RotorSport UK Ltd Service Bulletin

Title: Retro-fit IVO-prop to MTOsport		
SB No.: 100 Iss1	**Related documents** MC No:318 CCAR No.: None	**Compliance Category:** **OPTIONAL** or ~~**RECOMMENDED or MANDATORY**~~
Applicability		
Aircraft type & model: **MTOsport**	**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.

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

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 MTOsport aircraft and offers a shorter take-off distance together with potential for improved fuel economy and reduction in noise.

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 or other approved organisation approved person (eg LAA) but limited to RSUK embodiment 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; 6 - 7hours

Tooling required

Hand tools to fit, calibrated inclinometer and straight-edge to check blade pitch.
Plastic drift C.WZ3020 or equivalent

Weight and Balance Effects

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 MTOsport 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).
The new weight must be added to the existing aircraft weight, and the new total shown on the aircraft weight placard in the cockpit area.

Manuals affected

MTOsport POH RSUK0043 is raised to Iss 8
MTOsport AMM RSUK0044 is raised to Iss8
IVO-prop Maintenance Manual RSUK0325 is raised to Iss2

Previous Modifications that affect the SB

None

Accomplishment instructions (Action required to implement this bulletin):

Effective date of SB is 15.10.15.
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-100 may only be embodied by RSUK.

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Installation of the IVO-prop is carried-out in six stages, followed by a flight test. 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 pneumatic, electrical and barometric equipment when the panel is re-fitted (as noted in MTOsport AMM RSUK0044).

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

1.1. Working on the Instrument panel fit the two LEDs in holes adjacent to the engine RPM gauge (8mm diameter holes at 20mm centres, positioned as shown in photo below). Ensure that the LED bodies will fit between the RPM gauge and the body flange, particularly if the larger digital gauge is to be used – see 2.2 below

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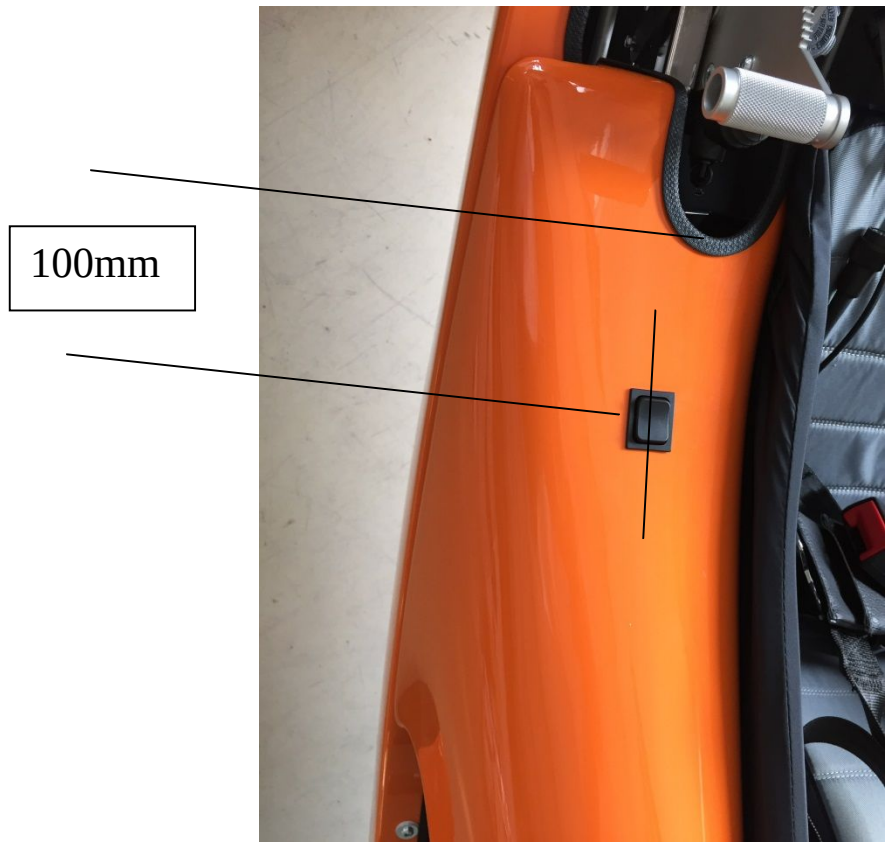
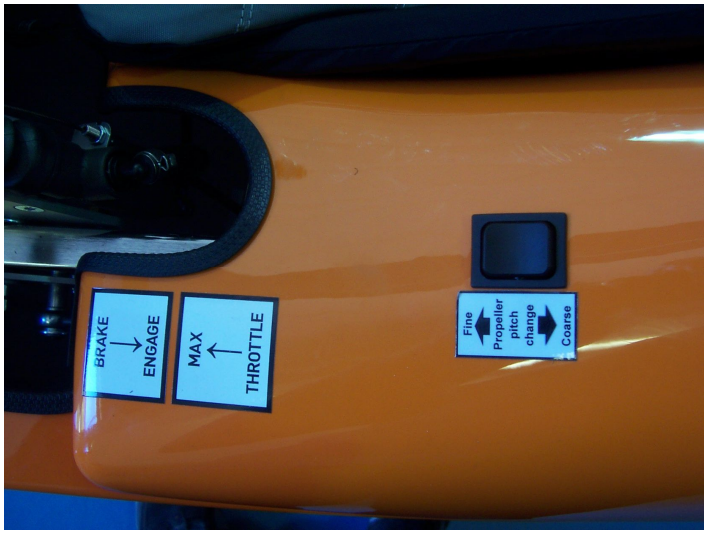
1.2 Fit the rocker switch to the left-hand seat fairing on the centre-line as shown below:



1.3. Fit the switch-sense placard adjacent to the switch



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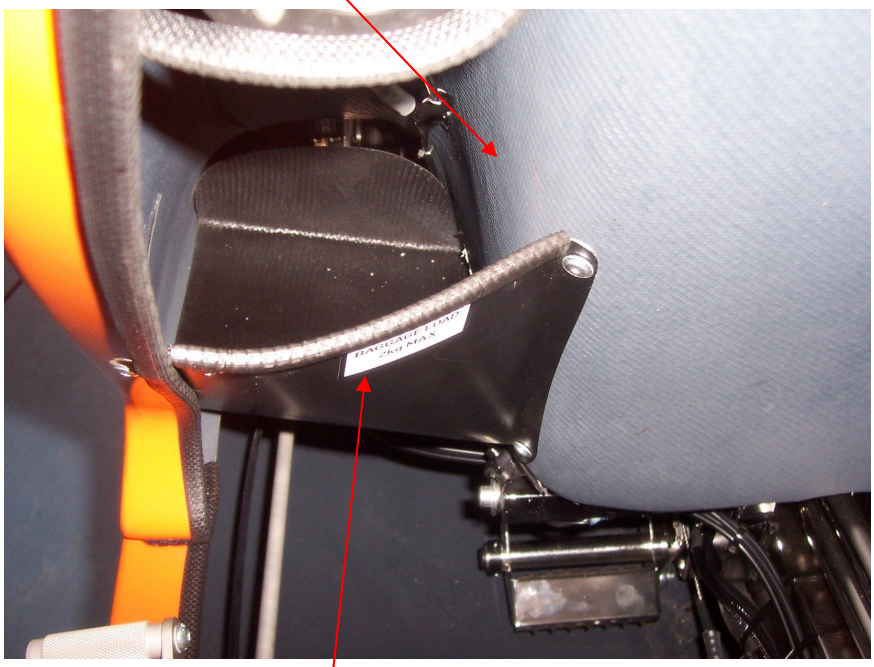
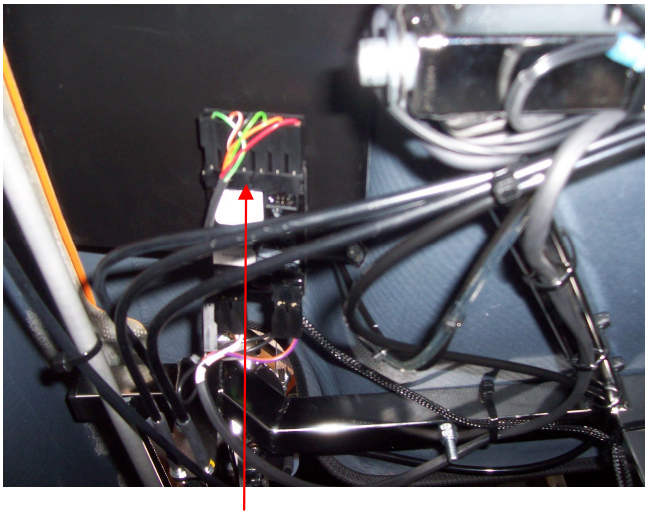
1.4. Using the supplied wiring harness make the connections of the end position control module (see BG4652 below) and secure the module to the hidden inner face of the seat body using Sikaflex EBT adhesive. If rear seat pockets are fitted it will be necessary to bond the module to the underside of the left-hand pocket, as shown in the photos below

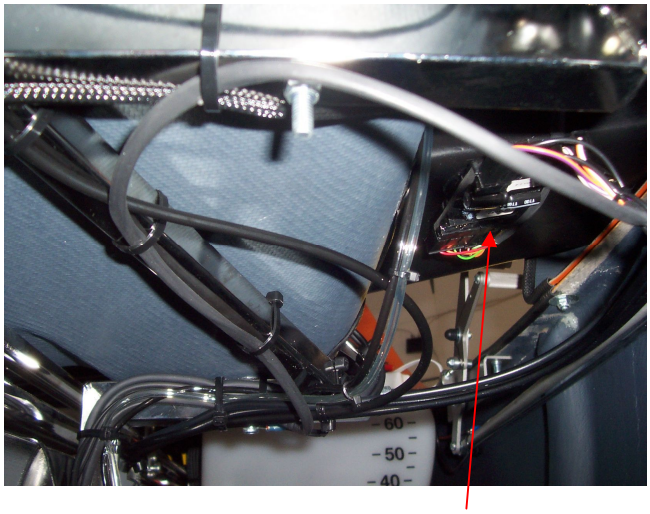
IVO-end position module normally bonded here



Left rear seat pocket



FWD view of module bonded under seat pocket



View looking aft

Module

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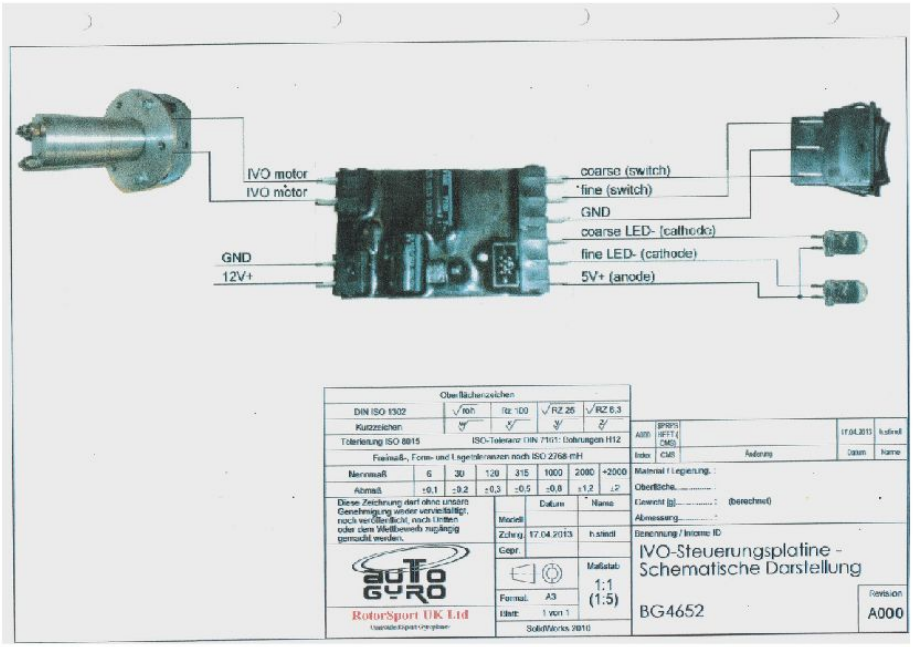
1.5. Provide 12VDC power and ground to the end position controller by means of the pre-fitted cables from the 25A “Prop” fuse and “mass-point” ground.

1.6. 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)



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 2.5 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 four 4.2mm holes drilled thru the panel. Secure the gauge using four M4x20 button-head socket screws and nyloc nuts. If necessary open-up the holes in the gauge body to 4.2mm diameter to accept the screws.

2.3. The electrical connections are described in the MAP-1 Operating Manual (Version English 1.04 at the time of writing). Fit male crimp terminals RSD4412 to the flying leads emanating from the supplied D-type connector. Provide 12VDC power (RED), ground (BLACK) and rpm signal (BLUE) to the gauge by means of the cable connectors removed from the original rpm gauge. While making these connections fit the supplied 220ohm ballast resistor across the rpm input and ground leads and protect with heat-shrink sleeving.
A supplementary fuse 1A slow-blow should be fitted in-line as the MTOS instrument panel’s circuit protection is 10A (Fuse F5)

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2.4. The other leads emanating from the D-connector are not used. Fold back and insulate with heat-shrink sleeving (+5VDCoutput (BROWN), Alarm lamp (WHITE)

2.5. 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. Seal the silicon tube to mating

2.6. If a MAP-1 gauge is used in combination with a 914UL turbocharged engine fit the manifold pressure placard adjacent to the combined gauge. If a conventional analogue gauge is used the coloured bands indicate the limitations. An RPM limits placard is fitted as below.

Combined digital gauge

Engine RPM
Max Cont.:
5,500
MAXIMUM
5,800

Max manifold pressure (take off):	39.9in Hg
Max continuous manifold pressure:	35.4in Hg

912ULS analogue gauge

914UL analogue gauge

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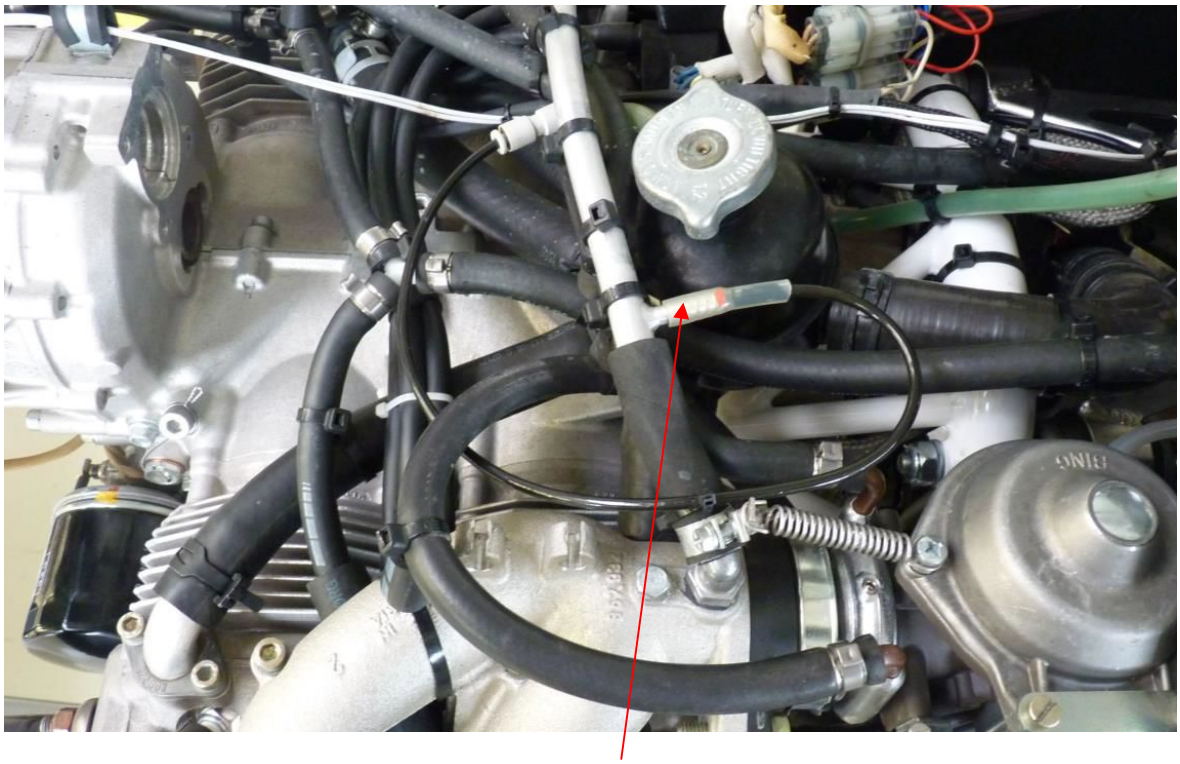
2.7. Working at the rear of the aircraft identify the pre-existing air pipe attached to the wiring loom. Remove the blanking screw fitted into the spigot of the carburettor balance pipe and using a short length of silicone tubing connect the air pipe to this spigot.
Secure the pipe with cable-ties.



Balance pipe pressure connection

2.8. The instrument panel should now be refitted and the equipment tested as required.

2.9. When the instrument panel is installed the MAP-1 gauge must be programmed to have the correct display format (Dual Pressure and RPM) and parameters;
Turn aircraft power on.
Press button once to activate the menu. Turning the knob scrolls down the main menu. ‘Done’ returns to main menu from a detail menu. ‘Exit’ exits the main menu.
Scroll to Hobbs. Turn off warnings.
Scroll to RPM. Set lwr warning off, upper warning at 5700. Set Pul/rev at 1.0.
Scroll to Pressure setup. Change units to “Hg

Full instructions are provided in the Operating Manual Section 4 Menu System.

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3. Removal of the HTC propeller

3.1. 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 surplus Loctite

Propeller mounting flange

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4. Assembly and fitment of the IVO-prop

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

• 912ULS engine:

From M.KU38 rear, total 2.4mm

From M.KU38front, total 5.7mm

or

• 914UL engine:

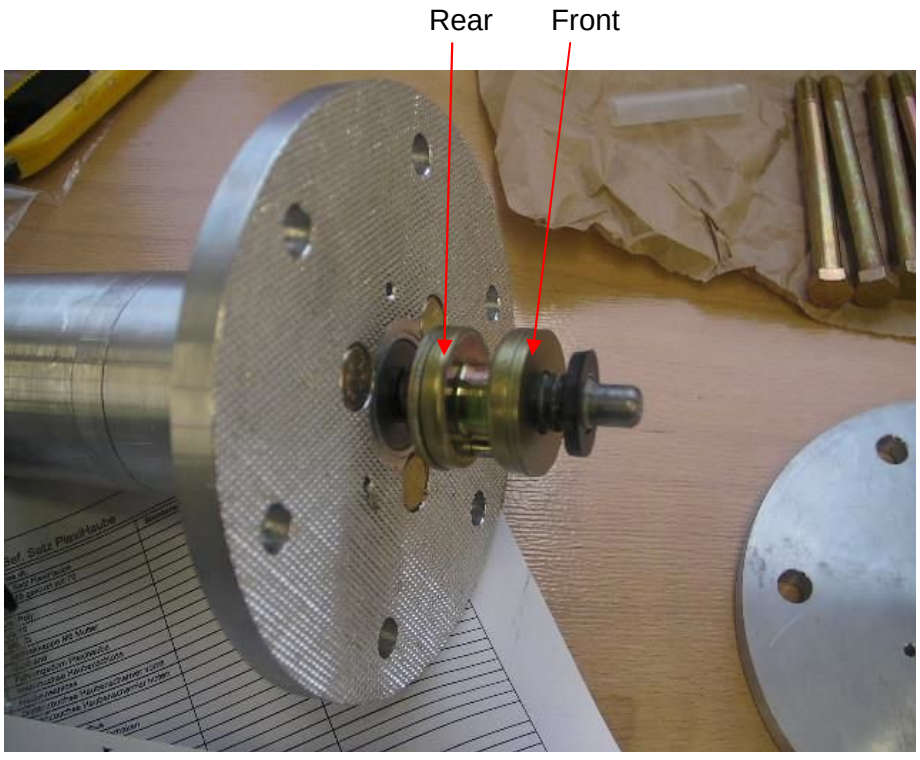
From M.MO23 rear (total 2.4mm)

From M.MO23 front (total 4.8mm)

Ensure that the two rubber cushion washers are in place.

Information: the large stack of washers originally fitted to the front is to limit the pitch to meet German noise regulations. It is the front washer stack that influences the FINE pitch setting

Record (at the end of this document) the height of each washer stack fitted



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4.2. Before proceeding to fit the blades, visually examine for any faults, bulges or nicks. If satisfactory then record (at the end of this document) the blade serial numbers/dates embossed (in reverse – rub through a piece of paper over the embossed area and look at the reverse paper side to see the code) and ink-marked on the root end of each blade:

4.3. 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.

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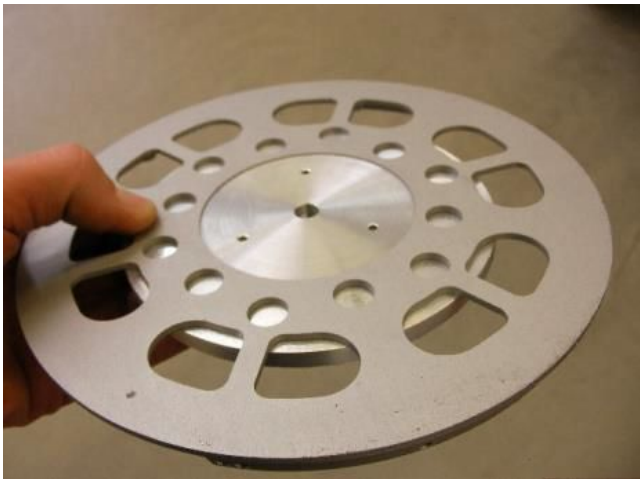
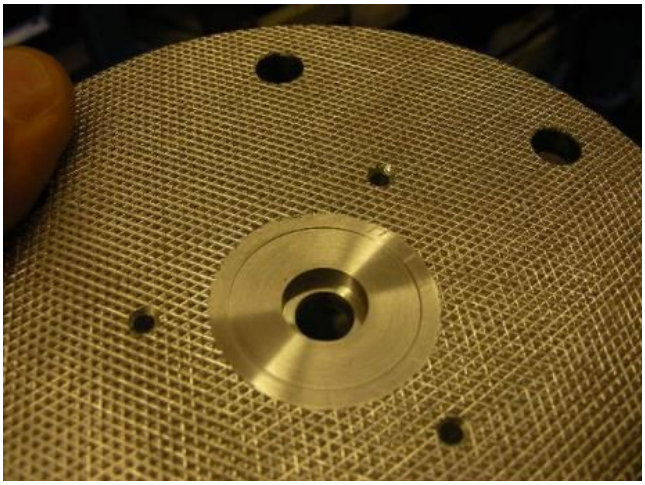
4.4. Fit the knurled clamping plate over the six protruding bolts, carefully pulling the two cables through the plate.

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





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4.6. Assemble the insulators and spacing plates in the order shown below

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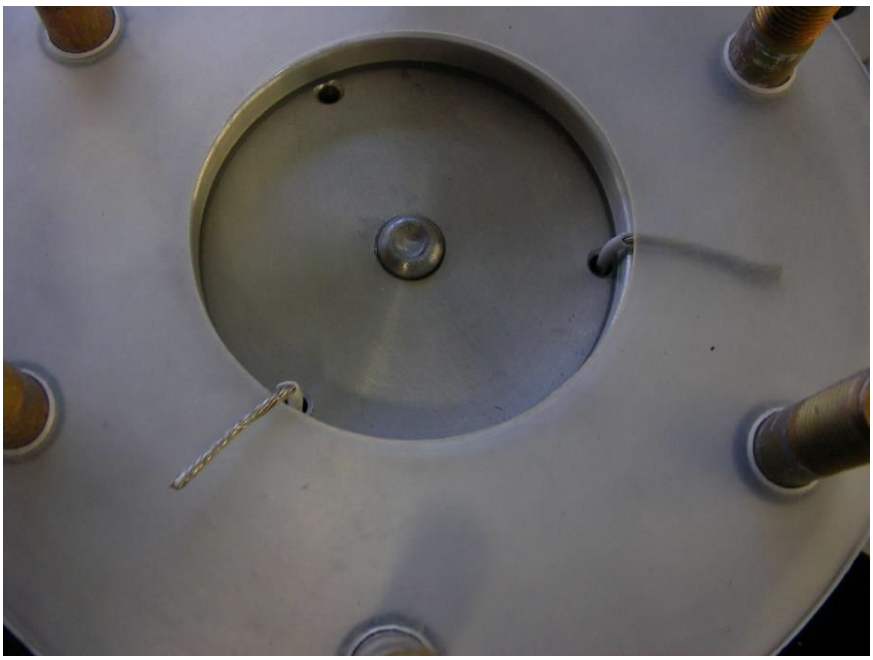
4.7. Fold over each of the cables so that one electrical cable connects to each plate:
NB: there is no solder or welding, electrical contact is made by the clamping pressure.



4.8. 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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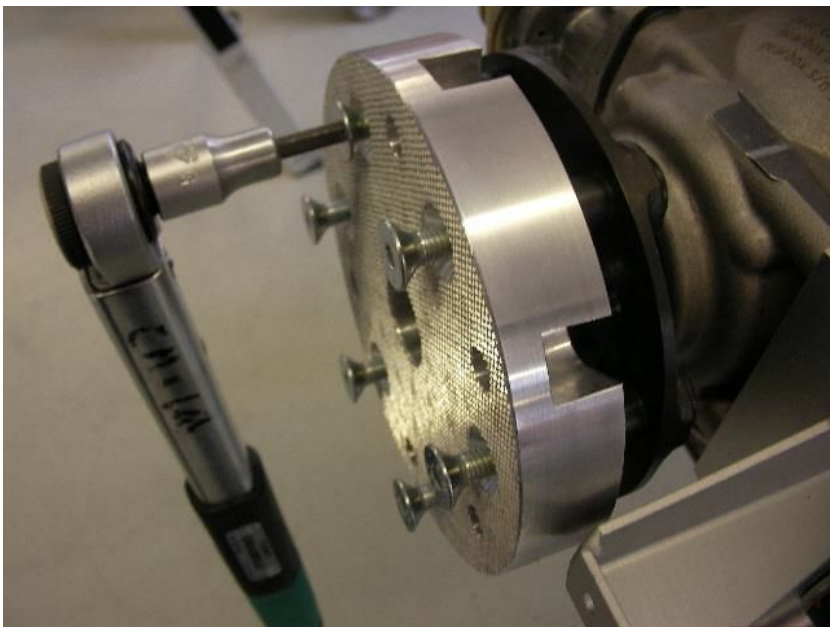
4.9. Install the adaptor plate on the engine using the M8 countersunk socket screws, Loctite 243 and torque (progressively) to 25Nm



4.10 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.
Note: Before fully tightening the bolts assess whether the nyloc nuts are “in safety” (i.e. minimum two visible threads protruding). If not so, then replace the six bolts with longer items RSD6401.

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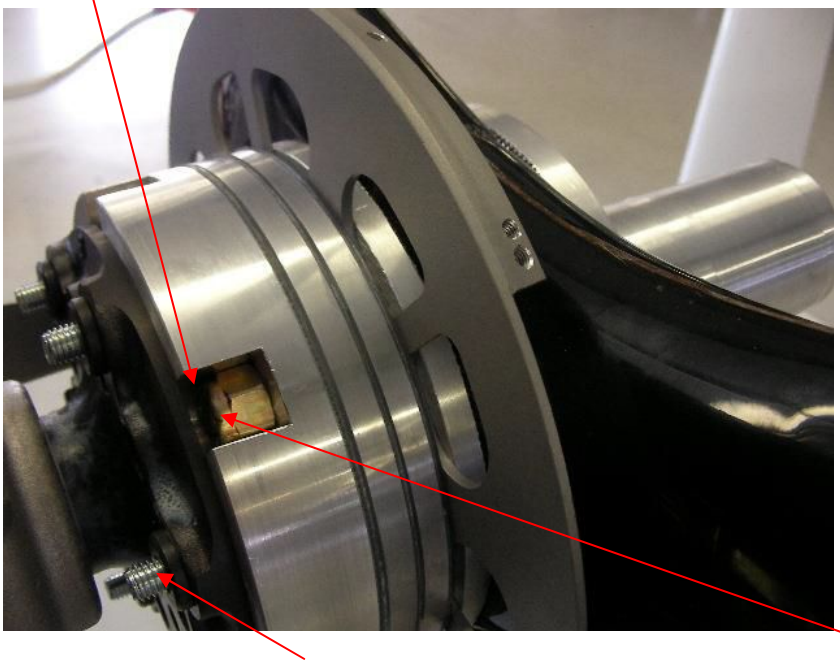
Check that there is adequate clearance between the end of each 3/8” bolt and the engine’s propeller flange (minimum 0.5mm)



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

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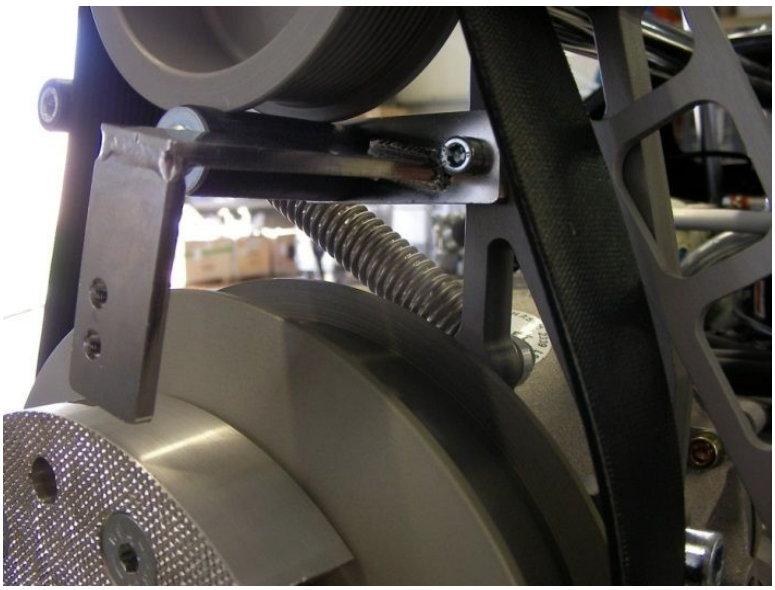
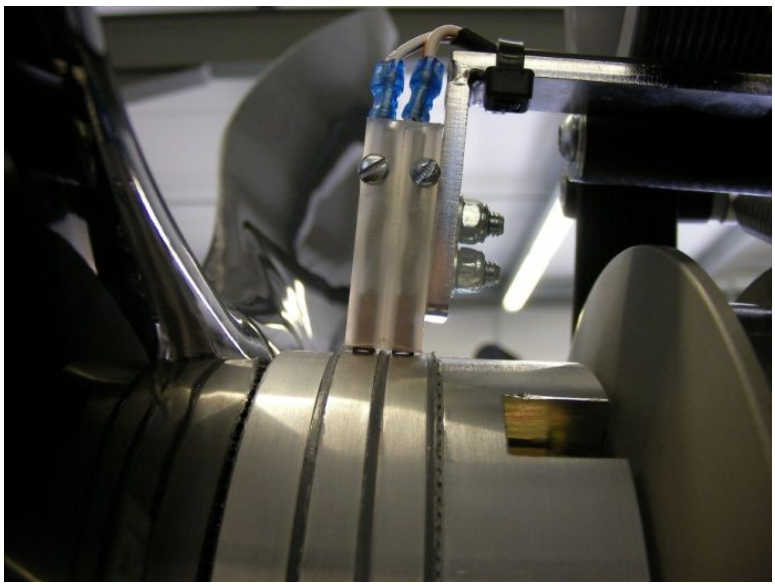
4.11. Install the brush holder as shown. Make sure that the brush housing has 0.5-1.5mm clearance to the contact discs/spacers





4.12. Identify the two spare cables tied-back above the engine and using 3/16” crimp terminals connect the two cables to the brush terminals.
Fit the special cable clip BT3535 to the gearbox casting and 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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4.13. Temporarily fit the spinner using the button-head socket screws and nylon washers. Mark the spinner/backing plate relationship.

4.14. Weigh the aircraft and arrange the issue of an AWC. Complete the aircraft's weight and balance placard accordingly.

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5. Ground test of the finished installation

5.1. Turn on the master switch and confirm that the MAP-1 is operative (if fitted)

5.2. 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

*** LEDs will turn off after a couple of seconds.

5.3. 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 (in fine pitch).
At an engine speed about 3000rpm cycle the propeller manually from fine to coarse stops and verify 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.

NOTE! If the rpm is over 5600 or less than 5400 then the fine pitch washer stack must be decreased or increased to suit. Record any changes in the document worksheet.

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5.4. If the digital engine rpm indication is erratic adjust the sensitivity of the MAP-1 gauge as described in the Operating Manual Section 9.2

6. Propeller balancing (if required)

6.1. 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 The MTOsport POH RSUK0043 issue 8

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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7.2. If operation is incorrect (particularly maximum rpm greater than 5,800rpm when climbing at full power in FINE pitch) then the pilot should return the aircraft for adjustment of the thrust washers.

Material information (Parts required to be made to implement this service bulletin):

The only parts manufactured during embodiment of this SB are small stand-off spacers made from scrap 6mm fuel hose (as required).

List of components (with purchasable part nos)

Parts required to perform process – *list batch or s/n for parts used*

Part no.	Iss	Description	Qty	Torque	Loctite	Special instructions/marking/locking	Batch no/serial
M.KU38 (BG535)	ND	Propeller assembly (including brush carrier)	1				
M.MO23 (BG504)	ND	Propeller mounting kit (including BG1178 fabricated brush bracket)	1				
M.KU53 (BG1316)	A000	Spinner	1				
M.MO29 (BG1483)	ND	Spinner installation kit	1				
M.EL302 (BG4762)	ND	End-position controller kit	1				
S.EL44 (BG1420)	ND	Analogue manifold pressure gauge for 912ULS engine, or	1			alternate	
S.EL43 (BG1419)	ND	Analogue manifold pressure gauges for 914UL engine, or	1			alternate	
RSD4806	ND	MAP-1 RPM/MAP gauge	1			alternate	
RSD4412	ND	Male connector	3			Only if MAP-1 used	
RSD4379	ND	Fuse holder	1			Only if MAP-1 used	
RSD4380	ND	1A fuse (glass)	1			Only if MAP-1 used	
RSD4852	ND	Rocker switch	1				
RSD6221	ND	M4 x 20 button head socket screw	4				
RSD6007	ND	M4 nyloc nut	4				
RSD4817	ND	Crimp terminal, male (red)	2			Alternatively RSD4818 crimp terminal, male (blue)	
RSD4656	ND	Heat-shrink sleeving (small)	a/r				
RSD4593	ND	Heat-shrink sleeving (large)	a/r				
RSD4438	ND	Silicone tubing	a/r				
None	ND	Stand-off spacers manufactured from 6mm fuel hose	a/r				
RSD6401	ND	3/8-24 AN6-40A hex-head bolt	6			If required for safe installation	

RotorSport UK Ltd Service Bulletin

Title: Retro-fit IVO-prop to MTOsport		
SB No.: 100 Iss1	**Related documents** MC No:318 CCAR No.: None	**Compliance Category:** **OPTIONAL** or ~~**RECOMMENDED or MANDATORY**~~
Applicability		
Aircraft type & model: **MTOsport**	**Aircraft serial Nos. affected:** **All**	

Interchangeability

Complete propellers are interchangeable, individual blades may be interchanged on a single propeller subject to availability and balancing limitations.

Parts disposition

a) Disposal requirements – the fixed-pitch HTC propeller (and spinner, if fitted) removed from the aircraft is normally retained by RSUK.
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.

Documentation (Service Bulletin Completion action)

a) Entries within the aircraft logbooks, eg CAA BCAR A3-7 Authorised Person (or equivalent) to certify that the work is completed by writing *'SB-100 IVO-prop.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 ot equivalent) together with their CAA (or equivalent) Authorisation number.

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

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

Document approval signatures			
Engineering Manager	**CVE (as required)** **Not required, MC-318 already approved.**	**Chief Test Pilot (if flight performance or safety effect)**	**Head of Airworthiness**
Gerry Speich Oct 21 2015 10:22 AM CoSign		Gerry Speich Oct 21 2015 10:22 AM CoSign	Andy Lyons Oct 21 2015 2:05 PM cosign

Service Bulletin implementation Worksheet

Aircraft type:	**Serial no:**	**G-**
Worksheet completed by:		**Document ref:**
Worksheet cross-checked by (if applicable):		**SB-100 Iss1**
Purpose – record service bulletin implementation actions taken to inspect aircraft and return to service.		
Maintenance manual referred-to and issue level/date:	MTOS - RSUK0043 Iss 8 of 28/09/15	

Note: attach SB sheets to this document

Task	Notes	Eng'r check/date	Inspector check/date
Record embossed serial number on blades:	Blade A Blade B Blade C		
Record code on blade ends:	Blade A Blade B Blade C		
Record serial number of MAP gauge			
Record serial number of end-position controller			
Fit and connect manifold pressure gauge, rocker switch, LEDs and end-position controller.			
If panel removed then verify correct function of barometric instruments when refitted			
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 relative to the propeller flange	Fine Coarse Blade A Blade B Blade C		
Balance propeller/fit IVO-spinner			
Flight test			

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. I confirm that no tools, equipment or debris have been left in the aircraft'***	
Engineer signature and date: CAA Authorisation code :	Location where work completed

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: AAN29247 Addendum 3	Service Bulletin number incorporated: SB-100 IVO-prop fitment to MTOsport

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 AAN29247 Addendum 3

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