Ministry of Defence

Defence Equipment and Support
Secretariat
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[redacted]

Our Reference:
FOI2023/04464
Date:
3 May 2023

Dear [redacted]

Thank you for your email of 3 April 2023 requesting the following information:

'I would ask that my original request be limited from "any information" to the following categories:

- **Trial reports;**
- **Release To Service documents;**
- **Modification clearance documentation;**
- **Modification Leaflet(s);**
- **Technical Instructions.'**

Your original request was submitted under the Freedom of Information Act 2000 (FOIA) reference 03848 as follows:

'I am seeking any information regarding the UK MoDs or UK Royal Navy's approval of the Carson Composite Blades for the Sea King Helicopters used in Afghanistan. Along with any installation or use approvals issues by UK MoD or Royal Navy, I would request any performance charts published or used with the blades.'

I am treating your correspondence as a request for information under the FOIA.

A search for the information has now been completed within the Ministry of Defence (MOD), and I confirm that some of the information in scope of your request is held.

However, some of the service modification and trial reports in question have been provided to the MOD by a third party in circumstances where disclosure to others would constitute an actionable breach of confidence. The information is therefore exempt under section 41 of the Freedom of Information Act 2000 (the exemption for information provided in confidence).
This is an absolute exemption and the public interest does not apply.

Some of the information requested under Technical Instructions has already been published and under Section 21 of the FOIA (information accessible to applicant by other means), links are provided below to the Sea King Mk 4 Flight Reference Cards and Aircrew Manual:

https://www.whatdotheyknow.com/request/585518/response/1418957/attach/5/Mk4%20Sea%20King.pdf?cookie_passthrough=1

https://www.whatdotheyknow.com/request/585518/response/1418957/attach/6/Mk4%20Aircrew%20Manual.pdf?cookie_passthrough=1

Please note Pages 97 to 100 of the Aircrew Manual refer to Advance Information Leaflet 2/10, Carson Main Rotor Blades and Five Bladed Tail Rotor.

Attached is the following:

- Sea King ASaC Mk7/0087 Service Modification Introduction of Carson Main Rotor Blades;
- Sea King Mk4 0030 Service Modification Introduction of Carson Main Rotor Blades;
- Sea King Mk4 Release to Service, Issue 2. Extract of Carson Main Rotor Blades.

Under Section 16 of the FOI Act (advice and assistance), we can advise that the Carson Main Rotor Blade fit was cleared for both the Sea King HC Mk 4 & ASaC Mk 7.

If you have any queries regarding the content of this letter, please contact this office in the first instance. If you wish to complain about the handling of your request, or the content of this response, you can request an independent internal review by contacting the Information Rights Compliance team, Ground Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail CIO-FOI-IR@mod.gov.uk). Please note that any request for an internal review should be made within 40 working days of the date of this response.

If you remain dissatisfied following an internal review, you may raise your complaint directly to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not normally investigate your case until the MOD internal review process has been completed. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website at https://ico.org.uk/.

Yours sincerely,

DE&S Secretariat

B3.11 SM/SK/0030 Carson Main Rotor Blades and 5 Bladed Tail Rotor

The aircraft fitted with SM/SK/0030 is cleared to operate throughout the modified flight envelope detailed at Figs B3.4, B3.5 and B3.6 below, subject to the following limitations, warnings, caution and advice to aircrew.

B3.11.1 **Limitations:**

B3.11.1.1 Aircraft operation is limited to the flight envelopes given in Figs B3.4, B3.5 and B3.6.

WARNINGS:

1. AT HIGH AIRSPEED, THE AIRCRAFT RESPONSE FOLLOWING AN ASE RUNAWAY IN THE PITCH CHANNEL COULD BE SEVERE, PARTICULARLY AT HIGH DENSITY ALTITUDE, AND MAY RESULT IN UP TO 400 FT BEING LOST BEFORE RECOVERY IS ESTABLISHED.

2. IN THE EVENT OF PITCH RUNAWAY, THE SEVERITY OF THE RESPONSE MAY ALSO BE INCREASED IF THE NULL INDICATORS ARE OFF TRIM.

B3.11.1.2 A maximum aircraft operating pressure altitude limit of 10,000 ft is to be observed. This maximum altitude may be reduced by the maximum permitted density altitude limits in Figs B3.4, B3.5 and B3.6.

B3.11.1.3 Launch and recovery is limited to 10,000 ft density altitude and below.

B3.11.1.4 The maximum airspeeds, density altitudes and AoB for visual flight conditions are given in Figs B3.4, B3.5 and B3.6.

B3.11.1.5 The normal rotor engagement torque of 40% – 60% should be used, however if greater than 90% per ECU is used then the Carson MRBs are rendered unserviceable.

B3.11.1.6 During shutdown, the Rotor Brake must be applied gently and at a maximum of 45% Nr, except in an emergency. If the MRH is stopped from greater than 45% Nr or from less than 45% Nr in less than 2 seconds the Carson MRBs are rendered unserviceable.

B3.11.1.7 Single engine ground running (rotor folded):

a. Wind speeds below 5 mph: - Single engine ground running of more than 20 minutes is prohibited.

b. Wind speeds above 5 mph: - Single engine ground running must be minimised and is not to exceed 5 minutes with winds between RED 150 through ahead to GREEN 020. The 20 minute limit is to be observed for all other wind directions.

Note: *Hot exhaust efflux from the ECU can impinge on the No.4 MRB in the folded position, causing damage to the composite blade material.*

B3.11.1.8 Flight in snow conditions is permitted within the limitations indicated in Fig B3.7.

B3.11.1.9 When ground running, in engine icing conditions (down to 0 °C), a minimum compressor speed of 78% Ng is to be maintained in accessory drive. With rotors engaged, the minimum compressor speed is to be 80% Ng.

B3.11.1.10 Flight in airframe icing conditions is prohibited, however, if icing conditions are inadvertently encountered, the following must be observed:

a. The condition must be vacated immediately.

b. Gentle manoeuvres only should be undertaken and abrupt control inputs must be avoided.

c. The Maximum IAS is 100 knots or 15 knots below the appropriate IMC envelope, whichever is lower.

B3.11.1.11 Rotors running operations on the ground are not permitted in airframe icing conditions

B3.11.1.12 The C of G position is limited to a maximum of 3 inches forward of the datum.

WARNING: THE AIRCRAFT HAS A TENDENCY TO PITCH NOSE DOWN WHEN COLLECTIVE PITCH IS APPLIED ON THE GROUND. WHEN OPERATING AT HIGH DENSITY ALTITUDE AND FORWARD C OF G POSITION, THIS NOSE DOWN PITCH IS SIGNIFICANT DURING RUNNING TAKE OFFS AND GROUND TAXIING.

B3.11.1.13 The aircraft is not cleared for parachuting or light supply dropping.

B3.11.1.14 The 'Forth Road Bridge' MRB restraint equipment is incompatible with Carson MRBs and should not be fitted.

B3.11.1.15 The AOA is to ensure that all aircrew operating Carson modified aircraft have read this clearance and have undergone AIR 366 'Commando Aircrew Sea King Mk 4 (plus)/ Carson Main Rotor Blade and 5 Blade Tail Rotor Conversion'. The AOA must also ensure that all aircrew that have operated the 'Carson Modified Sea King Mk 4', reverting to operate conventional Sea King Mk 4 aircraft, are subject to a process which re-familiarises them with conventional MRB aircraft.

B3.11.1.16 All flight planning must be conducted iaw Figs B3.4, B3.5, B3.6 and the ODM Rapid Planning Data.

B3.11.1.17 The carriage of external freight is permitted only within the flight envelopes detailed at Figs B3.1 and B3.2 of this RTS. The limitations detailed at Para D1 of this RTS must also be observed.

B3.11.1.18 Operations from ships is prohibited

B3.11.1.19 Rates of descent greater than 300 ft/min with power applied are prohibited at low airspeed (less than 30 knots)

B3.11.2 **Advice to Aircrew:**

B3.11.2.1 In autorotation at high Nr, the maximum airspeed may be further reduced by the limitations defined in Fig B3.5.

Fig B3.4 – SM/SK/0030 Carson Main Rotor Blades and 5 Bladed Tail Rotor - Normal Visual Flight Envelope 103% RRPM

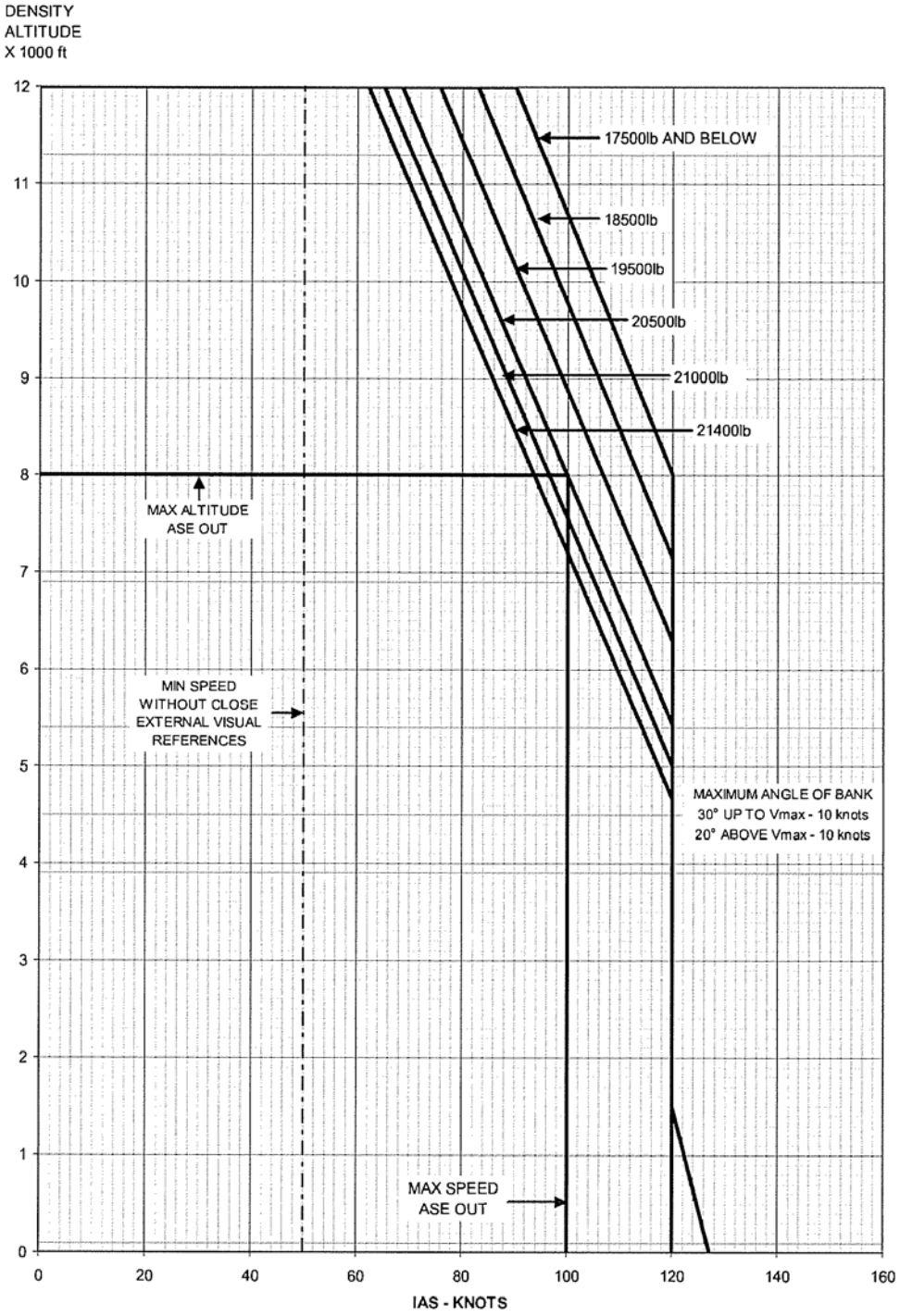


Fig B3.5 – SM/SK/0030 Carson Main Rotor Blades and 5 Bladed Tail Rotor – Maximum Airspeed at High Nr

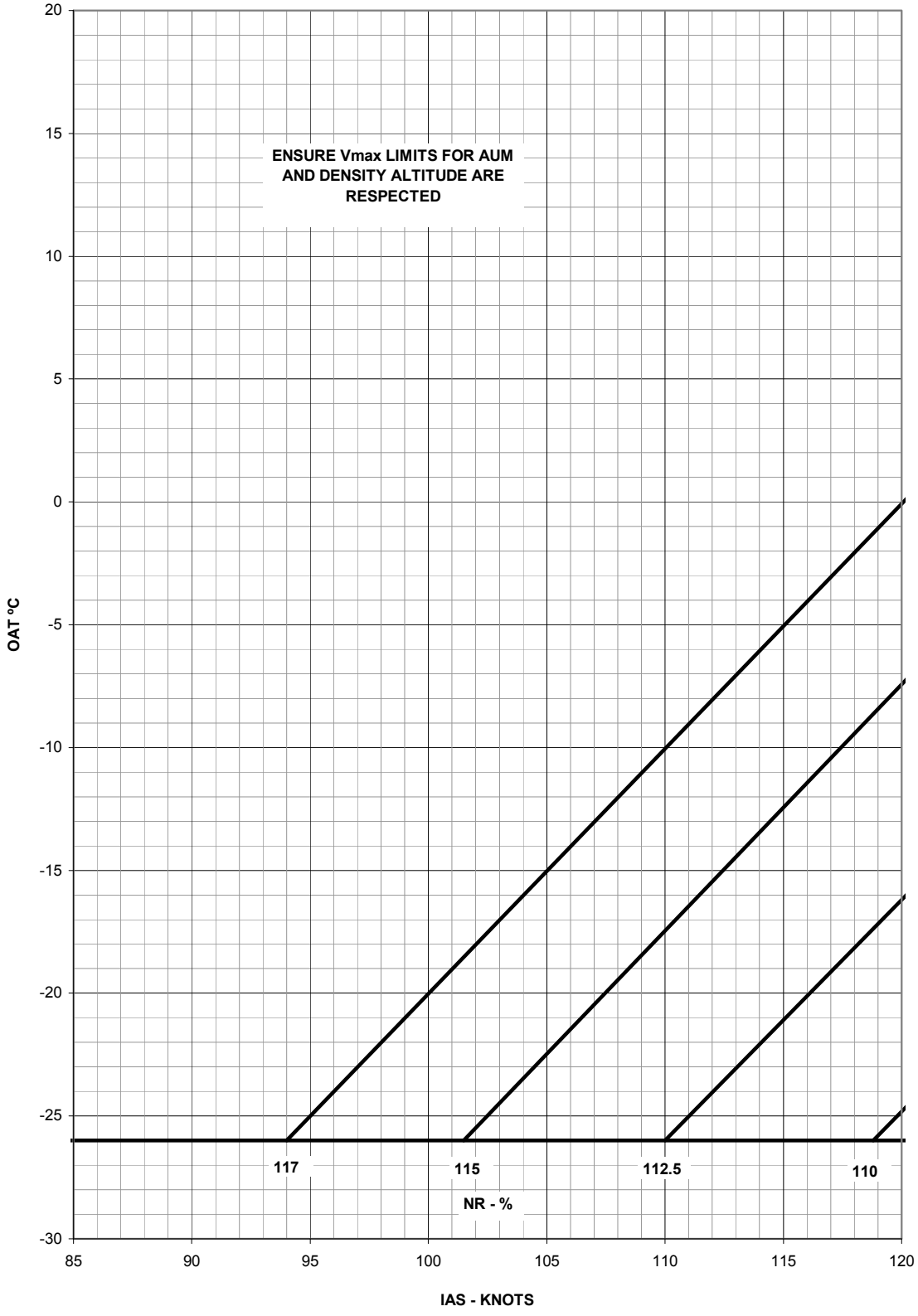
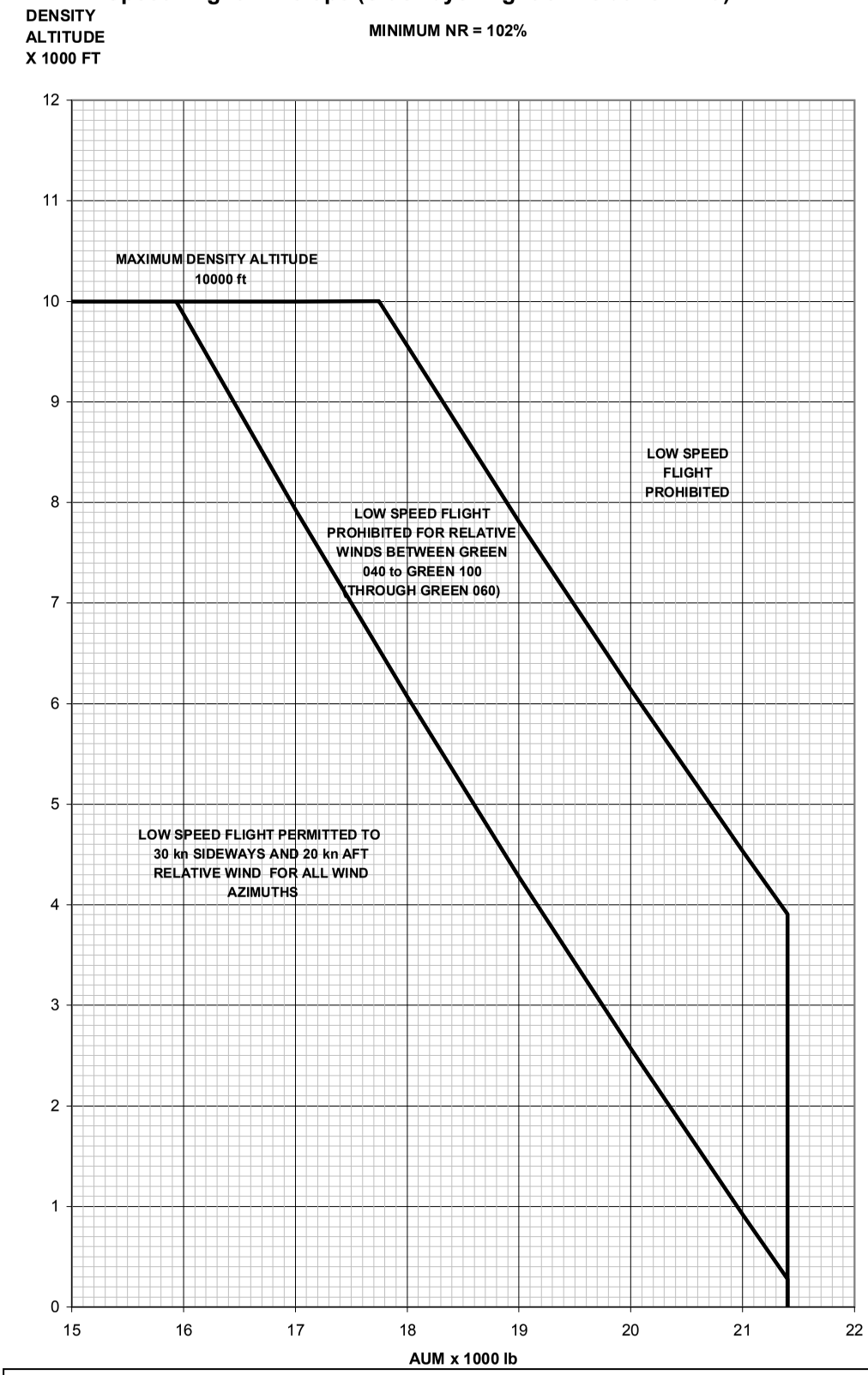


Fig B3.6 – SM/SK/0030 Carson Main Rotor Blades and 5 Bladed Tail Rotor - Low Speed Flight Envelope (Sideways Flight or Relative Wind)



Note: For density altitudes below zero use zero altitude values.

Fig B3.7 – SM/SK/0030 Carson Main Rotor Blades and 5 Bladed Tail Rotor - Flight in Snow Conditions

Condition	Centrisep Intake Fitted (Mods 5096/5567)	FOD Shield Fitted (Mods 5072/5077/5505)	Neither Centrisep Intake nor FOD Shield Fitted
General	1 Prior to engine starting it must be ascertained that the Centrisep plenum chamber is free from ice and snow accretion. If the aircraft has been flown in snow (precipitating or recirculating) or parked in precipitation or blowing snow since the last inspection, a further inspection must be made. All ice and snow accretions must be removed.	1 If an engine is shut down during turn round, the intake area is to be carefully inspected and any accretions found are to be removed before engine restart. 2 External rear view mirrors. If ice or slush is seen to build up on the support tubes or on the forward face of the mirrors and descent is to be made into air at positive temperature, the accretion should be cleared. Manual removal of the accretion is to be made with the gloved hand whilst maintaining level flight and the aircraft speed as high as possible to minimise the risk of ice/slush entering the engine air intakes.	Not Applicable
Release Conditions	1 Windscreen and pitot tube anti-icing must be selected ON. Pitot mast anti-icing is not required.	1 Windscreen, pitot and engine bay door heating must be ON. 2 Fluid anti-icing should be used if available.	Not.Applicable
	1. Flight when freezing rain or drizzle is present or forecast in the intended area of operation is prohibited. If encountered the condition must be vacated immediately.		Not Applicable
Operation in Precipitating And Recirculating Snow – General Limitations	1 Minimum OAT is -26°C true. 2 Normal maximum AUM and IAS limits apply. ***Note:*** *Pitot mast heating is not required.* 3 The engine anti-icing requirements of Part B1.4 are applicable. The pitot tube anti-icing must be selected ON.	1 Minimum OAT is -10°C true. 2 Normal AUM and IAS limits apply. 3 The following modifications are essential: 363, 366, 493, 508, 557, 5072/5077 and 5505. 4 The engine anti-icing limitations contained in Part B1.4 must be observed and the engine bay door heaters must be switched ON. 5 The FOD shield fluid anti-icing system is normally to be selected OFF. If slush is observed building up on the FOD shield the system may be selected ON briefly at airspeeds greater than 60 knots. This will assist shedding and maintain the slush in a soft state. Below 60 knots the TKS system MUST NOT be used. Flying into colder air between encounter and landing is to be avoided. 6 Engine starting is not to be attempted, nor sorties commenced in precipitating snow with visibility below 500 m.	Not Applicable

<table>
<tr><th>Condition</th><th>Centrisep Intake Fitted (Mods 5096/5567)</th><th>FOD Shield Fitted (Mods 5072/5077/5505)</th><th>Neither Centrisep Intake nor FOD Shield Fitted</th></tr>
<tr><td>Precipitating Snow Limitations</td><td>
1. Ground running, taxying, hovering IGE or OGE and forward flight in snow is permitted, by day or night, in visual contact conditions only. The limitations that apply are summarised in the Table below.
<table>
<tr><th>VISIBILITY</th><th>OAT Warmer than -3°C</th><th>OAT -3°C to -6°C</th><th>OAT Colder than -6°C</th></tr>
<tr><td>Less than 500 m</td><td>10 minutes</td><td>10 minutes</td><td>Unlimited</td></tr>
<tr><td>500 m to 2000 m</td><td>30 minutes</td><td>60 minutes</td><td>Unlimited</td></tr>
<tr><td>Greater than 2000m</td><td>Unlimited</td><td>Unlimited</td><td>Unlimited</td></tr>
</table>
Notes:
(1) Time accrued in the 'unlimited' areas does not affect cumulative time limits in other visibility/OAT bands.
(2) If a change of OAT or visibility band occurs, the most stringent time limit applies.

2. When the visibility is greater than 2,000m, regardless of the OAT, no time limits apply.
3. When the OAT is colder than -6°C, no visibility or time limits apply.
4. When the visibility due to the presence of snow is in the range 500 m to 2,000 m, the following cumulative time limits apply:
4.1. OAT warmer than -3°C, 30 minutes per sortie.
4.2. OAT -3°C to -6°C, 60 minutes per sortie.
5. When the visibility is below 500 m and the OAT is -6°C or warmer, a cumulative time limit of 10 minutes per sortie is permitted.
</td><td>
1 Ground running, taxying, hovering IGE or OGE and forward flight in snow is permitted, by day or night, in visual contact conditions only.
2 Flight in snow with visibility below 500 m is to be avoided. If such severe weather is encountered, the conditions are to be vacated as soon as possible with a minimum recommended airspeed of 60 knots.
3 If precipitating snow is encountered with visibility below 500 m, the cumulative time spent at airspeeds below 60 knots (covering hovering in any wind strength) must not exceed 15 minutes per flight. If recirculating snow is also present the time limit is 10 minutes.
</td><td>When the FOD shield or Centrisep intake is removed, flight with precipitating snow present or forecast within the effective operation area is prohibited.</td></tr>
<tr><td>Recirculating Snow Limitations</td><td>1. No limitations are applicable to operations in recirculating snow.</td><td>1 Taxying, hovering, take-off and landing are permitted but are to be kept to the shortest time to achieve the sorties objectives; this is not to exceed 10 minutes per sortie.</td><td>1 Taxying over lying snow is permitted provided the recirculation does not enter the engine intake.
2 Hover over lying snow and in the recirculation thereof is permitted as necessary for take-off, landing and pick-up or release of external stores for a maximum time of 1 minute.</td></tr>
</table>

SM/SEA KING/0030
INTRODUCTION OF CARSON MAIN ROTOR BLADES

APPLICABILITY

Sea King HC Mk 4

INTRODUCTION

(1) This Service Modification (SM) introduces a set of new Rotor Blades (Pt No 163-101-901G) to the Mk 4 Sea King. The Carson Rotor Blades allow for an increase in airspeed of the helicopter, an increase in lift and an increase in payload. As a further requirement with the introduction of the Carson Main Rotor Blades a new Tail Rotor Assembly (Pt No WD-4239-00001-013) must be fitted.

(2) This SM is only applicable to aircraft of the following build standard:

— General arrangement 550 (WD0400-00001-041) to "Y" standard 4Y1

— General arrangement 550 (WD0400-00001-041) to "Y" standard 4Y2

— General arrangement 550 (WD0400-00001-041) to "Y" standard 4Y3

— General arrangement 550 (WD0400-00001-041) to "Y" standard 4Y4.

(2) This SM is only applicable if the following modifications are embodied. The following modifications are pre-requisites and must have been carried out prior to the embodiment of this Service Modification:

— Mod 686 - Rear fuselage aerodynamic strake

— Mod 781 - Introduction of Rolls Royce Gnome H1400-1T engine

— Mod 894 - Countersunk washer for main rotor head blade securing bolts

— Mod 1278 - Tail rotor gearbox changes

— Mod 5096 - Introduction of sand filter, pre-requisite to Mod5567

— Mod 5567 - Introduction of engine air particle separator incorporating snow & ice protection system.

This SM does not sepersede, partially supersede or satisfy the work called for by any other Modification, Service Modification or Technical Instruction.

EMBODIMENT

(3) This SM is applicable to Sea King HC MK 4 that have been selected for Operations as directed by CHF.

(4) This SM is incompatible with Mod GE8059 Ground Support Equipment/Blade Fold Equipment.

APPROXIMATE TIME FOR EMBODIMENT

(5) Embodiment of one complete installation:

M - 80 Man-hours.

AV - 0 Man-hours.

REFERENCE DATA

(6) Design Organization Configuration Status Record (CSR) - 2490005 CSR issue 3.

(7) Installation Drawings - None.

(8) AP References:

— AP 101C-0400-06 Series
— AP 101C-0404-01
— AP 101C-0001-1
— 04-10-00-302 Ground Handling - Parking
— 07-10-00-201 General Precautions
— 07-10-00-203 Torque Loading
— Chap 07-30-00 General Maintenance - Tools
— 07-10-00-211 Panels
— 55-05-00-201 External Power – Connect/Disconnect.

PARTS AND SPECIAL TOOLS

(9) The items that follow are required for embodiment of this SM:

NSN	Part Number / Drawing No	Nomenclature	Qty
----	163-101-901G	Main Rotor Blade	5
----	WD-4239-00003-053	Tail Rotor Head Assembly	1
----	WD4239-00015-051	Tail Rotor Blade (Pre Mod 1252)	5
	or		
----	WD4239-00015-055	Tail Rotor Blade (Post Mod 1252)	5
----	61150-20576-042	Bracket	5
----	MRE0-005	Bonding Lead	5
----	NAS 509-5C	Nut	5
----	AN960C516L	Washer	5
----	AN960-10L	Washer	5
----	AN525-10R6	Screw	5

MODIFICATION OF SPARES

(10) No spares are modified by this SM.

CHANGE OF REFERENCE, PART AND ASSEMBLY NUMBERS

(11) Not Applicable.

SEQUENCE OF OPERATIONS

(12) Before commencing work, refer to documents listing the safety precautions to be observed when working on the equipment concerned, e.g. the Topic 1 Warning instruction and Hazard information for the equipment, apply the precautions accordingly.

WARNING 1 : ENERGIZED CIRCUITS. MAKE SURE THE ELECTRICAL POWER SUPPLY IS DISCONNECTED FROM THE AIRCRAFT. AN ENERGIZED CIRCUIT CAN KILL YOU OR CAUSE AN INJURY.

WARNING 2 : BEFORE YOU USE DANGEROUS MATERIALS MAKE SURE YOU KNOW THE RELATED SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS. FOR MORE DATA REFER TO:

— THE LABEL OF THE MATERIALS CONTAINER

— THE MANUFACTURER'S DATA SHEET

— JSP 375 (HEALTH AND SAFETY HANDBOOK)

— JSP 515 FOR THE MATERIAL

— LOCAL SAFETY ORDERS AND REGULATIONS.

NOTE : *All references to consumable items can be found in AP 101C-0001-1 Consumable Materials List.*

Installation of Carson Main Rotor Blades and 5 bladed Tail Rotor Hub and Blades

(13) Refer to AP 101C-0404 AMM Work Cards 04-10-00-302 and 07-10-00-201. Make sure that the aircraft is safe for ground maintenance.

(14) Refer to AP 101C-0404 AMM Work Card 53-21-00 401. Remove the Tail Rotor Head.

(15) Refer to AP 101C-0404 AMM Work Card 53-11-00 901. Prepare Tail Rotor Blades (6 off) for preservation and storage.

(16) Refer to AP 101C-0404 AMM Work Card 53-21-00 201. Prepare the Tail Rotor Head for preservation and storage.

(17) Refer to AP 101C-0404 AMM Work Card 50-11-01 401. Remove the Main Rotor Blades.

(18) Refer to AP 101C-0404 AMM Work Card 50-11-00 301. Prepare and pack the Main Rotor Blades.

Tail Rotor Installation

(19) Refer to AMM SAL 53-22-00-401. Install the Tail Rotor.

Tail Rotor Pitch Change Beam Installation

(20) Refer to AMM Work Card SAL 52-25-04-401. Install the Tail Rotor Pitch Change Beam.

Installation of the Tail Rotor Blades

(21) Refer to AMM Work Card SAL 53-12-00-401. Install the Tail Rotor Blades.

Installation of the Main Rotor Blades (Fig 1)

WARNING : MAKE SURE THERE ARE NO PERSONS OR OBJECTS IN THE AREA THE MAIN ROTOR BLADES MOVE THROUGH.

CAUTION : **You must be careful not to cause damage to the main rotor blades. If you hit the blades, internal failures can occur which you cannot detect externally.**

(22) Open the left and the right engine servicing platforms and the left and the right transmission servicing platforms (Work Card 07-10-00-209).

(23) Turn the main rotor head until the applicable main rotor blade attachment is at the applicable position. Engage the rotor brake.

CAUTION : **You must not let solvents touch the joints that are bonded. Solvents will make the bond material weak.**

(25) Remove all the corrosion preventative compound from the blade cuffs using White Spirit (C124).

(26) Visually examine the main rotor blades for any evidence of damage to the spar, skin, trailing edge and nickel caps. If dents, scratches, cuts or any other damage is suspected perform 150 hr inspection (SAL Work Card 50-11-00 601).

(27) Make sure that the blade sleeve has the same colour band as the main rotor blade.

(28) Remove the ten bolts (1-3) and the ten washers (1-2) (Mod 894), from the head sleeve (1-1).

(29) Make sure that the main rotor head is in the correct position and the rotor brake is engaged.

NOTE : *Make sure that the blade handler clamps (1-6) are a close fit on the main rotor blade (1-4) and the lock pin is installed.*

(30) Install the blade handler (1-5) at the position stripes on the main rotor blade (1-4). Adjust and lock the blade handler clamps (1-6) on the main rotor blade (Work Card 04-10-00-315).

(31) Make sure the leading edge of the main rotor blade (1-4) points in the direction of rotation.

(32) Hold the main rotor blade (1-4) so that it does not turn and it is level. Lift the main rotor blade to the installed position with the hoist.

NOTE 1 : *You must use the Mod 894 washers (1-2) when you install the main rotor blade (1-4).*

NOTE 2 : *At the 6/7 o'clock position the Mod 894 washer is replaced by the bonding bracket Pt No 61150-20576-042.*

NOTE 3 : *Make sure the countersunk face of the washers (1-2) is against the head of the bolt (1-3).*

(33) Attach the main rotor blade (1-4) to the head sleeve (1-1) with the nine washers (1-2) and the nine bolts (1-3).

(34) At the 6/7 o'clock position attach the main rotor blade with bonding bracket Pt No 61150-20576-042 and bolt (1-3).

(35) Attach bonding lead Pt No MRE0-005 to stub at blade root, use nut Pt No NAS 509-5C and washer Pt No AN960C516L. Tighten the nut and wirelock (C126) the nut to bolt inboard of stud (See Fig. 4).

(36) Attach the bonding lead to the bracket, use screw Pt No AN525 -10R6 and washer AN960 -10L (See Fig. 2).

(37) Torque tighten the ten bolts (1-3) to between 70 and 80 lbf ft (9.66 and 11.04 kg/m). Lock the ten bolts with wire (C126).

(38) Use the assist pole to release and carefully remove the blade handler (1-5) and the blade handler clamps (1-6).

Tail Rotor Installation Rigging

(39) Do the Tail Rotor Installation Rigging iaw SAL Work Card 19-21-00-501.

Main Rotor Head Installation Rigging

(40) Do a check of rigging iaw Work Card 19-10-00-601 and make sure that a basic rigging figure of 8° 15' can be achieved. Enter that figure in the F728 (Sea King) Table 4 if necessary.

Final Operations

(41) Make sure that the work area is clean and there are no loose objects.

(42) Remove all the tools and equipment from the aircraft.

(43) Close the left and the right engine servicing-platforms and the left and the right transmission servicing-platforms (Work Card 07-10-00-209).

(44) Do an engaged ground run and balance the Tail Rotor Hub iaw RADS Technique (See AP101C-0404-5G1 Based on WHL information).

NOTE : *There is no requirement to do the Pre-tracking requirements laid down in Work Card 50-22-05-501 Para 2 Task 1.*

(45) Do the blade tracking adjustment and test (AP101C-0400-5G1).

(46) Do adjustments after blade tracking (Work Card 50-22-05 501).

(47) Do the test flight (AP101C-0400-5M).

(48) Do the vibration analysis check.

(49) Do the autorotation revolutions check.

(50) Do adjustments after autorotation check (Work Card 50-22-05 501 para 6). Enter any adjustments into the F728 Main Rotor Head and Blade Track Record.

REMOVAL

(51) Do Removal in the reverse order of the Installation.

SPECIAL TESTS AFTER EMBODIMENT

(52) There are no Special Tests applicable after embodiment of this Service Modification.

RECORDING ACTION

Installation

(53) Record embodiment of this SM on a Maintenance Work Order.

(54) Record embodiment of this SM on MOD Form 703A1 as follows:

(a) Identification. SM/SK/0030.

(b) Narrative. SM/SK/0030 replaces the standard main rotor blade installation with Carson Main Rotor Blades Pt No 163-101-901G. Additionally the Tail Rotor Assembly has been replaced with a 5 bladed Tail Rotor Assembly WD-4239-00001-013 to accommodate the Carson Blades installation. If the aircraft has HUMS (Mod 1180) embodied the following statement must be added: The Tail Rotor HUMS feed has been removed. There is no tail rotor tachometer signal for channel 16 and 17 and no data will be received by the HUMS system.

(55) Record a MOD Form 705 (SSR) entry as follows:

(a) Before Flight

(i) Main rotor blades visually examine for evidence of damage to the spar, skin, trailing edge, and nickel cap. If dents, scratches, cuts, or any other damage is suspected, do the inspections specified for 150 hours.

(ii) Visually examine main rotor blade sacrificial leading edge tape (C539) if fitted for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail rotor head and blades visually examine for damage.

(iv) Tail rotor blades visually examine sacrificial tape for damage. Replace as necessary (SAL Work Card 53-12-00 201).

(v) The Carson MRB specific tip socks must be installed in windy conditions.

NOTE : *Arctic covers cannot be installed to aircraft with Carson Blades.*

(vi) In icing conditions examine the blades to make sure that they are clear of ice.

(b) Turn Round

(i) Main rotor blades visually examine for evidence of damage to the spar, skin, trailing edge, and nickel cap. If dents, scratches, cuts, or other damage is suspected, do inspections specified for 150 hours.

(ii) Visually examine main rotor blade sacrificial leading edge tape (C539) if fitted for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail rotor head and blades visually examine for damage.

(iv) Tail rotor blades visually examine sacrificial leading edge tape for damage. Replace as necessary (SAL Work Card 53-12-00 201).

(v) Install Carson MRB specific tip socks in windy conditions.

NOTE : *Arctic covers cannot be installed to aircraft with Carson Blades.*

(vi) In icing conditions examine the blades to make sure that they are clear of ice.

(c) After Flight

(i) Main rotor blades visually examine for evidence of damage to the spar, skin, trailing edge, and nickel cap. If dents, scratches, cuts, or other damage is suspected, do inspections specified for 150 hours.

(ii) Visually examine main rotor blade sacrificial leading edge tape (C539) if fitted for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail rotor head and blades visually examine for damage.

(iv) Tail rotor blades visually examine sacrificial leading edge tape for damage. Replace as necessary (SAL Work Card 53-12-00 201).

(v) Install Carson MRB specific tip socks in windy conditions.

NOTE : *Arctic covers cannot be fitted to aircraft fitted with Carson Blades.*

(d) Every 25hrs:

(i) Tail rotor blades examine (SAL Work Card 53-11-00-601).

(ii) Tail rotor head lubricate pitch change links connected (SAL Work Card 53-21-00-301).

(e) Every 50hrs:

(i) Tail rotor head lubricate pitch change links disconnected (SAL Work Card 53-21-00-301).

(ii) Tail rotor head pitch change links check wear (SAL Work Card 53-21-00-601).

(f) Every 150hrs - Examine main rotor blades for general damage with blades installed on the helicopter (SAL Work Card 50-11-00-601).

(g) Every 1200hrs - Examine main rotor blades removed from aircraft (SAL Work Card 50-11-00-601).

(h) Conditional Inspections - Do Conditional inspections immediately after an exposure to ballistic and non-ballistic damage, bird strike, lightning strike, hard landing, abnormal vibration, rpm overspeed, and sudden stoppage. The type and degree of inspections is dependent on the type and severity of each occurrence. Contact Carson Helicopters for detailed procedure for each specific occurrence of such incident.

(i) No 4 Blade - After each main rotor blade fold examine the No 4 blade for thermal damage (eg heat damage, localized surface cracking or delamination), paying particular attention to the inboard trailing edge region. If the blade is found damaged remove it and do a 1200 hr inspection on the blade items iii, iv, vii and ix. If damage is found within limits after the 1200hr inspection the blade can be refitted subject to the following inspection:

(i) Every 75hrs do an inspection of the trailing edge, use a x10 magnifier.

(ii) If no damage is found after both inspections the blade may be returned to the normal 150hr inspection.

(j) At 7292hrs. Replace the blades.

(k) The No 4 position mounted blade only:

(i) At 6000hrs when the Main Rotor Blade spread operations, with the engine running are not recorded. Replace the blade.

(56) Record on MOD Form 746 the embodiment of this SM.

(57) Record embodiment on MOD Form 746.

Full Removal (Section C)

(58) Record disembodiment of this SM on a Maintenance Work Order.

(59) Remove MOD Form 703A1 Carson Blades entry.

(60) Remove MOD Form 705 (SSR): N/A

(61) Remove MOD Form 727C (SMR): N/A.

(62) Record on MOD Form 746 the disembodiment of this SM from the aircraft.

(63) Record disembodiment on MOD Form 746.

REDUNDANT PARTS AND DISPOSAL INSTRUCTIONS

(64) The following parts are made redundant by the embodiment of this modification.

NSN	Part Number	Nomenclature	Qty	Disposal
----	WD0129-90250	Main Rotor Blade	5	Return R3/R4
----	WD-5039-00003-043	Tail Rotor Head Assembly	1	Return R3/R4
----	or			
----	WD-5039-00003-045			
----	WD01-39-90052-049	Tail Rotor Blade	6	Return R3/R4
----	or			
----	WD4239-00012-043			
----	WD4239-00010-049			
----	WD4239-00010-045			

EFFECT ON AIRCRAFT WEIGHT AND MOMENT

(65) Introduction of Carson Main Rotor Blades has the following change on Weight and Moment:

(a) Carson Main Rotor Blades and Tail Rotor Assembly Weight:

(i) PLUS 37.71 lbs and a change of Longitudinal Moment of MINUS 6993.6 lb in.

(ii) WRAM Code = SGY 0030/1

(b) Carson Main Rotor Blades and Tail Rotor Assembly Weight, Main Rotor Blade Tape fitted:

(i) PLUS 42.1 lbs and a change of Longitudinal Moment of MINUS 6993.6 lb in.

(ii) WRAM Code = SGY 0030/2

EFFECT ON AIRCRAFT OR EQUIPMENT OPERATION AND HANDLING

(66) This modification has no effect on aircraft or equipment operation and handling.

EFFECT ON MAINTENANCE AND GROUND SUPPORT EQUIPMENT

(67) This modification has no effect on maintenance and ground support equipment.

CHANGES IN POWER SUPPLY REQUIREMENTS

(68) This modification has no effect on power supply requirements.

EMC AND TEMPEST CLEARANCE

(69) Not Applicable.

NIGHT VISION GOGGLES (NVG) COMPATABILITY

(70) Not Applicable.

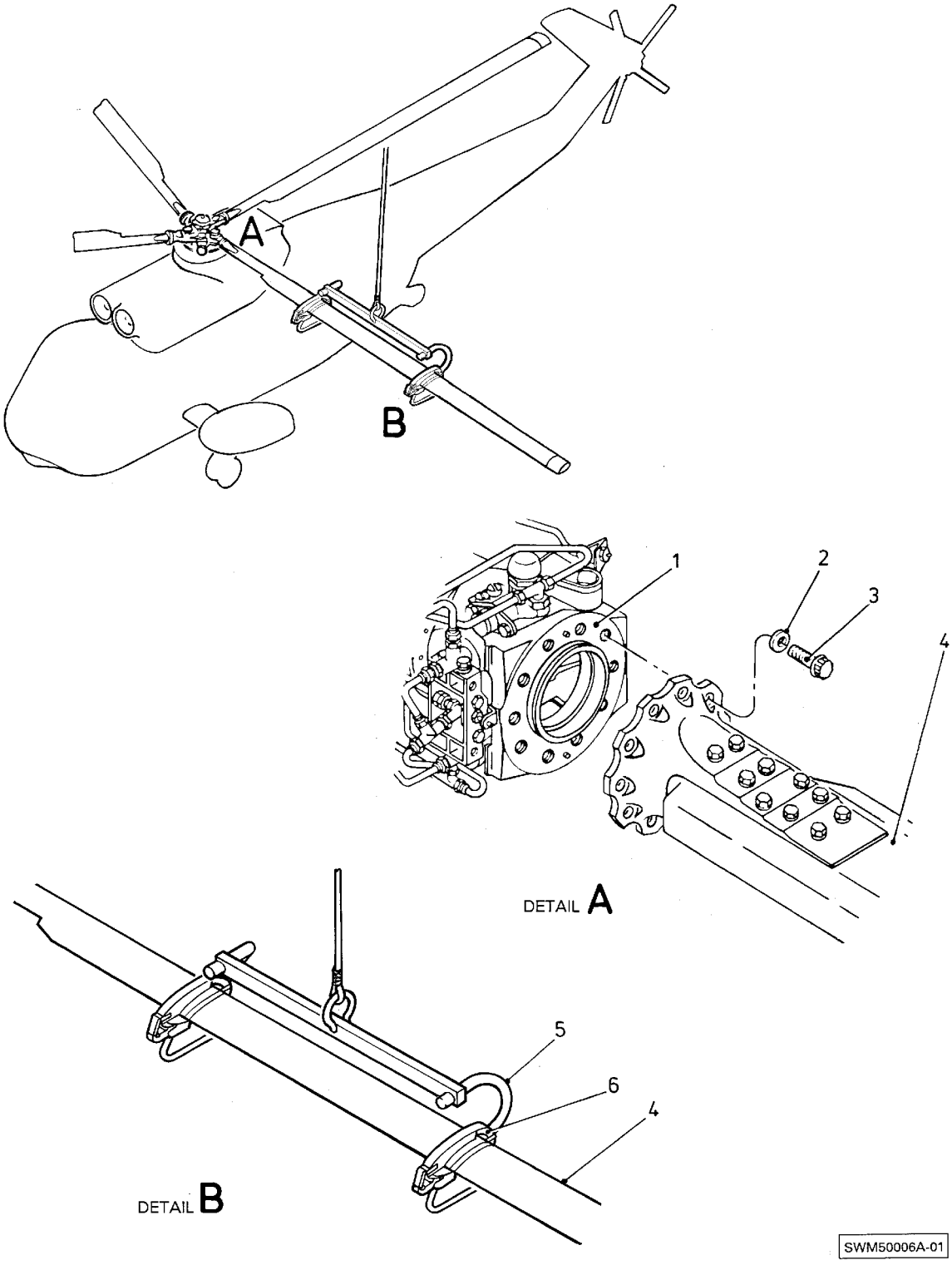


Figure 1 Carson Main Rotor Blade Installation

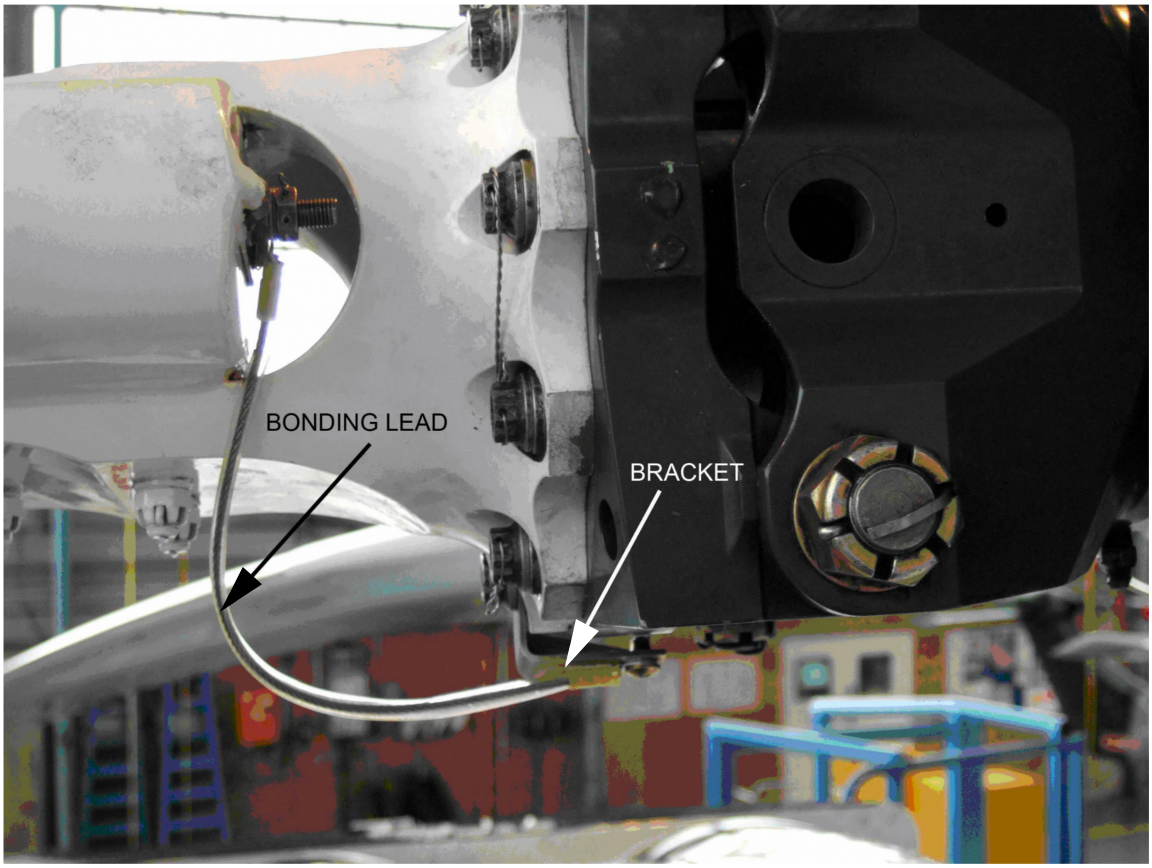


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Figure 2 Blade Bonding Lead Attachment

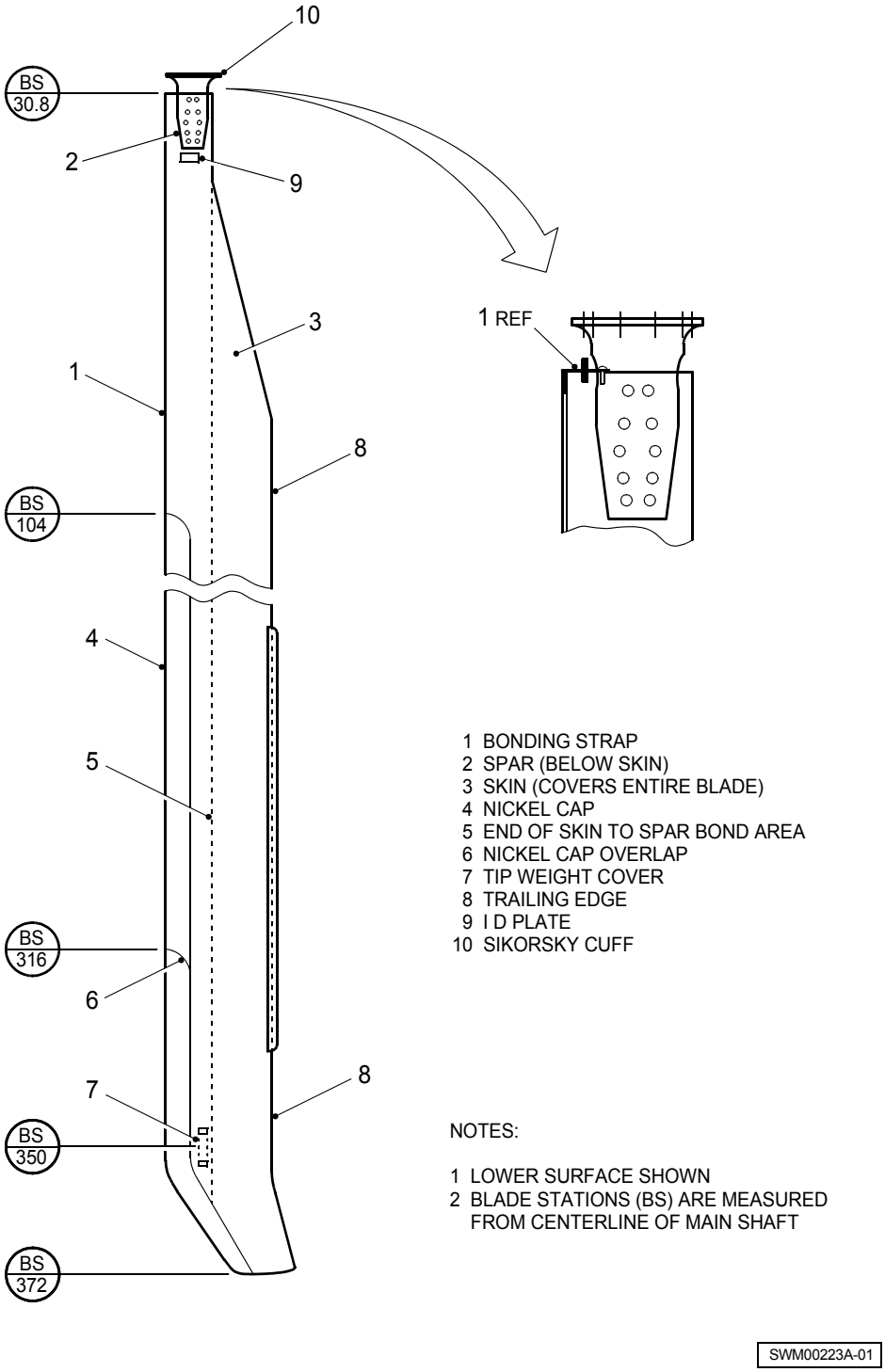

Figure 3 Carson Blade Inspection Limits

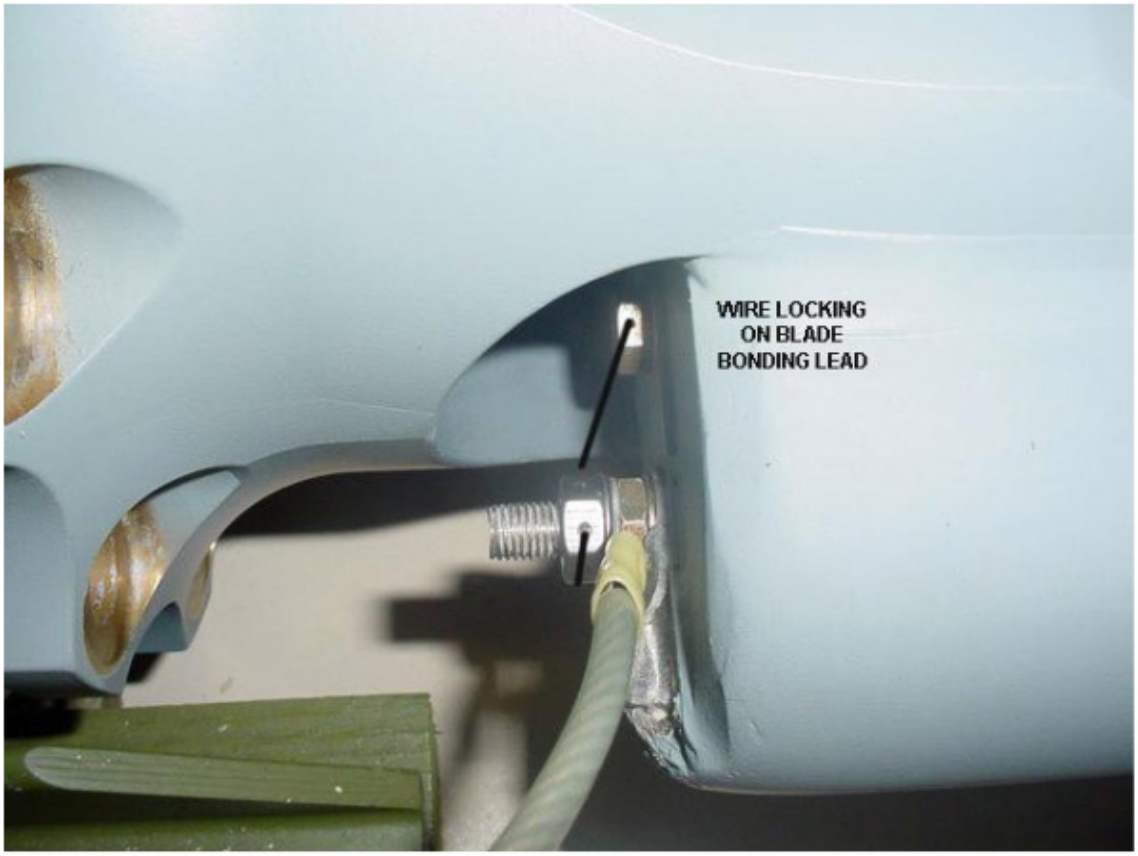

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Figure 4 Wire Locking on Blade Bonding Lead

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SM/SEA KING/0087
INTRODUCTION OF CARSON MAIN ROTOR BLADES

APPLICABILITY

Sea King ASaC Mk 7.

INTRODUCTION

(1) This Service Modification (SM) introduces new main rotor blades (Part No 163-101-901G) and a new tail rotor assembly (Part No WD-4239-00001-013) to the Sea King ASaC Mk 7. The modification results in increased forward flight, low speed envelopes and increases the maximum hover mass at high altitude.

This SM does not supersede, or partially supersede or satisfy the work called for by any other Modification, Service Modification or Technical Instruction.

EMBODIMENT

(2) This SM is incompatible with Mod GE8059 Ground Support Equipment/ Blade fold Equipment and is applicable to Sea King ASaC MK 7 as directed by CHF.

APPROXIMATE TIME FOR EMBODIMENT

(3) The estimated man-hours required to embody one complete installation:

M - 80 Manhours.

AV - 0 Manhours.

REFERENCE DATA

(4) Design Organization Configuration Status Record (CSR) - CSR No 3592005CSR.

(5) No installation drawings are required for the embodiment of this SM.

(6) AP references:

— **AP101C-0400-06 Series**
— **AP101C-0407-01**
— **AP101C-0001-1**
— 04-10-00-302 Ground Handling - Parking
— 07-10-00-201 General Precautions
— 07-10-00-203 Torque Loading
— Chap 07-30-00 General Maintenance - Tools
— 07-10-00-211 Panels
— 55-05-00-201 External Power – Connect/Disconnect.

PARTS AND SPECIAL TOOLS

(7) The items that follow are required for the embodiment of this SM:

Ref Number / NSN	Part Number	Nomenclature	Qty
----	163-101-901G	Main Rotor Blade	5
----	WD-4239-00001-013	Tail Rotor Assembly	1
----	WD4239-00015-051	Tail Rotor Blade	5
----	61150-20576-042	Bracket	5
----	MRE0-005	Bonding Lead	5
----	NAS 509-5C	Nut	10
----	AN960C516L	Washer	5
----	AN 525-10R6	Washer	5

MODIFICATION OF SPARES

(8) No spares are modified as a result of this SM.

CHANGE OF REFERENCE, PART OR ASSEMBLY NUMBERS

(9) There are no changes to Reference, Part or Assembly numbers as a result of this SM.

SEQUENCE OF OPERATIONS

(10) Before commencing work, refer to documents listing the safety precautions to be obeyed when working on the equipment concerned, e.g. the Topic 1 Warning instruction and Hazard information for the equipment; apply the precautions accordingly.

WARNING 1 : ENERGIZED CIRCUITS. MAKE SURE THE ELECTRICAL POWER SUPPLY IS DISCONNECTED FROM THE AIRCRAFT. AN ENERGIZED CIRCUIT CAN KILL YOU OR CAUSE AN INJURY.

WARNING 2 : BEFORE YOU USE DANGEROUS MATERIALS MAKE SURE YOU KNOW THE RELATED SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS. FOR MORE DATA REFER TO:

- **THE LABEL OF THE MATERIALS CONTAINER**
- **THE MANUFACTURER'S DATA SHEET**
- **JSP 375 (HEALTH AND SAFETY HANDBOOK)**
- **JSP 515 FOR THE MATERIAL**
- **LOCAL SAFETY ORDERS AND REGULATIONS.**

NOTE : *All references to consumable items can be found in AP101C-0001-1 Consumable Materials List.*

Installation of Carson Main Rotor Blades and 5 Bladed Tail Rotor Hub and Blades.

(11) Refer to AP101C-0407 AMM Work Cards 04-10-00-302 and 07 10 00 201. Make sure that the aircraft is safe for ground maintenance.

(12) Refer to AP101C-0407 AMM Work Card 53-21-00 401. Remove the Tail Rotor Head.

(13) Refer to AP101C-0407 AMM Work Card 53-11-00 901. Prepare Tail Rotor Blades (6 off) for preservation and storage.

(14) Refer to AP101C-0407 AMM Work Card 53-21-00 201. Prepare the Tail Rotor Head for preservation and storage.

(15) Refer to AP101C-0407 AMM Work Card 50-11-01 401. Remove the Main Rotor Blades.

(16) Refer to AP101C-0407 AMM Work Card 50-11-00 301. Prepare and pack the Main Rotor Blades.

Tail Rotor Installation

(17) Refer to AMM SAL 53-22-00-401. Install the Tail Rotor.

Tail Rotor Pitch Change Beam Installation

(18) Refer to AMM Work Card SAL 52-25-04-401. Install the Tail Rotor Pitch Change Beam.

(19) Refer to AMM Work Card SAL 53-12-00-401. Install the Tail Rotor Blades (Fig 1).

WARNING : **MAKE SURE THERE ARE NO PERSONS OR OBJECTS IN THE AREA THE MAIN ROTOR BLADES MOVE THROUGH.**

CAUTION : **Take care not to cause damage to the Main Rotor Blades. If you hit the blades, internal failures can occur which you cannot detect externally.**

(20) Refer to AMM Work Card 07-10-00-209. Open the left and the right engine servicing platforms and the left and the right transmission servicing platforms.

(21) Turn the Main Rotor Head until the applicable Main Rotor Blade attachment is at the applicable position. Engage the Rotor Brake.

CAUTION : **You must not let solvents touch the joints that are bonded. Solvents will make the bond material weak.**

(22) Use White Spirit (C124) to remove all the corrosion preventative compound from the blade cuffs.

(23) Visually inspect the Main Rotor Blades for any evidence of damage to the spar, skin, trailing edge and nickel caps. If dents, scratches, cuts or any other damage is suspected perform the 150 hr inspection (SAL Work Card 50 11 00 601).

(24) Make sure that the Blade Sleeve has the same colour band as the Main Rotor Blade.

(25) Remove the ten bolts (1-3) and the ten washers (1-2) (Mod 894), from the head sleeve (1-1).

(26) Make sure that the Main Rotor Head is in the correct position and the Rotor Brake is engaged.

NOTE : *Make sure the blade handler clamps (1-6) are a close fit on the Main Rotor Blade (1-4) and the lock pin is installed.*

(27) Install the blade handler (1-5) at the position stripes on the Main Rotor Blade (1-4). Adjust and lock the blade handler clamps (1-6) on the Main Rotor Blade (Work Card 04-10-00-315).

(28) Make sure that the leading edge of the Main Rotor Blade (1-4) points in the direction of rotation.

(29) Hold the Main Rotor Blade (1-4) so that it does not turn and it is level. Lift the Main Rotor Blade to the installed position with the hoist.

NOTE 1 : *You must use the Mod 894 washers (1-2) when you install the Main Rotor Blade (1-4).*

NOTE 2 : *At the 6/7 o clock position the Mod 894 washer is replaced by the bonding bracket Part No 61150-20576-042.*

NOTE 3 : *Make sure the countersunk face of the washers (1-2) is against the head of the bolt (1-3).*

(30) Attach the Main Rotor Blade (1-4) to the Head Sleeve (1-1) with the nine washers (1-2) and the nine bolts (1-3).

(31) At the 6/7 o clock position attach the Main Rotor Blade with bonding bracket Part No 61150-20576-042 and bolt (1-3).

(32) Attach the bonding lead Part No MRE0-005 to stub at blade root using Nut Part No NAS 509-5C and Washer Part No AN960C516L. Tighten the nut and wirelock to the bolt inboard of stud (See Fig. 4).

(33) Attach the bonding lead to the bracket using screw Part No AN525 10R6 and washer AN960-10L (See Fig. 2).

(34) Torque the ten bolts (1-3) to between 70 and 80 lbf ft (9.66 and 11.04 kgf m). Lock the ten bolts with wire (C126).

(35) Use the assist pole to release and carefully remove the blade handler (1-5) and the blade handler clamps (1-6).

Main Rotor Installation Rigging

(36) Refer to Work Card 19-10-00-601. Carry out a check of rigging and make sure that a basic rigging figure of 8° 15' can be achieved. Enter that figure in the F728 (Sea King) Table 4 if necessary.

Tail Rotor Head Installation Rigging

(37) Refer to SAL Work Card 19-21-00-501. Carry out Tail Rotor installation rigging.

Final Operations

(38) Make sure the work area is clean and there are no loose objects.

(39) Remove the tools and equipment from the aircraft.

(40) Close the left and the right engine servicing platforms and the left and the right transmission servicing platforms (Work Card 07-10-00-209).

(41) Perform an engaged ground run and balance the Tail Rotor Hub in accordance with RADS Technique (See AP 101C-0400-5G1 based on AgustaWestland information).

NOTE : *There is no requirement to carry out the pre-tracking requirements laid down in Work Card 50-22-05-501 Para 2 Task 1.*

(42) Do the blade tracking adjustment and test (AP101C-0400-5G1).

(43) Carry out adjustments after blade tracking (Work Card 50-22-05 501).

(44) Do the test flight (AP101C-0400-5M).

(45) Do the vibration analysis check.

(46) Do the autorotation revolutions check.

(47) Carry out adjustments after autorotation check (Work Card 50 22 05 501 Para 6). Enter any adjustments in to the F728 Main Rotor Head and Blade Track Record.

Removal of Carson Main Rotor Blades

(48) Carry out Removal in the reverse order of the installation.

SPECIAL TESTS AFTER EMBODIMENT

(49) There are no special tests required after the embodiment of this SM.

RECORDING ACTION

Installation

(50) Certify embodiment of this SM on a Maintenance Work Order.

(51) Record embodiment of this SM on MOD Form 703A1 as follows:

(a) **Identification:** SM/SK/0087.

(b) **Narrative:** SM/SK/0087 replaces the standard Main Rotor Blade installation with Carson Main Rotor Blades Part No 163-101-901G. Additionally the Tail Rotor Assembly has been replaced with a 5 bladed Tail Rotor Assembly WD-4239-00001-013 to accommodate the Carson Blades installation. If the aircraft has HUMs (Mod 1180) embodied the following statement must be added:

The tail rotor HUMS feed has been removed. There is no tail rotor tachometer signal for channel 16 and 17 and no data will be received by the HUMS system.

(52) Raise a MOD Form 704 entry as follows:

When SM/SK/0087 is embodied. In high ambient temperatures (45°C and above) excessive blade flapping should be avoided during ground handling and aircraft tethering to prevent possible damage to the blade skin.

(53) Raise a MOD Form 705 (SSR) entry as follows:

(a) Before Flight

(i) Main Rotor Blades - Visually inspect for any evidence of damage to the spar, skin, trailing edge, and Nickel cap. If dents, scratches, cuts, or any other damage is suspected, perform inspections specified for 150 hours.

(ii) Visually inspect Main Rotor Blade sacrificial leading edge tape (C539) if fitted for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail Rotor Head and Blades - Visually inspect for damage.

(iv) Tail Rotor Blades - Visually inspect sacrificial tape (C539), if fitted, for damage. Replace as necessary (SAL Work Card 53-12-00 201).

NOTE : *Arctic covers cannot be fitted to aircraft fitted with Carson Blades.*

(v) In icing conditions inspect the blades and confirm clear of ice.

(b) Turn Round.

(i) Main Rotor Blades - Visually inspect for any evidence of damage to the spar, skin, trailing edge, and Nickel cap. If dents, scratches, cuts, or any other damage is suspected, perform inspections specified for 150 hours.

(ii) Visually inspect Main Rotor Blade sacrificial leading edge tape (C539) if fitted for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail Rotor Head and Blades - Visually inspect for damage.

(iv) Tail Rotor Blades - Visually inspect sacrificial tape (C539) if fitted for damage. Tail rotor blades visually inspect sacrificial tape for damage. Replace as necessary (SAL Work Card 53-12-00 201).

NOTE : *Arctic covers cannot be fitted to aircraft fitted with Carson Blades.*

(v) In icing conditions inspect the blades and confirm clear of ice.

(c) After Flight.

(i) Main Rotor Blades - Visually inspect for any evidence of damage to the spar, skin, trailing edge, and Nickel cap. If dents, scratches, cuts, or any other damage is suspected, perform inspections specified for 150 hours.

(ii) Visually inspect main rotor blade sacrificial leading edge tape (C539), if fitted, for damage and security of attachment. Replace as necessary (SAL Work Card 50 11-00 202).

(iii) Tail Rotor Head and Blades - Visually inspect for damage.

(iv) Tail Rotor Blades - Visually inspect sacrificial tape (C539), if fitted, for damage. Replace as necessary (SAL Work Card 53-12-00 201).

(54) Raise a MOD Form 727C (SMR) entry as follows:

(a) Every 25hrs.

(i) Tail Rotor Blades - Examine (SAL Work Card 53 11 00 601).

(ii) Tail Rotor Head - Lubricate pitch change links connected (SAL Work Card 53-21-00-301).

(b) Every 50hrs.

(i) Tail Rotor Head - Lubricate pitch change links disconnected (SAL Work Card 53-21-00-301).

(ii) Tail Rotor Head - Pitch change links check wear (SAL Work Card 53-21-00-601).

(c) Every 150hrs - Inspect Main Rotor Blades for general damage with blades installed on the aircraft (SAL Work Card 50-11-00-601).

(d) Every 1200hrs - Inspect Main Rotor Blades removed from aircraft (SAL Work Card 50-11-00-601).

(e) Conditional Inspections - Conditional inspections are to be performed immediately after an exposure to ballistic and non-ballistic damage, bird strike, lightning strike, hard landing, abnormal vibration, rpm overspeed, and sudden stoppage. The type and degree of inspections is depended on the type and severity of each occurrence. Contact Carson Helicopters for detailed procedure for each specific occurrence of such incident.

(f) No 4 Blade - After each Main Rotor Blade fold examine the No 4 blade for thermal damage (eg heat damage, localized surface cracking or delamination), paying particular attention to the inboard trailing edge region. If the blade is found damaged remove it and carry out a 1200 hr inspection on the blade iaw SAL Work Card 50-11-00-601 items (c), (d), (g) and (i). If damage is found within limits after the 1200hr inspection the blade may be refitted subject to the following inspection:

(i) Every 75hrs carry out an inspection of the trailing edge using a x10 magnifier.

(ii) If no damage is found after both inspections the blade may be returned to the normal 150hr inspection.

(g) At 14474 hrs. Replace the blades.

(h) The No 4 position mounted blade only:

(i) At 6000hrs when the Main Rotor Blade spread operations, with the engine running are not recorded. Replace the blade.

(55) Annotate MOD Form 746 to reflect embodiment of this SM.

(56) Record embodiment on MOD Form 746.

Full Removal (Section C)

(57) Certify disembodiment of this SM on a Maintenance Work Order.

(58) Remove MOD Form 703A1 Carson Blades entry.

(59) Remove MOD Form 705 (SSR): N/A.

(60) Annotate MOD Form 746 to reflect disembodiment of this SM from the aircraft.

(61) Record disembodiment on MOD Form 746.

DISPOSAL OF REDUNDANT PARTS

(62) The following parts are rendered redundant by the embodiment of this SM.

NSN	Part Number	Nomenclature	Qty	Disposal
	WD0129-90250	Main Rotor Blade	5	Return R3/R4
	WD-5039-00003-043	Tail Rotor Head Assembly	1	Return R3/R4
	or			
	WD-5039-00003-045			

NSN	Part Number	Nomenclature	Qty	Disposal
	WD01-39-90052-049	Tail Rotor Blade	6	Return R3/R4
	or			
	WD4239-00012-043			
	WD4239-00010-049			
	WD4239-00010-045			

EFFECT ON WEIGHT AND MOMENT

(63) Introduction of Carson Main Rotor Blades has the following change on Weight and Moment:

(a) Carson Main Rotor Blades and Tail Rotor Assembly Weight:

(i) A weight change of PLUS (+) 37.1 lbs.

(ii) A change of moment of MINUS (-) 7255.9 lb in.

(b) Carson Main Rotor Blades and Tail Rotor Assembly Weight Tape fitted:

(i) A weight change of PLUS (+) 42.1 lbs.

(ii) A change of moment of MINUS (-) 6993.6 lb in.

(c) Use the following GOLDesp Weight and Moment codes:

(i) SGY 0087/1

EFFECT ON AIRCRAFT OR EQUIPMENT OPERATION AND HANDLING

(64) There is no effect on Aircraft or equipment operating and handling as a result of this SM.

CHANGES IN POWER SUPPLY REQUIREMENTS

(65) There is no effect on the aircraft primary power supplies.

EFFECT ON MAINTENANCE AND GROUND SUPPORT EQUIPMENT

(66) This SM does not affect Maintenance and Ground Support Equipment.

EMC AND TEMPEST CLEARANCE

(67) There is no effect on the EMC and Tempest status of the aircraft as a result of this SM.

EFFECT ON NIGHT VISION GOGGLES (NVG) COMPATIBILITY

(68) There is no effect on the Night Vision goggles (NVG) as a result of this SM.

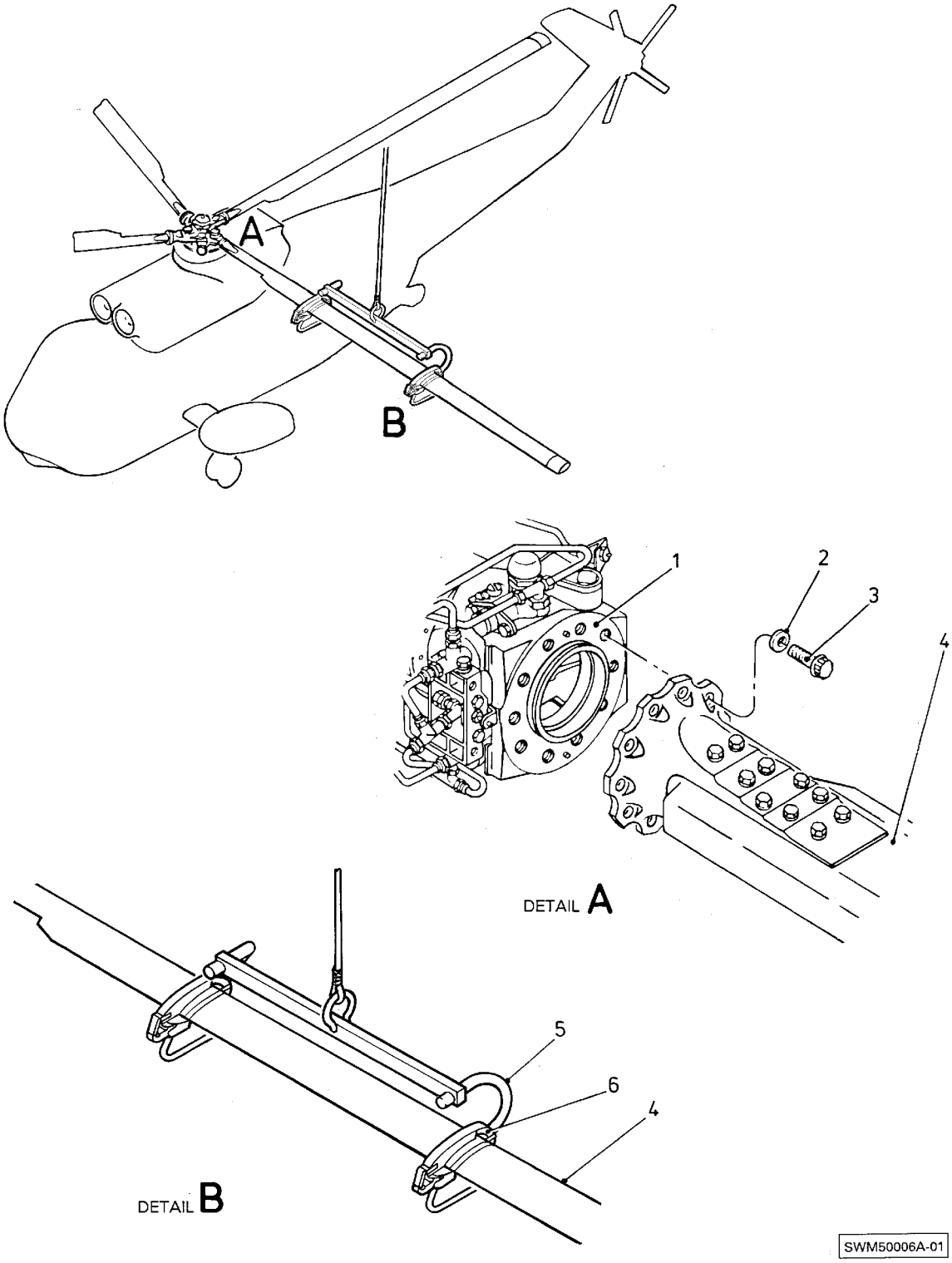

Fig 1 Carson Main Rotor Blade Installation

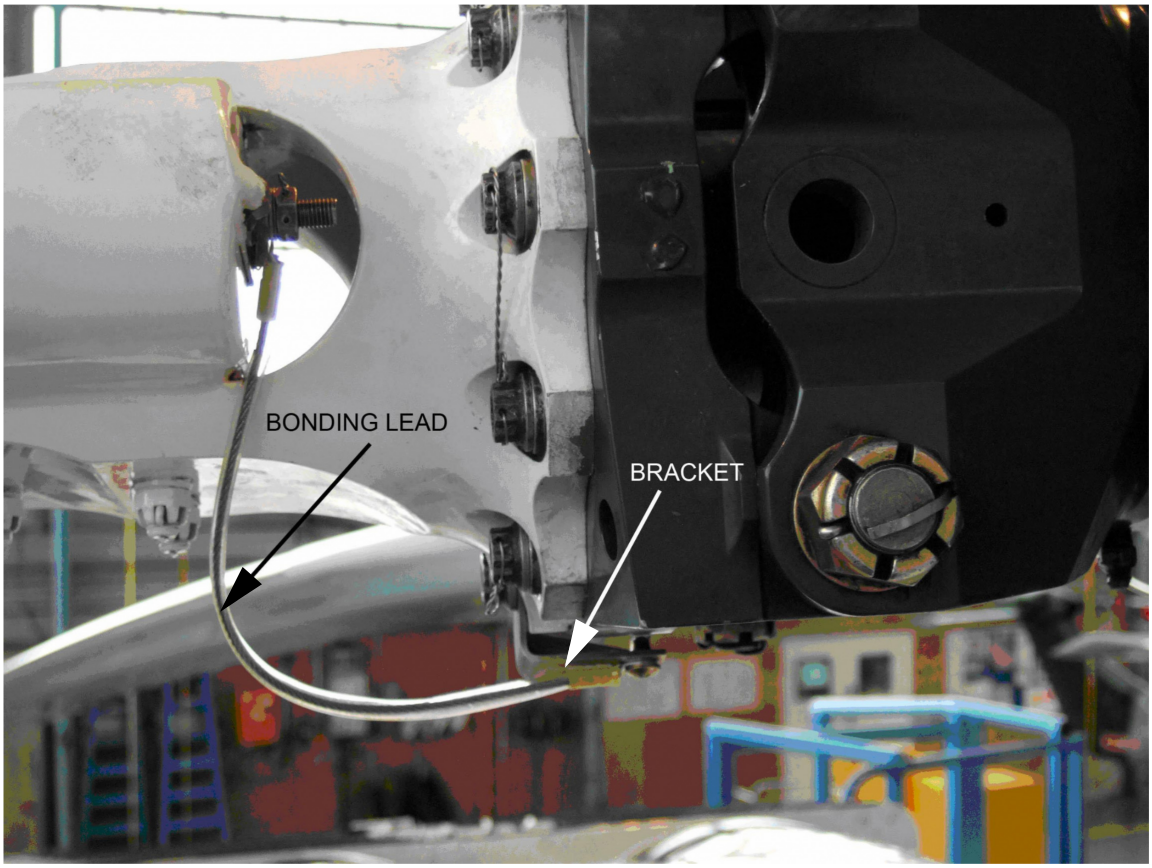

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Fig 2 Blade Bonding Lead Attachment

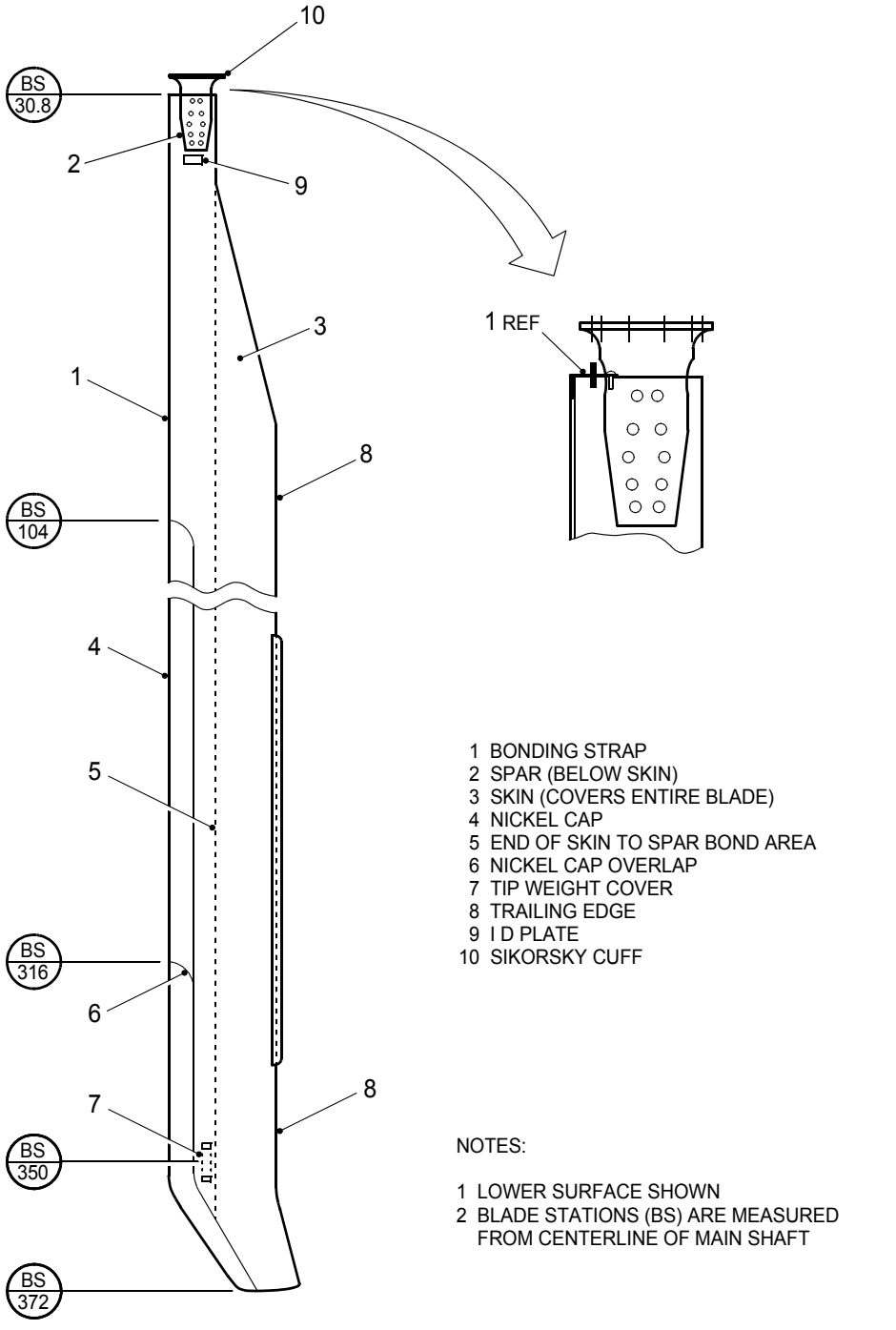

Fig 3 Carson Blade Inspection Limits

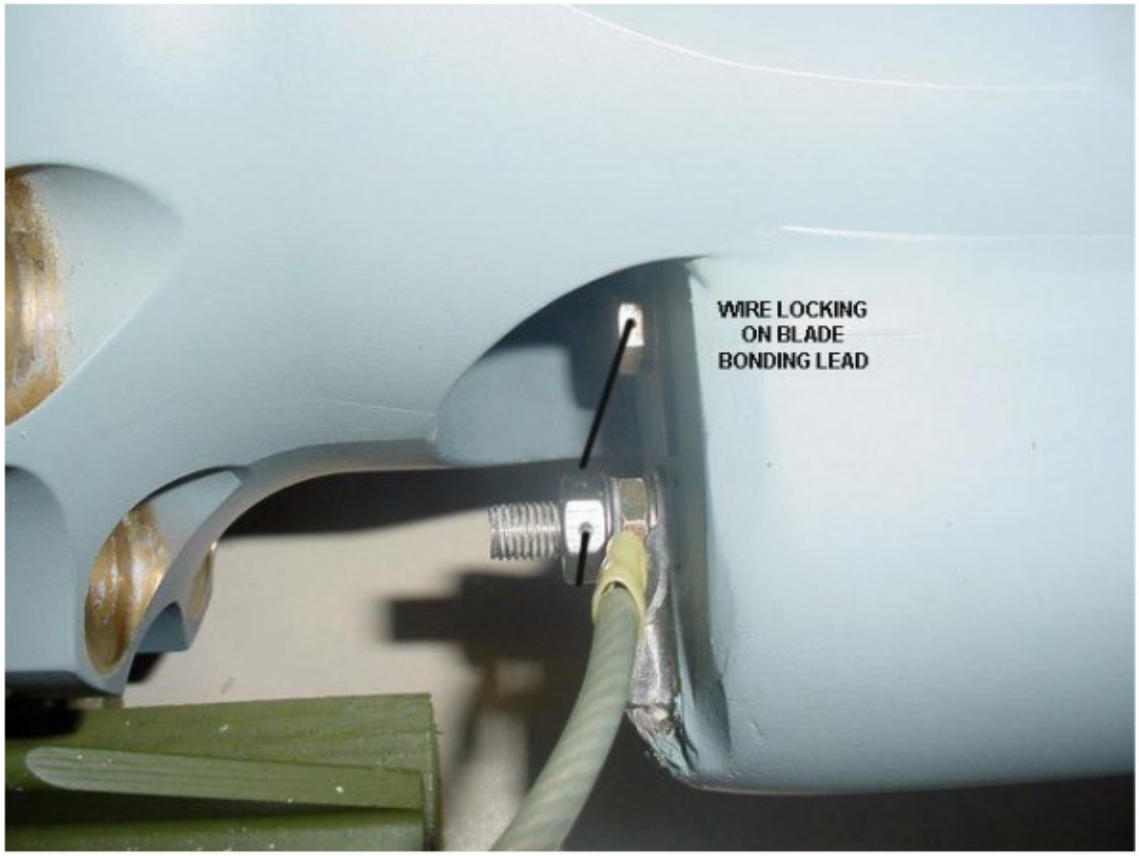

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Fig 4 Wire Locking on Blade Bonding Lead

End of Data Module