chapter.

Applicability:

All operators and maintainers of aircraft fitted with standard aircraft hardware MS 21042 / NAS 1291 series nuts.

Purpose:

This Continuing Airworthiness Notice (CAN) is issued to alert operators and maintainers of reported failures of new MS 21042 and NAS 1291 series self-locking nuts.

Background:

This CAN is prompted by the CAA receiving numerous reports of finding cracked MS 21042 / NAS 1291 series self-locking nuts and CASA Airworthiness Bulletin (AWB) 14-002 which alerts owners, operators and maintenance personnel of in-situ failures of new MS 21042 and NAS 1291 series nuts. These nuts are widely used in aviation applications. This type of nut is used by TCM to hold the cylinders in place on various model TCM engines. The CAA received two reports of finding these nuts cracked on TCM engines. During a pre-flight inspection on a Robinson R22 the pilot noticed a crack in one of the twelve pitch horn retention nuts on the main rotor blade. CASA recently received a report of finding cracked MS21042 L4 nuts on a R44 helicopter main rotor blade cuff to hub attachment. The defective nuts were detected following an investigation of an oil leak in the cuff region.

Robinson Helicopter Company (RHC), including Bell and Agusta Westland have issued maintenance information on this subject after receiving similar reports of finding failed MS21042 and NAS 1291 series self-locking nuts. Operators and maintenance personnel are reminded of the importance of inspecting standard hardware fitted to the aircraft for defects. The consequences of an in-flight failure in this type of standard hardware item can be serious.

It is widely known that MS21042 and NAS 1291 series self-locking nuts supplied as standard aircraft hardware are used throughout the aviation industry in a wide variety of applications, and standard aircraft hardware manufacturing processes are outside the control of aircraft manufacturers.

These failures are typical of hydrogen embrittlement (hydrogen induced crack formation) due to the presence of hydrogen in the steel. This condition is attributed to improper heat treatment at manufacture or following re-plating, and failures occur under sustained tensile stress. The stress is induced from the moment the nut is torqued and may fail hours, days or weeks later. One or more cracks usually appear approximately in-line with the longitudinal axis of the nut. The nut may split wide open and stay in place, as if serviceable.

When the nut fails in this way, they no longer function as designed. All the tension on the stud or bolt is released which may have serious secondary effects. The bolt may fall out and/or as in the case with the R22/44 main rotor blade cuffs, the higher loads are then transferred to the remaining fasteners. This higher load in the remaining fasteners could result in an overload situation. If the nuts are then replaced a subsequent failure of the bolts or studs may occur some-time after replacement.

Recommendation:

The CAA strongly recommends the following:

- Operators and maintainers are recommended to inspect all standard aircraft hardware made from high-strength steel, including MS 21042 / NAS 1291 series self-locking nuts for hydrogen induced cracks after installation of the hardware, and thereafter at every daily/pre-flight inspection and every periodic inspection.
- Before the replacement of cracked/failed nuts, contact the manufacturer for advice about the replacement of associated fasteners which may have been subject to overload due to the failure of one or more nuts.
- Report all MS 21042 and NAS 1291 series nut failures to the CAA via the defect reporting system.

For further background information on the subject of this CAN:

- A copy of CASA Airworthiness Bulletin (AWB) 14-002 issue 1, dated 12 October 2011 can be obtained from http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90516
- Robinson Helicopter Company R22 SL No.58, R44 SL No.38 and R66 SL No. SL 01.
- Bell Helicopter Textron Operation Safety Notice (OSN) GEN 11-43.
- Agusta Westland Information Letter GEN-11-024.
- CASA AWB 85-11 Piston Engine Overhaul - Dangers of Replating Engine Hardware following in-situ failures of inadequately re-plated aircraft hardware.

Enquiries:

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