

SB No.	A/C Models	Aviation	Details (Para)	Issue Date
1	B series	Factory Recommended	Replacement u/c fibreglass rods	01/03/85
2	B & B-D	Factory Mandatory	Replace foam intake filter with Rotax muffler MOD 008	23/03/86
3	B & B-D	Factory Mandatory	Test mainwheel axles for cracking	23/12/86
3a	B & B-D	Factory Recommended	Rotax 447 cooling shroud with internal deflector	01/06/87
4	B & B-D	Optional Fit	Rotax 447 redctn grbox,torsional shock absorber mods	17/07/87
5	B & B-D	Factory Recommended	Aileron control rod ends, remove, locktite 242e, refit etc.	03/12/87
6	B & B-D	Factory Recommended	Holes to assist air mass venting of wing outer 'D' boxes	01/03/88
7	All	Factory Recommended	White coloured upper surface of wings combat solar heating	21/05/90
8	All	Optional Fit	Alloy wheels	01/05/90
9	B,B-D,C,C-D,SS	Factory Recommended	Support for front hanger bracket. (Wing)	11/06/90
10	B/B-D,C/C-D,SS	Factory Recommended	Fore and aft wing movement,provision of pressure pads	06/11/90
11	All	Factory Recommended	Replace solid Morse elevator cable with multi-strand	01/09/95
12	All	CAA Mandatory	Rudder fin post,examination for cracks,replace or repair	14/07/98
13	All	Factory Recommended	Rudder pedal hinges,hinge pins found loose	03/04/01
14	All	CAA Mandatory	Cracking tailplane spar leading edge male spigot tubes	15/05/01

SERVICE BULLETINNO. 1DATE 1.3.85CFM METAL-FAX LTD CONSIDERSCOMPLIANCE - ~~Mandatory~~/Recommended/~~Optional~~
(delete which is not applicable)

<u>SUBJECT</u>	UNDERCARRIAGE FIBRE GLASS PULTRUSION ROD - 1" DIA.
<u>MODELS AFFECTED</u>	SHADOW SERIES B
<u>SERIES NOS. AFFECTED</u>	003, 004, 005, 006, 007.
<u>COMPLIANCE TIME</u>	AT YOUR CONVENIENCE
<u>PURPOSE</u>	TO REPLACE UNDERCARRIAGE FIBRE GLASS RODS, BOTH SIDES, WITH NEW MATERIAL.
<u>INSTRUCTIONS</u>	INSPECT BOTH RODS AT TOP AND BOTTOM ENDS ON EITHER SIDE FOR SIGNS OF DETERIORATION. DO NOT PLACE LOADS IN REAR COCKPIT UNTIL NEW RODS HAVE BEEN FITTED.
<u>MATERIAL REQUIRED</u>	AS SUPPLIED BY CFM METAL-FAX - TO INCLUDE ARALDITE.
<u>AVAILABILITY OF PARTS</u>	SUPPLIED FREE OF CHARGE AS SOON AS POSSIBLE.
<u>EFFECTIVITY DATE</u>	IMMEDIATE
<u>SUMMARY</u>	THERE HAS BEEN A FAILURE ON A/C SERIAL NO. 005 AT THE TOP END OF THE STBD GLASS FIBRE ROD, DUE TO THE SUPPLY OF SUB-STANDARD MATERIAL.
<u>NOTES</u>	DETAILED FITTING INSTRUCTIONS WILL BE SENT WITH NEW MATERIAL.

SERVICE BULLETINNO. 2DATE 23.3.86CFM METAL-FAX LTD CONSIDERSCOMPLIANCE - Mandatory/~~Recommended~~/~~Optional~~
(delete which is not applicable)

<u>SUBJECT</u>	MOD 008 - AIR INTAKE MUFFLER - PROPELLER PITCH CHANGE
<u>MODELS AFFECTED</u>	SHADOW SERIES B & B-D
<u>SERIES NOS. AFFECTED</u>	K016, K018, K020, K021, K022, K023, K027, 024, 026, 028, 029
<u>COMPLIANCE TIME</u>	APRIL 1st 1986
<u>PURPOSE</u>	TO CONFORM TO THE NOISE CERTIFICATION REQUIREMENTS INTRODUCED ON APRIL 1st 1986 - (SERIES NOISE CERTIFICATE 39M DATED 1 AUG 1986 REFERS).
<u>INSTRUCTIONS</u>	REPLACE FOAM AIR FILTER WITH ROTAX INTAKE MUFFLER. (SEE FITTING INSTRUCTIONS). REPLACE MAIN JET TO No. 155. FIT NEWTON PROPELLER 51" DIA. x 45" PITCH. UPDATE LOG BOOK, PILOTS NOTES, SERVICE MANUAL.
<u>MATERIAL REQUIRED</u>	ROTAX INTAKE MUFFLER NEWTON PROPELLER 51" DIA. x 45" P. MAIN JET No. 155
<u>AVAILABILITY OF PARTS</u>	STOCK OR 2 - 3 WEEKS
<u>EFFECTIVITY DATE</u>	APRIL 1st 1986
<u>SUMMARY</u>	AIRCRAFT PERFORMANCE UNCHANGED
<u>NOTES</u>	FOLLOW DETAILED FITTING NOTES

SERVICE BULLETIN NO. 2

FITTING INSTRUCTIONS

FITTING ROTAX AIR INTAKE MUFFLER

1. Remove other foam air filter.
2. Fit new intake muffler using jubilee clip with air filter facing forwards and horizontal.
3. Fit attached lanyard to nearest (Stbd) hanger tube bolt.
4. Wire lock air filter to muffler.
5. Fit main Jet No. 155.

LIST OF PARTS

PART NO.

- | | | |
|--|---|---------------|
| (1) Rotax Air Intake Muffler (complete with air filter and clip) |) | CM 70 |
| Plus wire lanyard/Tang-complete |) | |
| (1) Main Jet NO. 155 | | ROTAX NO. 155 |

FITTING PROPELLER

1. Remove existing propeller and fit NEWTON 51" ϕ x 45" Pitch. Ref. Service Manual for bolt torques, tracking and locking.

LIST OF PARTS

- | | |
|---|-------|
| (1) NEWTON propeller 51" ϕ x 45" pitch | CM 77 |
|---|-------|

23rd September, 1986

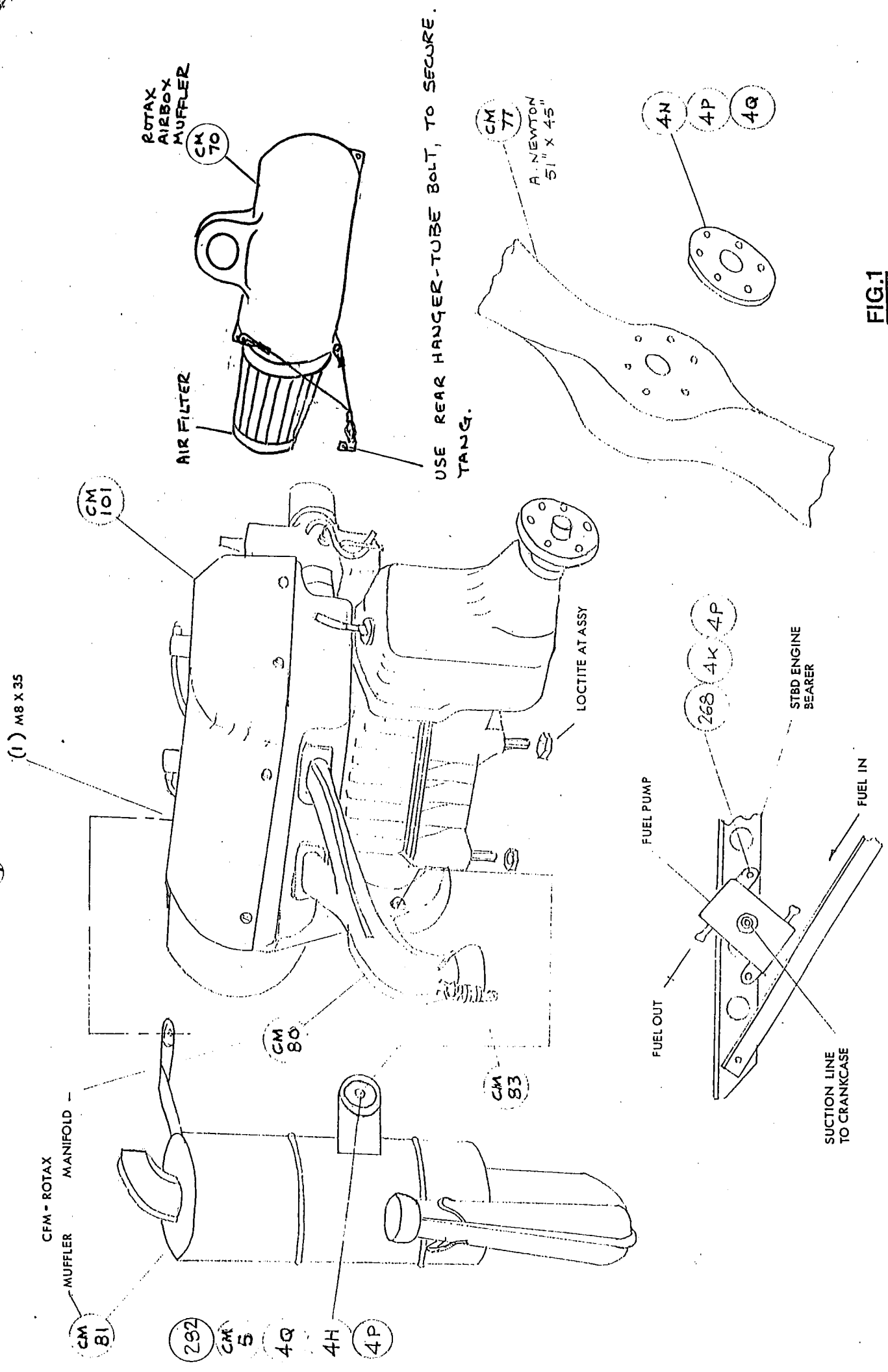


FIG.1

CFM METAL-FAX LTD
 CHANGE NOTE - SHADOW SERIES
 REF. B & B-D

ISSUE N° 008
 DATE 10-8-86

DRG MOD	PART N°	SPEC SECT	SPEC SHT	PRO. SHT ISS	DETAILS OF CHANGE	REMARKS
					<u>CHANGE DETAIL:</u>	
					REPLACE FOAM AIR INTAKE FILTER	
					ON CARBURETTOR OF ROTAX 447	
					ENGINE TO ROTAX AIR-BOX MUFFLER.	
					CHANGE MAIN JET TO N° 155	
					NOTE: THE ROTAX AIR BOX MUFFLER	
					IS A STANDARD OPTION OFFERED	
					BY ROTAX FOR FITTING TO	
					THE 447 UNIT.	
					NEWTON PROPELLER - PUSHER-CHANGED	
					FROM 51"φ x 44" PITCH TO 51"φ x 45" PITCH.	
					NOTE: PROPELLER MANUFACTURER REMAINS	
					THE SAME.	
					CONSTRUCTION, TYPE, STANDARD,	
					& PATTERN ARE IDENTICAL. ONLY	
					THE PITCH IS ALTERED.	

REASON FOR CHANGE:
 TO SUIT SOUND - NOISE REQUIREMENTS
 MOD. LEVEL: MINOR.

SIGNED:
J. COOK

SERVICE BULLETINNO. 3DATE 23.12.86CFM METAL-FAX LTD CONSIDERSCOMPLIANCE - Mandatory/~~Recommended~~/~~Optional~~
(delete which is not applicable)

<u>SUBJECT</u>	AXLE - MAINWHEELS
<u>MODELS AFFECTED</u>	SHADOW SERIES B & B-D
<u>SERIES NOS. AFFECTED</u>	K023, 024, 026, K027, 028, 029, 030, K031, K032, 033, K034, 035, 036, K037, K038, K039, 040, K041, K043, K044.
<u>COMPLIANCE TIME</u>	MANDATORY
<u>PURPOSE</u>	TO INSTRUCT OWNERS TO EFFECT A SIMPLE ETCHING TEST ON BOTH MAINWHEEL AXLES - WE HAVE EVIDENCE OF A FAILURE WHERE AN AXLE HAS CRACKED AT THE INNER END. FAULT IS POSSIBLE INCORRECT HEAT TREATMENT.
<u>INSTRUCTIONS</u>	SEE ATTACHED FOR DETAIL OF FIELD TEST INDICATOR
<u>MATERIAL REQUIRED</u>	SEE INSTRUCTIONS
<u>AVAILABILITY OF PARTS</u>	WILL BE EXCHANGED - THERE WILL BE SOME DELAY
<u>EFFECTIVITY DATE</u>	23 December, 1986
<u>SUMMARY</u>	EFFECT CHECK AS DIRECTED. IF SUSPECT RETURN COMPLETE UNDERCARRIAGE MINUS WHEELS AND BRAKE ASSEMBLY.
<u>NOTES</u>	PLEASE PHONE US WITH YOUR RESULTS. REFER TO SERVICE MANUAL FOR REMOVING THE UNDERCARRIAGE. COMPLETE COMPONENT WILL BE REPLACED FOC - excl. FREIGHT CHARGES IF A KIT VERSION (prefix 'K') - return axle assemblies LH & RH if not already glued up.

BULLETIN NO. 3

(GENERAL INSTRUCTIONS)

FIELD TEST. REMOVE MAINWHEELS. LIGHTLY REMOVE A 3/16" STRIP OF PLATING OVER ENTIRE AXLE LENGTH WITH 600 GRADE WET/DRY PAPER. REQUEST CHEMIST TO MAKE UP 100cc SOLUTION OF CONC. NITRIC ACID IN METHANOL - 5 PARTS ACID 95 PARTS METHANOL. TAKE SAFETY PRECAUTIONS. WITH COTTON WOOL LIGHTLY AND EVENLY WIPE ON OVER UNPLATED STRIP. IF SURFACE AREA OF STRIP APPEARS A DULL GREY ALL OVER THEN ITEM IS SERVICEABLE. IF SHINY - PROBABLY TOWARDS THE WELD - THEN ITEM IS SUSPECT - SEE FIG. 1. IF SO REMOVE COMPLETE UNDERCARRIAGE ASSEMBLY (SEE SERVICE MANUAL) AND RETURN TO CFM. IF NOT, GREASE UNPLATED AREA FOR PROTECTION.

FIG 1A

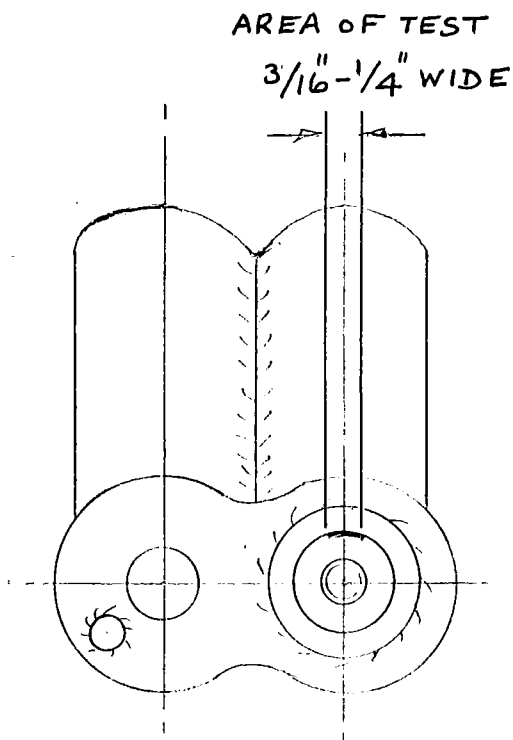
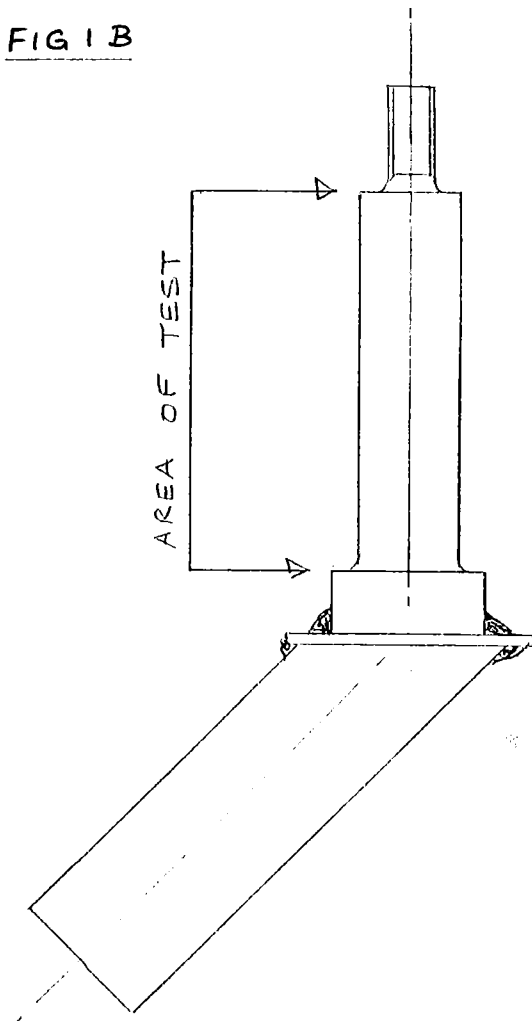


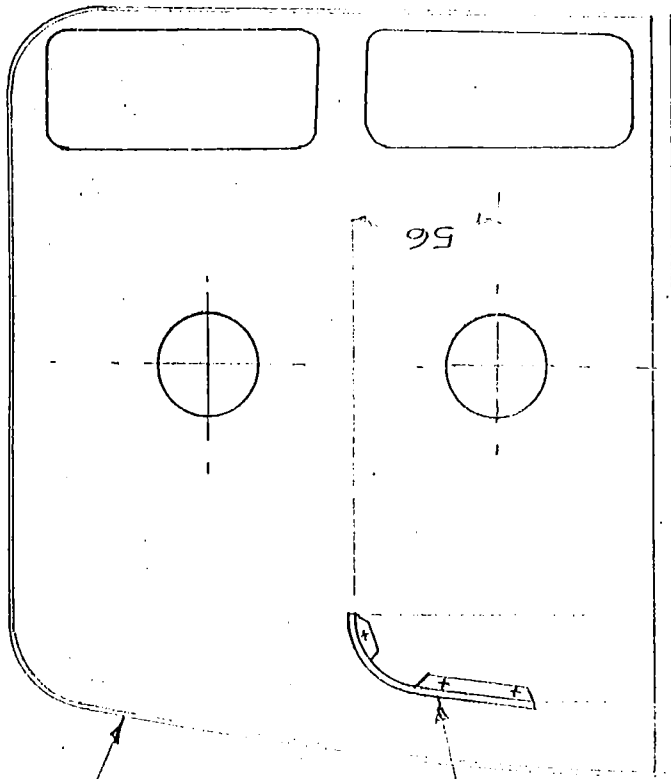
FIG 1B



SERVICE BULLETINNO. 3aDATE JUNE 87CFM METAL-FAX LTD CONSIDERSCOMPLIANCE - ~~Mandatory~~/Recommended/~~Optional~~
(delete which is not applicable)

<u>SUBJECT</u>	AIR GUIDE - COOLING SHROUD
<u>MODELS AFFECTED</u>	ALL SHADOW AIRCRAFT FITTED WITH ROTAX 447 ENGINE
<u>SERIES NOS. AFFECTED</u>	B and B-D
<u>COMPLIANCE TIME</u>	FIT AS SOON AS POSSIBLE
<u>PURPOSE</u>	TO REDUCE THE TEMPERATURE DIFFERENTIAL BETWEEN THE FRONT AND REAR CYLINDERS.
<u>INSTRUCTIONS</u>	STUDY DRAWING PROVIDED. ATTACH AIR GUIDE TO INSIDE OF UPPER COWLING WITH 1/8" DIA. POP RIVETS.
<u>MATERIAL REQUIRED</u>	ENCLOSED: (1) AIR GUIDE (3) 1/8" POP RIVETS
<u>AVAILABILITY OF PARTS</u>	EX. STOCK
<u>EFFECTIVITY DATE</u>	23rd JUNE 1987
<u>SUMMARY</u>	CFM METAL-FAX REPORTED TO ROTAX THAT THE FRONT CYLINDER HEAD TEMPERATURE EXCEEDED THEIR STATED LIMITS. ROTAX SIMULATED TRIALS WITH '447' AS FITTED TO THE SHADOW AIRCRAFT. THEY REPORTED THAT THERE IS NO INSTALLATION PROBLEM IN RESPECT OF THE REAR FUSELAGE WALL SHIELDING.
<u>NOTES</u>	ROTAX ADVISE THE FITMENT OF THIS AIR GUIDE TO REDUCE THE TEMPERATURE DIFFERENTIAL BETWEEN THE CYLINDER TO WITHIN LIMITS. PREVIOUSLY THE FRONT CYLINDER (MAG. END) WAS READING HIGHER THAN THE REAR CYLINDER (P.T.O. END).

TOP ENGINE
COWLING ROTAX
447



AIR DEFLECTOR
(E118) AFFIX WITH
(3) 1/8" DIA FOR RIVETS

78
124

REVISION	No.	DESCRIPTION	DATE
A	PROD	ISSUE	6/87

AIR DEFLECTOR ASSY
ROTAX 447 ENGINE COWLING

DRAWN	TRACED	CHECKED	APPROVED	DATE	SCALE
S&E				16-6-87	N.T.S

DRAWING No. E119

SERVICE BULLETINNO. 4DATE 17.7.87

CFM METAL-FAX LTD CONSIDERS

COMPLIANCE - ~~Mandatory/Recommended~~/Optional
(delete which is not applicable)

<u>SUBJECT</u>	UL - REDUCTION GEAR BOX - TORSIONAL SHOCK ABSORBER
<u>MODELS AFFECTED</u>	SHADOW B & B-D
<u>SERIES NOS. AFFECTED</u>	ALL SERIES AIRCRAFT FITTED WITH ROTAX 447
<u>COMPLIANCE TIME</u>	OPTIONAL
<u>PURPOSE</u>	SEE ROTAX SERVICE INFORMATION SHEET ATTACHED - 2 UL 87/E FEB 87.
<u>INSTRUCTIONS</u>	"
<u>MATERIAL REQUIRED</u>	"
<u>AVAILABILITY OF PARTS</u>	FROM CYCLONE HOVERCRAFT LTD.
<u>EFFECTIVITY DATE</u>	N/A
<u>SUMMARY</u>	
<u>NOTES</u>	

ch **CYCLONE HOVERCRAFT LTD.**

FOR



ROTAX **ENGINES**

Registered Office:
'BURNSIDE'
DEPPERS BRIDGE
LEAMINGTON SPA
CV33 0SU
TEL: (0926) 612188
FACSIMILE: (0926) 613781

14-7-87

RE - SERVICE INFORMATION 2UL 87/E

Rotax have made some amendments to the above Service Information Sheet which was sent to you recently. A copy of the latest issue dated May 1987 is enclosed. Could you please replace the original in your records with this amended version.

Circulation:

Microlight Manufacturers
CAA
PFA
Peter Lovegrove
Paul Owen
Dave Simpson
Mac Smith



UL-Reduction gear box, torsional shock absorber - Reduction gear
 Configuration with prop shaft in one piece

Preload setting of the 12 spring ass'y

execution with 4-dog hub

for engines 377, 447, 462, 503 and 532 for engines

edition: May 1987

1) Preface

1.1 In the course of further development of the gear-box for ultra-light engines, the 2-dog hub has been changed to 4-dog hub. In this context, also the dog gear has been modified.

ATTENTION:

- a) The 2-dog-hub can be replaced by the new 4-dog-hub 958 770, but not reverse.
- b) The dog gear used up to date has 8 bores of approx. 20 mm dia. These bores are eliminated on the new dog gear.
- c) Replacement for the old dog-gear (with 8 bores) is the new dog gear together with 4-dog-hub.
- d) The axial distance dimension for spring pre-load has changed for the new version (see ill. 1 and 4).
- e) The oil slinger fitted together with the drive gear is eliminated (can be left off also on former models).

1.2 Due to wear on components of the torsional shock absorber in the UL-reduction gear box, an occasional check and correction on the pre-load setting of the spring pack has to be carried out.

1.3 At a conversion to the 12 spring configuration, a new initial preload setting is necessary. This conversion requires the use of a prop shaft execution with marking groove (C) on shaft flange (see ill. 1).

2) Procedure

2.1 Disassembly

2.11 Drain oil.

2.12 Withdraw gear box from engine after removal of 4 hex. nuts M8 (item 31).

2.13 Remove 2 hex. nuts M8 (item 31a) and push off gearbox cover (item 16) using 2 M6 screws (part no. 241 875) together with the assigned tapped holes in the cover.



- 2.14 Pull off ball bearing (item 8) from prop shaft.
- 2.15 Place gearbox under hand press (see Ill. 2) and apply pressure via mounting yoke (part no. 876 880) on the dog gear (item 26) until ring halves (item 29) become free and can be taken off.

C a u t i o n : Load must not exceed 16000 N (3600 lbs) otherwise dog gear might be damaged.

- 2.16 Withdraw angular ring, 2 thrust washers 0,8 mm thick, dog gear, 4-dog hub, disk springs, distance ring and shims (item 28, 27, 26, 25, 24, 23, 22) from the prop shaft.

2.2 Checking

- 2.21 Clean all parts and check for wear. Examine carefully the groove in the prop shaft for the ring halves (see **(D)**, Ill. 3). REMOVE any burr at edges ensuring that outer shoulder is straight cut. If any doubt exists replace shaft.

2.3 Exchange of the respective parts for conversion from 8 to 12 spring configuration

- 2.31 Exchange the 13,7 long distance sleeve (part no. 847 505) for a 4,5 mm thick distance ring, part no. 847 620 (item 23), with one side tapered. To ease recognition of the tapered side see marking groove **(B)** Ill. 3.

- 2.32 Exchange the 8 existing springs for 12 new ones (part no. 939 020, item 24). When converting fairly new gear boxes, the existing springs (2 mm thickness) may be continued for use. Use 50 hrs as a guideline.

- 2.33 Use shims as required after determination of preload with sizes from 0,1 - 0,2 - 0,3 - 0,5 up to 1,0 mm (part no. 944 474, 944 470, 944 471, 944 472, 944 473) at location 22 (see para. 2.4 below, also **(E)** Ill. 4).

- 2.34 2 thrust washers 0,8 mm thick, 944 469, have to be placed between dog gear and angular ring (item 27).

- 2.35 Renew prop shaft (837 025) in case of excessive wear.

2.4 Determination of the proper preload setting of the springs

- 2.41 Assemble the distance ring (item 23) with the tapered side (marking groove **(B)**) towards springs, 12-spring pack (item 24, also **(F)**, Ill. 4), the 4-dog hub (item 25), dog gear (item 26) and the 2 thrust washers 0,8 mm (item 27). Don't yet place any shims (item 22) in position (see Ill. 3).

A t t e n t i o n : Fit disk springs together in pairs, according to illustr. 4 **(F)**.



- 3 -

- 2.42 Place gearbox under handpress (see illustr. 2) with mounting yoke (part no. 876 880) over dog gear (item 26). Do not use motorized press.
- 2.43 Place angular ring (item 28) upside down on the prop shaft (see illustr. 3) to facilitate reading of the distance (A).
- 2.44 Apply 16000 N (3600 lbs) via the yoke, so that springs will be completely compressed (to a block).

C a u t i o n : Don't exceed 16000 N (3600 lbs) otherwise dog gear might be damaged.

- 2.45 At this completely compressed state, the distance between upper side of angular ring to lower edge of groove has to be measured. (see ill. 3). Add appropriate shims between angular ring and dog gear face until bottom is flush with inside groove (D).

- 2.46 Release the load and compensate the determined distance (A) with shims (item 22) between distance ring (item 23) and bearing (item 20).

Shims are available in the sizes 0,1 - 0,2 - 0,3 - 0,5 and 1,0 mm (see 2.33).

2.5 Reassembly of the gear box

- 2.51 Fit the shims determined according to para 2.45, the distance ring with the marking groove (B) on top and the 12 springs to prop shaft. Apply gear lub to all springs prior to ass'y.

To prevent metal galling, apply LOCTITE Antiseize at specified positions (item 42) to prop shaft and to dog gear, 4-dog hub and the 2 thrust washers, 0,8 mm thick, (item 27) prior to assembly (see ill. 1 and 4).

- 2.52 Place angular ring to prop shaft with open end upside and coat mating side with LOCTITE Antiseize (see illustr. 4).

- 2.53 Apply load, in the already described manner, to dog gear until insertion of the ring halves (item 29) into groove in prop shaft is possible. Pull angular ring over ring halves before releasing load.

Don't exceed 16000 N (3600 lbs) load.

A t t e n t i o n : Take care for proper position of the ring halves in groove and angular ring.

- 2.54 To ease fitting of bearing (item 8) heat up gear housing to appr. 80 degrees Celsius. Insert both aligning dowels (item 10) renew gasket (item 11) fit gear cover ass'y to gear housing. Hand tighten hex. nuts M8 (item 31a).

N o t e : If bearing (item 8) fits too loose in gear housing, degrease and apply LOCTITE 648 on outer ring of bearing.



Re-fitting of gear box ass'y to engine

- 3.1 Check adapter (item 2) for tight fit and cracks. If need be, tighten M10 Allen head screws to 38 - 42 Nm (340 - 370 in. lbs) using LOCTITE 221 on threads and LOCTITE 648 under screw head.

N o t e : When loosening or tightening Allen head screws, always use proper Allen head spanner with guide-pin, e.g. Rotax part no. 277 817.

Renew O-ring seal (item 1) in case adapter has been taken off.

- 3.2 Check drive gear (item 12) for wear and damage. If replacement required install lock pin in impulse hole and turn crankshaft slowly until pin engages. Remove 1/2" U.N.F. bolt (standard right hand thread). Clean all mating surfaces well and reassemble with LOCTITE 221 on thread and torque to 60 Nm (530 in. lbs).
- 3.3 Apply Loctite 648 to mating surfaces between gear housing and adaptor, place new O-ring seal (item 6) in position, fit gear-box ass'y to already fitted adaptor and studs and tighten the 4 hex. nuts M8 (item 31).

Torque all M8 nuts to 20 - 24 Nm (180 - 210 in lbs).

- 3.4 Thoroughly clean and refit magnetic plug M18x1,5 (if so equipped).
- 3.5 Fill gear box with oil up to lower level plug.
- Use only quality gear box oil. e.g. API-GL5 or GL6.
- 3.6 Check breather hole in vent cap and replace.
- 3.7 Lock wire all plugs.

MEMBER: SIUL87E
Febr. 87



ILL. 1

