AUSTRALIAN SPORT ROTORCRAFT ASSOCIATION INC

ABN 53 412 417 012

AIRWORTHINESS DIRECTIVE

No. 2008.01

Date: 1 May 2008

Subject: Gyroplane Hub-bars

This Airworthiness Directive supersedes AD 05/2005.

AD 05/2005 is hereby cancelled.

Background

In October 2004, a member suffered fatal injuries when the hub-bar of his rotor system broke in-flight. ASRA issued an AD as a result.

Since May 2005, actual failures or cracks in various brands of hub-bars have been reported. In one case, post accident investigation revealed that the hub bar had significant cracks prior to the accident from which the instructor and student were very fortunate to escape with significant injuries. A post impact fire destroyed the gyro. In another case, the hub-bar failed after a ground strike that occurred in a rollover accident. In 2 other cases, significant cracks were detected before flight and probable tragedy.

The above occurrences are of great concern to ASRA, and whist investigation into the possible causes of these separate incidents continues unabated, it is necessary, in the interests of safety, to issue the following directive and recommendation.

Directive

With immediate effect and until further notice, the owners and operators of all gyroplanes that are registered with ASRA as **two seaters**, or that are registered with ASRA as **type approved single seaters** must:

1. Where the time in service of the rotor system exceeds 500 hours or 3000 landings, subject the hub-bar to non-destructive testing in accordance with the procedure below, or replace with a manufacturer or ASRA approved replacement.
2. When the time in service of these hub-bars reaches 600 or 3600 landings and 700 hours or 4200 landings, subject the hub-bar to non-destructive testing in accordance with the procedure below, or replace with a manufacturer or ASRA approved replacement.
3. When the time in service of these hub-bars reaches 800 hours or 4800 landings, replace the hub-bar with a manufacturer or ASRA approved replacement.
4. Make entries into the gyroplane logbook recording these tests and the results thereof in the form of documentation provided by the approved testing agency.

Where gyroplanes are registered with ASRA as **single seaters** that are engaged in **high-energy manoeuvres**, it is strongly recommended that the owners and operators comply with the following:

1. Where the time in service of the rotor system exceeds 500 hours or 3000 landings, subject the hub-bar to non-destructive testing in accordance with the procedure below, or replace with a manufacturer or ASRA approved replacement.
2. When the time in service of these hub-bars reaches 600 or 3600 landings and 700 or 4200 landings hours, subject the hub-bar to non-destructive testing in accordance with the procedure below, or replace with a manufacturer or ASRA approved replacement.

3. When the time in service of these hub-bars reaches 800 hours or 4800 landings, replace the hub-bar with a manufacturer or ASRA approved replacement.
4. Make entries into the gyroplane logbook recording these tests and the results thereof in the form of documentation provided by the approved testing agency.

NOTE 1: High-energy manoeuvres are defined as those where the angle of bank consistently exceeds 45 degrees, or where changes in pitch attitude cause a g-loading in excess of + 2 g or – 0 g.

NOTE 2: The procedure detailed below has been recommended and is produced for reference purposes. Other Approved or Licenced facilities may opt to use a different procedure which is acceptable provided the testing is carried out in a manner that will ensure the detection of cracks or weaknesses

NOTE 3: Whilst the procedure below refers specifically to the holes in the centre of the hub bars, the intent is that ALL holes in a hub bar be checked in a similar manner.

Non-destructive Inspection Procedure

ASRA with the assistance of Mr Tony Collier, Manager AEROSPACE NDI PTY LTD, 6 Hyne Rd South Guildford WA 6055, Ph 08 92773692 Fax 08 92773692 has developed Procedure No: ANDI/ASRA/ECI 1 ISSUE 1, Dated 20 August 2005. The procedure as detailed below must be applied by a CASA approved Non Destructive Inspection (NDI) facility.

Gyroplane operators not within reasonable proximity to a CASA approved NDI facility can take advantage of a discounted cost ASRA has negotiated with Aerospace NDI Pty Ltd for the procedure below. This cost is expected to be below $100 plus return freight at the time of issuing this AD.

Should gyroplane operators have any questions regarding this AD or Inspection Procedure they are encouraged to call the ASRA Operations Manager or Technical Manager.

PROCEDURE No: ANDI/ASRA/ECI 1 ISSUE 1, DATED 20 AUGUST 2005

BOLT HOLE AND SURFACE SCAN EDDY CURRENT INSPECTION OF THE ROTOR HUB ATTACHMENT BAR

INTRODUCTION

101. Recently, an aircraft suffered a catastrophic blade separation during a go-around manoeuvre, which resulted in the total loss of the aircraft and injuries to both crew. Investigations revealed that the Hub Bar failed from a bolt hole that attaches the hub bar to rotor head via a teeter block assembly.

102. The hub bar that failed was manufactured from 6061 T6 aluminium alloy. The failure initiation appeared to originate in a teeter block attachment bolt hole. Catastrophic failure occurred when the defect reached approximately 12mm in length. The defect would not have been visible during pre-flight inspections as propagation was under the teeter block. Figure 1 details the inspection area.

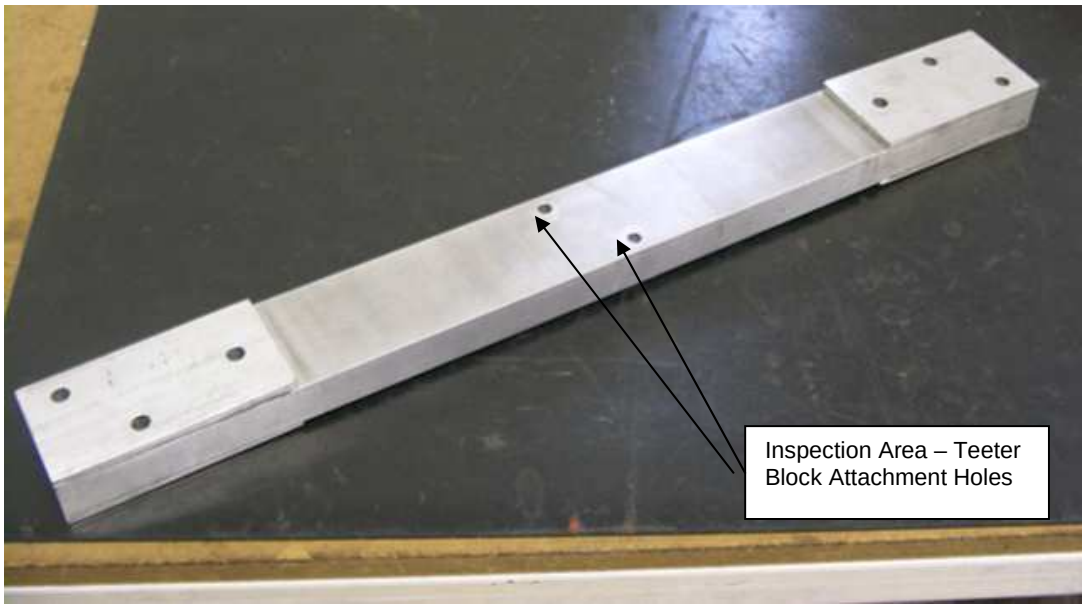

Figure 1: Location of Teeter Block Attachment Holes

OPERATOR LEVEL

103. The minimum operator level required for this procedure is NDI Level 2 Eddy Current Inspection (ECI) holding a current CASA Airworthiness Authority for ECI.

PURPOSE

104. This inspection procedure is intended to detect cracking emanating from the bore of the Teeter Block attachment bolt holes in Aluminium alloy hub-bars.

APPLICABILITY

105. This procedure is applicable to all Gyroplanes fitted with an aluminium hub bar.

PRE INSPECTION REQUIREMENTS

106. Ensure the hub-bar is prepared as follows:

a. Remove the rotor assembly from the aircraft;
b. Remove the rotor blades and teeter block from the hub-bar; and
c. Clean the hub-bar and check for obvious defects.

EQUIPMENT REQUIREMENTS

107. The equipment used to develop this procedure was:

a. Zetec Miz 21SR phase analysis eddy current instrument or equivalent;
b. ZS4 high speed rotary hand scanner with 5/16" reflection bolt hole probe and lead combination;
c. Calibration standard containing 5/16" hole with 1mm cross drilled hole;
d. 3mm Diameter, 500KHz shielded probe and lead combination;
e. Calibration Standard - Aluminium containing a 0.5mm deep EDM slot; and
f. Approved marking medium

NOTE

**ALTERNATE EQUIPMENT MAY BE USED
PROVIDED THE SENSITIVITY OF THE INSPECTION
IS MAINTAINED**

CALIBRATION PROCEDURE PART A – SURFACE SCAN

108. Calibrate the instrument utilising the manufacturer's handbook to represent an 80% of full screen height (FSH) response (null point represents 0% FSH) from the 0.5mm deep EDM slot. Figure 2 depicts a typical screen response.

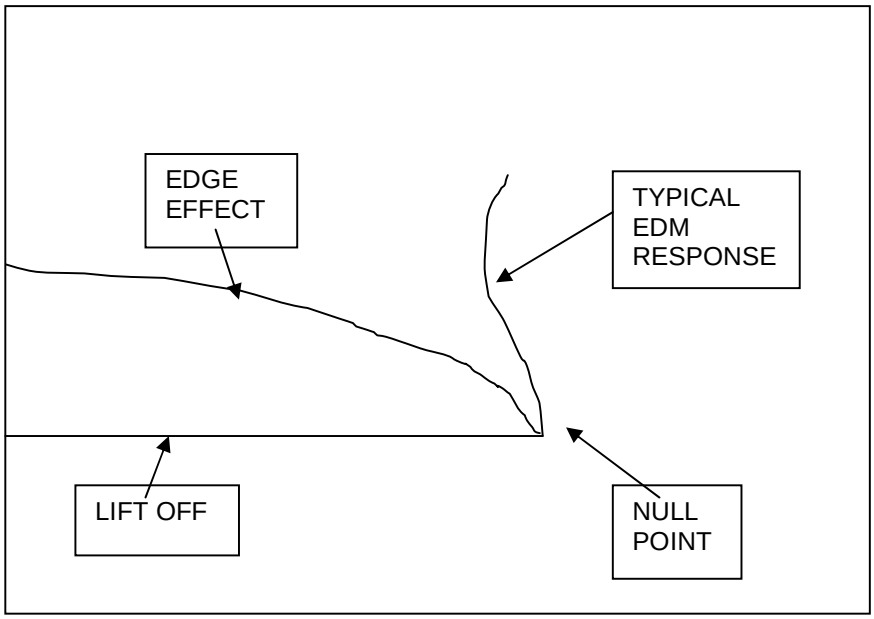

Figure 2: Eddy Current Instrument Screen Set-up

INSPECTION PROCEDURE – PART A

109. Perform the inspection as follows:

a. Place the probe on the inspection surface approximately 2mm from the edge of a teeter block attachment hole.

b. Balance the instrument and check the lift off response.

c. Adjust the phase angle (if required) to achieve a lift off response as shown in figure 2.

d. Scan around both bolt holes on the upper and lower surfaces of the hub-bar.

e. Scan the upper and lower surfaces in an area that will cover 10mm further outboard than the extremity of where the teeter block mounts. Inspection area shown in Figure 3.

f. Mark any repeatable defect indications that cannot be attributed to edge effect or lift-off.

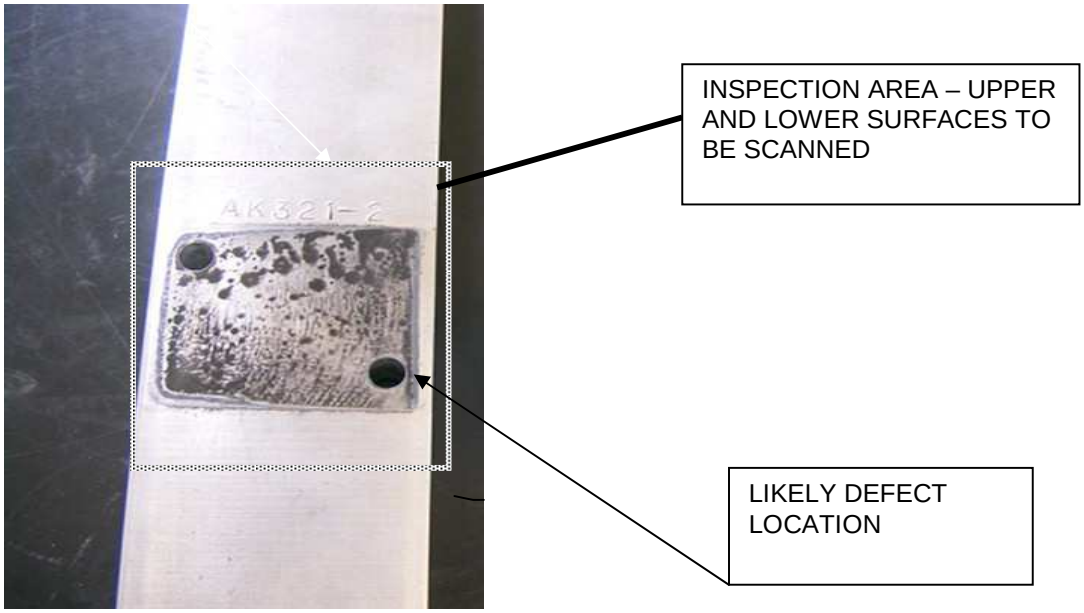

Figure 3: Hub Bar Showing Possible Defect Location and Scan Areas

CALIBRATION PROCEDURE PART B – ROTARY BOLT HOLE INSPECTION

110. Calibrate the instrument utilising the manufacturer's handbook to represent an 80% of full screen height (FSH) response from the 1mm cross-drilled hole in the reference standard. Figure 4 depicts a typical screen response.

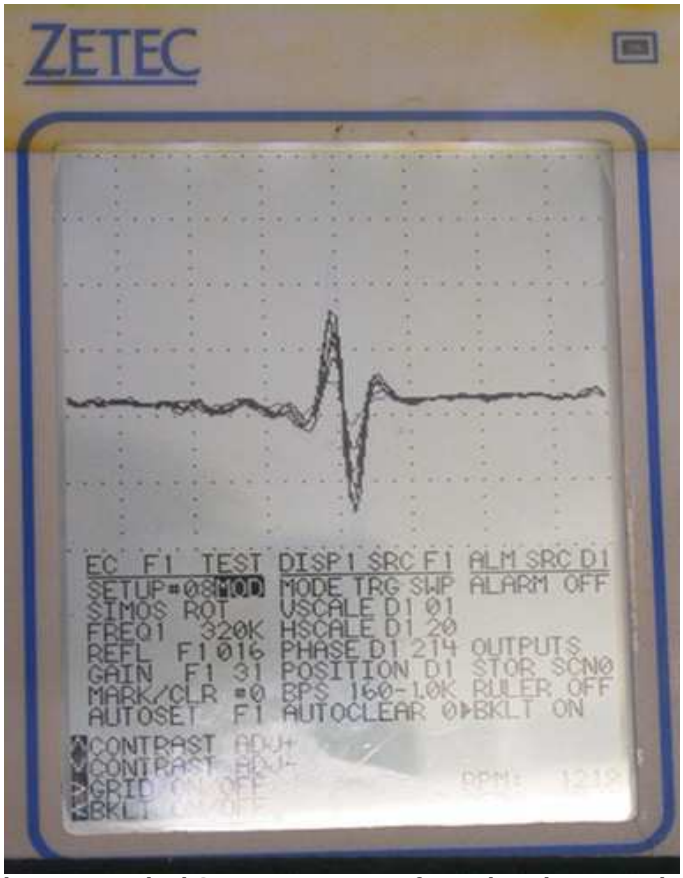

Figure 4: Typical Screen Response for Bolt Hole Inspection

INSPECTION PROCEDURE – PART B

111. Scan the entire bore length of both teeter block attachment holes.

ACCEPTANCE/REJECTION CRITERIA

112. Any repeatable defect indication that cannot be attributed to lift off or part geometry is cause for the Hub Bar to be placed unserviceable.

BACK UP PROCEDURE

113. Type 1, Method C, Form D, Sensitivity Level 3 Fluorescent Liquid Penetrant Inspection should be used to confirm any defect indications.

RECORDING OF INSPECTION RESULTS

114. Document the inspection results on a NDI Report as applicable. Reports are to be forwarded to the aircraft owner and Technical Manager ASRA PO Box 666 MORISSET NSW 2264

Procedure Author: Mr A.M. Collier

Position: NDIL3 ANDI

Date: 20 August 2005

Procedure Authorisation: Mr Adrian Stoffels

Position: Technical Manager Australian Sport Rotorcraft Association

Date: 26 August 2005

A U S T R A L I A N . S P O R T
R O T O R C R A F T . A S S O C I A T I O N

MEMO

Date: Tuesday, 5 July 2016

Subject: AD 2008.01

An enquiry was received questioning the applicability of AD 2008.01 in relation to the hub-bar design used on Magni and TAG Aviation Gyroplanes.

Extensive research has revealed that there have been no known failures or defects detected in the hub-bars currently fitted to these gyroplanes most likely indicating that the "side plate" design (photo below) is not prone to the fairly predictable onset of cracking and very occasional catastrophic separation known to occur in conventional aluminium hub bars substantially exceeding 1000 hours time in service. Additionally, the eddy current testing process described within the AD is only relevant for deep holes in thick metals.

Dispensation. Gyroplanes manufactured by Magni Gyro Company and TAG Aviation that utilise the hub-bar design pictured above are exempted from the requirements of ASRA AD 2008.01. Testing and life of these hub-bars is as per manufacturer's recommendations or requirements. This dispensation is only applicable to hub-bar designs similar to that pictured.

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