

RotorSport UK Ltd Service Bulletin

Title: Retro-fit IVO-prop to Calidus		
SB No.: 083 Iss1	Related documents MC No:276 CCAR No.: None	Compliance Category:
Applicability		OPTIONAL or RECOMMENDED or MANDATORY
Aircraft type & model: Calidus	Aircraft serial Nos. affected: All	
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.		
<u>Reason and overview of the Service Bulletin (cause of problem if known)</u> Auto-Gyro aircraft manufactured for markets other than UK have the option of a 3-blade in-flight-adjustable variable pitch propeller manufactured by the American company IVOprop Corp. This propeller has now been approved for fitment to UK-registered Calidus aircraft and offers a shorter take-off distance together with potential for improved fuel economy and reduction in noise.		
<u>Approval</u> The technical content of this document is approved under the authority of the UK CAA Design Organisation Approval Ref: DAI/9917/06		
<u>Manpower estimates</u> Accomplishment of this Service Bulletin requires the following personnel <ul style="list-style-type: none"> (i) A3-7 Authorised engineer or other approved organisation approved person (eg LAA) (RSUK only) (ii) Second certifying signatory (e.g. other A3-7 engineer, qualified gyroplane pilot, CAA authorised inspector or other approved organisation approved person) and estimated man-hours to complete the task as a standalone item are; 4 -5hours		
<u>Tooling required</u> Hand tools to fit, calibrated inclinometer and straight-edge to check blade pitch. Plastic drift C.WZ3020 or equivalent		
<u>Weight and Balance Effects</u> The IVO-prop itself is 3.5kg heavier than the standard HTC fixed-pitch propeller and this additional weight, together with that of the brush-bracket 82g, act at the rear of the aircraft. A manifold pressure gauge, rocker switch, end-position controller and LED indicators add 250g to the front of the aircraft. The electrical cables and pneumatic pipe are pre-installed in all Calidus so add no weight. Total additional weight is 3.8kg which does have an effect on aircraft CG and is shown by an up-issued Weight and Balance Certificate (AWC)		
<u>Manuals affected</u> Calidus POH RSUK0060 is raised to Iss 5 Calidus AMM RSUK0061 is raised to Iss6 IVO-prop Maintenance Manual RSUK0325 is published at Iss1		
<u>Previous Modifications that affect the SB</u> None		

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Accomplishment instructions (Action required to implement this bulletin):

Effective date of SB is 01.08.14.

There is no relevant MPD or other outside body documentation to be referenced.

As the aircraft weight and balance is affected, requiring up-issue of the AWC and modification of the Aircraft Payload Specification placard, this SB-083 may only be embodied by RSUK.

Installation/test is carried-out in six stages.

1. Fitment of the rocker switch, end-position controller and LEDs

1.1. If an air-pressure type of manifold pressure gauge is to be fitted Stages 1 and 2 may be accomplished by carefully pulling the instrument panel forwards for access. If the digital combined engine rpm/ manifold pressure gauge is to be fitted the instrument panel must be removed, this requiring a check of the barometric instruments when the panel is re-fitted (as described in Calidus AMM RSUK0061).

1.2. Working on the Instrument panel:

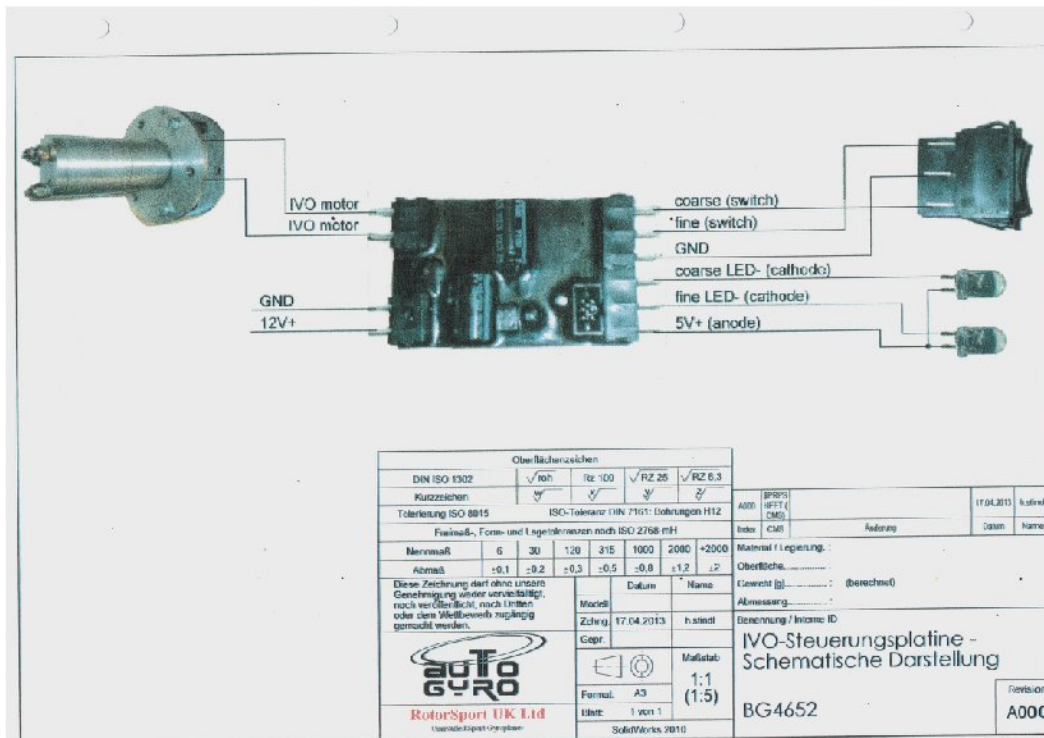
Clip the rocker switch into place

Clip the two LED indicators into place

Using the supplied wiring harness make the connections of the end position control module and cable-tie the module securely to the main wiring harness

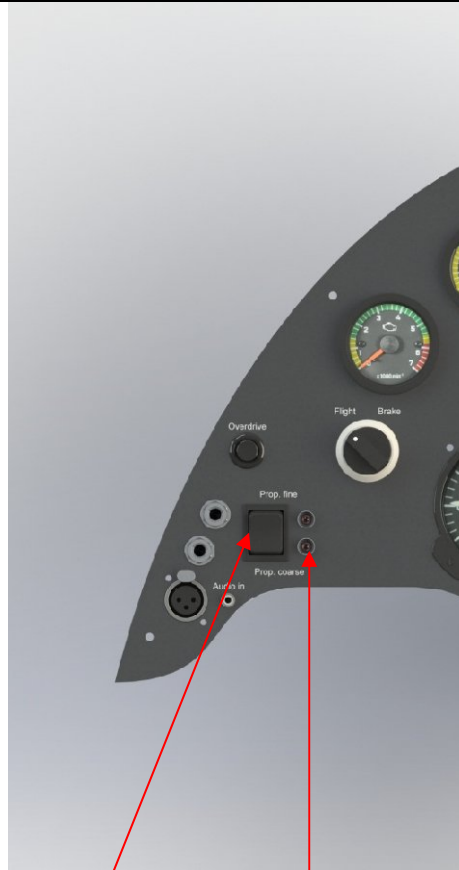
Provide 12VDC power and ground to the end position controller by means of the pre-fitted cables from the 25A "Prop" fuse and mass-point ground.

Identify the two spare "IVO" cables tied back to the main wiring harness, fit two crimp terminals and connect to the module (no polarity requirement)



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Rocker switch and LEDs at left of panel

2. Fitment and connection of the manifold pressure gauge

2.1. To fit an air-pressure type of manifold pressure gauge remove the blanking panel from the chosen location and fit the gauge in its place. There are no electrical connections to be made, see para 2.3 for the manifold pressure connection

2.2. To fit the digital combined engine rpm/manifold pressure gauge first remove the analogue engine rpm gauge then offer-up the new gauge. It will be necessary to trim the mounting hole (from nominally 2in diameter to 2.25in diameter) before the gauge can be fitted (ensuring that the gauge body will clear the inside of the cockpit moulding) and the four 3.5mm holes drilled thru. Secure the gauge using four M3x20 socket-head screws and nyloc nuts.

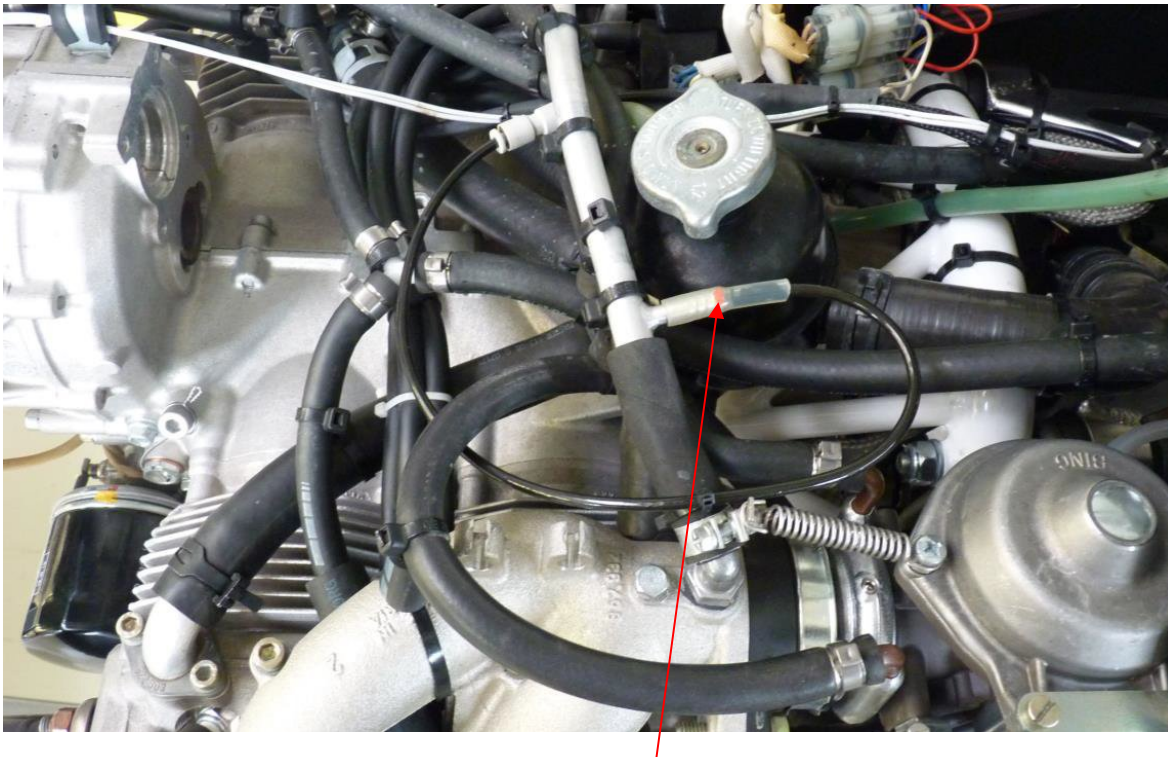
Provide 12VDC power and ground to the gauge by means of the spare instrument power-bus connectors, or if none available by splicing into the power bus and ground cables, followed by reconnection of the rpm signal cable.

2.3. With either the analogue gauge or the digital gauge a manifold pressure connection must be made. Identify the pre-existing air pipe attached to the instrument panel wiring loom, fit this with a short length of silicone tubing and connect to the gauge port.

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2.4. Working at the rear of the aircraft identify the pre-existing air pipe attached to the wiring loom. Remove the blanking screw fitted into the spigot of the carburettor balance pipe and using a short length of silicone tubing connect the air pipe to this spigot. Secure the pipe with cable-ties.



Balance pipe pressure connection

2.5. The instrument panel should now be refitted and baro instruments tested as required.

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3. Removal of the HTC propeller

Remove the engine cowlings in accordance with Calidus AMM RSUK0061.

Remove the spinner (if fitted) by releasing the button-head socket screws

Progressively release the six M8 capscrews retaining the propeller hub

Lift-off the propeller complete

Store either flat on the floor or suspended by the hub. Do not place the weight on the blade tips.

Thoroughly clean the engine's propeller mounting flange and threaded bushes of any surplus Loctite



Propeller mounting flange

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4. Assembly and fitment of the IVO-prop

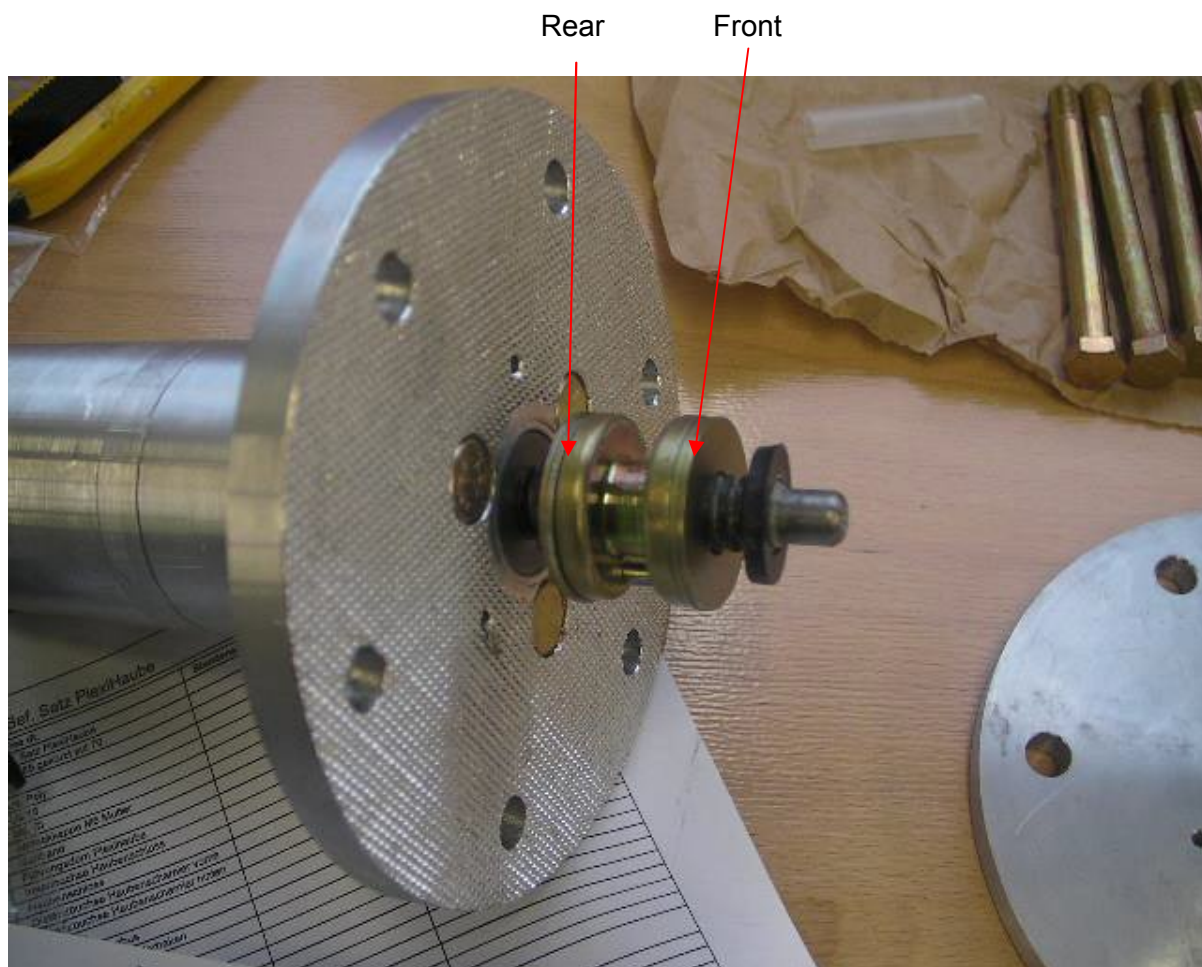
Place the steel thrust washers on the actuator motor's lead-screw as shown in the photograph, selecting for engine fitment:

- 912: 2 x out of C.KU37 rear (total 2.5mm)
- 3 x out of C.KU37 front (total 5.7mm)

or

- 914: 1 x out of C.MO14 rear (total 1.2mm)
- 4 x out of C.MO14 front (total 7mm)

Ensure that the two rubber cushion washers are in place.



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Clamp the actuator motor vertically in a vice (use soft-jaws) and using the 3/8" AN bolts and washers fit the three blades. Ensure that the two cables are free.



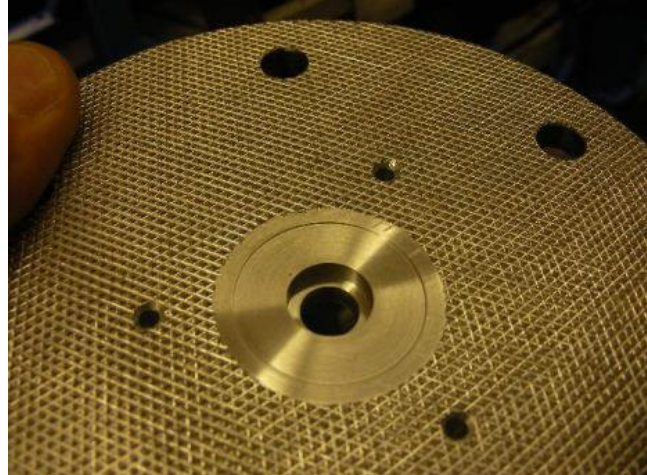
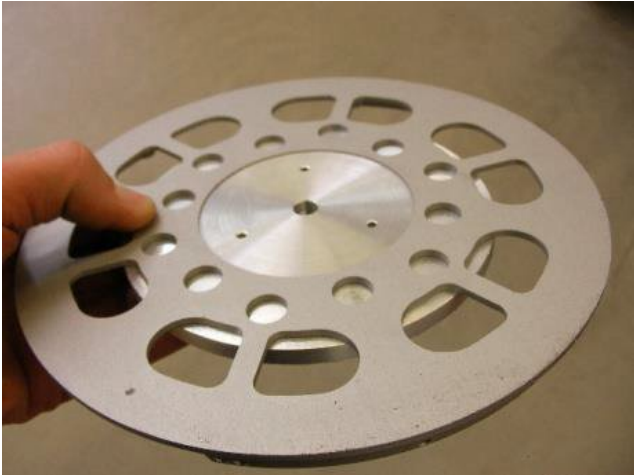
Fit the knurled clamping plate over the six protruding bolts, carefully pulling the two cables through the plate.



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If A spinner is to be fitted use the alternate knurled clamping plate and spinner backing plate.



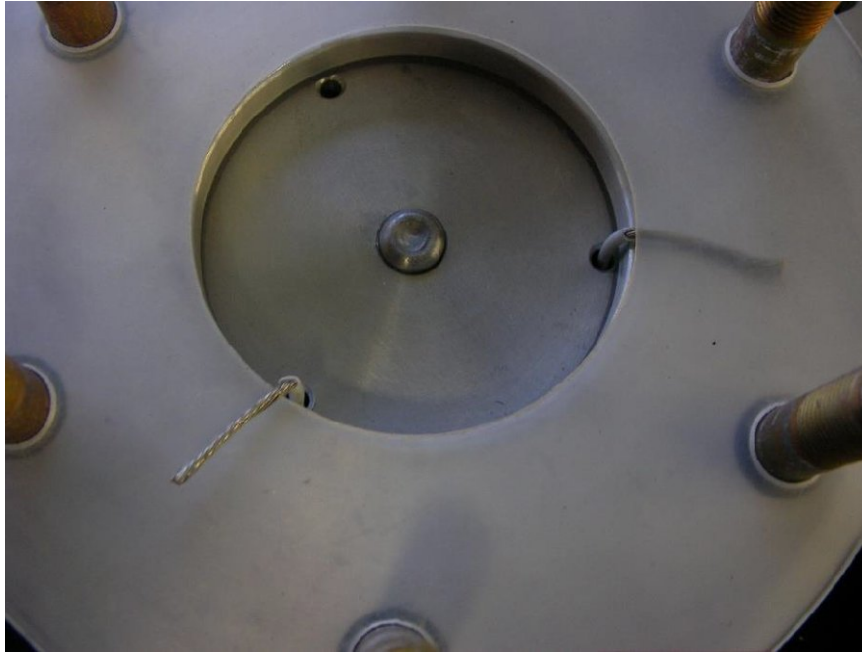
Assemble the insulators and spacing plates in the order shown below



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Fold over each of the cables so that one electrical cable connects to each plate:
NB: there is no solder or welding, electrical contact is made by the clamping pressure.



Make sure that the insulator bushes are in the correct position, if they have moved out push them back into place with tool C.WZ3020



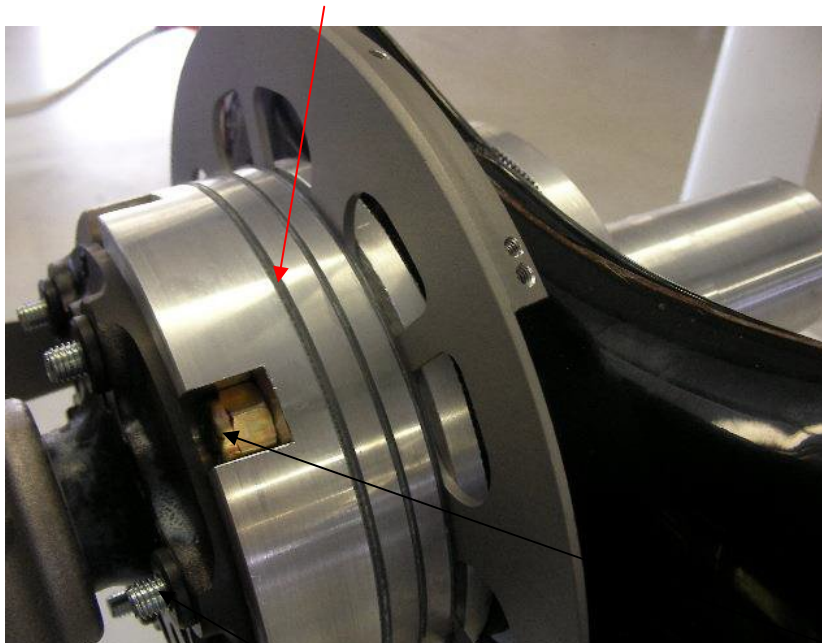
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Install the adaptor plate on the engine using the M8 countersunk socket screws, Loctite 243 and torque (progressively) to 25Nm



Attach the whole prop unit to the adaptor plate using the 3/8 AN5 hex-head bolts and nyloc nuts positioned in the recesses. Tighten the main prop bolts (progressively) to 40Nm. When everything is correctly located and the bolts tightened use a scalpel to trim any protruding insulator flush with the outer diameter of the aluminium spacers



Paint stripe between M8 c/sunk screw and propeller flange, and between nut and bolt end, 6pls ea..

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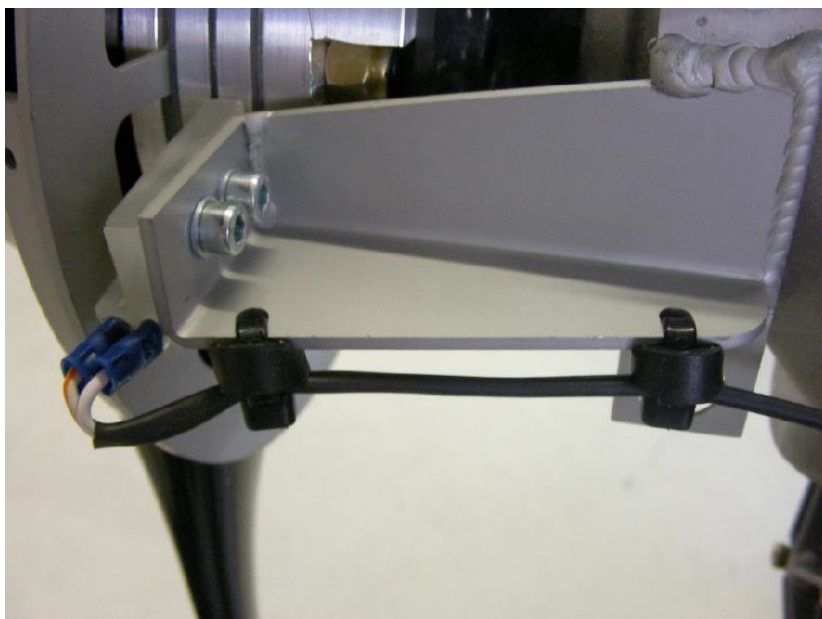
Install the brush holder as shown. Make sure that the brush housing has 0.5mm clearance to the contact discs/spacers



Identify the two spare cables tied-back above the engine and using 3/16" crimp terminals connect the two cables to the brush terminals.

Use cable ties and spacers (made from scrap fuel hose) to secure the cable as shown.

Check for correct direction of propeller movement in relation to the rocker switch/LEDs. If reversed swap the two connectors. Leave the propeller set in the full-FINE condition.



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Temporarily fit the spinner using the button-head socket screws and nylon washers. Mark the spinner/backing plate relationship.

Refit the engine cowlings in accordance with AMM RSUK0061.

5. Ground test of the finished installation

5.1. Turn on the master switch and without starting the engine, use the selector (rocker) switch to cycle the propeller to full-COARSE then back to full-FINE. Verify visually that the two indicator LED's function correctly, and audibly and visually that the propeller blades have changed pitch with no untoward noises. Whilst at the FINE and COARSE limits measure the pitch angle of each blade, which should be:

912ULS installation – Fine 13.0deg Coarse 20.0deg

914UL installation – Fine 14.0deg Coarse 21deg

Maximum variation blade-to-blade 1.5deg.

The pitch angle is relative to the propeller hub and is measured just inboard of each propeller tip with the blade leading-edge set horizontal.

Finally, set the propeller to the full-FINE position

The logic table for operation of the propeller controller is:

Both LEDS off	Propeller is not at an end position and no pitch change command active
Upper LED blinking	Propeller changing pitch to FINE
Lower LED blinking	Propeller changing pitch to COARSE
Upper LED steady ON	End position FINE reached and electronic pitch inhibit FINE activated*
Lower LED steady ON	End position COARSE reached and electronic pitch change inhibit COARSE activated*
Both LEDS flashing fast	Actuating motor does not work despite rocker switch activation. Possible defects, e.g. brushes worn, cable break.**

*Electronic pitch change inhibit is deactivated after selecting pitch change in opposite direction for at least 1 second

**Indication can only be reset by switching the master switch temporarily to OFF and then back to ON. In order to avoid pilot distraction, indication of a possible defect is retriggered after another activation of the rocker switch

5.2. Following safe practice position and tie-down the aircraft in a suitable location for engine run-up. A qualified gyroplane pilot in the front seat should start and warm-up the engine.

At an engine speed about 3000rpm cycle the propeller manually from fine to coarse stops and verify

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an audible change in engine note / rpm change, and correct sense of rocker switch.
With the prop set at the fine limit apply full power and verify that the maximum engine speed is 5,500rpm.

6. Propeller balancing

Balance the propeller by means of adhesive weights attached to the inside of the spinner backing plate.

When the spinner is refitted after balancing, use a small amount of Loctite 243 on the socket-screw threads.

7. Flight-test of the installation

The pilot must first ensure they are familiar with the operational instructions contained with POH RSUK0060 issue 5.

With the propeller set to full-FINE the pilot should take-off then climb to a cruise condition. Ensure that the engine rpm does not exceed 5,800 rpm in the climb at full power and full fine pitch. In cruise verify that the propeller functions correctly and that manifold pressure/rpm indications are consistent with the appropriate table below:

ROTAX 912 ULS

Power setting	Engine RPM	MAP	Fuel flow [ltr/h]
Max. TOP	5800	27.5	27
Max. MCP	5500	27	26
75% MCP	5000	26	20
65% MCP	4800	26	18
55% MCP	4300	24	14

ROTAX 914 UL

Power setting	Engine RPM	MAP	Fuel flow [ltr/h]
Max. TOP	5800	39	33
Max. MCP	5500	35	26
75% MCP	5000	31	20
65% MCP	4800	29	17.5
55% MCP	4300	28	12.5

MCP – Maximum Continuous Power

TOP – Take-Off Power

MAP – Manifold Absolute Pressure

MAP limits do not apply at engine speeds above 5100 RPM.

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<u>Material information (Parts required to be made to implement this service bulletin):</u> The only parts manufactured during embodiment of this SB are two small stand-off spacers made from scrap 6mm fuel hose.		
<u>List of components (with purchasable part nos)</u> C.KU37 (BG535) Propeller assembly (including brush carrier) C.MO14 (BG967) Propeller mounting kit (including BG968 fabricated brush bracket) C.KU43 (BG1184) Spinner (finished in aircraft body colour) C.MO26 (BG1483) Spinner installation kit C.EL300 (BG4759) End-position controller kit S.EL44 (BG1420) Analogue manifold pressure gauges for 912ULS engine, or S.EL43 (BG1419) Analogue manifold pressure gauges for 914UL engine, or RSD4806 Digital combined engine rpm/ manifold pressure gauge		
<u>Interchangeability</u> Complete propellers are interchangeable, individual blades may be interchanged on a single propeller subject to availability and balancing limitations.		
<u>Parts disposition</u> a) Disposal requirements – the fixed-pitch HTC propeller (and spinner, if fitted) removed from the aircraft is retained by RSUK as part of the cost of change. b) Environmental hazards of parts containing hazardous materials – if handling the stainless-steel foil leading edge protection be cautious of sharp edges c) Scrap requirements – when the fixed pitch HTC propeller is removed if any blades are found damaged beyond approved limits, they should be destroyed.		

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Documentation (Service Bulletin Completion action)		
<p>a) Entries within the aircraft logbooks, eg CAA BCAR A3-7 Authorised Person (or equivalent) to certify that the work is completed by writing '<i>SB-083 IVO-prop.incorporated</i>' 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 (or equivalent) together with their CAA (or equivalent) Authorisation number.</p> <p>b) Completion of the SB worksheet attached, This must contain the PMR statement, and a final check item that no tools or equipment have been left within the aircraft</p> <p>c) Permit change application document. This is required as the SB will affect the permit limitations in respect of the propeller installation and empty weight, and enables the owner to request the permit change required</p>		

Document approval signatures			
Engineering Manager  <small>Graham Skew Aug 5 2014 5:24 PM</small>	CVE (as required) Not required, MOD already approved.	Chief Test Pilot (if flight performance or safety effect)  <small>Gerry Speich Aug 5 2014 5:23 PM</small>	Head of Airworthiness  19 Aug 2014

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Service Bulletin implementation Worksheet			
Aircraft type:	Serial no:	G-	
Worksheet completed by:		Document ref:	
Worksheet cross-checked by (if applicable):		SB-083 Iss1	
Purpose – record service bulletin implementation actions taken to inspect aircraft and return to service.			
Maintenance manual referred-to and issue level/date:	Calidus - RSUK0061 Iss of 10/06/14		
Note: attach SB sheets to this document			
Task	Notes	Eng'r check/date	Inspector check/date
Fit manifold pressure gauge, rocker switch , LEDs and end-position controller to instrument panel			
If panel removed then verify correct function of barometric instruments when refitted	See RSUK0061 for method		
Remove engine cowlings	Inspect for cosmetic or structural damage. Report any found.		
Connect MAP gauge pipework			
Remove HTC prop (and spinner if fitted)	Describe disposal		
Assemble and fit IVO-prop	Rear washer set thickness Front washer set thickness		
Fit brush box assembly and connect			
Test prop function and verify correct sense of switch and LED's			
Measure achieved pitch angles	Blade A Blade B Blade C Hub angle		
Balance propeller/fit IVO-spinner			
Refit engine cowlings			
Flight test			

Customer acceptance:	
Name:	Aircraft hobbs meter reading:
Signature/date:	Confirm logbooks annotated:
Permit Maintenance Release:	
<i>'The work recorded above has been completed to my satisfaction and in that respect the aircraft is considered fit for flight. I confirm that no tools, equipment or debris have been left in the aircraft'</i>	
Engineer signature and date:	Location where work completed
CAA Authorisation code :	

RotorSport UK Ltd Service Bulletin

Permit Change Application

The purpose of this document is to provide sufficient information to the CAA to allow a change of the Permit to Fly to incorporate a specific aircraft modification or upgrade.

Aircraft reg no

G-

Aircraft serial No.

RSUK/

AAN that has been incorporated:
AAN29266 Addendum 2

Service Bulletin number incorporated:
SB-083 IVO-prop fitment to Calidus

Owners name and address

Daytime telephone number

Email

Summary of change required: (cross out as required)

IVO-prop variable pitch propeller fitted, as approved by AAN29266 Addendum 2

Documents to be included with this application:

Photocopy of aircraft and/or engine logbook pages with certifying signatures from the A3-7 authorised person that confirm embodiment of the service bulletin and Permit Maintenance Release certification.
Existing CAA Permit to Fly.

Application fee as specified in the CAA Scheme of Charges paragraph 6.1

(<http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=list&type=subcat&id=1>)

Send to:

CAA Applications and Approvals

Aviation House

Gatwick Airport South

West Sussex

England

RH6 0YR