RotorSport UK Ltd

Service Bulletin

Title: Stick vibration reduction.		
SB No.: 061 Iss 1	**Related documents** MC No: MC-209 CCAR No.: None	**Compliance Category:** ~~**OPTIONAL**~~ or **RECOMMENDED or** ~~**MANDATORY**~~
Applicability		
Aircraft type & model MT-03 MTOsport Calidus	Aircraft serial Nos. effected Any Any prior to RSUK/MTOS/048 Any prior to RSUK/CALS/022	

This form is the response from RotorSport UK Ltd either against a problem found in the product in service requiring a containment or rectification action, or as service information for aircraft modification incorporation.
For help, contact RotorSport on 44(0)1588 650769, or email info@rotorsport.org.

Reason and overview of the Service Bulletin (cause of problem if known)

This service bulletin describes the installation of Pitch/Roll Improvement Kit RSD7218 which reduces the transmission of rotor vibration to the control stick. It is particularly effective with Calidus aircraft (which utilise push/pull control cables) but also provides some benefit for MTOsport and MT-03 aircraft (which use control rods).

The kit consists of:

RSD1121Iss2 Gimbal thrust washer (roll) 40mm OD x 21mm ID (2-off)
RSD1120 Iss2 Gimbal thrust washer (pitch) 40mm OD x 21 ID (2-off)
RSD6369 Shim washer 0.1mm steel (as required, 2-off provided)
RSD6340 Shim washer 0.3mm steel (as required, 2-off provided)
RSD6054 3.2mm split pin (3-off)

The thrust washers are fitted to the gimbal block (aka pitch/roll block) that is located at the top of the mast immediately beneath the rotor bridge fabrication. Two washers are fitted to each pivot axis after the pitch/roll block has been removed.

When the system has been reassembled the final tightening of the pitch and roll bolts/castellated nuts is carried-out to achieve specified control stick loads. In order that these loads are realised with coincident split-pin/castellation alignment, the 0.1mm or 0.3mm shim washers are used.

Approval

The technical content of this document is approved under the authority of the UK CAA Design Organisation Approval Ref: **DAI/9917/06**

Manpower estimates

Accomplishment of this Service Bulletin requires the following personnel

(i) A3-7 Authorised engineer
(ii) Second certifying signatory (e.g. other A3-7 engineer, qualified gyroplane pilot, CAA authorised inspector)

and estimated maximum manhours to complete the task as a standalone item are;

(i) MT-series 1.0 hours
(ii) Calidus 1.5 hours

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Tooling required
No special tooling required

Weight and Balance Effects
No significant change

Manuals affected
The Pilots handbooks are not affected.
The following AMMs are affected:

MT-03 - RSUK0012 is changed to Iss 9
MTOsport - RSUK00044 is changed to Iss7
Calidus - RSUK0061 is changed to Iss5

Previous Modifications that affect the SB
None

Accomplishment instructions (Action required to implement this bulletin):

Preamble
Effective date of this SB is 01.10.12
There is no relevant MPD or other outside body documentation applicable.
The attached SB worksheet provides the inspection record for the task
The task may only be carried-out by, or under the certification of a CAA A3-7 approved person. Duplicate inspection of the installation by another A3-7 approved person or qualified gyroplane pilot is required

Instructions
To remove to the gimbal block it is necessary to first remove the rotor then move the rotor head aside for access. This differs for Calidus and MT-series aircraft. Aside from this there are common tasks to be carried-out on the bench – these are detailed in a later section

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MT-series

View of MT series rotor head. Speed sensor Pitch bolt Roll bolt

(i) To remove gimbal block from aircraft

1. Position the aircraft on level ground and apply brakes/chock wheels. Remove the rotor as described in the Maintenance Manual.
2. Disconnect the rotor rpm sensor and tie the cable safe to one side
3. Remove the split pin, and unscrew the nut from the pitch-pivot bolt. Remove the washers and the bolt and move the rotor-head clear of the mast
4. NB: on early aircraft the pivot bolt head may be adjacent to the rotor-speed sensor requiring that the sensor is temporarily removed. Before doing this use a feeler-gauge to establish the clearance between the sensor face and the disk and note the orientation of the sensor. Its face should be clear of the disk by ~2mm.
5. Remove the split-pin, and unscrew the nut from the roll-pivot bolt.
6. Remove the washers and the bolt and lift the gimbal block clear.

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(iii) Carry-out common bench work as below

(iii) To reassemble gimbal block to aircraft

1. Holding the new thrust washers in place against the gimbal block replace the gimbal block and roll-pivot bolt, washers and nut. Hand-tighten the nut only and check that that the block moves freely between the stops. Now progressively increase the nut torque until the block can just be moved with the finger tips. Visually check the possibility for split pin alignment and if necessary fit a shim washer under the nut head, or under the washer under the nut head, so that a split pin may be fitted and formed with the nut in the required position. Insert pin but do not form it.
2. Again holding the new thrust washers in place against the gimbal block refit the rotor head over the gimbal block and replace the pitch pivot fasteners. Position the bolt so that its thread is adjacent to the rotor rpm sensor and refit the washers, and castle-nut. Hand-tighten the nut only at this stage, but check that that the head moves freely between the stops. Note: Fitting the pivot bolt with its nut adjacent to the rotor-speed sensor is the standard configuration for later aircraft and its reversal on early aircraft is approved under MC-056. Now progressively increase the nut torque until the rotor head can just be moved in pitch with the finger tips. Visually check the possibility for split pin alignment and if necessary fit a shim washer so that a split pin may be fitted and formed with the nut in the required position. Fit pin, but do not form it.
3. Refit the rpm sensor cable and replace any cable-ties previously removed
4. Using the control stick verify that the control system has full-and-free movement and correctly reaches the mechanical stops in pitch and roll. NB: With the stick in mid-position, fully forward, the rotor-head is set 1 degree to the left.
5. Switch on the a/c master switch and check that the trim/brake system functions correctly. Set to “flight” and using the trim button deplete all air from the pitch-trim system (as indicated by the pressure gauge on the instrument panel. Switch off the master switch.
6. Check the pitch and roll forces are within the limits (pitch 22-26N pushing forwards, roll 6-10N) using a hand held force gauge or spring balance around the middle of the grip area, and that there is **no** stick-slip action in the stick movement.
7. If necessary, adjust the tightness of the pitch and/or roll bolts, properly forming the two split pins when the forces are satisfactory.
8. Attach a grease gun (Castrol LM or equivalent) to each of the two grease nipples on the gimbal block. Pump until grease is seen to extrude around the washers.
9. Refit the rotor and grease the teeter bolt pivot as described in the Maintenance Manual.

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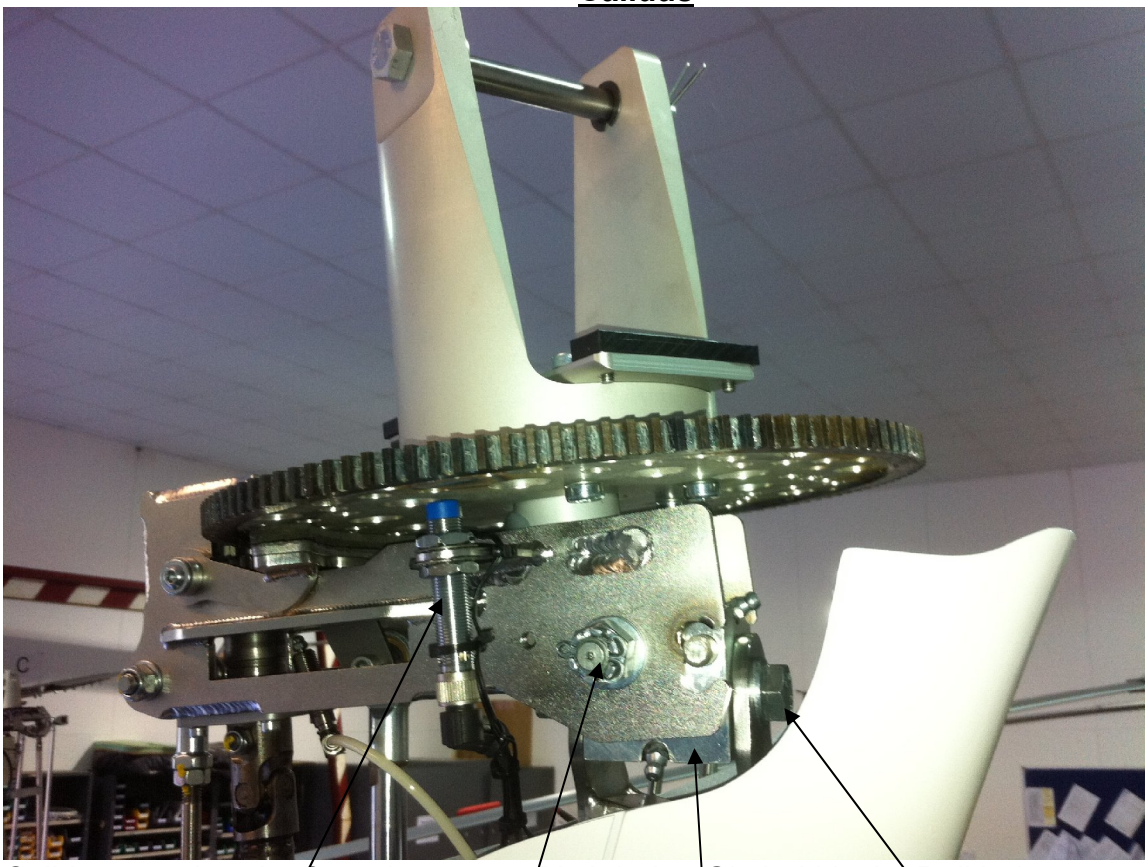
10. Double-check that the pitch, roll and teeter bolt split pins are fitted and correctly formed.
11. Complete the inspection sheet appended to this SB to ensure correct task completion

Calidus



(i) To remove gimbal block from aircraft

1. Position the aircraft on level ground and apply brakes/chock wheels. Remove the rotor as described in the Maintenance Manual.
2. Cover the canopy with thick fabric to protect against any dropped tools
3. If required (recommended), remove the upper engine cowling and the two mast cowlings
4. Set the pitch damper (if fitted) to minimum by turning fully anti-clockwise.
5. Disconnect the rotor rpm sensor and tie the cable safe to one side
6. Disconnect the roll control cable and roll trim cylinder from the rotor head. Note

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the spacer positions and orientation.

7. Remove the split pin, and unscrew the nut from the pitch-pivot bolt. Remove the washers and the bolt and move the rotor-head clear of the mast
8. Remove the split-pin, and unscrew the nut from the roll-pivot bolt.
9. Remove the washers and the bolt and lift the gimbal block clear.

(ii) Carry-out common bench work as later section

(iii) To reassemble gimbal block to aircraft

1. Holding the new thrust washers in place against the gimbal block replace the gimbal block and roll-pivot bolt, washers and nut. Hand-tighten the nut only and check that that the block moves freely between the stops. Now progressively increase the nut torque until the block can <u>just</u> be moved with the finger tips. Visually check the possibility for split pin alignment and if necessary fit a shim washer so that a split pin may be fitted and formed with the nut in the required position. Fit pin, but do not form it.
2. Again holding the new thrust washers in place against the gimbal block refit the rotor head over the gimbal block and replace the pitch pivot bolt, washers, and castle-nut. Hand-tighten the nut only at this stage, but check that that the head moves freely between the stops. Now progressively increase the nut torque until the rotor head can <u>just</u> be moved with the finger tips. Visually check the possibility for split pin alignment and if necessary fit a shim washer so that a split pin may be fitted and formed with the nut in the required position. Fit pin, but do not form it.
3. Refit the roll control cable and roll trim cylinder ensuring that the spacers are correctly positioned and orientated. Use Loctite 243 and a new nyloc nut (M6). Paint-mark the nut after tightening
4. Refit the rpm sensor cable and replace any cable-ties previously removed
5. Using the control stick verify that the control system has full-and-free movement and correctly reaches the mechanical stops in pitch and roll. NB: With the stick in mid-position, fully forward, the rotor-head is set 1 degree to the left.
6. Switch on the a/c master switch and check that the trim/brake system functions correctly. Set to “flight” and using the trim button deplete all air from the pitch-trim system (as indicated by the pressure gauge on the instrument panel. Switch off the master switch.
7. Check the pitch and roll forces are within the limits (pitch 25 - 29N pushing forwards, roll 15 -19N) using a hand held force gauge or spring balance around the middle of the grip area, and that there is **<u>no</u>** stick-slip action in the stick movement.
8. If necessary, adjust the tightness of the pitch and/or roll bolts, properly forming the two split pins when the forces are satisfactory.
9. Reset the pitch damper (if fitted) to the pilots preference

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10. If removed, refit the mast cowlings and upper engine cowl.
11. Attach a grease gun (Castrol LM or equivalent) to each of the two grease nipples on the gimbal block. Pump until grease is seen to extrude around the washers.
12. Refit the rotor and grease the teeter bolt pivot as described in the Maintenance Manual.
12. Double-check that the pitch, roll and teeter bolt split pins are fitted and correctly formed.
13. Complete the inspection sheet appended to this SB to ensure correct task completion

Common bench tasks

Thoroughly clean the gimbal head using Amberclene LO30

Check the condition of the flanged bushes and replace as necessary.
Verify that the V-slots are correctly oriented in the gimbal block as shown in the photographs.
The photographs below show how the two washers are fitted around the flanged bushes present in the rotor head. The grey polymer surfaces face outwards, to make contact with the polished stainless-steel plates of the mast and rotor head-fabrication.

1) Pitch pivot

Pitch/roll block and full-washer

Full-washer in place

The bore of the washer should fit closely around the flange of the headed bush with the

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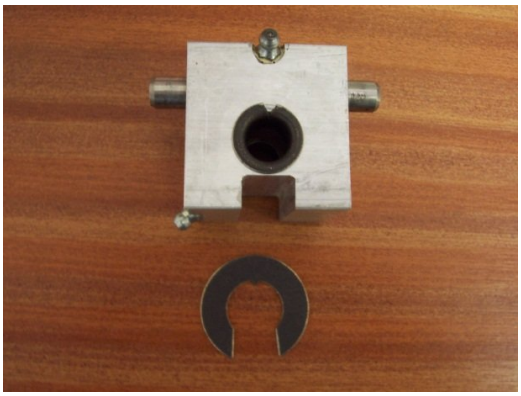
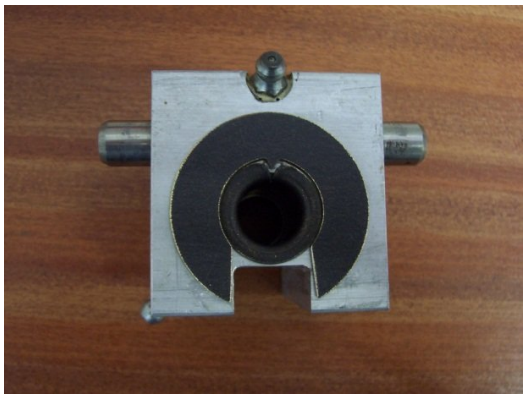
anti-rotation peg engaged in the V-notch and the washer completely flat against the aluminium block. If there is distortion in the flange preventing proper location it is permissible to dress the bore of the thrust washer with a swiss-file – the direction of filing must push the grey polymer material against the steel backing.

2) Roll pivot



Pitch/roll block and slotted washer



Slotted washer in place

In addition to the requirement for proper location described above it is important that the large slot in the gimbal block is not obstructed by the slot in the washer. If necessary to achieve clearance the washer slot may be dressed, but by no more than 1mm. If this does not achieve the required clearance the flanged bush must be replaced with a new part correctly oriented when in place.

When satisfied that all four washers correctly fit the gimbal block, wipe all items clean with a fresh paper towel then apply a small amount of grease (Castrol LM or equivalent) to the washers so that they are held in place on the gimbal block. Then apply a film of grease to the polymer working surface of each thrust washer.

The gimbal block assembly is now ready for refitting to the aircraft

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Material information (Parts required to be made to implement this service bulletin):
There is no requirement for parts to be manufactured.

List of components (with purchasable part nos)
Pitch/Roll improvement kit RSD7218 kit consists of:

RSD1121Iss2 Gimbal thrust washer (roll) 40mm OD x 21mm ID (2-off)
RSD1120 Iss2 Gimbal thrust washer (pitch) 40mm OD x 21 ID (2-off)
RSD6369 Shim washer 0.1mm steel (as required, 2-off provided)
RSD6340 Shim washer 0.3mm steel (as required, 2-off provided)
RSD6054 3.2mm split pin (3-off)

A small amount of grease (Castrol LM or equivalent) is also required

Interchangeability
The gimbal block removed must be refitted to the same aircraft

Parts disposition
a) Disposal requirements – other than split pins (which are replaced with new) no parts are removed.
b) Environmental hazards of parts containing hazardous materials – none known
c) Scrap requirements – none (other than split pins)

Documentation (Service Bulletin Completion action)
a) Entries within the aircraft logbooks, eg CAA BCAR A3-7 Authorised Person to certify that the work is completed by writing '*SB-061 Rotor Vibration Control incorporated'* in the aircraft logbook white pages, and record the action in the pink pages entitled 'Aircraft Modifications'. Both entries must be signed by the CAA Authorised Person together with their CAA Authorisation number.

b) Completion of the SB worksheet (attached). This contains a PMR statement, and a final check item that no tools or equipment have been left within the aircraft.

Document approval signatures

Engineering Manager	CVE (as required)	Chief Test Pilot (if flight performance or safety effect)	Head of Airworthiness
Gerry Speich Oct 5 2012 11:01 AM	David Starkey Dec 6 2012 6:03 PM	Gerry Speich Oct 5 2012 4:08 PM	Andrew Lyons Dec 12 2012 2:45 PM

RotorSport UK Ltd
Service Bulletin

Aircraft type Aircraft serial no. Registration G-	**Service Bulletin implementation Worksheet**	Date raised: Raised by:
Purpose – record service bulletin implementation actions taken to inspect aircraft and return to service.		Document reference: **SB-061**
Maintenance manual referred-to and issue level/date:	MT-03 - RSUK0012 Iss 9 of 10/10/12 MTOsport - RSUK0004 Iss7 of 10/10/12 Calidus - RSUK0061 Iss5 of 10/10/12 (Delete as applicable)	
Note; attach SB sheets to this document		

Task	Notes	Eng'r check/date	Inspector check/date
Pitch function satisfactory and split-pin replaced	Recorded stick force in pitch:		
Roll function satisfactory and split pin replaced	Recorded stick force in roll:		
Rotor refitted and teeter-bolt split pin replaced			
Confirm all tools and loose items removed from aircraft			
Calidus only below		----------	----------
Roll cable and trim cylinder refitted and paintmarked			
Pitch damper reset			
Mast cowlings, fuel inlet and grounding cable replaced			
Upper engine cowling securely re-fitted			

Customer acceptance: Name: Signature/date:	Aircraft hobbs meter reading Confirm logbooks annotated:
Permit Maintenance Release: The work recorded above has been completed to my satisfaction and in that respect the aircraft is considered fit for flight.	
Engineer/Inspector signature Name: CAA Authorisation code :	Date of work Location where work completed

Retain this worksheet with the aircraft records.