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Avro
CF105
72-Proj.-
7-13
c.2

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72/PROJ 7/13
ARROW 2 CONTROL BOXES
DEVELOPMENT PROGRAM PROGRESS REPORT

NRC - CISTI
J. H. PARKIN
BRANCH

JUN 8 1995

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CNRC - CISTI

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by authority of.....(date).....

Signature *G. W. Buchanan*

ARROW 2 CONTROL BOXES

DEVELOPMENT PROGRAM PROGRESS REPORT

Prepared by Arrow 2 Project Office

Date: July 11th 1958

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CONFIDENTIAL
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A Report # 72/PROJ 7/3 dated May 1st 1958 was issued to discuss the life philosophy that has been adopted for the control box mechanisms and to outline the Development Program required to establish the required level of performance.

This report is issued to cover the progress made on the Development Program up to the end of June 1958.

2.0 PROGRESS REPORT ON THE DEVELOPMENT PROGRAM2.1 Summary

Due to the short period of time between the issue of the original report and this document, significant progress has only been made on two items, and these are discussed further in paras. 2.2 and 2.3.

The details for the running of the 200 hour duty cycles tests have been established, however before these tests can commence the BI rig has to undergo a program of upgrading to be made more representative of the current aircraft system, i.e. steel instead of aluminium bellcrank levers. However, this modification program is held up due to the BI rig having to be constantly available for use on other programs associated with the early Arrow 1 aircraft.

} Flying
Control
Improvement

2.2 Structures2.2.1 Control Box Structures

Further checks have been made by Quality Control Inspection during the build of the 3rd and 4th Arrow 1 airframes and these checks confirm the statements already made that interchangeability at the control box joints is virtually impossible.

2.2.2 Fatigue Testing

45 specimens of the Elevator Hinge joint have been ordered and testing has started, 2 static loadings are complete and 3 fatigue tests have been done using loads varying from 21% to 70% of ultimate.

continued/

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2

2.2.2 Continued/

The R.T.'s have been issued for testing joints with increased hole tolerances .32 specimens representative of the Aileron Rear Spar joint have been ordered and are now in the process of manufacture.

A fatigue test has been called up for the elevator on the Static Test aircraft. This test involves applications of full limit load and will be done after completion of the landing gear spring back case. This will test elevator structure, hinge joint, control box structure and control box to spar joint, but not the flying control linkages.

done

*broke shear
connected
injury to
joint early
4c*

2.3 Investigation into Maintenance Simplification

Our first approach to this problem has been concerned with investigating methods of simplifying the greasing tasks on the control boxes.

It is felt that if this task could be simplified to the state where all greasing points were on the surface of the control boxes, and were accessible without removing structure or fairings, the prime concern of the dangers associated with entry into the boxes for greasing would no longer be valid. The length of time required to perform the greasing task would also be considerably shortened and if after investigation, it is still found that the period between greasing cannot be lengthened, this simplification would overcome the Maintenance Appraisal Teams present objections.

On all three boxes the present solution has been to group the greasing points on the box skin connected to the bearing greasing point by a small dia flexible nylon tube. Each of the three boxes are discussed in more detail in subsequent paragraphs.

continued/

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2.3.1 Elevator Control Box

A print of the scheme applicable to this box, # 7-0115-517 is enclosed with this report.

A section through the box at # 2 lever is given as typical for all levers, the section at each being constant, and shows the two internal greasing points connected to adjacent fittings on the top skin of the box. The top skin in this case has been chosen as the bottom skin of the box is removeable in situ and it is undesirable to have the greasing points complicating this feature.

Being on the top skin the grease nipples would be susceptible to dirt accumulation so they have been sunk into the skin and are covered by a "DOT" Plug Button which would be removed by a small screw-driver when greasing was in progress.

The main lever pivot bolt, which is greased from the top skin, and the attachment between elevator and link rod which is accessible by moving the elevators to the maximum UP position, remain unchanged.

2.3.2 Aileron Control Box

A print of the scheme applicable to this box, # 7-0115-518, is enclosed with this report.

A section through the box at the outboard lever # 7 is given, this being the thinnest section, and is similar for other levers except that they would have more clearance. The section shows the four internal greasing points connected to adjacent fittings on the top skin of the box. The top skin in this case has been chosen to avoid the removeable bottom link fairings.

The actual grease nipple is buried and covered as per the elevator control box.

2.3.3 Rudder Control Box

A print of the scheme applicable to this box, # 7-0115-519, is enclosed with this report.

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2.3.3 Continued/

The scheme shows the method of connecting the various internal lubrication points to fittings on the skin. In this case, the grease nipples are not buried or covered as per the other boxes due to being in a vertical plane, and thereby less likely to be affected by dirt, however, the buried feature could be introduced if desired.

2.3.4 Conclusions

Advantages:

Ease of access to greasing nipples, no access required into control boxes, or removal of any structure to perform a greasing task.

Disadvantages:

No view of bearings when greasing is being done, therefore impossible to be sure that grease has reached the bearing, possibility of blocked or broken pipes greasing pipes going undetected until an internal inspection of the box is made.

Weight increase yet to be determined.

If the philosophy of this suggested change is adopted by the RCAF, a development and test program will be needed before it can be applied to an aircraft. This will ensure the satisfactory operation of the system, establish greasing procedures and confirm that through all ranges of travel the greasing pipes are free from snags and abrasion. It is desirable that comments on the above proposal be forthcoming as soon as possible, so that engineering work may proceed with the view to performing the test program on the BI rig and clearing the system for incorporation in as early an aircraft as possible.

ADDITIONAL MATERIAL REQUIRED IN THIS AREA
TO PROVIDE BOSS FOR CONNECTOR

NYLON TUBING
.125 DIA X .022 WALL
(TYPICAL)

NYLON TUBING
.125 DIA X .022 WALL
(TYPICAL)

NAS 516/1

MS 20426 AD4

DOT PLUG BUTTONS

REAR SPAR

A

B

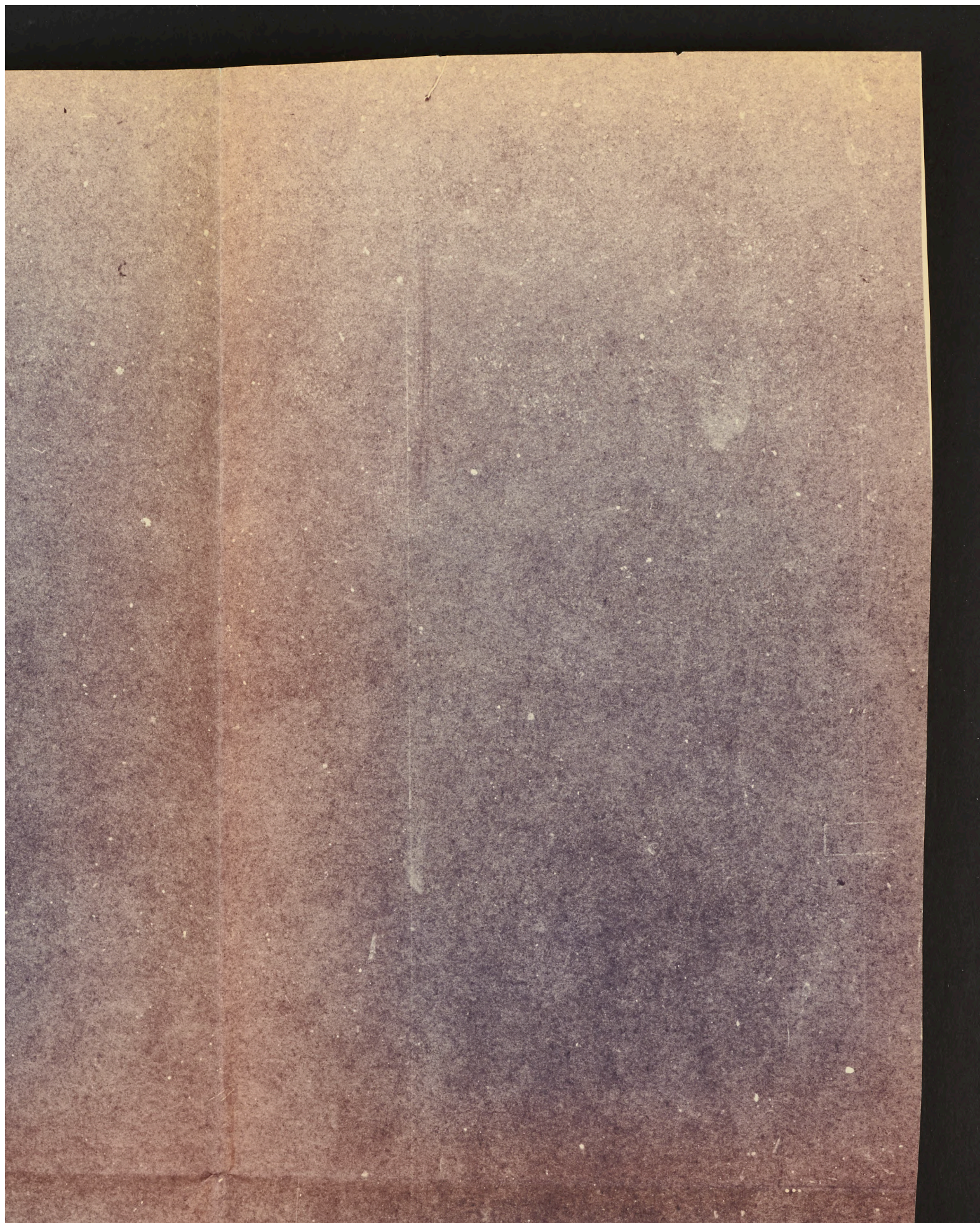


REAR SPAR DATUM

A

50
31

50
31



ADDITIONAL MATERIAL REQUIRED IN THIS AREA
TO PROVIDE BOSS FOR CONNECTOR

NYLON TUBING
1/25 DIA X .022 WALL
(TYPICAL)

VIEW ON ARROW B

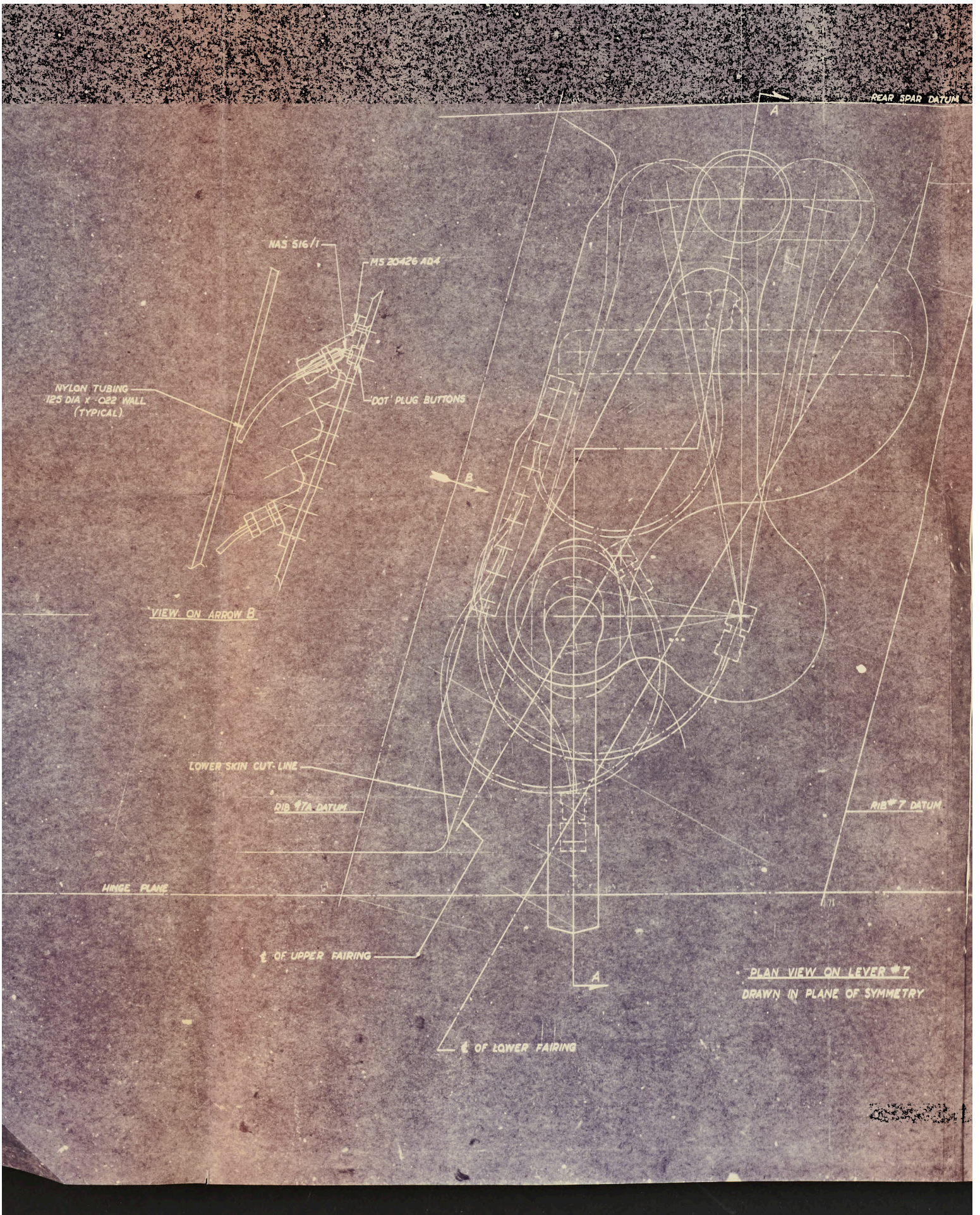
LOWER SKIN CUT LINE

RIB #7

HINGE PLANE

SECTION A-A
TUBING OMITTED FOR CLARITY

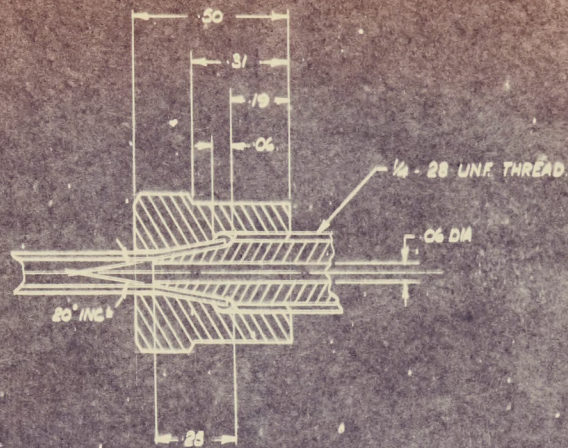
OF UP



A

RIB# 7 DATUM

IN VIEW ON LEVER #7
IN PLANE OF SYMMETRY



PROPOSED TUBE END CONNECTION
SCALE: 1/4"

NOT

REFERENCE DRAWING	
ITEM NO.	DESCRIPTION
1	GENERAL CONTRACTOR
2	GENERAL CONTRACTOR
3	GENERAL CONTRACTOR
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5	GENERAL CONTRACTOR
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9	GENERAL CONTRACTOR
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100	GENERAL CONTRACTOR

THREAD

5. DUE TO POSITION OF LUBRICANT CONNECTOR, LINK WILL NEED TO BE HANDED

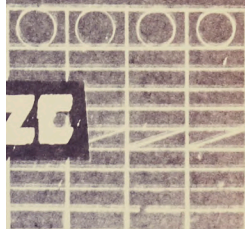
4. EXISTING METHOD OF LUBRICATION REQUIRES REMOVAL OF LOWER FAIRINGS ATTACHED BY MAXIMUM OF 15 COUNTERSUNK SCREWS

3. EXISTING PARTS CAN BE MODIFIED WITH THE EXCEPTION OF LEVER WHICH REQUIRES ADDITIONAL MATERIAL AS SHOWN

2. LEVER #7 IS SHOWN AS BEING TYPICAL FOR ALL LEVERS ALTHOUGH DETAIL INVESTIGATION WILL BE REQUIRED TO DETERMINE INDIVIDUAL PIPE RUNS ETC.

1. THIS INVESTIGATION IS BASED ON THE ASSUMPTION THAT SUITABLE FLEXIBLE NYLON TUBING WILL BECOME AVAILABLE

NOTES



REFERENCE DRAWINGS		AVRO AIRCRAFT LIMITED MALTON ONTARIO			
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
CLASS	INVESTIGATION	SCALE			
DESCRIPTION	AILERON CONTROLS - REMOTE LUB	SIZE			
GROUP	FLYING CONTROLS	TYPE			
COMPONENT	OUTER WING	DRAWING NO.			
				7-0115-518	

155-1 7-0115-518

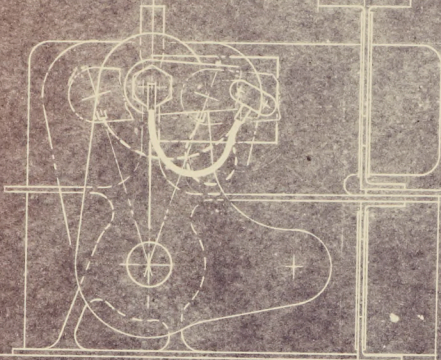
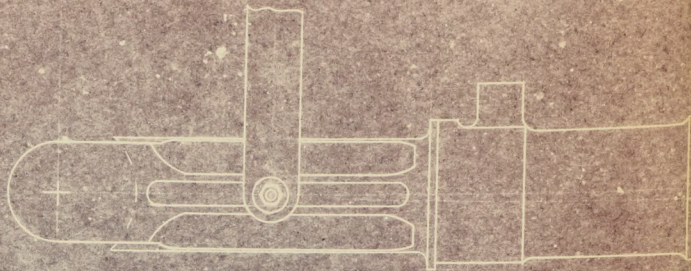
SPAR 3 DATUM

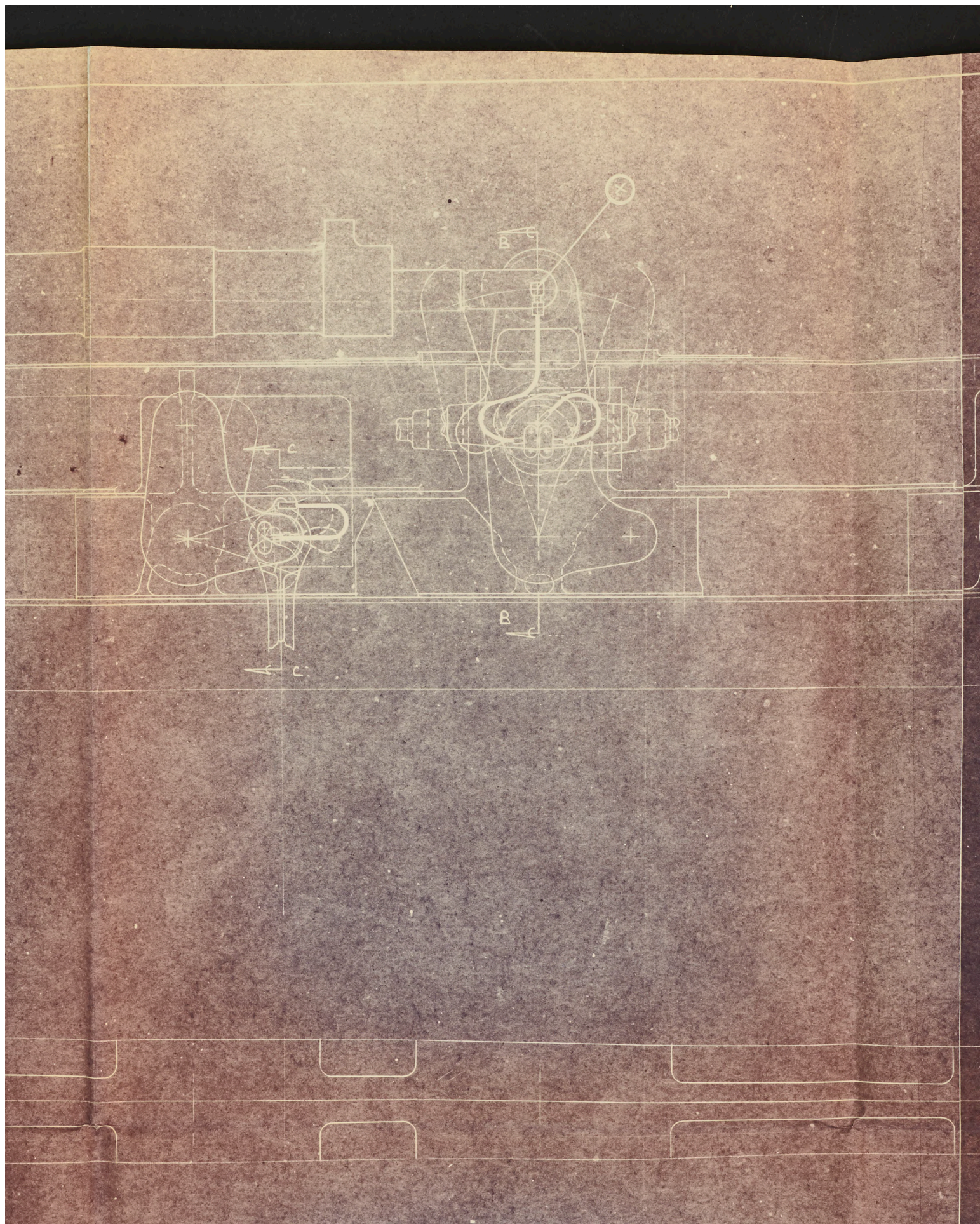
LOC. HINGE

A

A

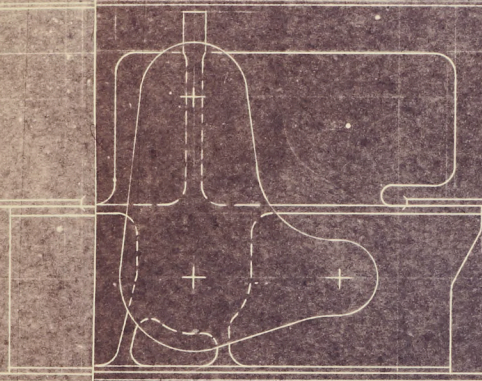
RUDDER HINGE





DESCRIPTION	

SCALE	
INCH	MM
UNITS UNLESS NOTED	
NOTED	



DESCRIPTION

CLASS

SCALE

FINISH

WORK

REVISIONS

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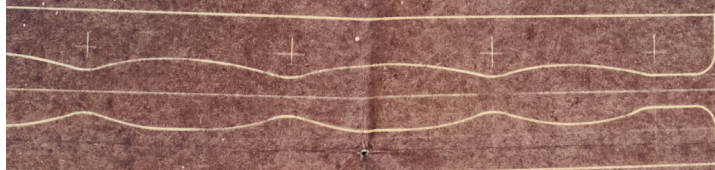
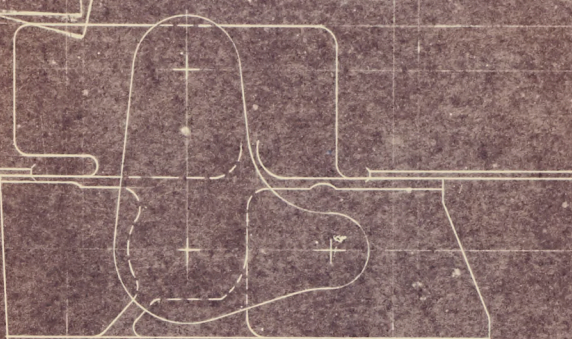
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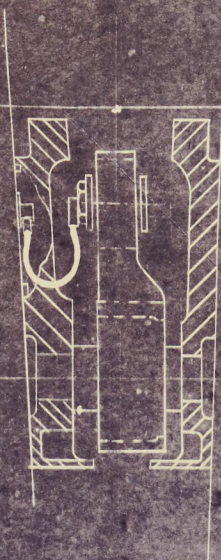
DRAWING NO. NO.



A

RUDDER HINGE

SECTION A-A
TYP FOR LEVERS



SECTION C-C
TYP FOR LINKS

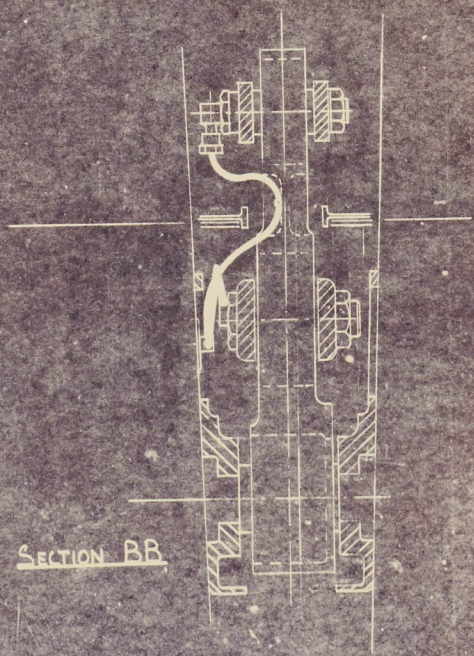


C

SECTION C-C
TYP FOR LINKS



SECTION BB



1/27 DIA

DETAIL OF BOLT ATT.
FULL SIZE.

DETAIL OF SKIN ATT.
FULL SIZE

25' DIA. HULL
IN SKIN

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DET

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ACCESS

2. DANG
HI-SH
ARE

1. THIS


Notes

ISSUE NO. **A**
MOD. NO. **17-200**
E.R.N. NO.
DRAWN BY **WAG-122**
DATE **June 20 58**
CHECKED
STRENGTH APP
DESIGN APP
CONTRACT APP

HALF SIZE

4. ALL SKIN LUBRICATION POINTS ON THIS INVESTIGATION ARE ATTACHED TO EXISTING DETACHABLE PLUGS, THESE WOULD REQUIRE MODIFICATION.

FILE - J. BOLTS

3. IT SHOULD BE POINTED OUT, THAT AT PRESENT, LUBRICATION POINTS IN THE RUDDER 'CONTROL BOX' ARE MODERATLY ACCESSABLE, WITH THE EXCEPTION OF THE POINT AT THE RUDDER JACK , WHICH NECESSITATES THE REMOVAL OF RUDDER JACK ACCESS DOOR.

2. DANGER EXISTS IN THAT THE TUBE MAY BECOME LODGED BEHIND ONE OF THE MANY HI-SHEAR PINS USED IN THE CONSTRUCTION OF 'CONTROL BOX', ALSO AS THE CONTROLS ARE ACTUATED, THE LUBRICATION TUBE WILL IN PLACES, RUB LIGHTLY ON THE STRUCTURE.

1. THIS METHOD OF LUBRICATION IS SUBJECT TO OBTAINING 1/2 IN. FLEXIBLE NYLON TUBE.

NOTES

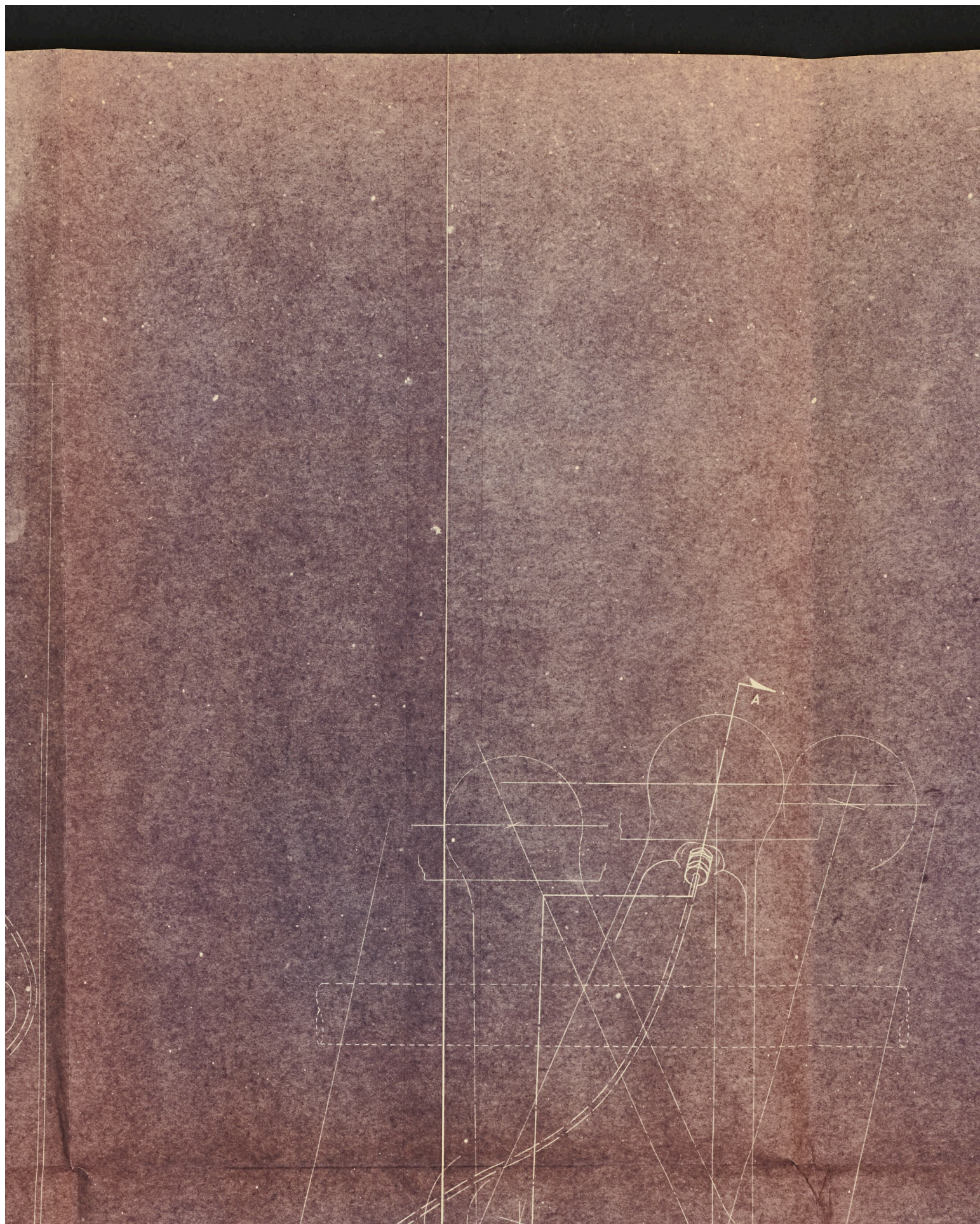
REFERENCE DRAWINGS		AVRO AIRCRAFT LIMITED MALTON ONTARIO			
DWG. NO.	DESCRIPTION	CLASS	INVESTIGATION	SCALE	
		DESCRIPTION	METHOD TO SIMPLIFY LUBN OF	1/2 IN. FLEXIBLE NYLON TUBE	
		GROUP	RUDDER BEARINGS	NOTED	
		COMPONENT	FIN	UNLESS NOTED	
				TYPE	NEXT ASSEMBLY
				DRAWING NO.	7-0115-519

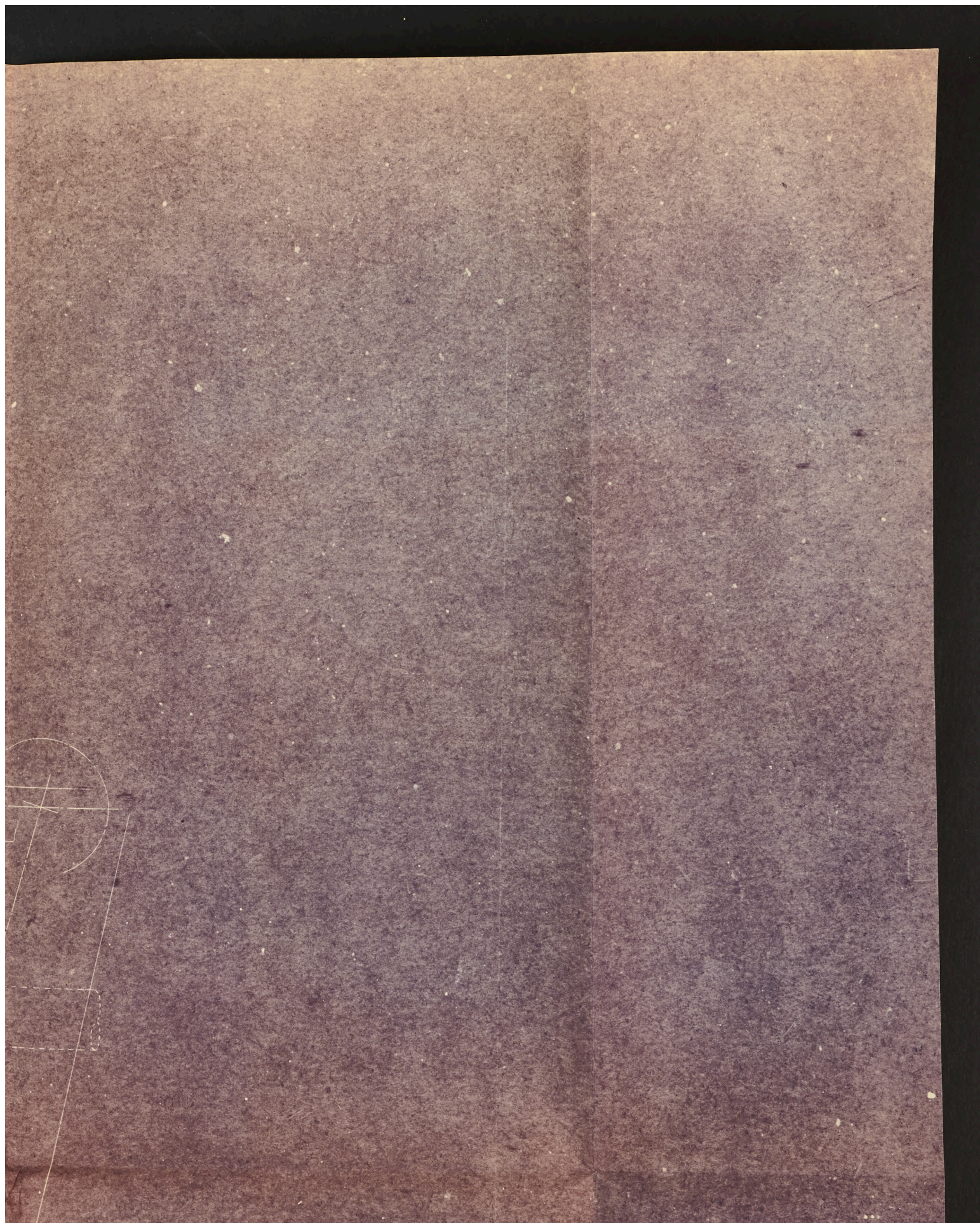
HALF SIZE

155.A 7-0115-519

ADDITIONAL MATERIAL REQUIRED IN THIS AREA
TO PROVIDE BOSS FOR CONNECTOR







ADDITIONAL MATERIAL REQUIRED IN THIS AREA
TO PROVIDE BOSS FOR CONNECTOR

.125 DIA NYLON TUBING

DOT PLUG BUTTON

NAS 5/16-11

20° DOWN

30° UP

SECTION A-A



5. FOR DETAILS OF PROPOSED TUBE END CONNECTOR SEE DRG# 7-0115-51B

4. EXISTING METHOD OF LUBRICATION REQUIRES REMOVAL OF SMALL ACCESS PANELS AT FORWARD END. MAIN PIVOT GREASE NIPPLES ARE SITUATED ABOVE UPPER SKIN WHILE LINK CAN BE GREASED THROUGH THE HINGE SPAR.

3. EXISTING PARTS MAY BE MODIFIED WITH THE EXCEPTION OF LEVER WHICH REQUIRES ADDITIONAL MATERIAL AS SHOWN.

2. LEVER #2 IS SHOWN AS BEING TYPICAL FOR ALL LEVERS ALTHOUGH DETAIL INVESTIGATION WILL BE REQUIRED TO DETERMINE INDIVIDUAL PIPE RUNS, ETC.

THIS INVESTIGATION IS BASED ON THE ASSUMPTION THAT SUITABLE FLEXIBLE NYLON TUBING WILL BECOME AVAILABLE

ELEVATOR HINGE

REFERENCE DRAWINGS		 AVRO AIRCRAFT LIMITED WALTON ONTARIO			
DWG. NO.	DESCRIPTION	CLASS	INVESTIGATION	SCALE	
V1062 / RS	S.A. ELEVATOR CONTROLS.				
V1062 / H	S.A. OUTER TRAILING EDGE	DESCRIPTION	ELEVATOR CONTROLS - REMOTE LUB ^d	PRIOR TO CHG	DRAWING NO. 7-0115-517
V1062 / B1	TLOWER SKIN				
V1062 / T1	UPPER SKIN	GROUP	FLYING CONTROLS	SMITH LUGGAGE NOTED	
V1062 / S	HINSE SPAR.				
		COMPONENT	INNER WING		

LF SIZE

155.1 2-0115-517

ДИО-ТАК
3558
МАМЕРУС