

## Service Bulletin

S.B. No: 188


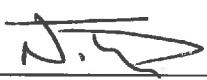

**Title: INSPECTION FOR RUDDER PEDAL CLEARANCES BETWEEN RUDDER PEDALS AND THE AIRCRAFT STRUCTURE AND COMPONENTS ALSO INSPECTION FOR GROUND TOWING DAMAGE.**

- Compliance:**
- a) Before next flight after 11 February 2009 (effective date of AD 2009-0013), unless SB No. 188 issues 1 or 2 or 3 or 4 or 5 have been accomplished within the last 12 months, carry out all actions as instructed in paragraphs 1 to 31 of Marshall Slingsby Advanced Composites (MSAC), previously Slingsby Advanced Composites Limited (SACL), SB No.188 Issue 6.  
Accomplishment of inspections carried out before 11 February 2009 (effective date of AD 2009-0013) in accordance with previous issues of SB No.188 satisfies the inspection requirements of paragraph (2.1) of AD 2009-0218.
  - b) Thereafter, at each annual inspection, repeat the inspections as instructed in paragraphs 1 to 31 of MSAC SB 188 Issue 6. Continue inspections even after embodiment of modification M919, except as noted in Actions paragraph 5.
  - c) Within 12 months after 26<sup>th</sup> October 2009 (the effective date of AD 2009-0218), modify the aircraft in accordance with SACL (MSAC) Modification Bulletin M919 issue 1.
  - d) Ensure at next scheduled annual check that compliances a) and c) have been complied with. Additionally ensure that the new inspections required in accordance with (IAW) this SB 188 issue 6, i.e.: Link bolt at paragraph 1 on page 4, bush inspection at paragraph 9, inspection pedal pad deformation at note paragraph 26 and Rudder bar weld inspection note at paragraph 30.5 are also complied with. Ensure that any aircraft not flown since 11 February 2009 has SB 188 issue 6 applied in its entirety prior to flight.

**Applicability:** T67B, T67C series, T67M (excluding works no. 1999), T67M-MkII and T67M200 (excluding works no. 2264 & 2265).

**This Service Bulletin is the subject of an EASA Airworthiness Directive (AD), 2009-0218 refers.**

This issue 6 has been raised primarily to highlight an incident related to on page 2, refer 11<sup>th</sup> paragraph of Introduction, and the subsequent new inspection required. New inspection at paragraph 1(b) and (c); refer to added Figure 11A and 11B. Additional inspections added; refer to change at paragraph 9, ref bush security; and at paragraph 26, Note; ref pedal pad deformation, also new Figures 12, 13 and 14 added. Permissible weld on rudder bar lever noted in paragraph 30.5, new Figure 15 added. Side force now quantified paragraphs as applicable and direction of application added at Figure 3.

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| Signature<br><br>Compiled  | Signature<br><br>Design CVE | Signature<br><br>Approval |
| Print Name: M. J. Rutter  | Print Name N. THORP  | Print Name P ANDREWS   |
| Date: 26 <sup>TH</sup> NOV. 2012.   | Date 13-12-12  | Date 20/12/12.   |
| MARSHALL SLINGSBY ADVANCED COMPOSITES<br>Kirkbymoorside, York. YO62 6EZ Tel: 01751 432474<br>Fax No: 01751 433016 E-mail: <a href="mailto:mike.rutter@marshall-slingsby.com">mike.rutter@marshall-slingsby.com</a><br>EASA Design Organisation Approval No. EASA.21J.181 (Marshall Aerospace) |  | Page 1 of 28 Issue 6   |

Name change Marshall Slingsby Advanced Composites in lieu of Slingsby Advanced Composites Limited throughout (new logo and minor text changes added).

All changes to text and figures are indicated by a vertical bar in the left hand margin.

#### **INTRODUCTION:**

This Service Bulletin is issued to reinforce the importance of ensuring correct clearances and maintenance of the rudder operating mechanism, mountings and stops to ensure the required clearances for safe operation.

The issuing of this Service Bulletin originally followed an incident, which occurred during spinning. During spin recovery a rudder pedal fouled a component. On inspection it was observed that the floor was damaged allowing the rudder bar support bracket to distort and the bar and its pedal to float to the left greater than the limit allowable for safe operation.

Further to issue 2 an incident has been reported of the brake master cylinder becoming detached from its support brackets causing de-lamination to the port GRP floor panel. This failure occurred during aircraft taxiing. The failure was the direct result of the aircraft towing angle being exceeded.

The investigation concluded that the most probable cause of the problem was the result of exceeding the vehicular towing angle and/or incorrect positional assembly of the brake cylinder support brackets. It should be noted that the port cylinder support brackets are shorter than their counterparts on the starboard side and they must NOT be interchanged.

The maximum towing angle is indicated by markings on the engine cowlings – under no circumstances should these limits be exceeded. The training of towing operatives should be carried out on a regular basis to ensure safe towing of the aircraft at all times. Operatives should be made aware that the exceedance of the towing angle limitation markings on the aircraft's cowling can cause damage – refer paragraph 10 - to the rudder control system which may go undetected prior to flight and lead to an in-flight airworthiness situation and possible death to the occupants.

The use of non Slingsby type vehicle or hand tow-bars or trolley/cart, (i.e. that cradle the nosewheel), are PROHIBITED for use on the Slingsby T67 type aircraft.

Therefore only Slingsby tow-bars SHALL be used for towing, i.e. T67A-88-201 for towing by vehicle and T67B-88-203 (adjustable handle length) or T67B-88-207 (fixed handle length) for towing by hand.

Vehicles when used for towing with the Slingsby type vehicle towing bar SHALL ensure that the driver has a clear view of the tow-bar turn limitation markings on the aircraft's cowling. Additionally ensure whilst towing with a vehicle that a competently trained operative occupies the cockpit ready to apply brakes in an emergency. MSAC recommend a maximum towing speed of 5 mph.

This Service Bulletin is issued to address the incidents related to above and to reinforce the importance of ensuring correct clearances, towing instructions and maintenance of the rudder operating mechanism, mountings and stops to ensure the required clearances for continued airworthiness and safe operation.

Service Bulletin issue 5 raised and issued to invoke Mod M919 Floor Reinforcement; this follows further investigation into the transmittal of loads from the rudder system into the floor at the portside.

This issue 6 of this Service Bulletin 188 has been actioned in response to an incident reported by a customer where the number 3 pedal inboard sideplate jammed behind the head of the forward screw attaching the starboard rudder cable link to rudder bar, this followed a rapid application of the pedal to the fully forward position, i.e. left rudder, refer Figure 11A Section F-F. The aircraft then entered a spin, recovering when the jam was freed. Paragraph 1(b) and (c) introduced by this incident. During the course of investigating this latest incident it was noted that the rudder bar pedal pad support plates were found to be distorted, refer Figure 13 and 14, this re-issue of this SB requires these items to be checked and rectified.

This Service Bulletin is re-issued to address the incident related to in the paragraph above and to reinforce the importance of ensuring correct clearances, towing instructions and maintenance of the rudder operating mechanism, mountings and stops to ensure the required clearances for Continued Airworthiness and safe operation.

Additionally this Service Bulletin addresses issues raised in previous Service Bulletins, see below, and draws notice to the relevant Maintenance Manual requirements. The information contained within this Service Bulletin supersedes the mandatory and advisory Service Bulletins listed below and Maintenance Manual instructions regarding clearances where applicable. The inclusion of the Service Bulletins listed below into this Service Bulletin effectively mandates their listed actions.

SB 008 Inspection of Rudder/Toe Brake Assembly for Security of Hexagon Socket Cap Screws. (CAA AD 013-11-85).

SB 015 Rudder Pedal to sidewall and Rudder Cable Clearances. (CAA AD 005-05-87).

SB 033 Special Inspection of Rudder Bar Pedal Support Lugs. (CAA AD 014-01-93).

SB 044 Check on Clearance Between Forward U/C Leg and Engine Mounting Frame. (CAA AD 004-03-94).

SB 049 Rudder Mechanism to Fuel Pipe Clearance Check. (Advisory).

SB 051 Inspection of Rudder Cable to Link Plate Socket Head Cap Screw. (CAA AD 015-03-94).

SB 071 Inspection of Rudder Pedal Lay shaft Mounting Brackets. (Advisory).

SB 083 Inspection for Foul between No.2 Rudder Pedal Pad Pivot and Nose wheel Steering Rod Arm. (CAA AD 006-02-96).

SB 099 Inspection and Rectification of Rudder Pedal Sliders. (Advisory).

SB 126 Inspection of Port Rudder Bar for Chafing. (Advisory).

SB 130 Inspection of Rudder Pedals for Adjustment Restriction. (Advisory).

SB 168 Inspection of Cockpit Floor Beneath Port Rudder Bar Support Bracket. (Advisory).

Note: SB 120 issue 3 "Inspection of Rudder Bar Support Brackets" (CAA AD 012-01-97) is now superseded by SB 120 issue 4 now subject to EASA Airworthiness Directive AD 2009-0013.

Mandatory Modification Bulletins where included are not covered by this Service Bulletin; they remain applicable in their own right and are cross referenced for confirmation of continued compliance and certification.

MB M576 Introduction of rudder pedal pad with chamfered side plate. (CAA AD 013-05-94).

MB M992 Introduction of fasteners to front of Frame 2 to 3 Trim Panel for added security. (CAA AD 005-03-2003).

#### **ACTION:**

**Prior to starting the inspections it is recommended that this Service Bulletin is read in its entirety and understood. Ensure that notes are made of the positions of removed items to aid correct re-assembly, unless otherwise specified by this Service Bulletin. If in doubt, contact MSAC.**

1. (a) The rudder pedal operating mechanism is to be checked for full and free movement in all aspects of normal operation and abnormal operation, e.g. application of toe brakes during extreme pedal deflections during spin recovery. The checks are to take into account all rudder pedal adjustment positions. Note rudder pedals at positions 2 and 4 can be set passed the fully forward adjustment position; ensure for clearance checks that they are in this position. It must be also noted that during the clearance checks the pedals do not necessarily have a direct fore and aft load applied; there will be side loads on the pedal pads deflecting the pedal pad laterally or pivoting it about its slider. Load is defined as adequate load to fully operate rudder pedals and brakes, with adequate side load to take up any free play that might be in the system.

(b) Referring to Figures 3, 11A and 11B, check the Right Hand pilot's left pedal (Pedal No. 3) for clearances from: i) starboard rudder cable attachment bolts to link plate and ii) link plate to rudder bar lever post. Clearances should be a minimum of 15mm and 16.5mm respectively. Clearance checks to be performed at all four pedal adjusted positions, but especially; with pedal adjusted fully forward (or past last adjustment position), with full left rudder applied, together with a left hand side force applied to the pedal – refer Figure 3 – and that any slack in the rudder cable is taken up in the starboard direction - see notes below.

Note 1: right hand rudder cable becomes slack on application of left rudder, therefore at link plate to turnbuckle attachment bolt, pull bolt assembly to starboard to take up any sideways play, as this will reduce clearance.

Note 2: ensure there is no end float in the bolts, i.e. that they are tight but not tight enough to restrict rotation. Ensure Loctite is applied to stiffnut after adjustment or replacement, MSAC code 126-51-066 or 067, Figure 11A Section F-F refers.

Note 3: if clearance of 16.5mm cannot be achieved then fit special low head bolt T67M-45-0579 thus invoking Mod MA1992. Mod kit T67A-05-1992 to be obtained from MSAC Product Support.

(c) Inspection process (b) – including notes 1, 2 and 3 – to be applied to left hand rudder cable and Left Hand pilot's right pedal (Pedal No. 2 in this instance) applying right hand rudder and pulling bolted assembly to left.

2. Check forward, aft and lateral play in pedal pads and their sliders; ensure play is no greater than 5mm when pedals locked in any of the adjustment positions. If greater than 5mm then assembly requires refurbishment. Consult MSAC if required.
3. Check rudder pedal bar end float is no greater than 1.0mm. Acceptable end float is 0.0mm to 1.0mm. If end float is greater than 1.0mm then rectify end float IAW paragraph 14. Refer Figure 1.
4. Check that the Rudder Pedal bar port outboard support bracket, ref. Figure 1 and 3 is square to the floor and not "lozenged", that there is no deformation to its base and ensure that the bracket is secure to the floor. Check floor panel under area of bracket, inspect for cracking which could allow the bracket to lean. Remove the floor panel and check for signs of cracking in the floor around the anchor nuts on Pre Mod M919 aircraft or the anchor nut mounting plate Post Mod M919 aircraft, refer Figure 2. Any GRP damage will be shown as a white shadow on the GRP, with cracking felt as a rough edge. A light shining up through the floor will show a shadow.
5. Establish Mod status of floor with regards to whether full incorporation of Mod M919 has been implemented as per DOI T67C-149 issue 5, Figure 2C refers. Un-modified floor will be as shown by Figure 2A. Aircraft Modified IAW DOI T67C-149 issue 1, i.e. only doubler plate fitted, see Figure 2B. If DOI T67C-149 issue 5 has been recorded incorporated, then there is no further requirement to remove panels with respect to this Service Bulletin unless damage is noted during course of the inspection, an incident or noted during normal maintenance.
6. If floor under port outboard support bracket position is found to be cracked or broken or not modified IAW Mod M919 Figure 2C, then repair IAW DOI T67C-149 issue 5 and subsequent, to fully incorporate Mod M919. If the full Mod M919 has been previously incorporated i.e. to DOI T67C-149 issue 4 and floor is found to be damaged, inform MSAC.



Important note: Prior to any GRP repair work ensure that the relevant operatives are competent to carry out the task, e.g. attended MSAC/SACL/SAL (Slingsby Aviation Limited) Firefly GRP Repair Training Course, and are deemed to be current. Any repair work arising from this SB constitutes a Complex Task Referred to in EC Regulation 2042/2003 Annex I (Part M), M.A.502(d)3, M.A.801(b)2 and M.A.801(c).

7. Check rudder bar for chafing from the hot air cable and rectify as necessary. For inspection procedure and rectification refer to SACL (MSAC) Service Bulletin SB 126 "Inspection of Port Rudder Bar for Chafing".
8. Referring to paragraph 4, should Rudder bar support bracket be damaged replace with new item ref. paragraph 9 below. Ensure bracket is secured with a torque of 58lbf in (6.5Nm). Spring washers may be fitted; Mod M720 "Introduction of Spring Washers to Rudder Pedal Lay-shaft Mounting Bracket Screws" refers. See Figure 1. Ensure when refitting brackets that the saddle washer, T67M-45-537, is re-fitted and is assembled with its corner radius into the brackets radius, refer Figure 1. Ensure that the shorter, (28mm), mounting brackets are supporting Rudder Pedal Bar T67M-45-257, i.e. Port Rudder Bar, refer Figures 1 and 3.
9. Check the remaining rudder bar support brackets are square to floor and are not "lozenged", that there is no deformation to their bases and ensure that the brackets are secure to the floor, reference Figures 1 and 3. Check all rudder bar support brackets for cracks in accordance with Service Bulletin SB 120 "Inspection of Rudder Bar Support Brackets". If any bracket is found to be suspect replace with new item, i.e. T67M-45-277/278/279/280. Note these are welded brackets and invoke Mod M763 where they replace brazed brackets. Welding of the pin to the bracket constitutes Modification M763. Ensure upon replacement of any bracket/s that the aircraft is fitted with brackets to the same modification state i.e. Post Mod M763, if not then any Pre Mod M763 brackets are to be replaced. Check floor under any damaged support bracket by removing panel. Check security of bush T67B-10-557 under starboard rudder outboard support bracket, refer Figure 3. If bush is found to be suspect remove starboard floor access panel and if bush is loose, then repair IAW DOI T67B-414. Ensure washers and brackets are correctly assembled refer paragraph 8 above. Inform MSAC of any damaged bracket or additional floor damage. Assemble item as per paragraph 8 and ensure end float is as stated in paragraph 14. Ensure bonding leads are correctly fitted, carry out bonding check refer relevant aircraft's Maintenance Manual. Ensure correct length screws for attaching the rudder bar support brackets have been fitted in the correct positions, refer Figure 3.

Important Note (ref. paragraph 9 above):

When re-assembling the rudder pedal/brake system ensure that the rudder bar support brackets are assembled in their correct positions. The port side rudder bar support brackets are shorter than their counterparts on the starboard side and must NOT be interchanged. Cross check with the approved aircraft maintenance manual for the correct part number of each bracket and its position in the aircraft.

10. Referring to Figure 9, ensure that there is either no gap or a gap either side of no greater than 0.5mm, at the brake master cylinder pivot points and that the support brackets are securely mounted to the floor panel, i.e. not loose. Brackets should not deflect if base fastenings are sound. If bracket is seen to be suspect, i.e. out of square, twisted or bent, remove brackets and replace with new brackets if damaged. Check that there is no damage to the bracket anchorages in the removable floor panel. Damage will show as whitening in the laminate surrounding the anchor nuts and foam reinforcement block, ref. Figures 9A and 9B, if in doubt remove panel and check anchor nuts for security. Figure 9 refers. The floor panel if found to be damaged is to be repaired or new panel fitted, refer to MSAC Product Support Department. If damage found then proceed as indicated by paragraphs 11 and 12. When rectified ensure all clearances and checks are accomplished as related to in this Service Bulletin.

Note: This check should be accomplished with the rudder pedal and brake system operating through to their extremes, as a gap can appear during the operation of the system, if the system is not correctly aligned or assembled. Some brake master cylinder support brackets have slotted mounting holes to assist in achieving correct alignment. If the bracket's mounting holes are not slotted then it is permissible to slot the holes as detailed at Figure 9, View on Arrow E.

Important Note:

Ensure that the rudder pedal/brake system brake cylinder support brackets are assembled in their correct positions. The port side cylinder support brackets are shorter than their counterparts on the starboard side and must NOT be interchanged. Cross check with the approved aircraft maintenance manual for the correct part number of each bracket and its position in the aircraft. Figure 9 refers.

11. If either the rudder bar support brackets or the brake master cylinder support brackets or floor panel or floor panel mountings are damaged then the entire rudder operating system should be thoroughly checked for damage to fittings, rudder pedal stops, rudder horn, cables, rear fuselage stops, nosewheel steering stops - Pre M468 aircraft only, etc. If any damage is found please report back to MSAC. Damaged items are to be repaired or replaced. When replacing brackets ensure attaching screws are torque loaded to  $5.7^{+0.5/-0}$  Nm,  $50^{+5/-0}$  lb. in.
12. If damage is found ref. Paragraph 10, then brake master cylinder to rudder pedal carriage attachment pin is to be checked for deformation/cracking, Figure 9 refers.
13. An identifiable cause for the distortion of the rudder pedal bar support brackets and brake cylinder support brackets is the ground handling the aircraft with a vehicle or other mechanised trolleys/carts, whereby the towing arm or trolley/cart has been outside of the limitation markings on the cowling when the aircraft is turned. However if there is damage to the support brackets and the aircraft has knowingly never been towed by a vehicle then inform MSAC. If the cowling has been repainted and/or limitation markings are missing or have been replaced then contact MSAC to ensure correct limitation marking positioning. MSAC/SACL/SAL vehicle and hand tow bars only shall be used for towing the Slingsby T67 series of aircraft, refer to introduction of this Service Bulletin.

Note: Ensure any airfield apron towing guidance markings are within the T67 Firefly aircraft's towing limitations.

14. Referring to Figure 1 ensure at each rudder bar pivot position that there is one spacer T67M-45-507 or one off washer 126-23-748 and up to a maximum of two off washers 126-23-749, i.e. 3 washers maximum.

If end float greater than 1.0mm, then 1 off packing washer may be added at each pivot position as required, i.e. 126-23-105 washer or 126-23-748 washer or 126-23-749 washer.

If packing washers are required on the right hand rudder bar (T67M-45-259), then the packing washer, (or the thicker washer if a thick and thin washer are required) should be placed at the outboard pivot. When end float of 1.0mm maximum achieved ensure that the brake cylinders are not subject to undue side load. If in doubt contact MSAC.

Note1: it is imperative that the combination of packing washers is adhered to as any more than the stated amount may allow the rudder bar mounting brackets pivots to become out of safety.

Note 2: 126-23-105 or 126-23-748 are 1.6 mm thick and 126-23-749 is 0.81mm thick.

Note 3: Ensure after packing, that the bars are not binding and have full and free movement.

Note 4: To further ensure clearances are achieved it is acceptable to shim between brake crank boss and rudder bar, as indicated by Figure 10. There are 3 thicknesses of shim available: 0.5mm, 1.0mm and 1.3mm, part numbers T67G-45-855, T67G-45-856 and T67G-45-857 respectively. The fitment of these shims invokes Change Mod M1035 "Introduction of Shim between Brake Crank Boss and Rudder Bar".

15. Check that the 'U' brackets are free of any deformation, and are parallel and square to the rudder bar axis; Figure 7 View on 'A' refers. Also ensure the rudder pedal carriages have full and free movement. If binding is suspected then check the 'U' bracket internal dimension. This should measure 35.0mm to 35.5mm, also check that the pivot bush protrudes from its boss by at least 0.25mm, see note 3 below. If the bracket internal dimension is greater or less, or if out of alignment then the bracket should be checked for cracking, refer Figure 7. If cracking is found then return rudder bar to MSAC for rework. Finally check length of carriage pivot bolts, reference Figure 3, if binding is noted then replace bolts with bolt part number T67B-08-537 this introduces a bolt 15 mm long, measured from under head, and invokes Mod M808

"Introduction of Shortened Pivot Bolt to Rudder Pedal Slider Assembly Mounting". Also refer to SB130 Inspection of Rudder Pedals for Adjustment Restriction".

Note 1: Use NDT methods, (dye penetrant) for detecting structural defects e.g. cracks, ensure paint is removed from the suspect area before carrying out test. If defects are found, replace item or return to MSAC for rework. If no defects are found, remove all NDT materials and re-apply finish.

Note 2: Note rudder stop plates, positions indicated on Figure 3, are permitted with deformation assuming full rudder movement and clearances have been achieved and there is no cracking in the welds supporting the stop plates, if in doubt return rudder bar to MSAC for rework.

Note 3: To achieve bush protrusion it is acceptable to shorten bosses, refer Figure 7.

16. Prior to checking rudder movements, remove and inspect to ensure that the rudder bar stop screws, Figure 9A refers, are  $39 \pm 3$  mm long under their heads and that the stop mountings in the floor panels pedestal are structurally sound. If stop is not 40mm then fit longer item T67B-45-613, Post Mod M458 "Introduction of Reduced Limits on Rudder Movement i.e.:  $30^\circ \pm 2^\circ$  now  $30^\circ \pm 1^\circ$ , plus Lengthened Stop Screw". Check threaded portion of stop for straightness, change stop screw if bent - part number T67B-45-613 or acceptable alternative T67B-45-633, (Change Mod M1043 "Introduction of Alternatively Manufactured Rudder Pedal Primary Stop Screw"). If it is noted that the stops are screwed fully in, then check rudder cable length, reference paragraph 20. Check play in links, i.e. for elongated holes, refer Figure 3. If holes are elongated replace links with new item/s. Replace rudder cable when turnbuckles are at the end of their adjustment.
17. Check the rudder pedal movement, ensuring that the rudder set-up procedure as detailed below is adhered to, otherwise setup as per Maintenance Manual paragraph 5.6.5. Ensure that the MSAC rudder movement board T67B-88-027 is used.
  - 17.1 Jack up the front of the aircraft until the nose wheel is just clear of the ground.
  - 17.2 Remove the cowling and disconnect the steering rod from the nose wheel.
  - 17.3 Set the rudder pedals fully forward for maximum leg length and screw in the rudder pedal stops to allow complete clearance with full rudder movement exerted.

Note: Rudder pedals at positions 2 and 4 can be set past the fully forward adjustment position. Ensure for set up that they are in the last indent.
  - 17.4 Remove the turnbuckle barrels from both rudder cable turnbuckles.
  - 17.5 Re-assemble the turnbuckle barrels ensuring equal engagement onto each thread. Screw up until no thread is showing.
  - 17.6 Secure a straight edge, Slingsby part number T67B-88-551 or T67G-88-501, across all four pedals, (all must touch), at  $90^\circ$  to the fuselage centreline.
  - 17.7 Position the rudder movement board, refer paragraph 16 above, over the fin.
  - 17.8 Check that the rudder is in neutral. If not, adjust the relevant turnbuckle by screwing threads further into the barrel.
  - 17.9 Remove the straight edge securing the rudder pedals.
  - 17.10 Check that the maximum movement is obtainable either side of neutral. If necessary adjust at the turnbuckles to give sufficient movement of the rudder to allow limits to be set. Take care to maintain the rudder neutral position.
  - 17.11 Set the rudder movement, within limits, by adjustment of the rudder pedal stops. Lock the stops when satisfied with setting. The stop bolts must not be screwed out more than 25.4mm (1 inch), measured from the structure to under the head of the stop.

- 17.12 Check rudder movements to full extent using foot loads. Verify all mechanical clearance, with the pedals at all adjustment positions, with and without brakes applied. When satisfied, wirelock the turnbuckles with a double figure of eight wire configuration between the clevis and the diametric hole on the turnbuckle barrel.
- 17.13 Reconnect the steering arm with the rudder neutral and nose wheel centred; adjust the steering link fork end as required.
- 17.14 Check that the nose wheel stops do not engage before full rudder movement is achieved.
18. Ensure Trim Panel Modification M992 "Introduction of Fasteners to Front of Frame 2 to 3 Trim Panel for Added Security" has been incorporated, UK CAA AD 005-02-2003 refers.
19. Upon completion of rudder movement set-up ref. Paragraph 17 above. Ensure minimum clearances of trim panel to pedal side plates and rudder cable to pedal side plates are met Figure 3 refers. If necessary to obtain the required clearances, Mod M232 "Introduction of Rudder Pedal Packing for Increased Clearance of Surrounding Components" may be required to be invoked. Refer paragraph 14 for packing washers on rudder bar.
20. Ensure fuel pipe to rudder pedal slider clearance is met; refer relevant aircrafts Maintenance Manual Paragraph, 5.6.5.1, where relevant the minimum acceptable clearance is now to be 5mm. If clearance cannot be achieved then; i) remove Rudder Cable and check length, length should be  $4862 \pm 2$  mm, Figure 6 refers; ii) additionally check condition of rudder pedal assembly, refer paragraph 2 iii), if i) and ii) do not achieve clearance; remove fuel pipe, refer relevant aircrafts Maintenance Manual, and re-orientate fuel pipe. If satisfactory clearance cannot be achieved inform MSAC.
21. Ensure head orientation of rudder cable link bolt head is outboard, Figure 3 refers, this is a Low Pan Head bolt T67M-45-570 on Post Mod M471 "Introduction of Pan Headed Bolt on Rudder Cable Turnbuckles", aircraft.
22. Ensure Pedal no 2 Pedal pad pivot bolt head height is less than 5mm and orientated as shown in Figure 4. A minimum of 1mm clearance is required, if not fit part no 126-21-210 or T67B-08-981, this invokes Mod M671 "Introduction of Low Head Rudder Pedal Pad Pivot Bolts – Pedal No. 2". If clearance is not still achieved check dimension from steering arm centreline to rudder bar end, dimension should be  $63 \pm .25$  mm, Figure 3 specifies. If the distance is incorrect, then return rudder bar to MSAC for re-work/new item. Alternatively if clearance of 1mm is still not achievable remove up to a maximum of 1.5mm from the steering arm screw this invokes Modification action M1029 "Introduction of Low Head Bolt on Rudder Pedal Bar to Steering Arm Pivot", Figure 4 refers, and paint modified screw head red.
23. Ensure the requirements of, SB 99 "Inspection and Rectification of Rudder Pedal Sliders", has been met. If all of the actions as quoted in SB99 have not been previously incorporated then monitor, at every 150 hours, for loose rivets until SB99 requirements are incorporated in their entirety.
24. Ensure that all the nylon liners in the rudder pedal carriages are fitted, (4 pieces per carriage in Pre-Mod M450\* aircraft, 1 piece liner in Post Mod M450) and are in a good condition and not worn, Figure 10 refers, replace liners if unsatisfactory. Return carriages to MSAC for replacement of liner.
- \*Mod M450 "Introduction of Improved rudder pedal sliders, adjusting mechanism and pedal incorrect assembly feature".
25. Ensure Mandatory Mod M576 has been invoked; CAA AD 013-05-94 refers. Pedal side plate should be as Figure 8.
26. Check structural integrity of pedal pad assembly especially around adjuster pushrod hole pedal plate, Figure 8 View on Arrow 'B' refers, if plate is cracked or damaged the pedal pad is to be repaired. Ensure riveting is secure, if rivets are loose then they have to be rectified. Ensure that the pad pivots are not worn and that the nuts are tight, but allow pad to pivot, nuts to be retained with adhesive 126-51-067. Replace pedal pads if worn. Contact MSAC for new pedal pad assembly, materials and any applicable repair scheme.



Note: When carrying out aircraft ground running at high RPM it is advisable to use effective chocks wherever possible and not rely upon the aircraft brake system alone because the aircraft may be dragged along with the wheels locked. In this situation, any further pressure on the brake pedals will be ineffective and cause damage to the rudder pedal pads, support plates and sliders. Typical deformation found is shown at Figures 12, 13 and 14. If any similar damage is found, part/s are to be returned to MSAC for rectification.

27. Ensure that the brake operating crank, as shown at Figure 10, has a minimum clearance of 4mm relative to the rudder pedal bar following all checks and rectifications. Allow for various brake conditions, refer paragraph 30.2. Should bar show signs of chaffing check depth of groove. If depth is 0.0mm to 0.5mm, remove rudder bar, blend out groove, repaint and refit. If the groove is to a depth greater than 0.5mm, remove rudder bar and return to MSAC for repair or replacement.
28. Ensure rudder pedal carriage socket head caps screws are wire locked and bonded in with adhesive 126-51-024, use minimum amount, Mod M162 "Wire Locking of Rudder Pedals – Upper Pivots", refers. See Figure 3.
29. Ensure on aircraft fitted with the Fairey Hydraulic undercarriage, (Post Mod M468 or Mod M791), that there is a minimum clearance of 2.5mm with steering linkage to engine mounting frame, see Figure 5. Ensure there is no damage to engine mounting frame if clearance is less than 2.5mm. If engine mounting frame is damaged then aircraft must not be flown until damage is rectified, consult MSAC. Also if clearance is less than 2.5mm embody Mod M575 "Introduction of Offset Steering Arm Pin – Ref Fairey Hydraulics Nose U/C", if Mod M575 is fitted and clearance is less than 2.5mm inform MSAC.
30. Ensure on the Annual inspection or during any maintenance in the area of the rudder pedal mechanism - e.g. trim panels removed - or upon removal of any of the rudder pedal operating mechanism, that the clearances in the areas noted in paragraph 1 to 29 above are met.
  - 30.1 It must be noted that during the clearance checks that the pedals do not necessarily have a direct fore and aft load applied, there will be side loads on the pedal pads deflecting the pedal pad laterally or pivoting the pedal about its slider. Also note rudder pedals at positions 2 and 4 can be set past the fully forward adjustment position\*, ensure for clearance checks that they are in this position. Load is defined as adequate load to fully operate rudder pedals and brakes, with adequate side load to take up any free play that might be in the system.

\* Note a customer Optional Change Mod M1037 "Introduction of Forward Limit Stop to Rudder Pedal Slider Mechanism – Rudder Pedals 2 & 4", is available to limit forward travel of the position 2 and 4 pedal pads, Mod Kit T67A-05-1037 available from MSAC Product Support.
  - 30.2 Ensure that the rudder pedal operating mechanism is checked for full and free movement in all aspects of normal operation and abnormal operation, e.g. application of toe brakes during extreme pedal deflections during spin recovery. Note the operation of the brakes when 'hard' will have clearances which are greater than when the brakes are 'soft', (spongy), therefore ensure safe operation and clearances throughout these limits.
  - 30.3 Ensure any wire locking employed, e.g. on cable turn buckles, will not foul or snag either adjacent parts or pilots clothing.
  - 30.4 Ensure fastenings have the correct torque applied IAW with the relevant aircrafts Maintenance Manuals as applicable, also reference can be made to Service Bulletin 141 Recommended Stiffnut Maintenance Procedures and Clarification of Existing Maintenance Manual Screw/Bolt Torque Values.
  - 30.5 Always check for deformation and structural integrity of the rudder operating mechanism. Inform MSAC of any abnormality, e.g. weld cracking (see note below), excessive corrosion, bent components, loose rivets etc., or if clearances cannot be met. Send components to MSAC for replacement or repair. There will be a charge for this service.

Note rudder bars may have minor cracks in the welds at the bases of the various lever positions Figure 15 refers. This is a known condition and can be returned to MSAC for repair or repaired IAW with DOI T67G-877 latest issue. Note each individual crack can only be repaired up to a maximum of 3 times. Record to be kept of weld repairs. Replacement bars T67M-45-257 and T67M-45-259 are available from MSAC product support.

- 30.6 Ensure all clearance checks are undertaken at all 4 rudder pedal adjustment positions, with and without brake applied.
  - 30.7 Ensure that instrument panel forward console sideplate ty-rap is replaced; IPC Chap 30, Figure 2 refers. Console width to be no greater than 132mm after ty rap applied is replaced.
  - 30.8 On the completion of this Service Bulletin's inspection and rectification procedure, ensure that each rudder pedal mechanism clearance is still as stated and has not been affected by any subsequent adjustment/s or rectification/s.
  - 30.9 Ensure all cabling and ducting is secure and will be clear from the rudder pedal mechanism in all its positions, consider movement of cables , etc., e.g. when the aircraft pulls 'g', flies inverted etc. Should any unsupported cable/ducting be identified then ensure it is secured in such a manner as to clear the rudder pedal mechanism and still be able to function
  - 30.10 Clearances, quoted in this Service Bulletin over-ride any clearances, quoted in the relevant aircraft Maintenance Manual.
31. If correct rudder movement and rudder operating mechanism clearances are met, annotate Logbook with "SB 188 incorporated", at each inspection. After completion of first inspection using Issue 6 of this SB, complete the attached form at Annex A and return it to the address provided. If upon subsequent inspections clearances have been found to be outside of limits and requiring repair, please also complete Annex A and return it to the address provided.
  32. At each subsequent Annual inspect IAW this Service Bulletin in its entirety until such time that the relevant aircrafts Maintenance Manual and Schedule are amended. Additionally, Maintenance Organisations are to ensure that the inspections contained in this Service Bulletin are added to their specific Maintenance Schedules where applicable.

For further information, existing repair schemes or Mod/Service Bulletins or parts please contact MSAC Customer Support. Please note these services will be subject to a charge, unless an individual or company has a Support Agreement or Subscription Service in place. For parts and non-existing repairs a charge will be made.

In addition if required by inspections Change Mod Bulletins M1029 Introduction of Low Head Bolt on Rudder Pedal Bar to Steering Arm Pivot and/or Change Mod Bulletins M1035 Introduction of Shim between Brake Crank and Rudder Bar and their Mod Kits T67A-05-1029 and/or T67A-05-1035 respectively; are available from MSAC Product Support if required.

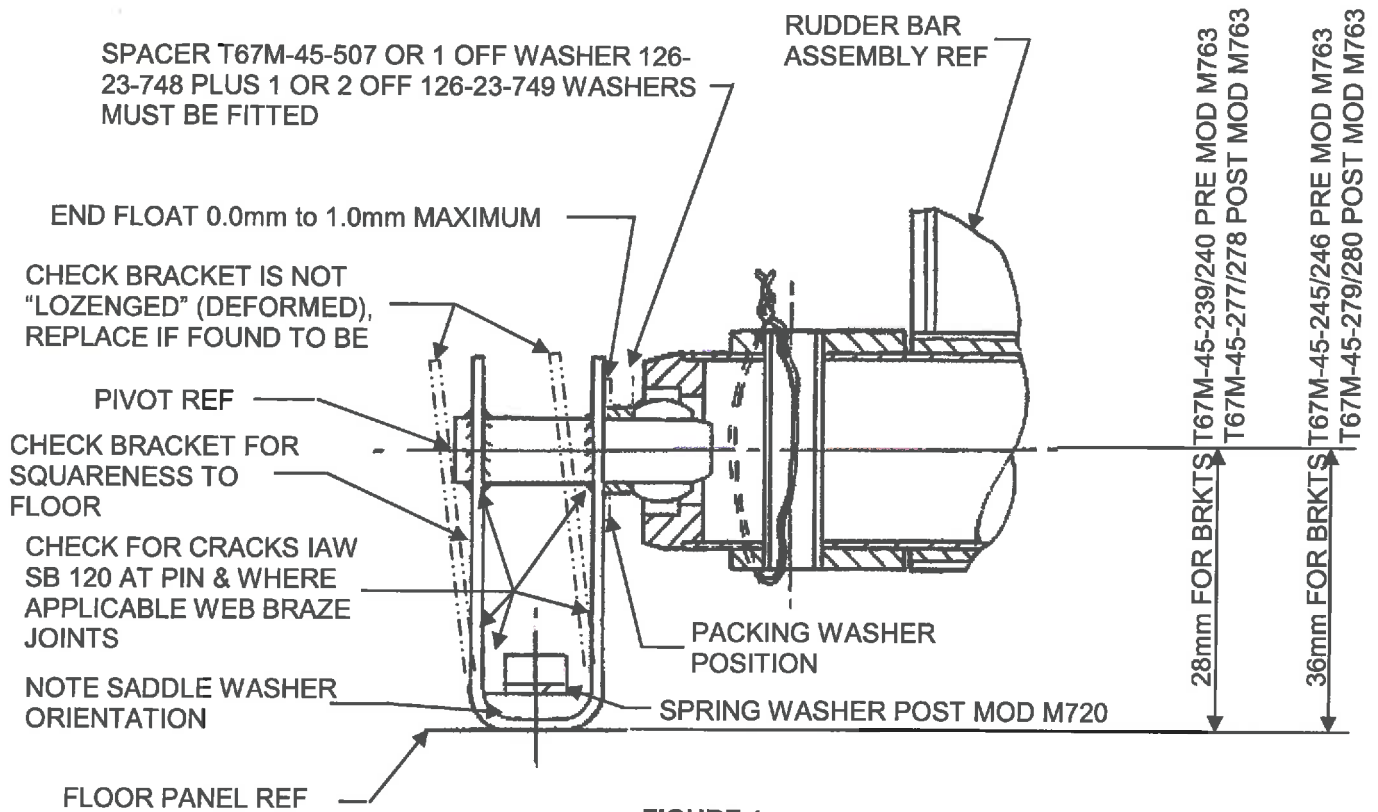


FIGURE 1

**RUDDER BAR END FLOAT AND ITS SUPPORT BRACKET**

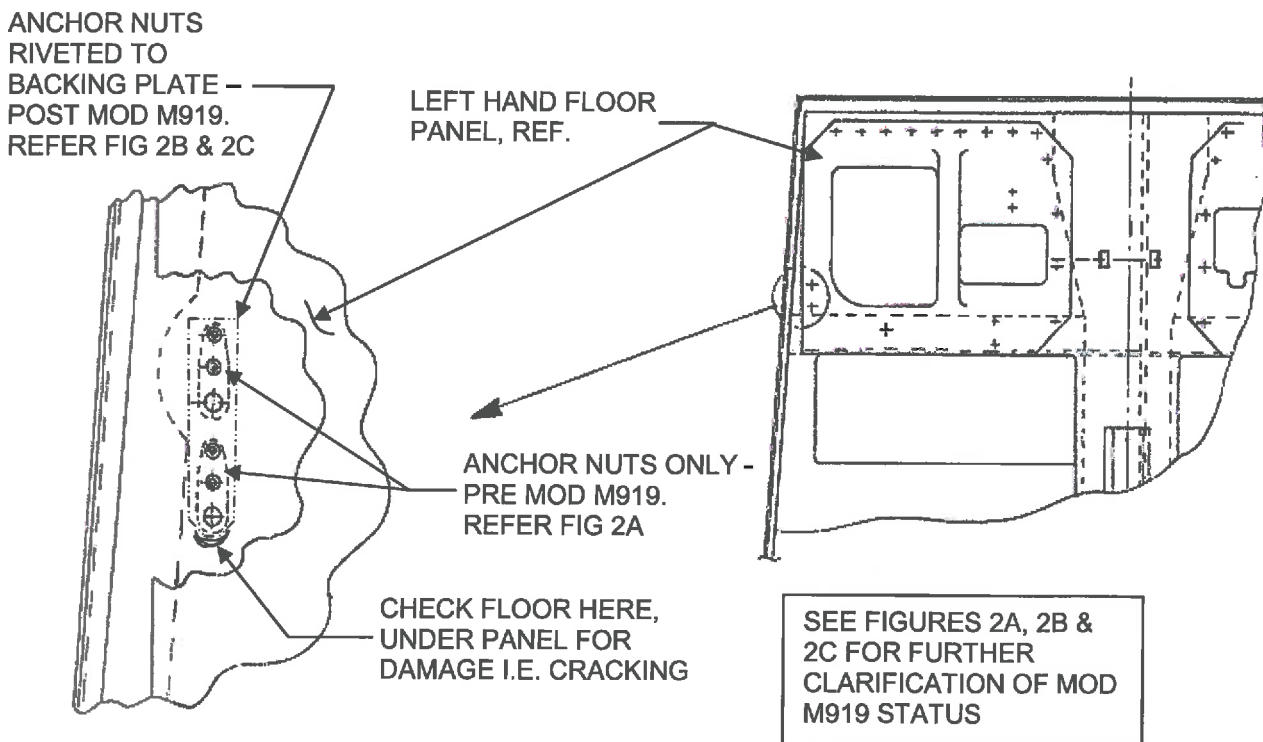
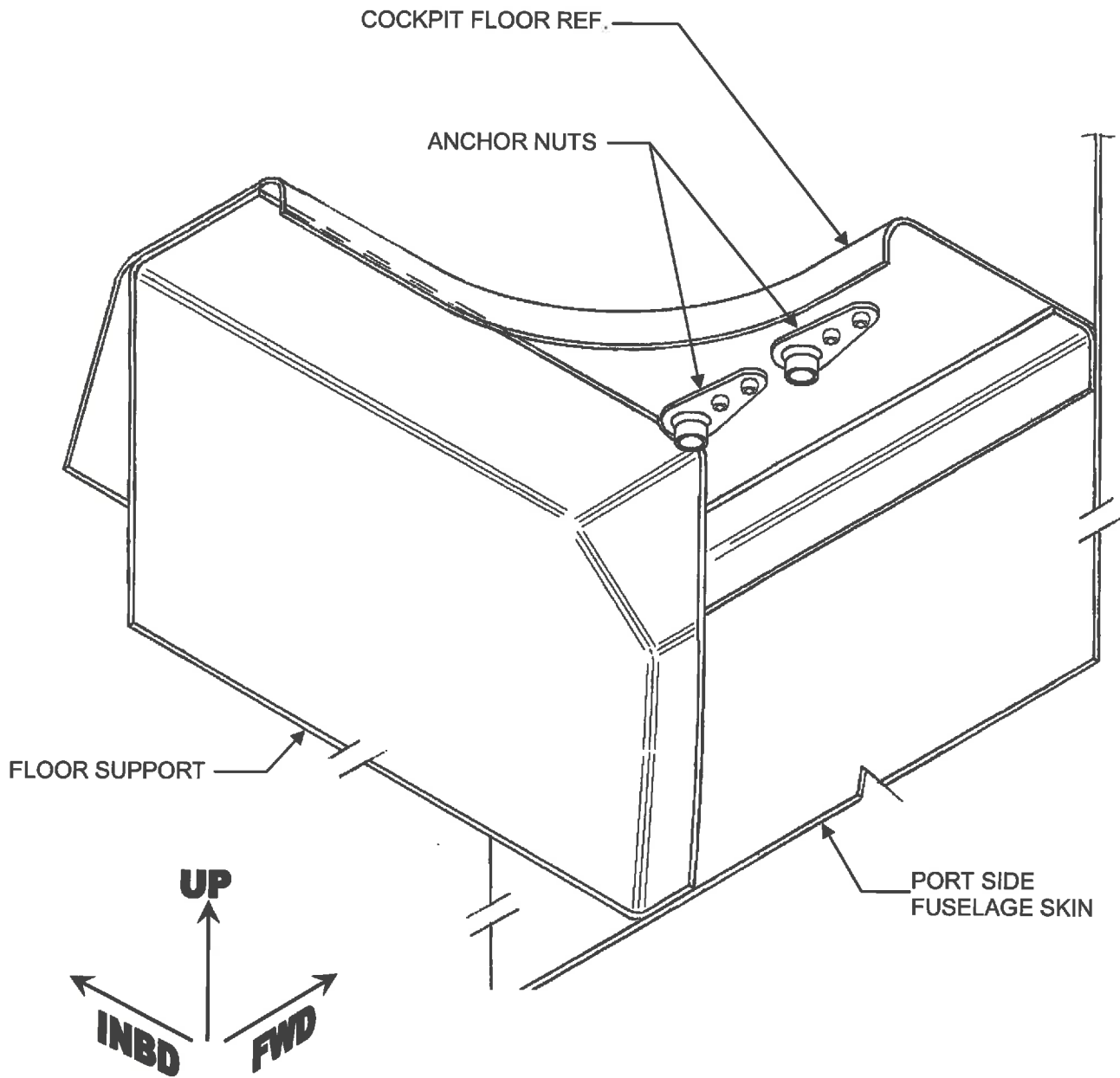


FIGURE 2

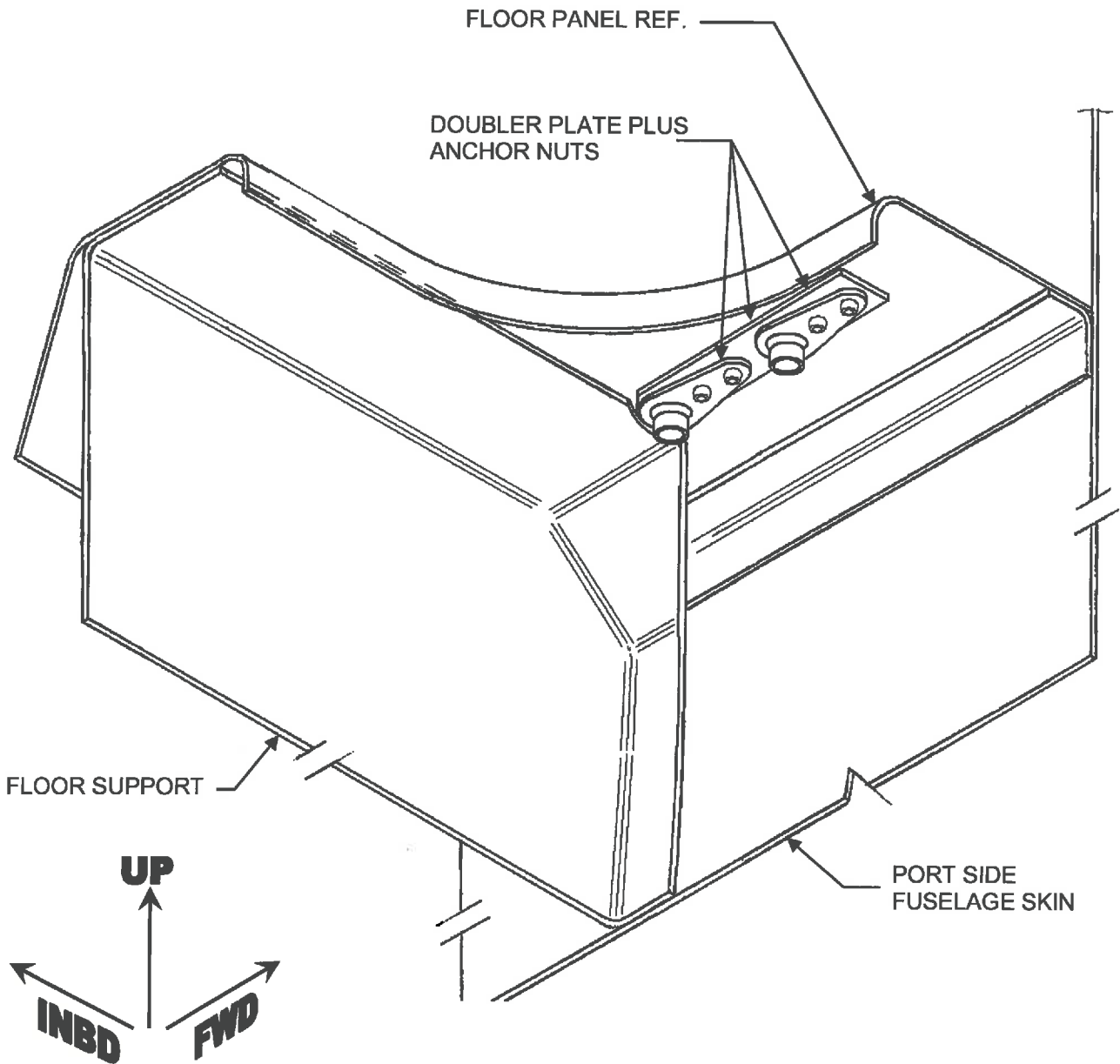
**AREA OF FLOOR REQUIRING INSPECTION**



**FIGURE 2A**

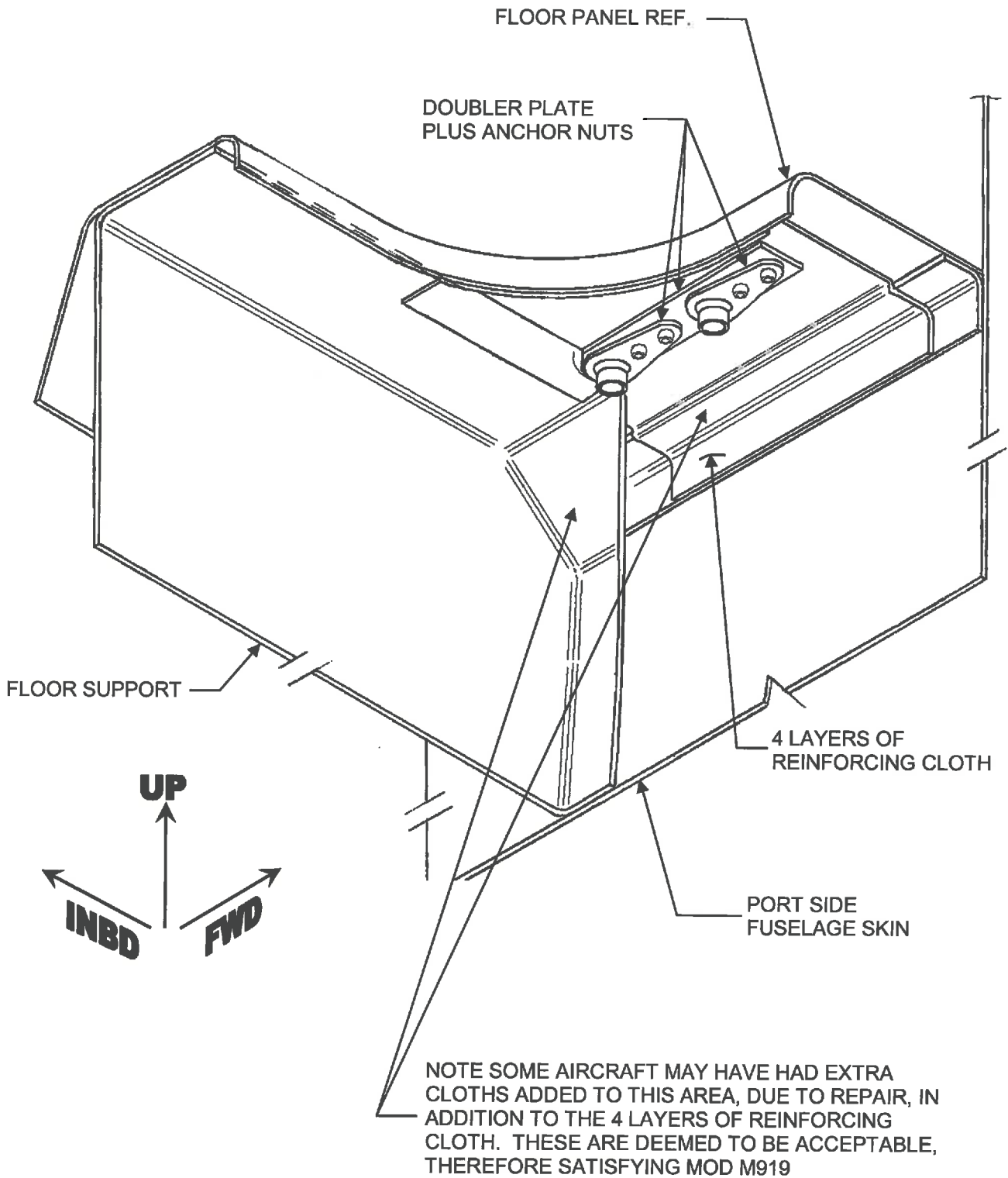
**SHOWING PRE MOD M919 CONFIGURATION  
REQUIRES REPAIR MODIFICATION IAW DOI T67C-149 ISSUE 5 & SUBS**





**FIGURE 2B**

**SHOWING PART MOD M919 INCORPORATION  
REQUIRES REPAIR MODIFICATION IAW DOI T67C-149 ISSUE 5 & SUBS**



**FIGURE 2C**

**SHOWING FULL MOD M919 INCORPORATION  
NO FURTHER ACTION REQUIRED**

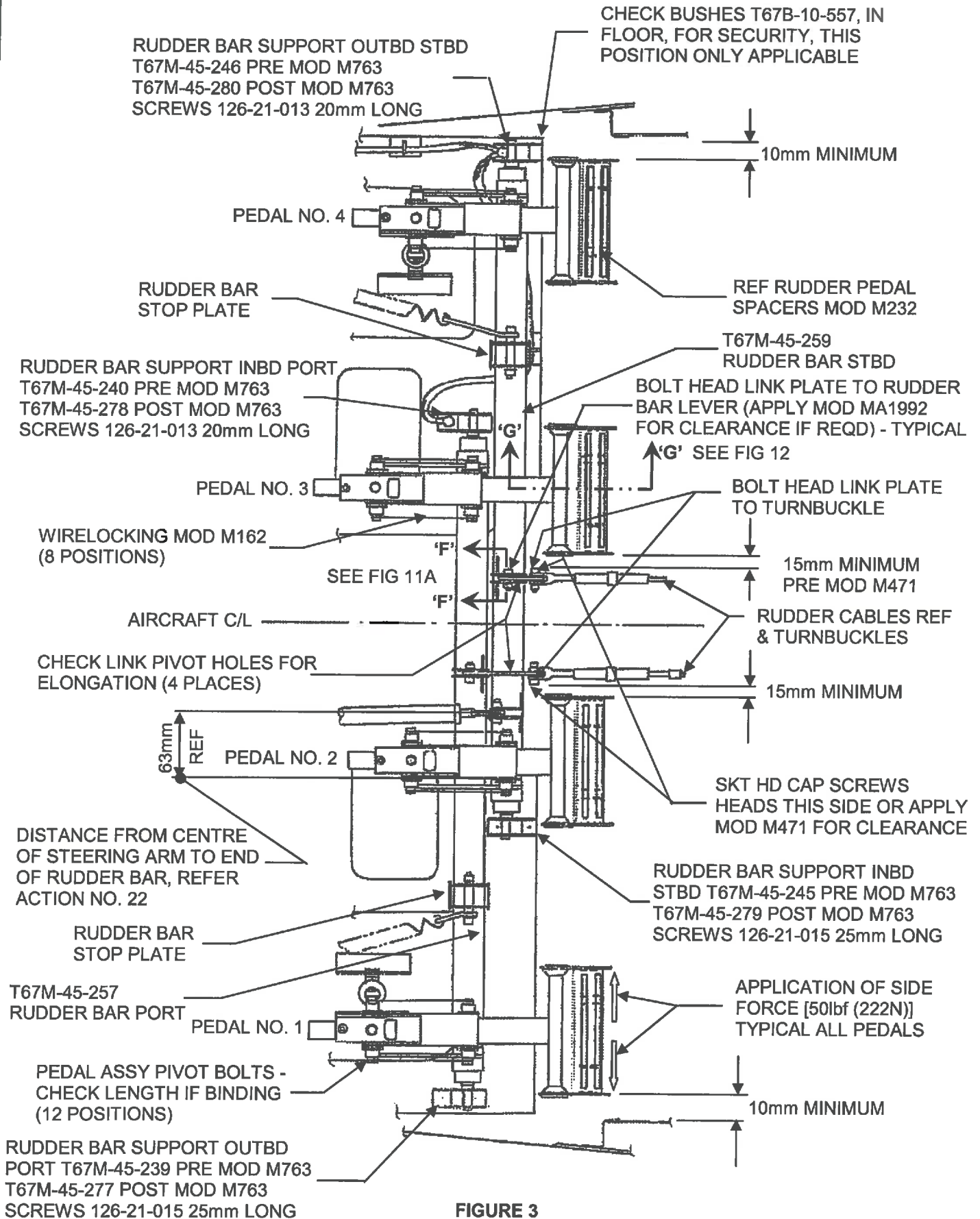


FIGURE 3

**RUDDER PEDAL CLEARANCES TO SIDE PANEL AND RUDDER CABLES**

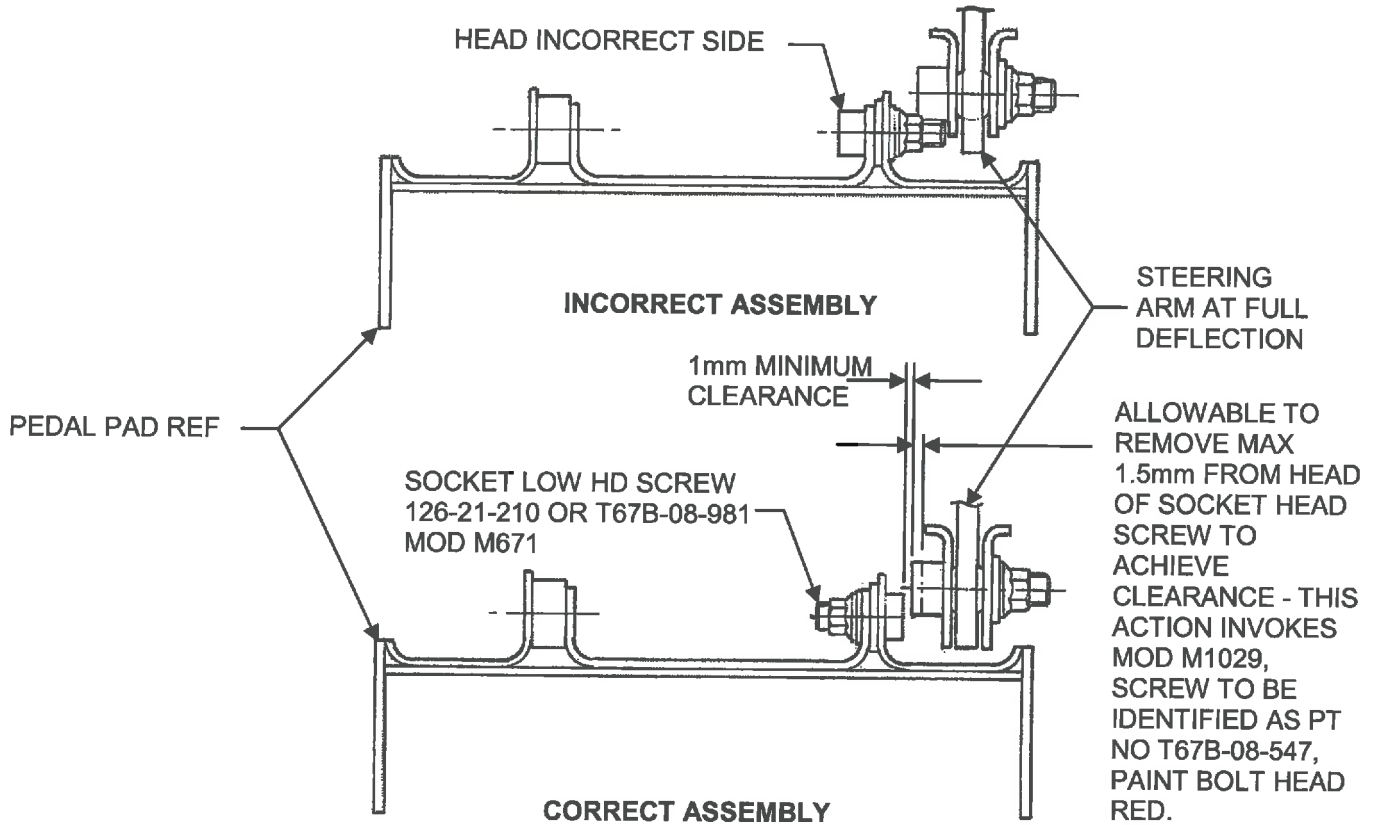


FIGURE 4

PEDAL NO. 2 TO STEERING ARM INTERFACE

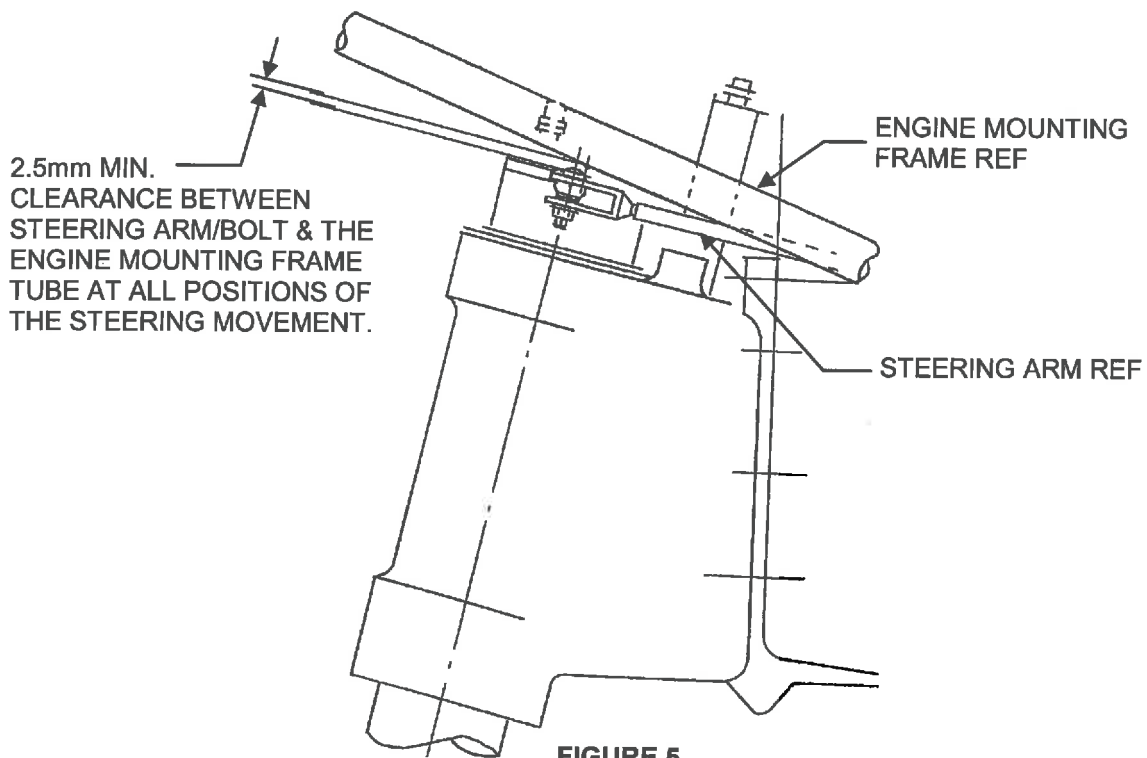
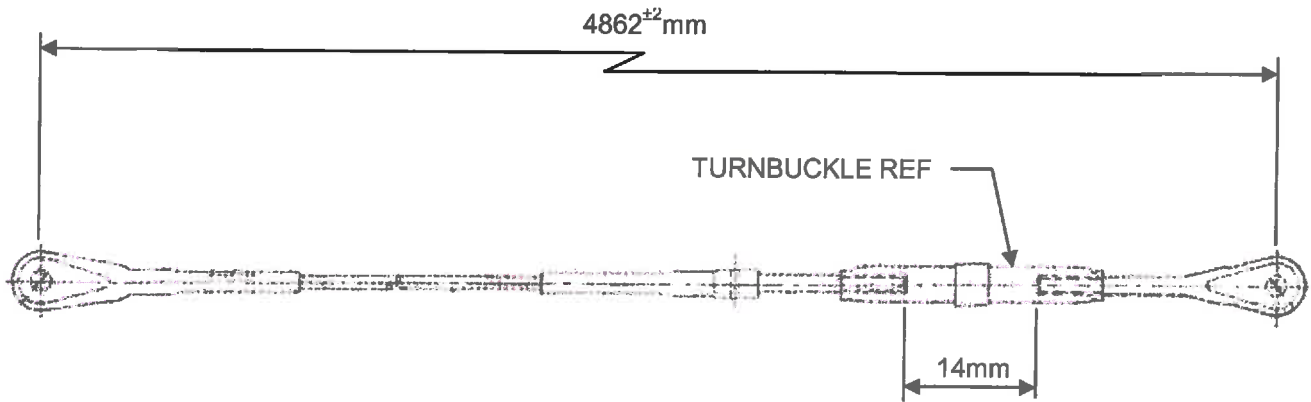


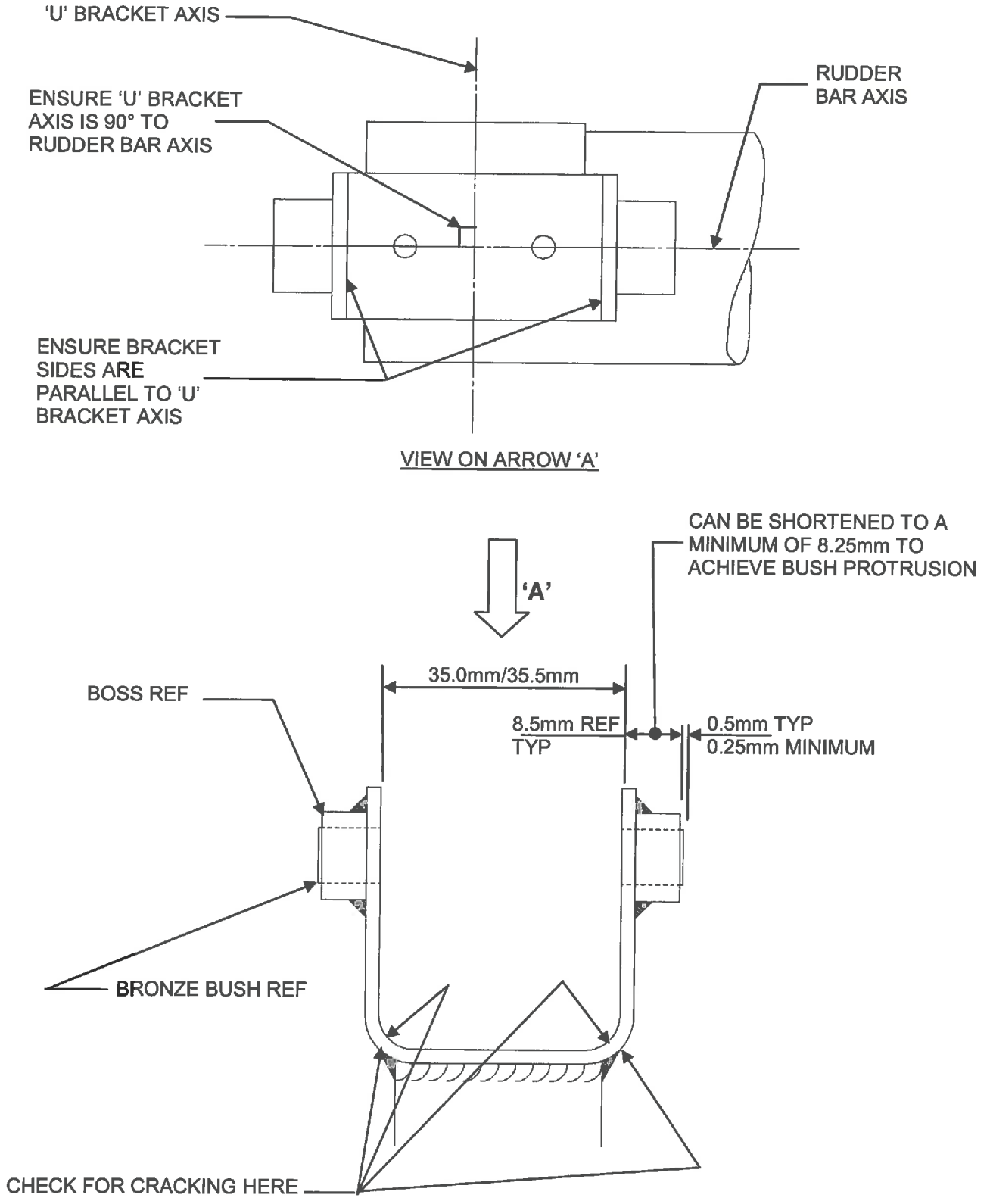
FIGURE 5

STEERING ARM ENGINE MOUNTING FRAME CLEARANCE





**FIGURE 6**  
**RUDDER CABLE T67B-45-219**  
**(ORIGINAL MANUFACTURED DIMENSIONS QUOTED)**



**FIGURE 7**  
**'U' BRACKET ON RUDDER BARS**  
**(4 POSITIONS)**

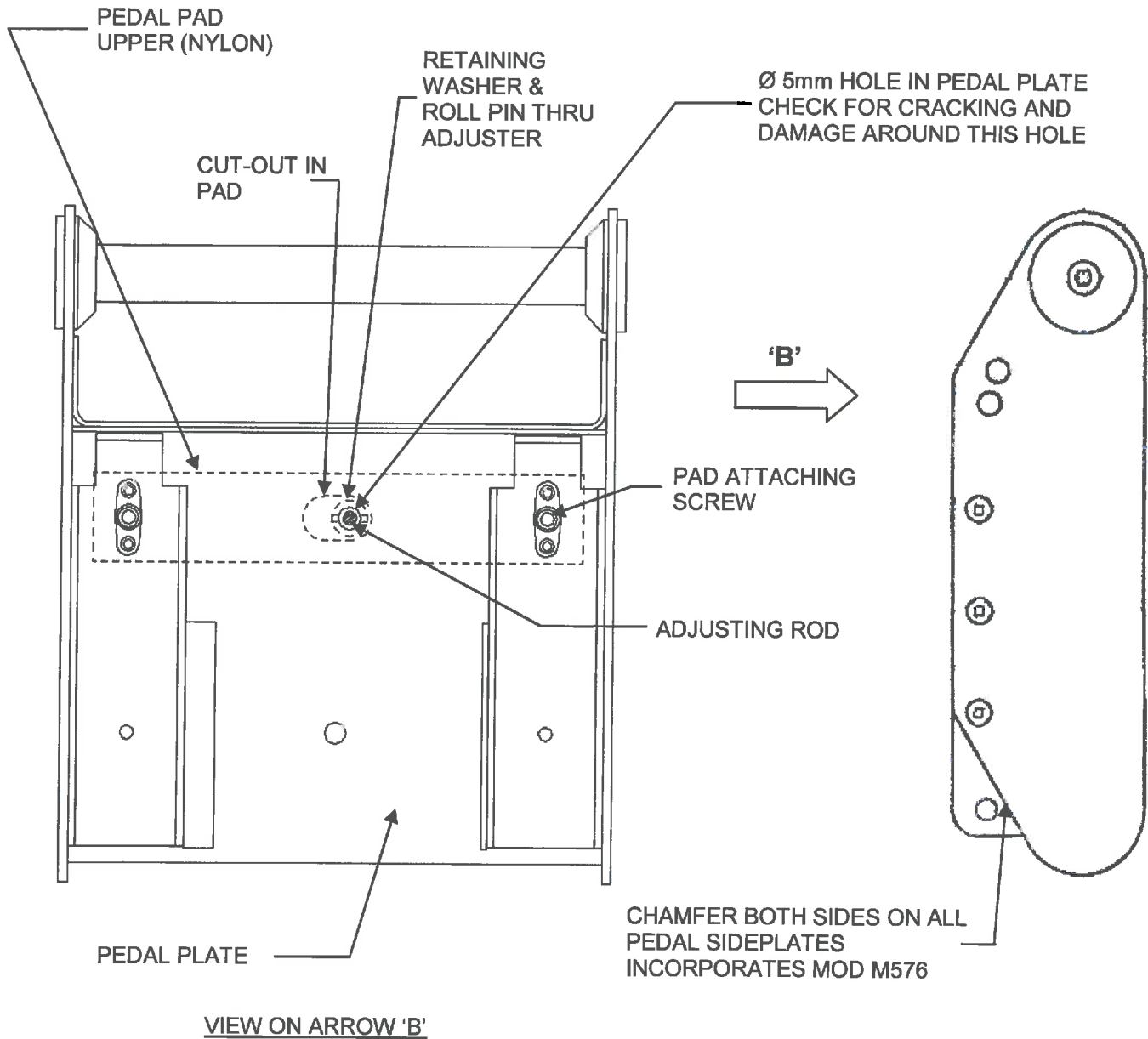
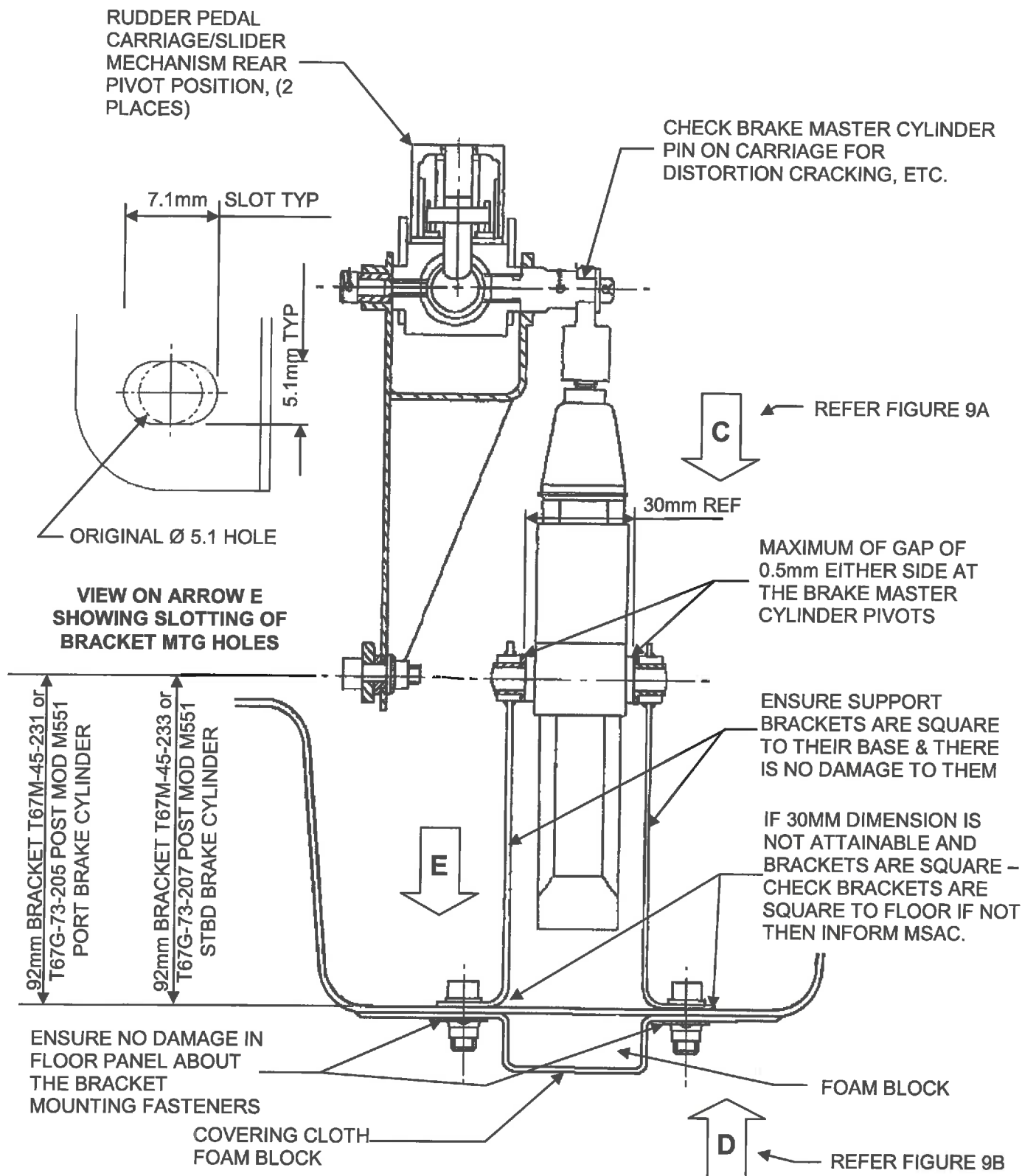


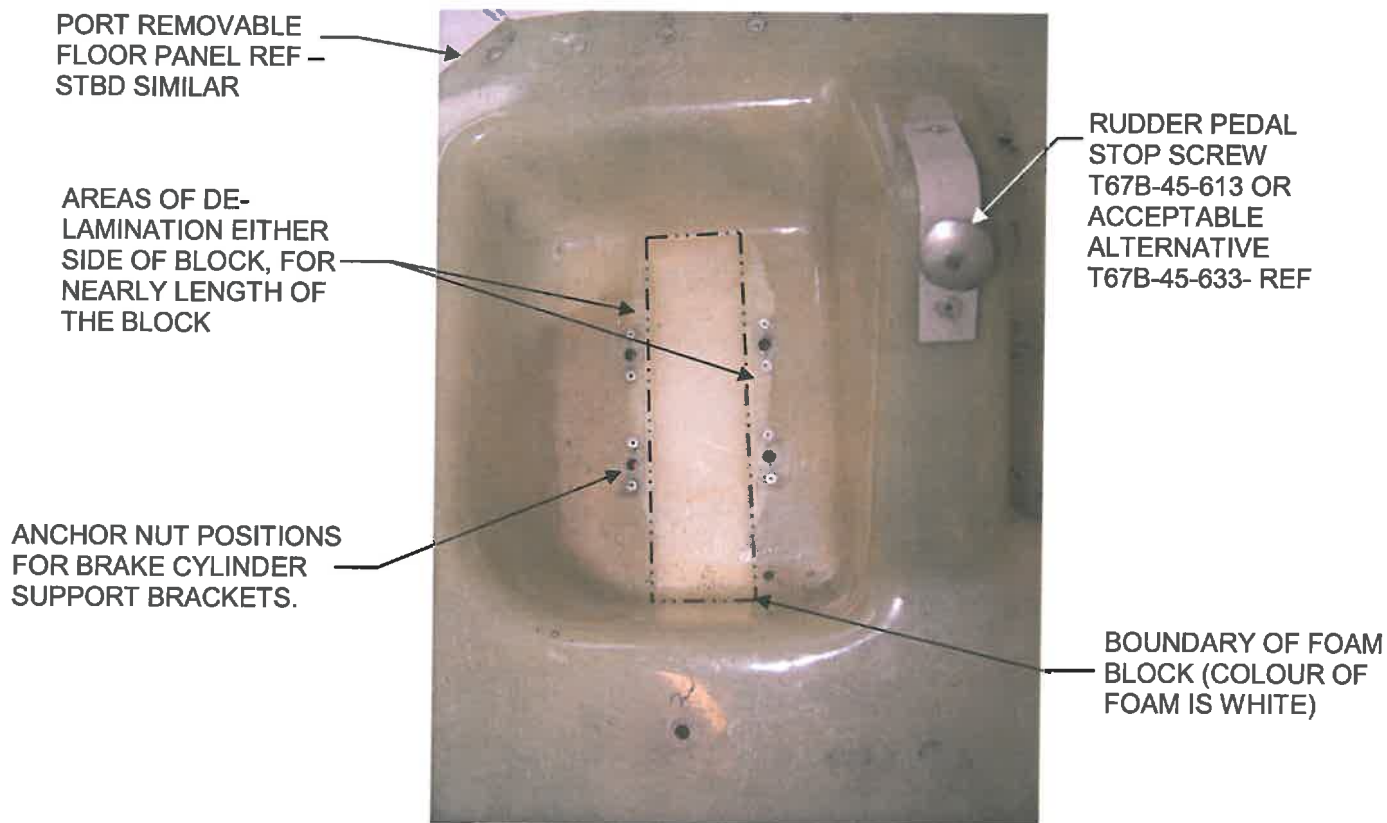
FIGURE 8

MOD M576 PEDAL SIDEPLATES WITH CHAMFER



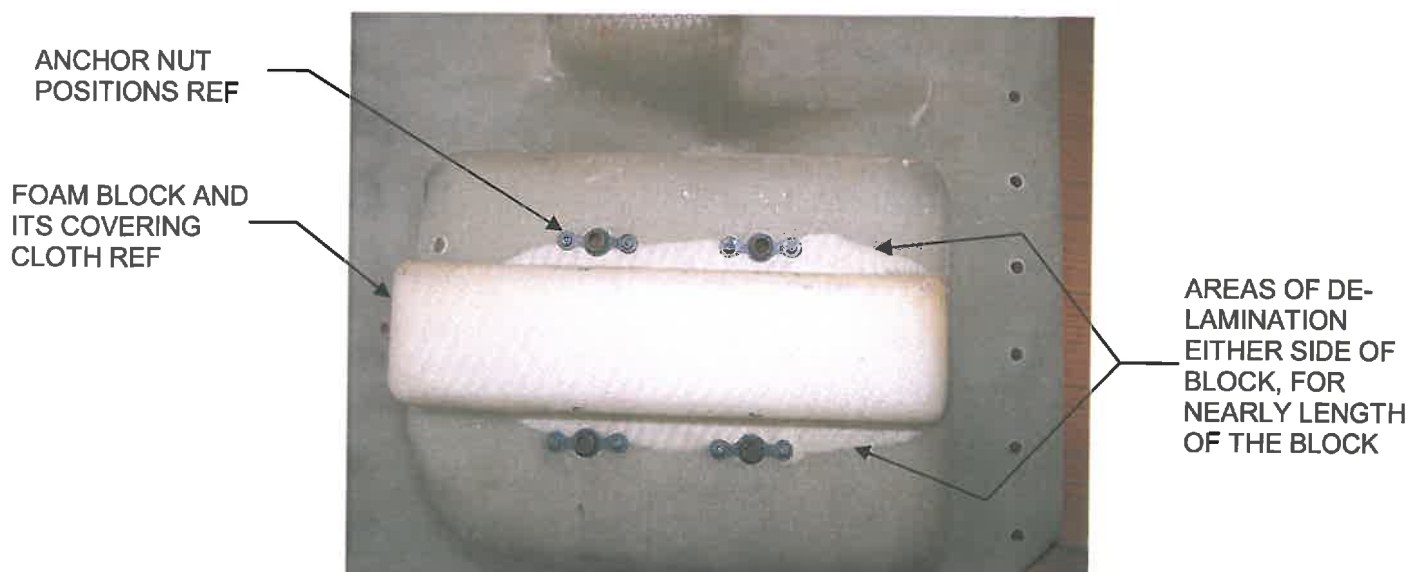
**FIGURE 9**  
**BRAKE MASTER CYLINDER SUPPORT BRACKETS**





**FIGURE 9A**

**PHOTOGRAPH ON ARROW C  
VIEW INTO TOPSIDE OF REMOVABLE PANEL SHOWING EXTENT OF DE-LAMINATION**



**FIGURE 9B**

**PHOTOGRAPH ON ARROW D  
VIEW ON UNDERSIDE OF REMOVABLE PANEL SHOWING EXTENT OF DE-LAMINATION**

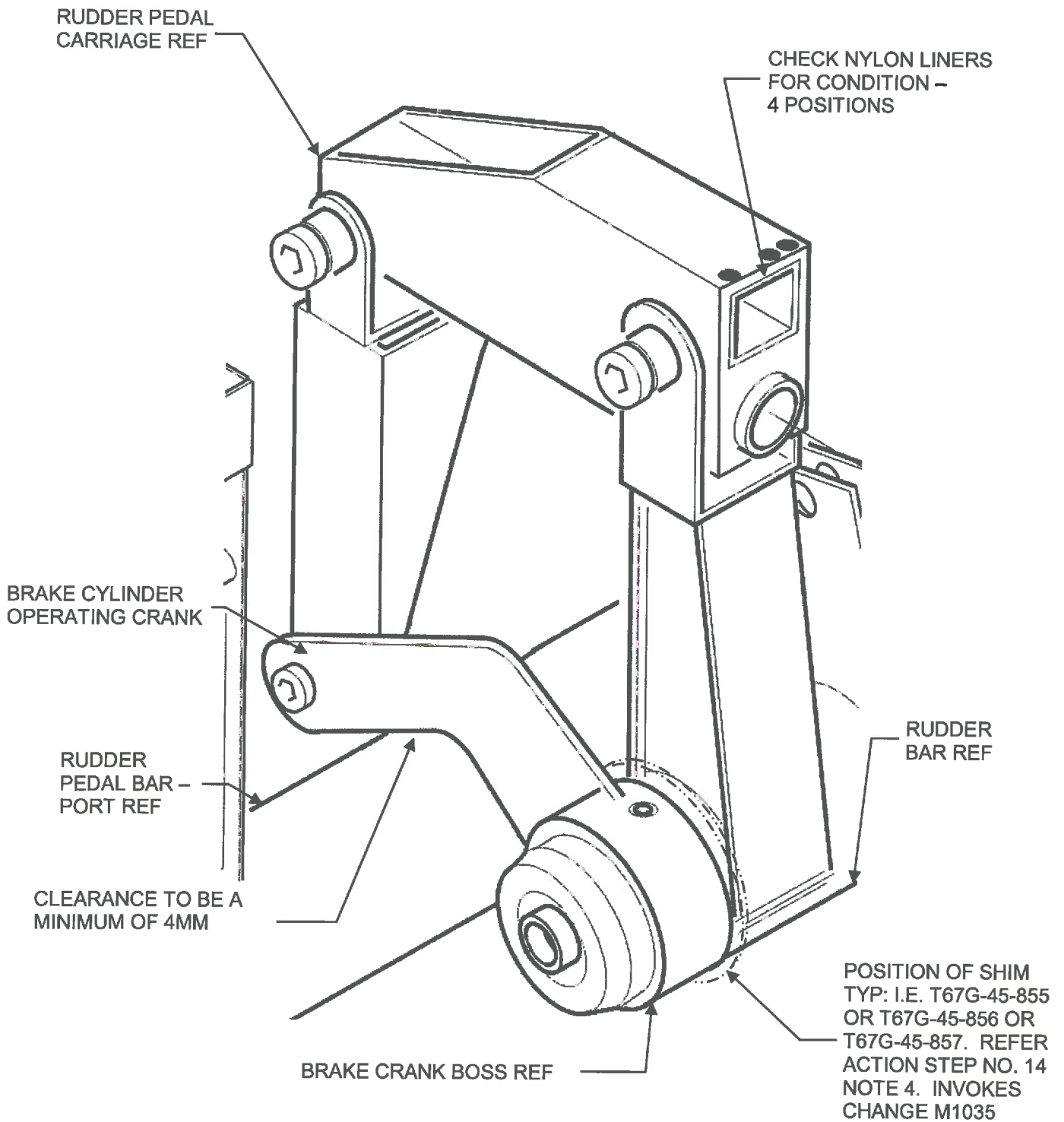
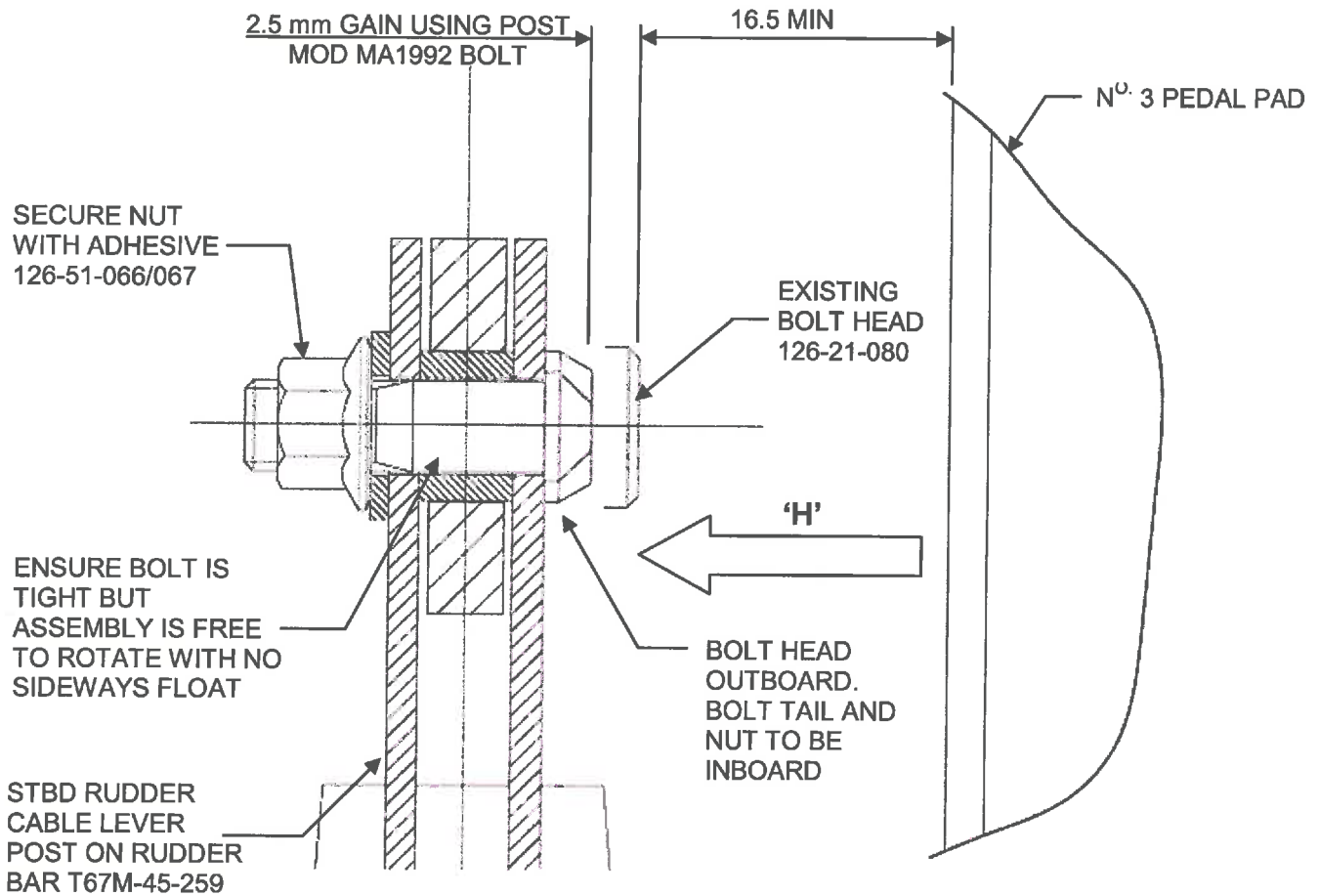


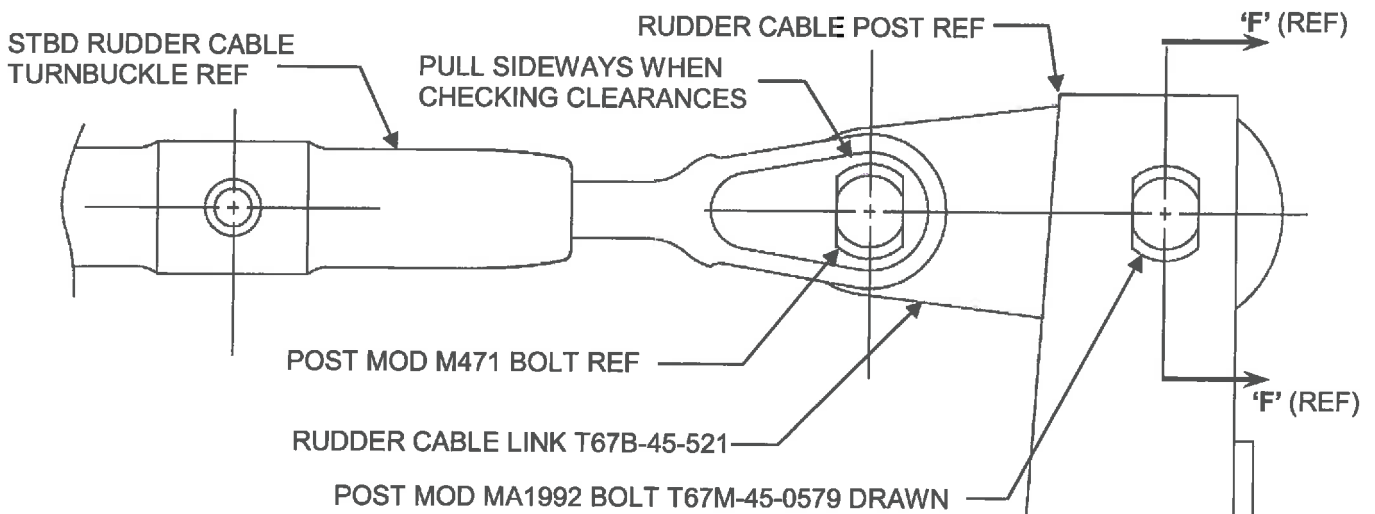
FIGURE 10

**BRAKE CRANK CLEARANCE AND NYLON SLIDER POSITION**



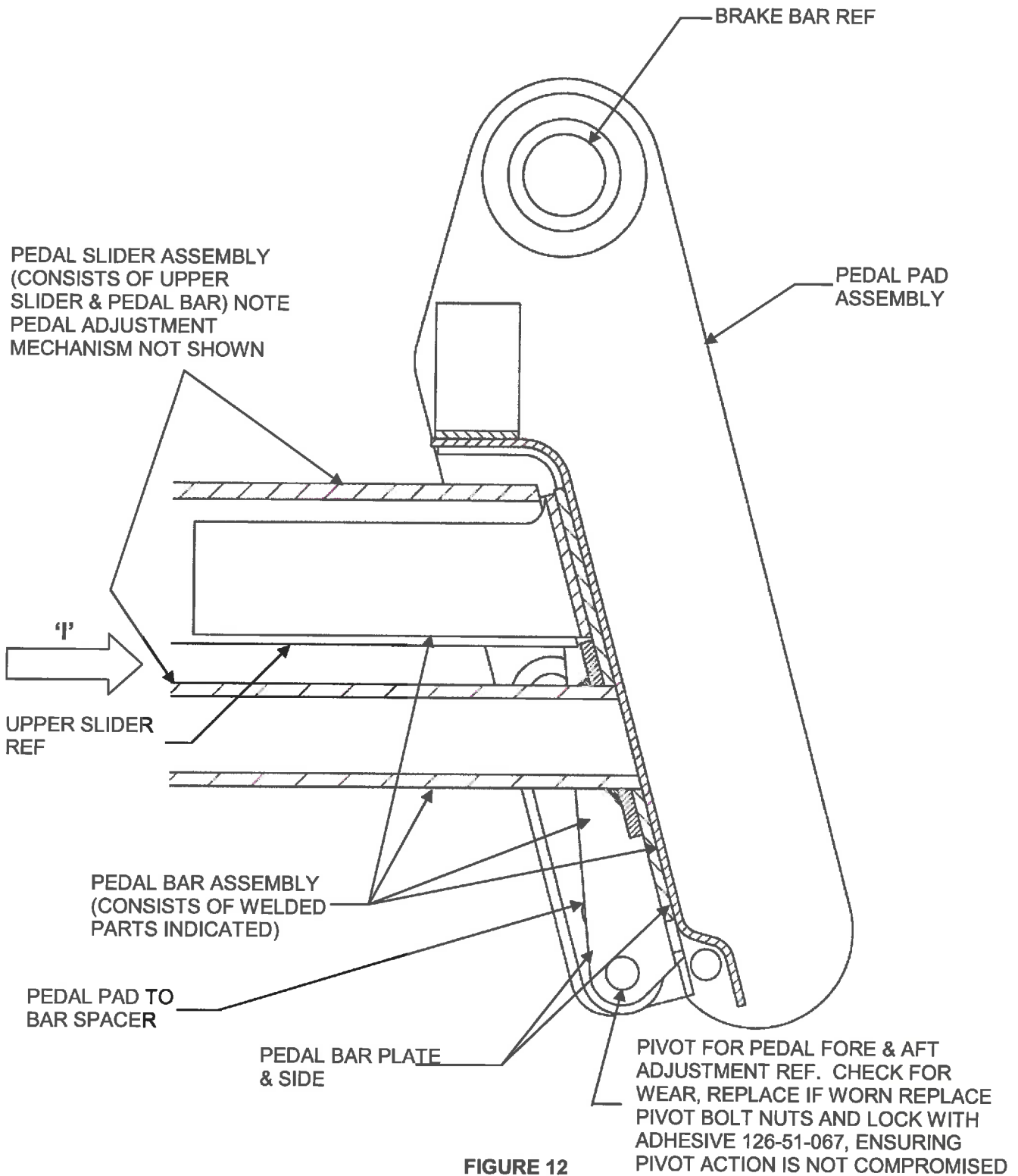
**FIGURE 11A**  
**SECTION 'F-F' (REFER FIGURE 3)**

**STBD RUDDER CABLE BOLT HEAD TO PEDAL NO. 3 CLEARANCE (PORT RUDDER CABLE OPPOSITE)**



**FIGURE 11B**  
**VIEW ON ARROW 'H' (REFER FIGURE 11A)**

**SHOWING STBD RUDDER CABLE TO LINK ATTACHMENT (PORT RUDDER CABLE OPPOSITE)**



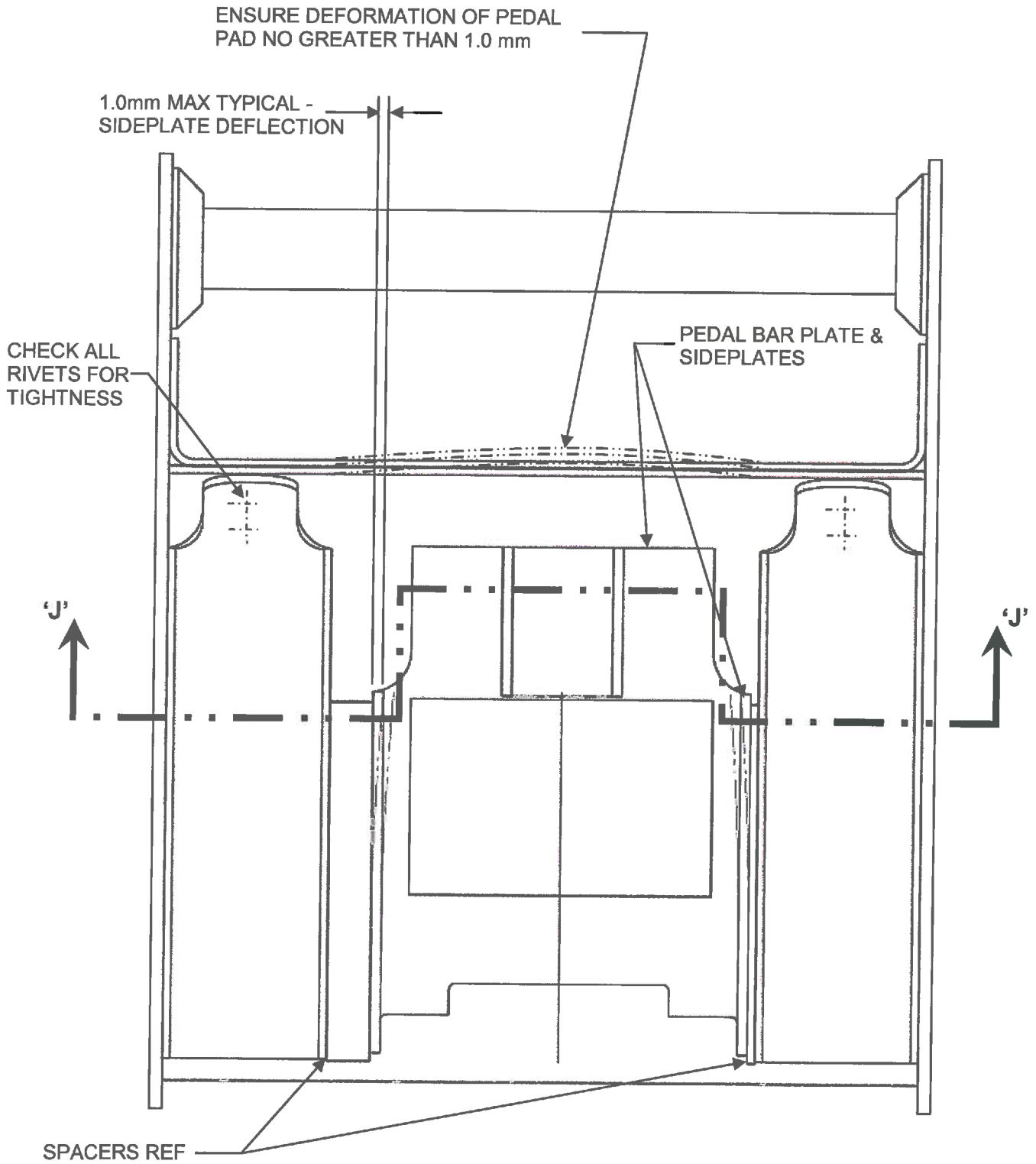
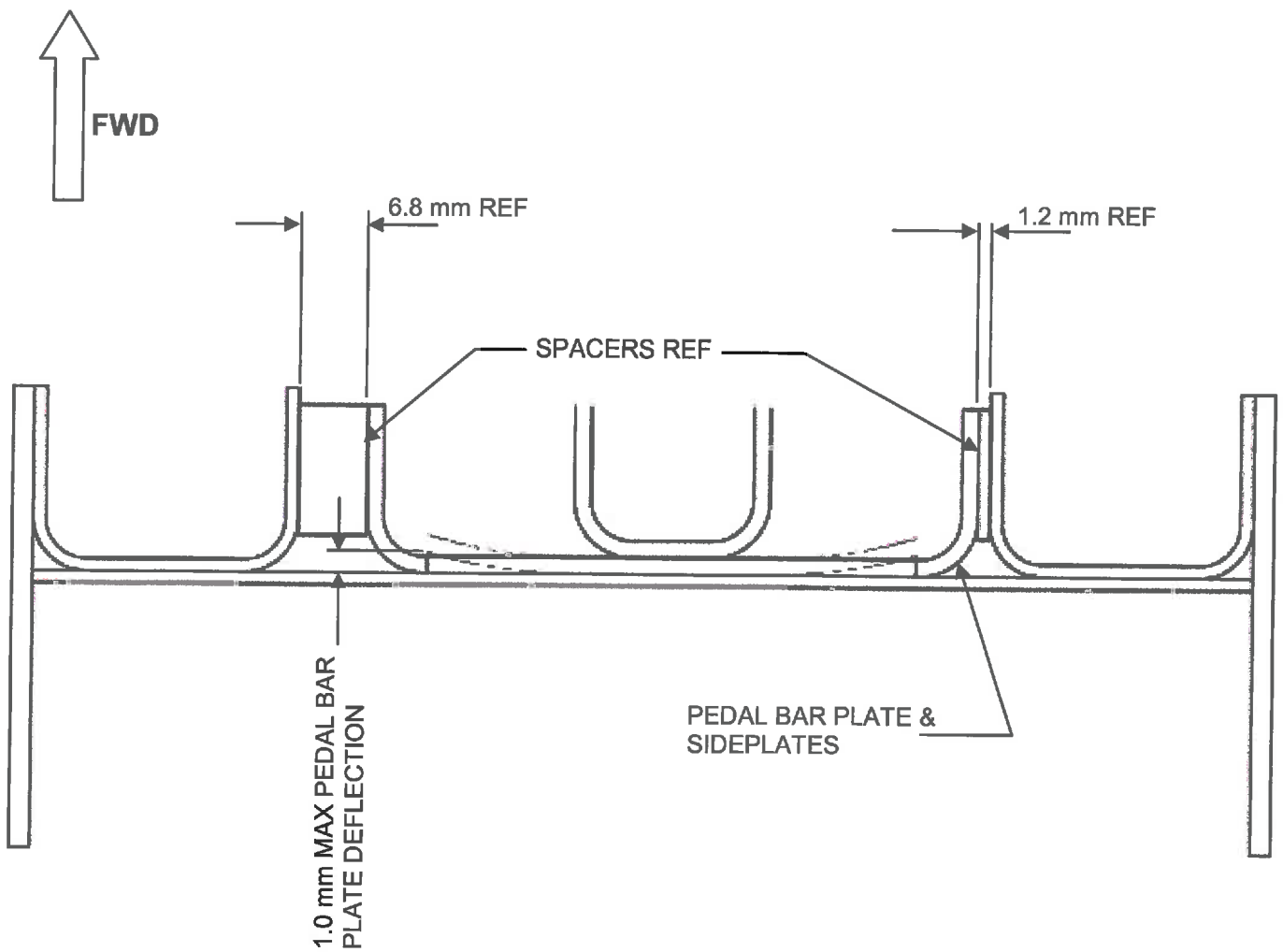


FIGURE 13

VIEW ON ARROW 'J' (REFER FIGURE 12)

SHOWING VIEW ON FORWARD FACE OF PEDAL  
(NOTE: APPLICABLE TO ALL PEDALS)

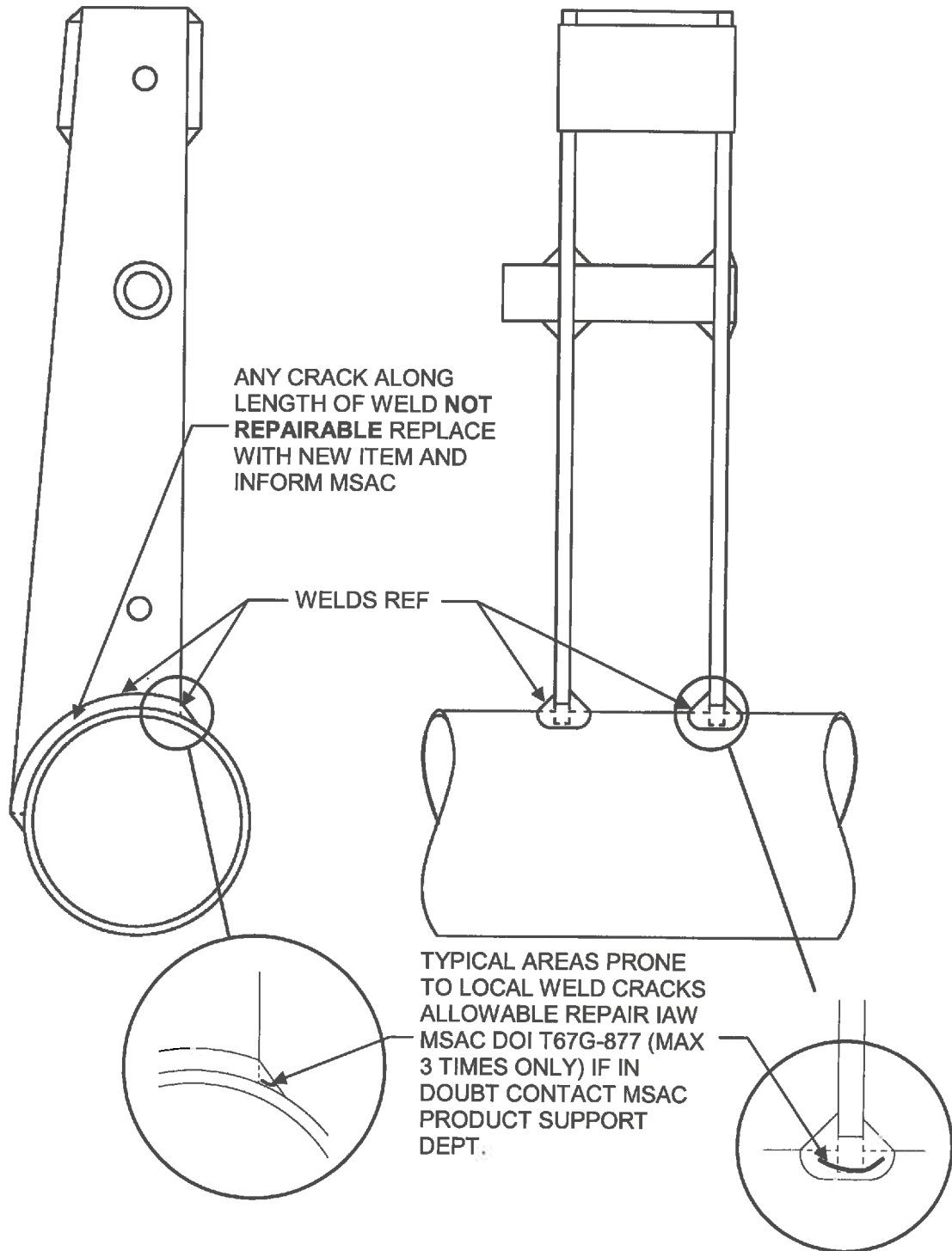


**FIGURE 14**

**SECTION 'J-J' (REFER FIGURE 13)**

**SHOWING SECTION THROUGH PEDAL  
(NOTE: APPLICABLE TO ALL PEDALS)**





**FIGURE 15**

**GENERAL PART VIEW ON RUDDER BAR T67M-45-257 OR T67M-45-259 TYPICAL LEVER POST POSITION SHOWING POSITION OF POSSIBLE CRACKING AND PERMITTED REPAIR**

**SB 188 ANNEX A**

**INSPECTION FOR RUDDER PEDAL CLEARANCES BETWEEN RUDDER PEDALS AND THE AIRCRAFT STRUCTURE AND COMPONENTS ALSO INSPECTION FOR GROUND TOWING DAMAGE.**

This form is to be completed and submitted to the address below.

Mr M J Rutter  
Airworthiness Co-ordinator  
C/O Marshall-Slingsby Advanced Composites  
Ings Lane  
Kirkbymoorside  
North Yorkshire  
England  
YO62 6EZ

Tel. No. +44 (0)1751 432474

Fax. No. +44 (0)1751 433016

E-mail: [mike.rutter@marshall-slingsby.com](mailto:mike.rutter@marshall-slingsby.com)

|   |  |
|---|--|
| Aircraft works number   |  |
| Date SB 188 carried out   |  |
| Indicate if any clearances did not meet allowable, or where any rectification work was required |  |
| Total flight hours  |  |
| Hours since last SB 188 inspection (if applicable)  |  |
| Reporters contact details i.e. Name, Address, e-mail, telephone etc                             |  |
| Owner's details   |  |