

BRITAIN MODEL LSA-2
STABILITY AUGMENTATION SYSTEM
INSTALLATION INSTRUCTIONS 11971

FOR

MOONEY MODEL M20C S/N 3185 AND SUBSEQUENT
MOONEY MODEL M20E S/N 832 AND SUBSEQUENT

1. INTRODUCTION

- 1.1 THE FOLLOWING INSTALLATION INSTRUCTIONS COVER THE INSTALLATION OF THE BRITAIN MODEL LSA-2 LATERAL STABILITY AUGMENTATION SYSTEM IN MOONEY MODELS M20C AND M20E.
- 1.2 ALL PHASES OF THIS INSTALLATION CAN BE ACCOMPLISHED BY A QUALIFIED A & P MECHANIC. THIS INSTALLATION MANUAL INCLUDES ALL SPECIFIC DATA AND DRAWINGS TO COMPLETE THE INSTALLATION. IF, AFTER COMPLETING INSTALLATION AND ASSOCIATED GROUND AND FLIGHT TESTS, THE SYSTEM DOES NOT FUNCTION PROPERLY, REFER TO THE ACCOMPANYING OPERATION AND SERVICE MANUAL.
- 1.3 READ THIS MANUAL THOROUGHLY BEFORE BEGINNING INSTALLATION. PARTICULAR ATTENTION SHOULD BE PAID TO THE FOLLOWING ITEMS:
 - A. INSPECT AIRCRAFT TO INSURE THAT THE CONTROL SYSTEMS FUNCTION SMOOTHLY.
 - B. DO NOT ROUTE PLASTIC TUBING NEAR HEATER DUCTS OR OTHER HEAT SOURCES.
 - C. MAKE CERTAIN THAT ALL PLASTIC TUBING CONNECTIONS ARE SECURED WITH CLAMPS. PURGE ALL TUBING WITH AIR BEFORE CONNECTIONS ARE MADE.

2. SPECIFICATIONS

- 2.1 TYPE: PNEUMATIC TWO-AXIS CONTROL WITH ROLL TRIM AND PUSH-BUTTON CUT-OFF CAPABILITIES.
- 2.2 POWER REQUIREMENTS: 4.5 + .25 - .0 IN. HG AT TEST BIB #1.
- 2.3 WEIGHT AND BALANCE: (COMPLETE SYSTEM) 7.1 LBS. AT STATION 46.6" AFT OF DATUM
- 2.4 APPROVAL BASIS: S.T.C. SA979WE
- 2.5 DRAWINGS REQUIRED: DRAWING 1700 SHTS 1 THRU 13

DATED: June 9, 65

APPROVED: J. Kolb

3. PILOT VALVE INSTALLATION

3.1 INSTALL PILOT VALVE ASSEMBLY, PART NUMBER 2965, AS SHOWN ON DRAWING 1700, SHEET 1. CUT THE EXISTING AIRCRAFT VACUUM TUBING AND INSTALL TWO TEE'S, PART NUMBER 11873-4, WITH CLAMPS (PROVIDED). SECURE THE PILOT VALVE TO THE REMAINING BIB OF ONE TEE WITH A SHORT LENGTH OF 3/8" O.D. BLACK TUBING AND CLAMPS PROVIDED.

4. REMOTE GYRO INSTALLATION

4.1 INSTALL REMOTE GYRO ASSEMBLY, PART NUMBER 11900-30, AS SHOWN ON DRAWING 1700, SHEET 2. SECURE THE GYRO ASSEMBLY TO EXISTING AIRCRAFT STRUCTURE WITH HARDWARE PROVIDED.

5. CUT-OFF VALVE INSTALLATION

5.1 INSTALL CUT-OFF VALVE ASSEMBLY, PART NUMBER 2960, AS SHOWN ON DRAWING 1700, SHEET 3. CAUTION: THE VALVE PORT MUST BE IN LINE WITH THE COPPER TUBES WITHIN THE CONTROL WHEEL AND THE ENTIRE AREA MUST BE AIR TIGHT AS SPECIFIED ON DRAWING 1700, SHEET 3.

6. ROLL TRIM VALVE INSTALLATION

6.1 INSTALL ROLL TRIM VALVE ASSEMBLY, PART NUMBER 2985, IN THE LEFT-HAND CONTROL WHEEL AS SHOWN ON DRAWING 1700, SHEET 4. SECURE WITH HARDWARE PROVIDED.

7. AILERON SERVO INSTALLATION

7.1 INSTALL AILERON SERVO ASSEMBLY, PART NUMBER 2983, IN THE LEFT AND RIGHT-HAND WINGS AS SHOWN ON DRAWING 1700, SHEET 5. ATTACH THE SERVO TO MOONEY BRACKET, PART NUMBER 210152, AS SHOWN WITH HARDWARE PROVIDED. SECURE THE SERVO ATTACHMENT CHAIN TO THE EXISTING BELLCRANK WITH HARDWARE PROVIDED.

8. RUDDER SERVO INSTALLATION

8.1 INSTALL FORWARD RUDDER SERVO ASSEMBLY, PART NUMBER 2980-~~3~~ AS SHOWN ON DRAWING 1700, SHEET 6. SECURE TO EXISTING BRACKET ON FUSELAGE STATION 103.0 WITH HARDWARE PROVIDED. INSTALL AFT RUDDER SERVO, PART NUMBER 2980-~~3~~, THROUGH EXISTING HOLE OF MOONEY MOUNTING BRACKET, PART NUMBER 830040, AS SHOWN ON DRAWING 1700, SHEET 6. SECURE WITH HARDWARE PROVIDED. ATTACH THE SERVO CABLE AND CLIP ASSEMBLY, PART NUMBER 1864, TO THE RUDDER PUSH ROD BELLCRANK AS SHOWN ON DRAWING 1700, SHEET 6. SECURE WITH EXISTING HARDWARE. ATTACH THE SERVO CABLES TO THE SERVO PISTONS AS SHOWN ON DRAWING 1700, SHEET 6.

9. VACUUM PLUMBING

- 9.1 FROM THE REMAINING TEE INSTALLED IN PARAGRAPH 3.1, PLUMB A REQUIRED LENGTH OF 3/8" O. D. BLACK TUBING TO THE PRIMARY VACUUM BIB OF THE REMOTE GYRO ASSEMBLY AS SHOWN ON DRAWINGS 1700, SHEETS 1 AND 2. SECURE WITH TUBING CLAMPS PROVIDED.
- 9.2 FROM THE SIDE BIB OF THE PILOT VALVE (INSTALLED AS INDICATED IN PARAGRAPH 3.1) PLUMB A REQUIRED LENGTH OF 3/8" O.D. GRAY TUBING TO THE SEQUENCED VACUUM BIB OF THE REMOTE GYRO ASSEMBLY AS SHOWN ON DRAWINGS 1700, SHEETS 1 AND 2. SECURE WITH CLAMPS PROVIDED.
- 9.3 FROM THE VACUUM BIB LOCATED IN THE CONTROL WHEEL HORN, PLUMB A REQUIRED LENGTH OF 3/16" O.D. GRAY TUBING TO THE PILOT VALVE AND ATTACH AS SHOWN ON DRAWINGS 1700, SHEETS 1 AND 3. SECURE WITH TUBING CLAMPS PROVIDED.
- 9.4 FROM THE COLOR CODED BIBS OF THE ROLL TRIM VALVE INSTALLED IN PARAGRAPH 6.1, PLUMB REQUIRED LENGTHS OF RED, GREEN AND BLACK 3/16" O. D. TUBING THROUGH THE CONTROL COLUMN AS SHOWN ON DRAWINGS 1700, SHEETS 3 AND 4. SECURE WITH TUBING CLAMP AT THE FORWARD END OF THE COLUMN AS SHOWN ON DRAWINGS 1700, SHEET 3. CAUTION SHOULD BE EXERCISED WHEN SECURING THIS TUBING TO PREVENT KINKS OR PINCHING. ATTACH THE BLACK TUBING TO THE REMAINING BIB OF THE PILOT VALVE AS SHOWN ON DRAWING 1700, SHEET 1. ATTACH THE RED AND GREEN TUBING TO THE REMOTE GYRO BIBS AS SHOWN ON DRAWING 1700, SHEET 2. SECURE WITH TUBING CLAMPS PROVIDED.
- 9.5 FROM THE REMAINING BIBS OF THE REMOTE GYRO ASSEMBLY, PLUMB REQUIRED LENGTHS OF RED AND GREEN 3/8" TUBING AFT TO TEES, PART NUMBER 11873 AS SHOWN ON DRAWINGS 1700, SHEETS 2 AND 12. SECURE WITH TUBING CLAMPS PROVIDED.
- 9.6 NOTE: THE SERVO TUBING FITTINGS ARE OF THE "B" NUT AND SLEEVE TYPE. WHEN CONNECTING TUBING TO THESE FITTINGS, THE FOLLOWING PROCEDURE MUST BE USED:
- A. CUT TUBING TO PROPER LENGTH.
 - B. REMOVE "B" NUT FROM FITTING AND PLACE ON TUBING.
 - C. PLACE PLASTIC SLEEVE ON TUBING.
 - D. INSERT TUBING INTO FITTING.
 - E. SECURE "B" NUT TO FITTING AND TORQUE TO 12 IN. TO 14 IN. LBS

FROM THE OPPOSITE BIBS OF THE TEES INSTALLED IN PARAGRAPH 9.5, PLUMB REQUIRED LENGTHS OF RED AND GREEN 3/8" O.D. TUBING AFT AND SECURE TO THE RUDDER SERVOS AS SHOWN ON DRAWINGS 1700, SHEETS 6 AND 12.

9. VACUUM PLUMBING (CONTINUED)

9.7 FROM THE REMAINING BIBS OF TEES INSTALLED IN PARAGRAPH 9.5, PLUMB REQUIRED LENGTHS OF RED AND GREEN 3/8" O.D. TUBING TO THE AILERON SERVOS AS SHOWN ON DRAWINGS 1700, SHEETS 5, 7, 8, 9, 10, 11 AND 12. ROUTE TUBING AS SHOWN AND SECURE WITH HARDWARE PROVIDED.

9.8 VACUUM PLUMBING IS NOW COMPLETE. COMPARE TUBING CONNECTIONS WITH THOSE SHOWN ON DRAWINGS 1700, SHEET 13.

10. VACUUM SETTING

10.1 ADJUST THE AIRCRAFT VACUUM REGULATOR TO PRODUCE 4.5 + .25 - .0 IN. HG. WHEN READ AT TEST BIB #1. REFER TO OPERATION AND SERVICE MANUAL.

11. FLIGHT TEST

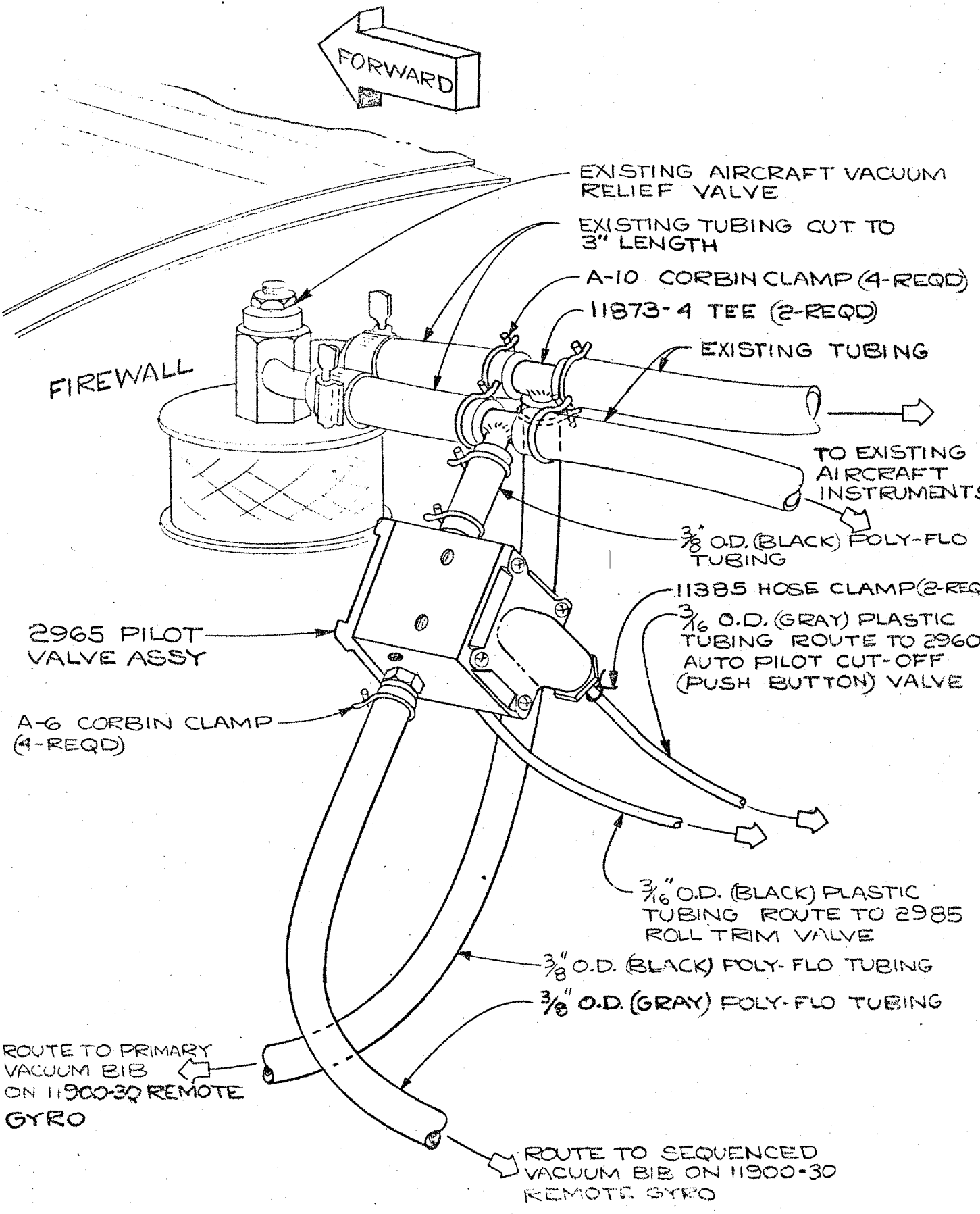
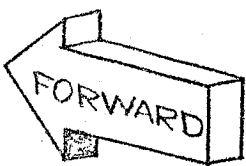
11.1 UPON COMPLETION OF THE LATERAL STABILITY AUGMENTATION SYSTEM INSTALLATION, THE AIRCRAFT MUST BE TEST FLOWN BY AN APPROPRIATELY RATED PILOT, (WITH AT LEAST A PRIVATE PILOT CERTIFICATE) AND THE RESULTS OF THIS TEST FLIGHT MUST BE RECORDED IN THE AIRCRAFT RECORDS. (REF: FAR PART 91.167 (A).)

1700 OF 13
DRAWING NUMBER

APPROVED BY: *[Signature]* DATE: 6-9-65
CHECKED BY: *[Signature]* DATE: 6-9-65
DRAWN BY: J.M. DONALDSON DATE: 5-12-65

DATE: _____
APPROVED BY: _____

FORM 81-00 9



FIREWALL

EXISTING AIRCRAFT VACUUM RELIEF VALVE

EXISTING TUBING CUT TO 3" LENGTH

A-10 CORBIN CLAMP (4-REQD)

11873-4 TEE (2-REQD)

EXISTING TUBING

TO EXISTING AIRCRAFT INSTRUMENTS

3/8" O.D. (BLACK) POLY-FLO TUBING

11385 HOSE CLAMP (2-REQD)
3/16" O.D. (GRAY) PLASTIC TUBING ROUTE TO 2960 AUTO PILOT CUT-OFF (PUSH BUTTON) VALVE

2965 PILOT VALVE ASSY

A-6 CORBIN CLAMP (4-REQD)

3/16" O.D. (BLACK) PLASTIC TUBING ROUTE TO 2985 ROLL TRIM VALVE

3/8" O.D. (BLACK) POLY-FLO TUBING

3/8" O.D. (GRAY) POLY-FLO TUBING

ROUTE TO PRIMARY VACUUM BIB ON 11900-30 REMOTE GYRO

ROUTE TO SEQUENCED VACUUM BIB ON 11900-30 REMOTE GYRO

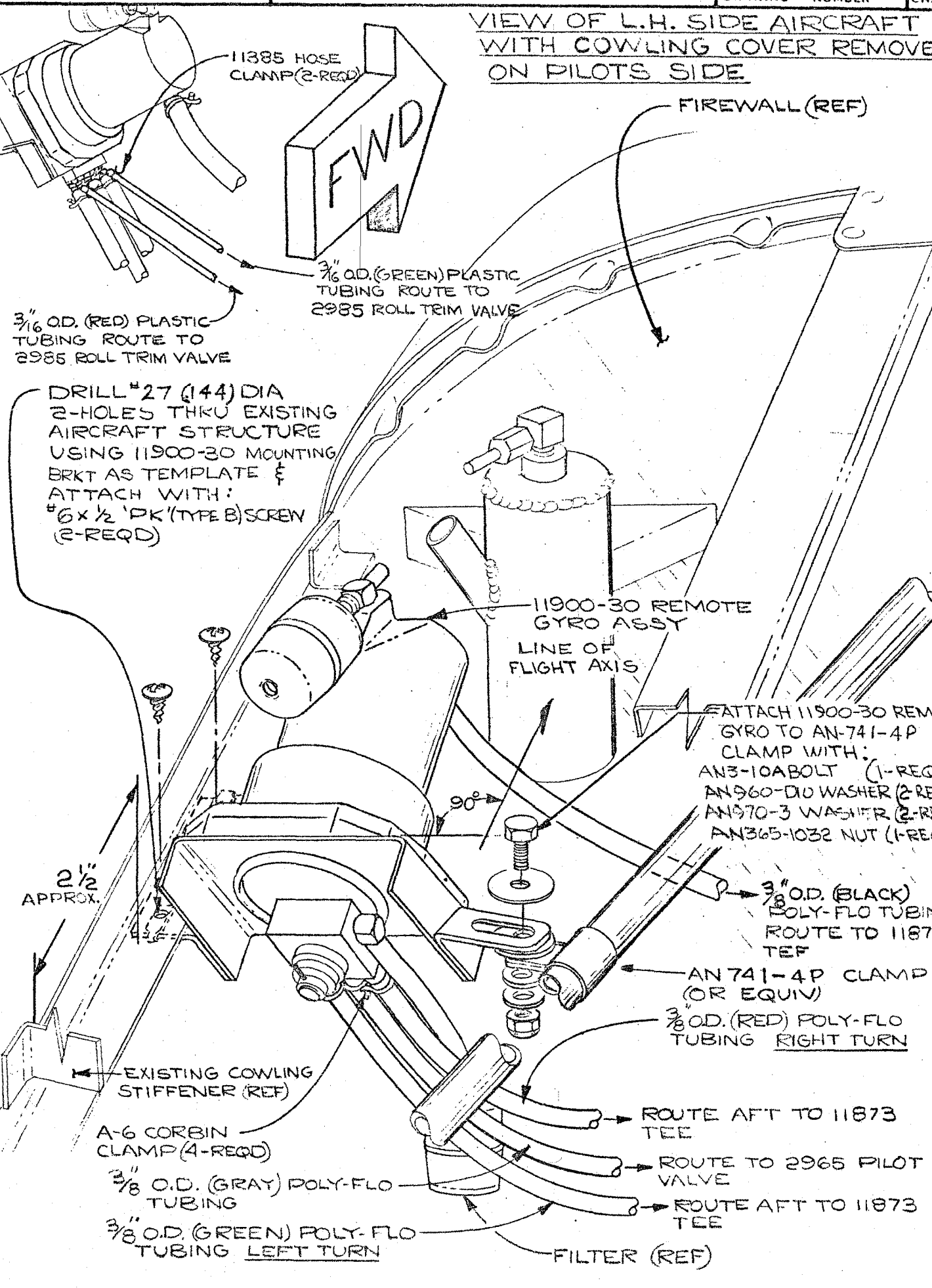
1700 SH 2 OF 13
DRAWING NUMBER

APPROVED BY: *[Signature]* DATE: 6-9-65
CHECKED BY: *[Signature]* DATE: 6-9-65
DRAWN BY: J.M. DONALD DATE: 5-19-65

APPROVED BY: *[Signature]* DATE:
CHECKED BY: *[Signature]* DATE:
DRAWN BY: *[Signature]* DATE:

B

VIEW OF L.H. SIDE AIRCRAFT
WITH COWLING COVER REMOVE
ON PILOTS SIDE



11385 HOSE CLAMP (2-REQD)

FWD

FIREWALL (REF)

3/16 O.D. (RED) PLASTIC TUBING ROUTE TO 2985 ROLL TRIM VALVE

3/16 O.D. (GREEN) PLASTIC TUBING ROUTE TO 2985 ROLL TRIM VALVE

DRILL #27 (144) DIA 2-HOLES THRU EXISTING AIRCRAFT STRUCTURE USING 11900-30 MOUNTING BRKT AS TEMPLATE & ATTACH WITH: #6 x 1/2 'DK' (TYPE B) SCREW (2-REQD)

11900-30 REMOTE GYRO ASSY
LINE OF FLIGHT AXIS

ATTACH 11900-30 REMOTE GYRO TO AN-741-4P CLAMP WITH:
AN3-10ABOLT (1-REQD)
AN960-D10 WASHER (2-REQD)
AN970-3 WASHER (2-REQD)
AN365-1032 NUT (1-REQD)

2 1/2 APPROX.

3/8 O.D. (BLACK) POLY-FLO TUBING ROUTE TO 11873 TEE

AN 741-4P CLAMP (OR EQUIV)

3/8 O.D. (RED) POLY-FLO TUBING RIGHT TURN

EXISTING COWLING STIFFENER (REF)

A-6 CORBIN CLAMP (4-REQD)

3/8 O.D. (GRAY) POLY-FLO TUBING

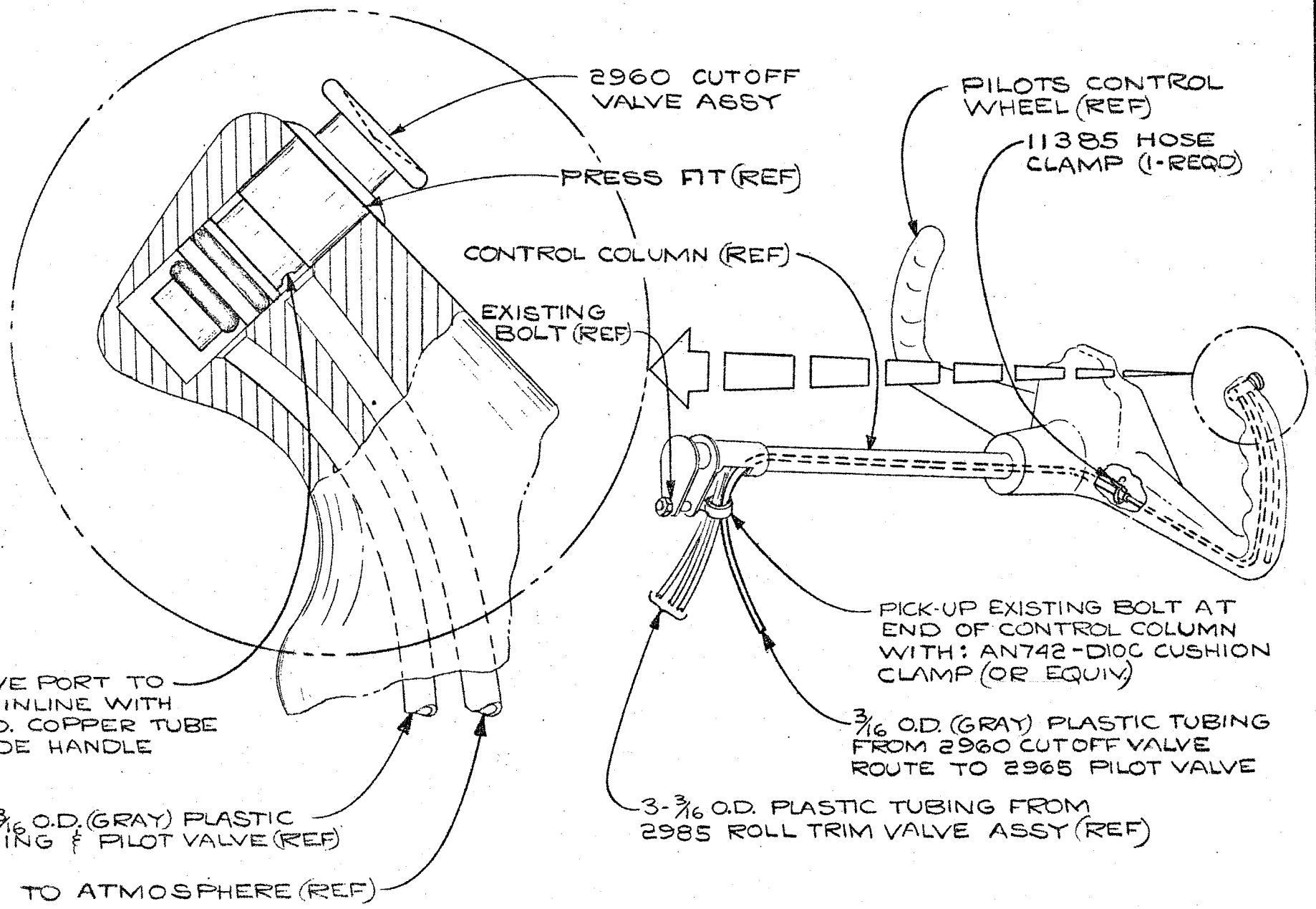
3/8 O.D. (GREEN) POLY-FLO TUBING LEFT TURN

ROUTE AFT TO 11873 TEE

ROUTE TO 2965 PILOT VALVE

ROUTE AFT TO 11873 TEE

FILTER (REF)



2960 CUTOFF VALVE ASSY

PRESS FIT (REF)

CONTROL COLUMN (REF)

EXISTING BOLT (REF)

PILOTS CONTROL WHEEL (REF)

11385 HOSE CLAMP (1-REQD)

PICK-UP EXISTING BOLT AT END OF CONTROL COLUMN WITH: AN742-DIOC CUSHION CLAMP (OR EQUIV)

3/16 O.D. (GRAY) PLASTIC TUBING FROM 2960 CUTOFF VALVE ROUTE TO 2965 PILOT VALVE

3-3/16 O.D. PLASTIC TUBING FROM 2985 ROLL TRIM VALVE ASSY (REF)

VALVE PORT TO BE INLINE WITH 1/8 O.D. COPPER TUBE INSIDE HANDLE

TO 3/16 O.D. (GRAY) PLASTIC TUBING & PILOT VALVE (REF)

TO ATMOSPHERE (REF)

ROUTE 3/16 O.D. (GREEN) PLASTIC TUBE TO
11900-30 REMOTE GYRO

ROUTE 3/16 O.D. (BLACK) PLASTIC TUBE TO
2965 PILOT VALVE ASSY

ROUTE 3/16 O.D. (RED) PLASTIC TUBE TO
11900-30 REMOTE GYRO

917009-1 MOONEY CONTROL WHEEL (REF)
COVER, ETC. OMITTED FOR CLARITY
(INSTALL PILOTS SIDE ONLY)

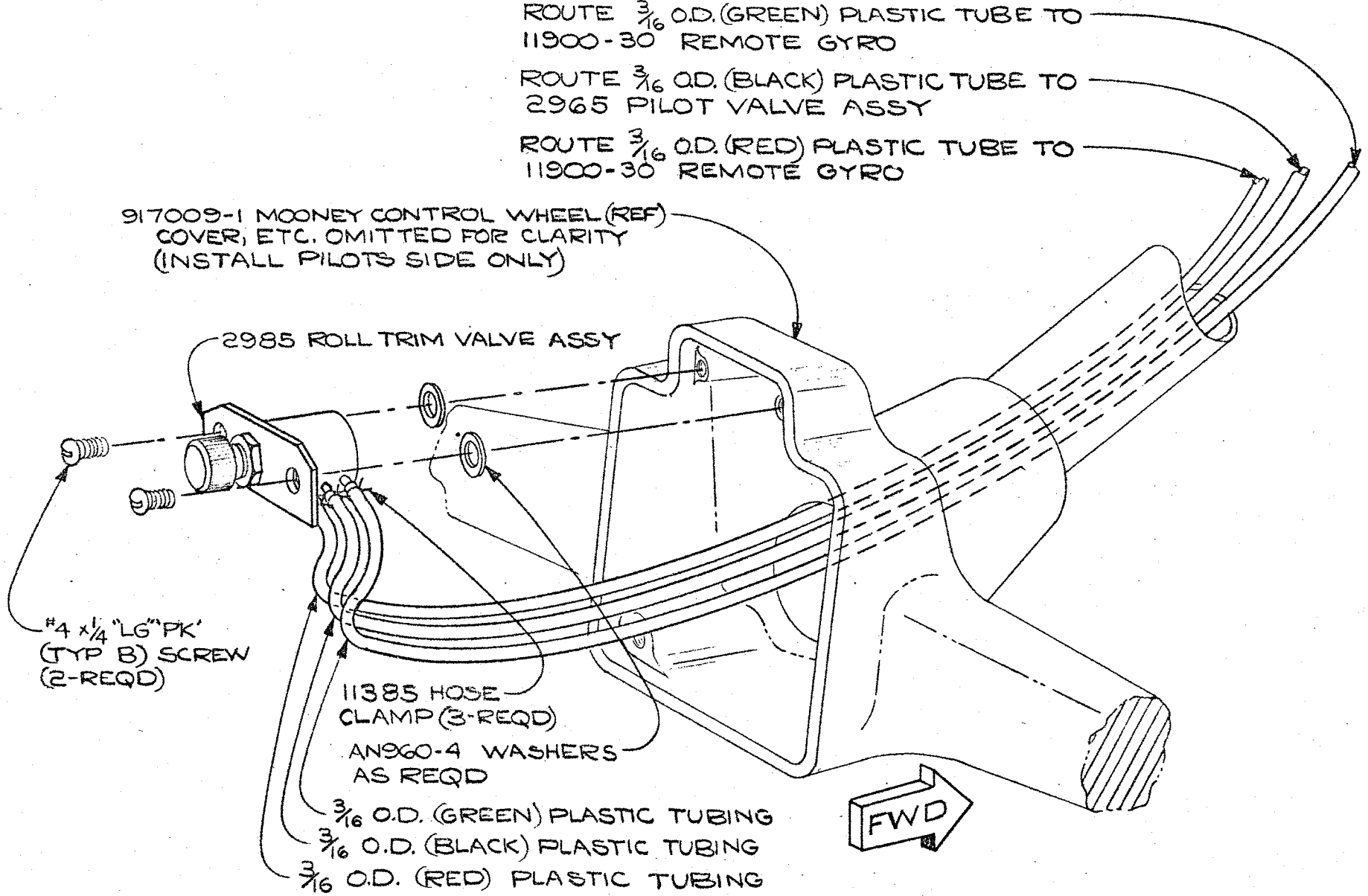
2985 ROLL TRIM VALVE ASSY

#4 x 1/4 "LG" PK'
(TYP B) SCREW
(2-REQD)

11385 HOSE
CLAMP (3-REQD)

AN960-4 WASHERS
AS REQD

3/16 O.D. (GREEN) PLASTIC TUBING
3/16 O.D. (BLACK) PLASTIC TUBING
3/16 O.D. (RED) PLASTIC TUBING

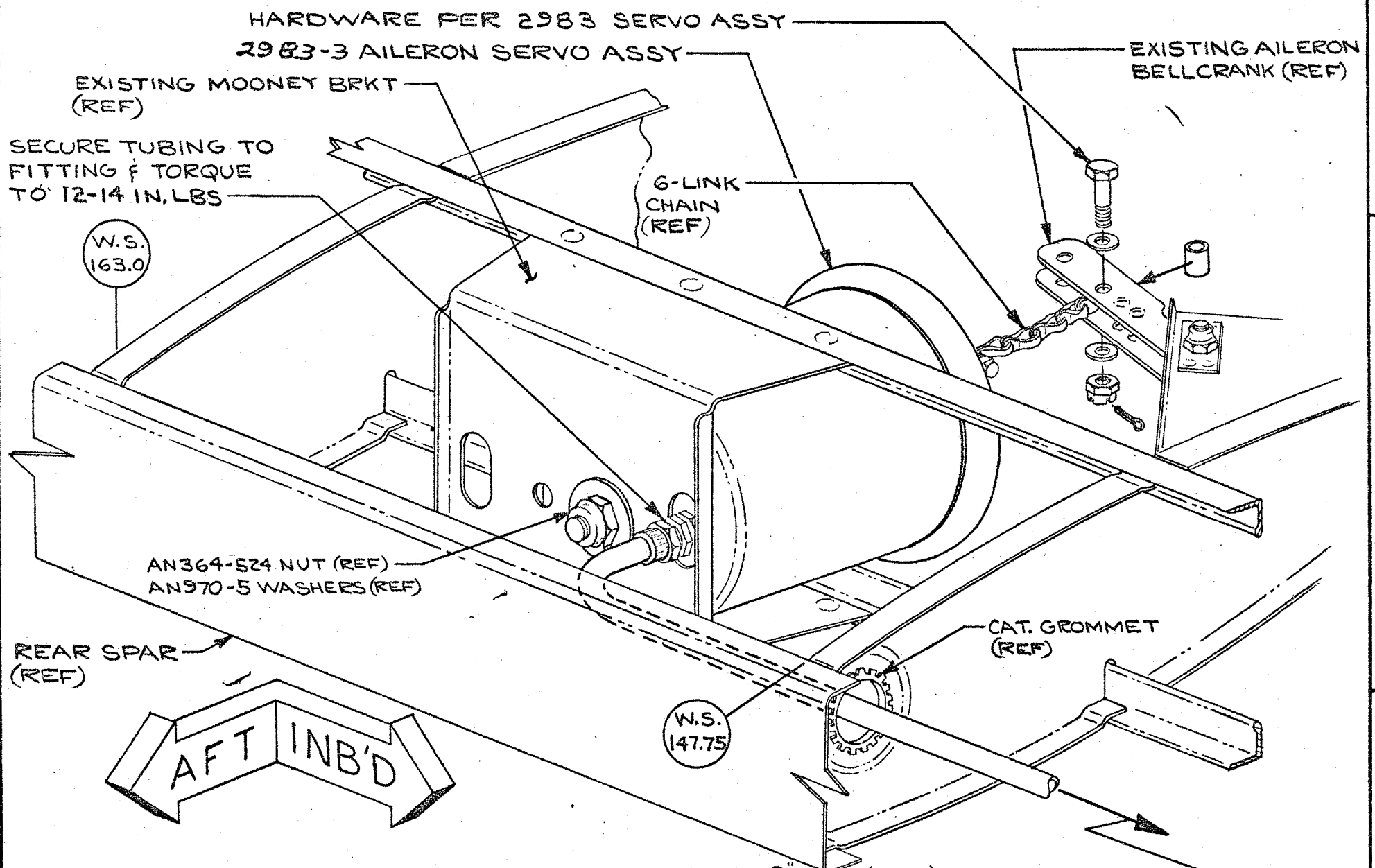


15	4/0 3579	130	403
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CHANGE APPROVED BY: *E. FR* DATE: 2-11-66

APPROVED BY: *J.M. Donaldson* DATE: 2-11-66
 CHECKED BY: *W.A. [unclear]* DATE: 2-11-66
 DRAWN: J.M. DONALDSON DATE: 2-3-66

1700 SH 5
 OF 13
 DRAWING NUMBER



L.H. INSTALLATION SHOWN
 R.H. INSTALLATION OPPOSITE

ROUTE INB'D- $\frac{3}{8}$ " O.D. (RED) POLY-FLO TUBING FOR L.H. WING INSTALLATION
 $\frac{3}{8}$ " O.D. (GREEN) POLY-FLO TUBING

HAWTHORNE CALIFORNIA

MOONEY

1700 OF 13
 DRAWING NUMBER

A 403578 CW 4/29/65

A

APPROVED BY: *J.M. Donald* DATE: 4-9-65

CHECKED BY: *J.M. Donald* DATE: 6-9-65

DRAWN BY: J.M. DONALD DATE: 5-10-65

1700 OF 13

A

FORM 81-00 9

CHANGE APPROVED BY:

DATE:

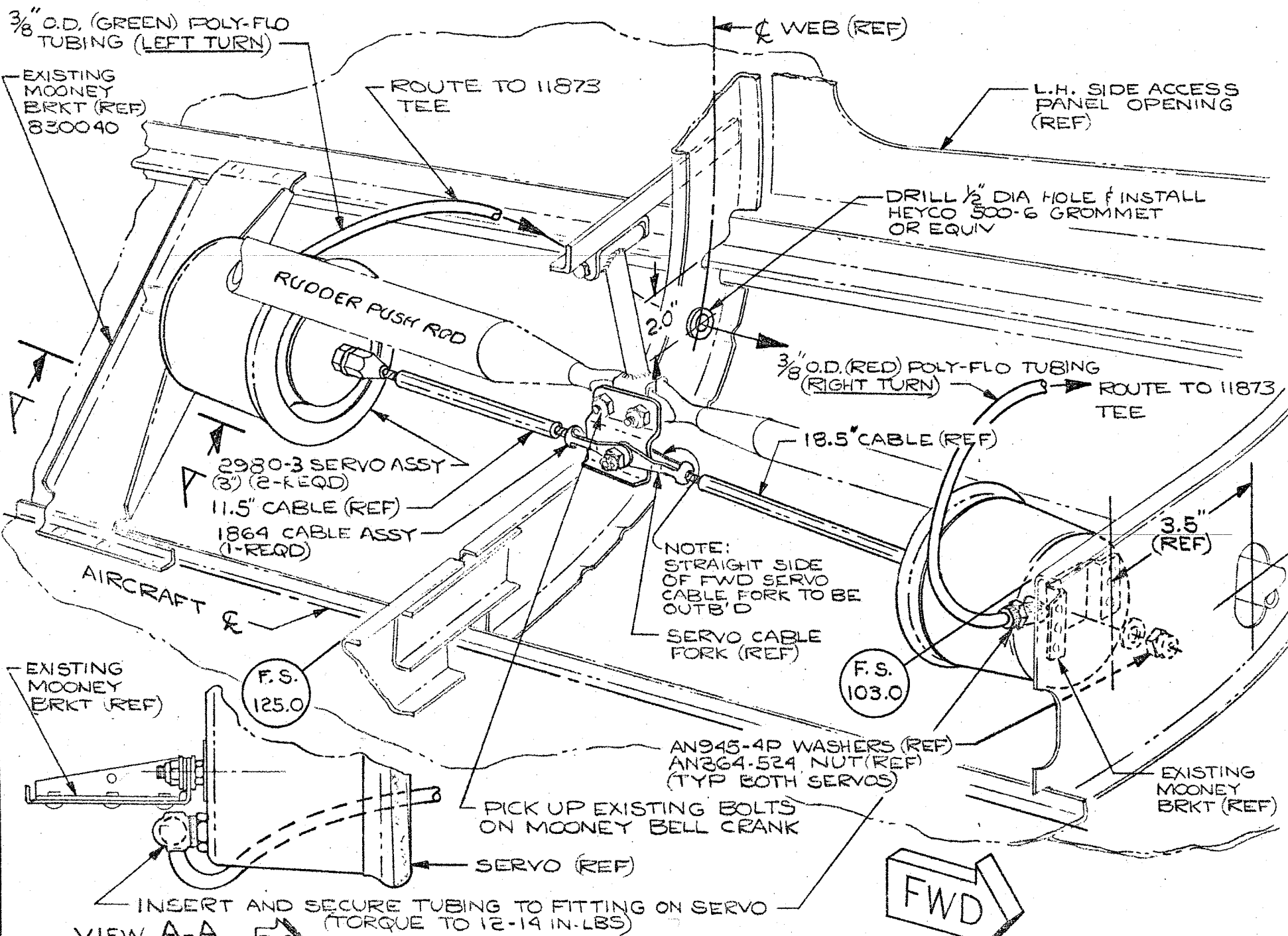
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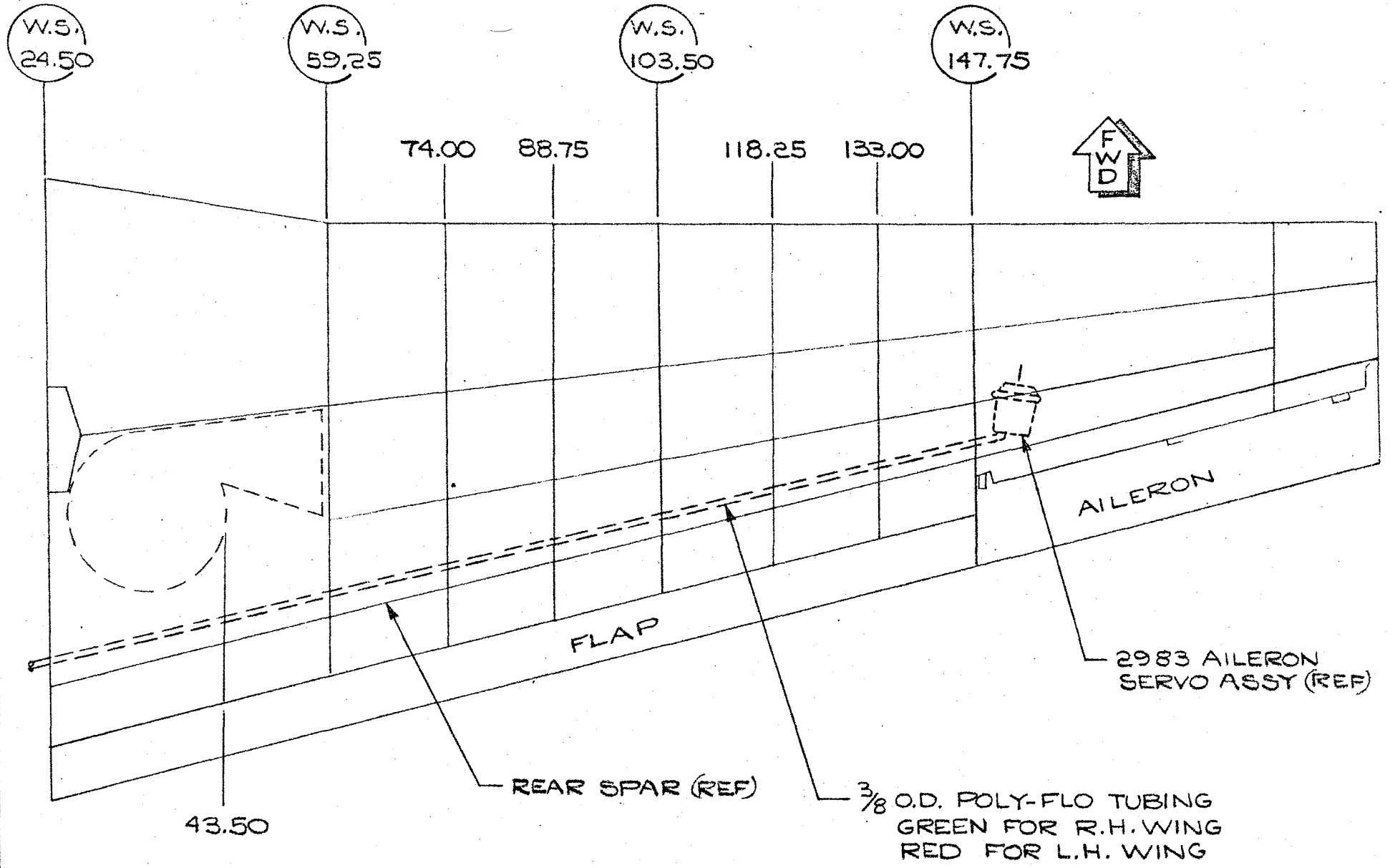
CHANGE

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

RUDDER SERVO INSTALLATION
MOONEY

DRAWING NUMBER
1700 OF 13
4
CHAN





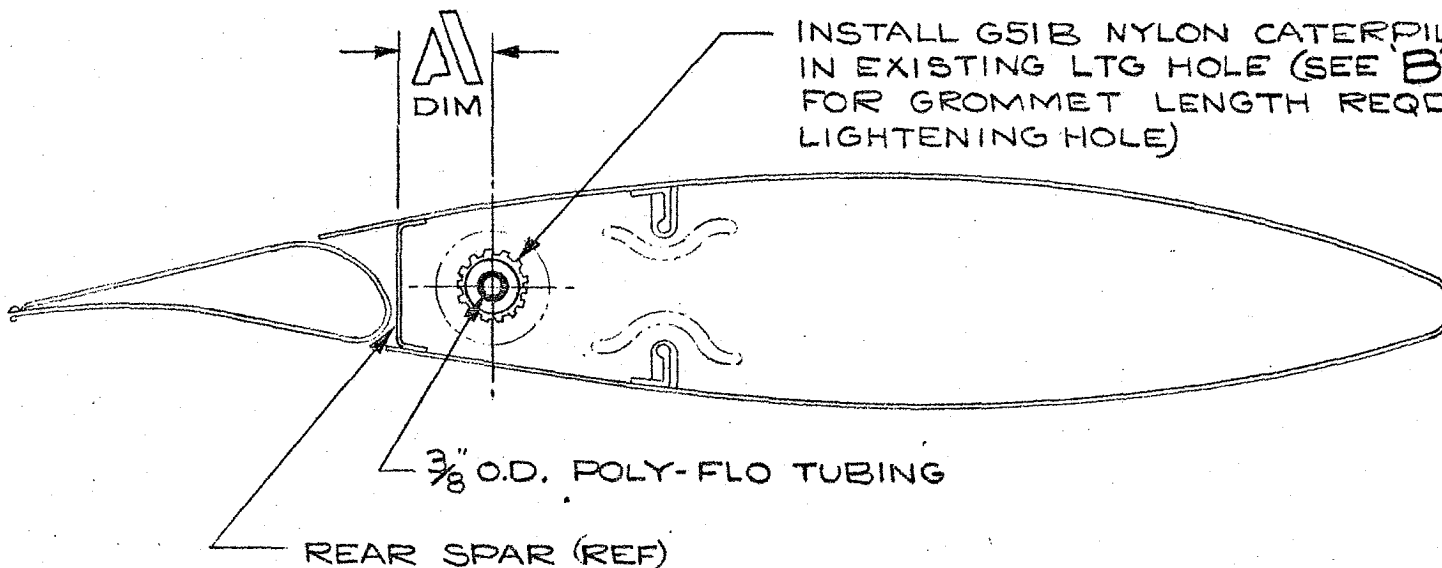
R.H. WING SHOWN
L.H. WING OPPOSITE

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

TUBE ROUTING-AILERON
MOONEY

1700 of 13 SH 8
DRAWING NUMBER

CHAN



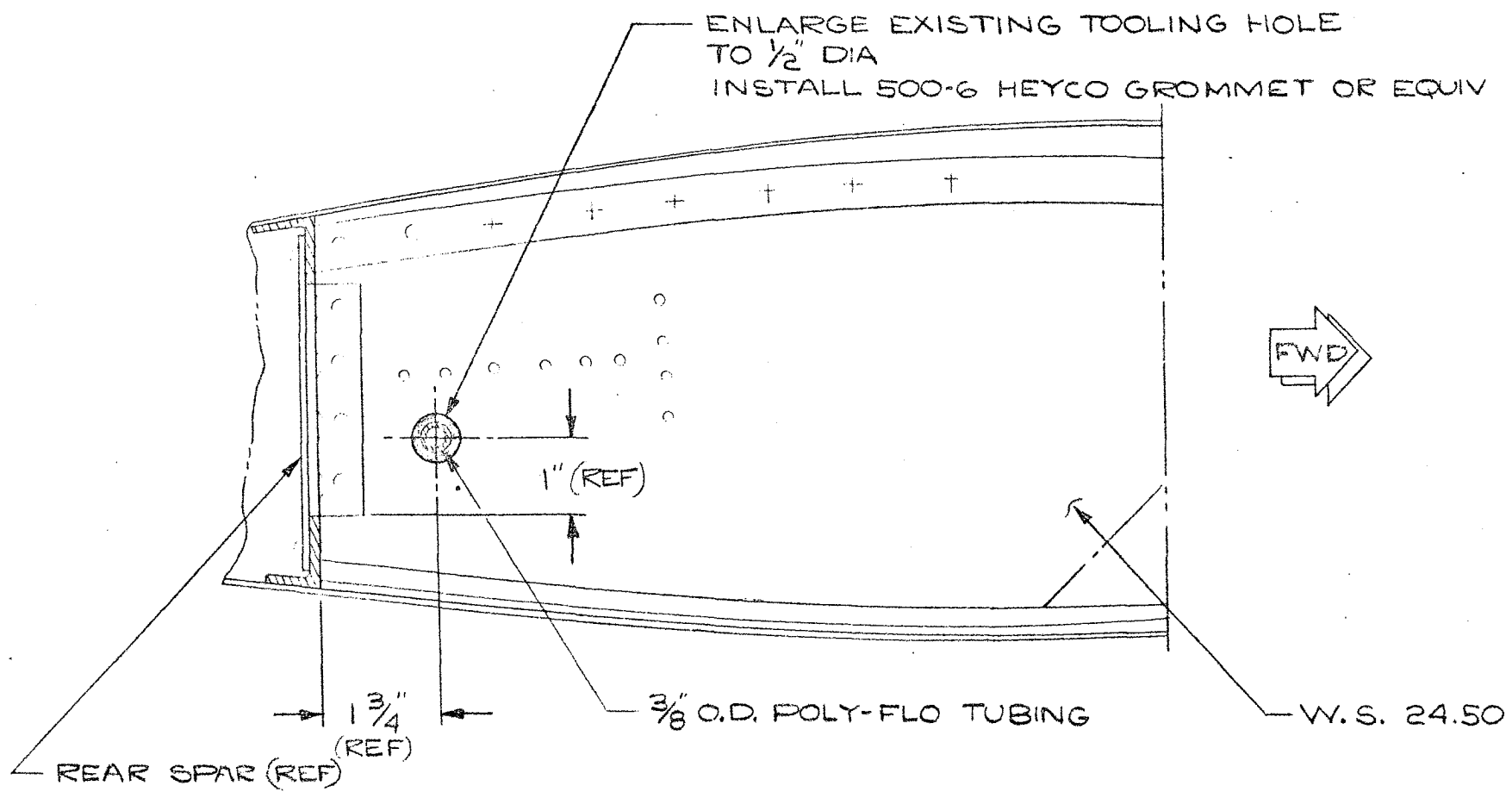
INSTALL G51B NYLON CATERPILLER GROMMET IN EXISTING LTG HOLE (SEE B DIM IN TABLE FOR GROMMET LENGTH REQD IN EA LIGHTENING HOLE)

3/8" O.D. POLY-FLO TUBING

REAR SPAR (REF)

TYPICAL WING RIB
FOR W.S. 74, 88.75, 103.5, 118.25, 133, 147.75

WING STATION	A DIM (REF)	B DIM
74.00	4.0	4.89
88.75	6.0	4.89
103.50	6.0	4.89
118.25	6.0	3.71
133.00	6.0	3.71
147.75	6.0	3.71



ENLARGE EXISTING TOOLING HOLE TO 1/2" DIA
INSTALL 500-6 HEYCO GROMMET OR EQUIV



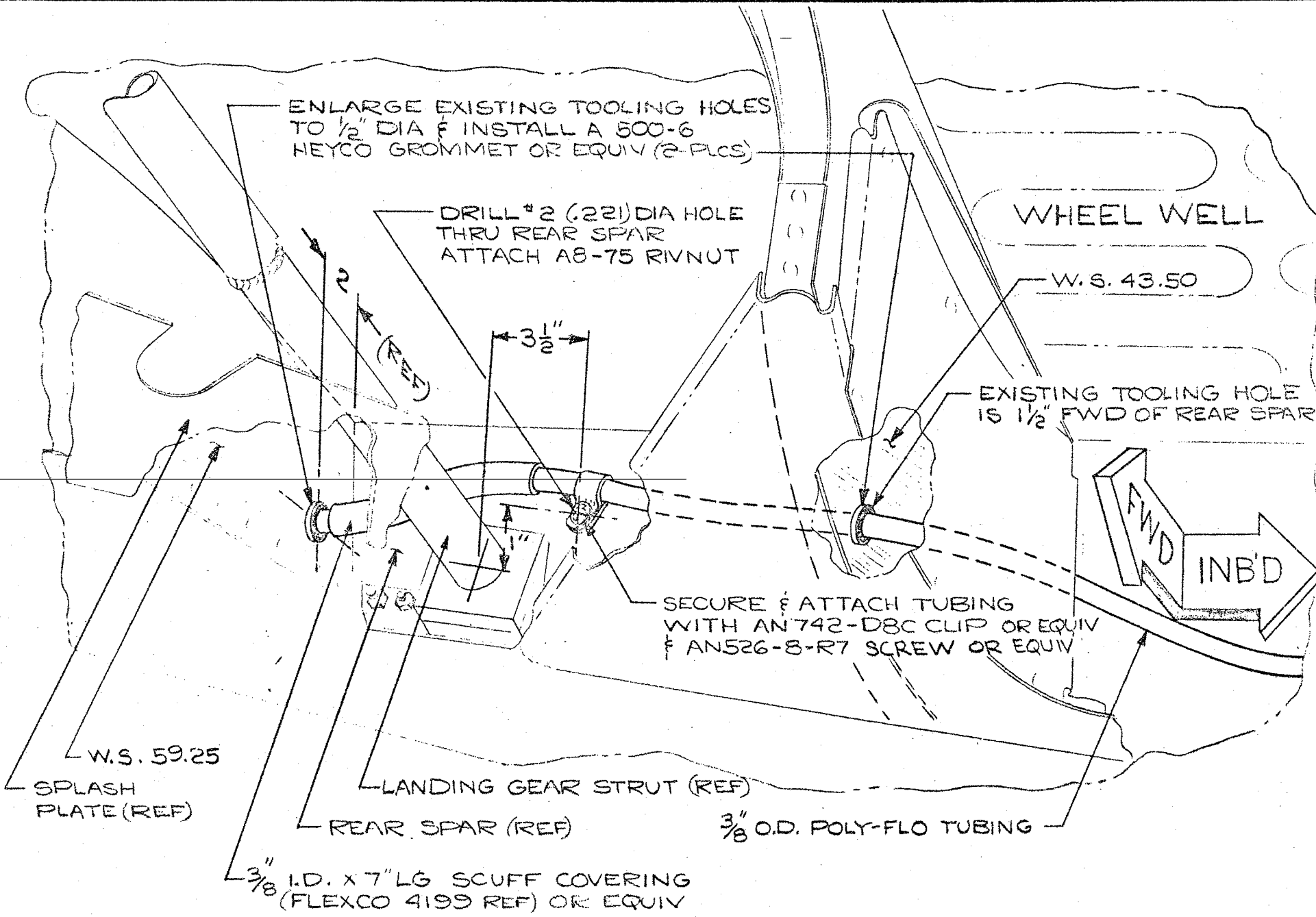
R.H. WING SHOWN
L.H. WING OPPOSITE
VIEW LOOKING INB'D

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

TUBE ROUTING-AILERON
MOONEY

1700 SH 9
OF 13
DRAWING NUMBER

CHAN



VIEW LOOKING UP AND AFT

R.H. WING SHOWN - L.H. WING OPPOSITE

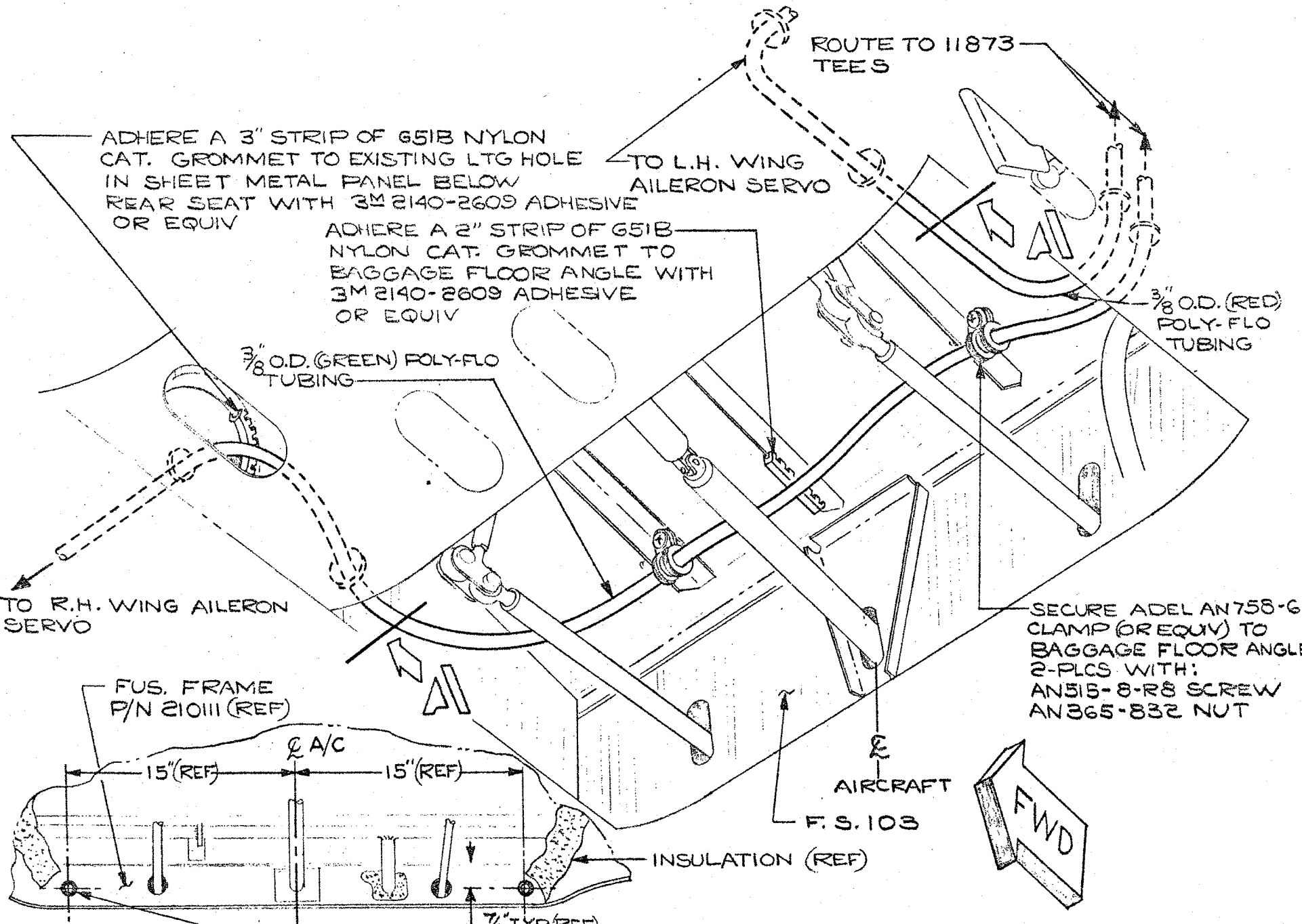
CHANGE	APPROVED BY:	DATE:	APPROVED BY: <i>[Signature]</i>	DATE: 6-9-65	SH 11
			CHECKED BY: <i>[Signature]</i>	DATE: 6-9-65	1700 OF 13
			DRAWN BY: J.M. DONALDSON	DATE: 5-11-65	DRAWING NUMBER

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

TUBE ROUTING-AILERON
MOONEY

1700 OF 13
SH 11
DRAWING NUMBER

CHAN



ADHERE A 3" STRIP OF G51B NYLON CAT. GROMMET TO EXISTING LTG HOLE IN SHEET METAL PANEL BELOW REAR SEAT WITH 3M 2140-2609 ADHESIVE OR EQUIV

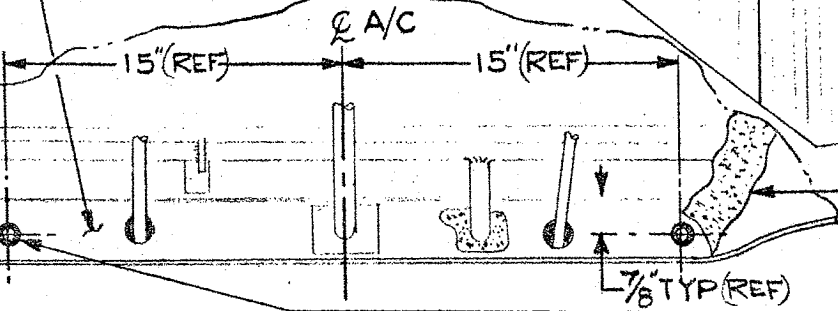
ADHERE A 2" STRIP OF G51B NYLON CAT. GROMMET TO BAGGAGE FLOOR ANGLE WITH 3M 2140-2609 ADHESIVE OR EQUIV

3/8" O.D. (GREEN) POLY-FLO TUBING

3/8" O.D. (RED) POLY-FLO TUBING

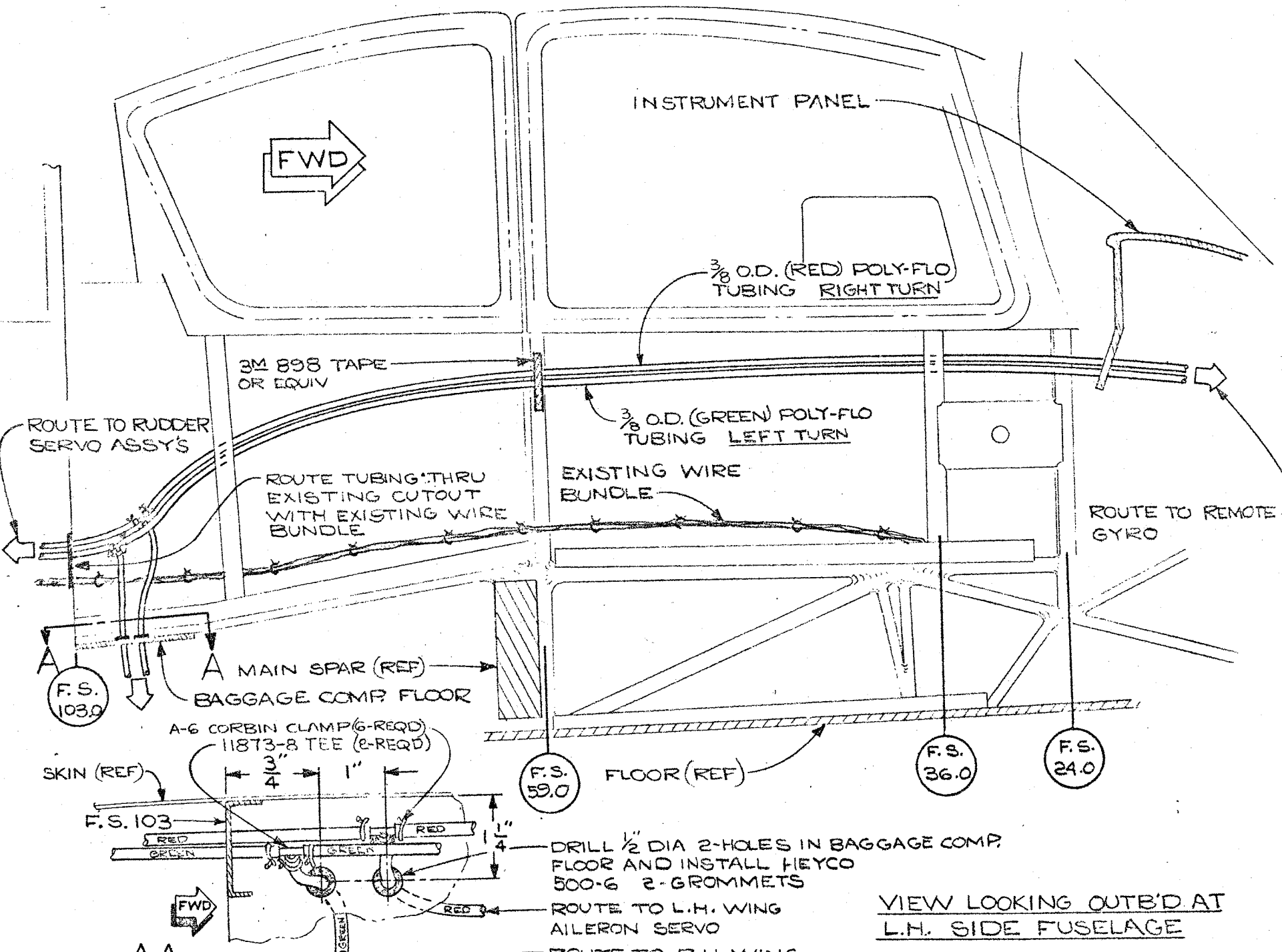
SECURE ADEL AN758-6 CLAMP (OR EQUIV) TO BAGGAGE FLOOR ANGLE 2-PLCS WITH: AN515-8-R8 SCREW AN365-832 NUT

FUS. FRAME P/N 210111 (REF)



VIEW LOOKING FORWARD

ENLARGE EXISTING TOOLING HOLE 2-PLCS TO 1/2" DIA TO TAKE 500-6 HEYCO GROMMET F



INSTRUMENT PANEL

FWD

3/8 O.D. (RED) POLY-FLO TUBING RIGHT TURN

3M 898 TAPE OR EQUIV

ROUTE TO RUDDER SERVO ASSYS

3/8 O.D. (GREEN) POLY-FLO TUBING LEFT TURN

ROUTE TUBING THRU EXISTING CUTOUT WITH EXISTING WIRE BUNDLE

EXISTING WIRE BUNDLE

ROUTE TO REMOTE GYRO

F.S. 103.0

A MAIN SPAR (REF)
BAGGAGE COMP FLOOR

A-6 CORBIN CLAMP (6-REQD)
118T3-8 TEE (2-REQD)

F.S. 59.0

FLOOR (REF)

F.S. 36.0

F.S. 24.0

SKIN (REF)

F.S. 103
RED
GREEN

DRILL 1/2 DIA 2-HOLES IN BAGGAGE COMP FLOOR AND INSTALL HEYCO 500-6 2-GROMMETS

ROUTE TO L.H. WING AILERON SERVO

ROUTE TO R.H. WING AILERON SERVO

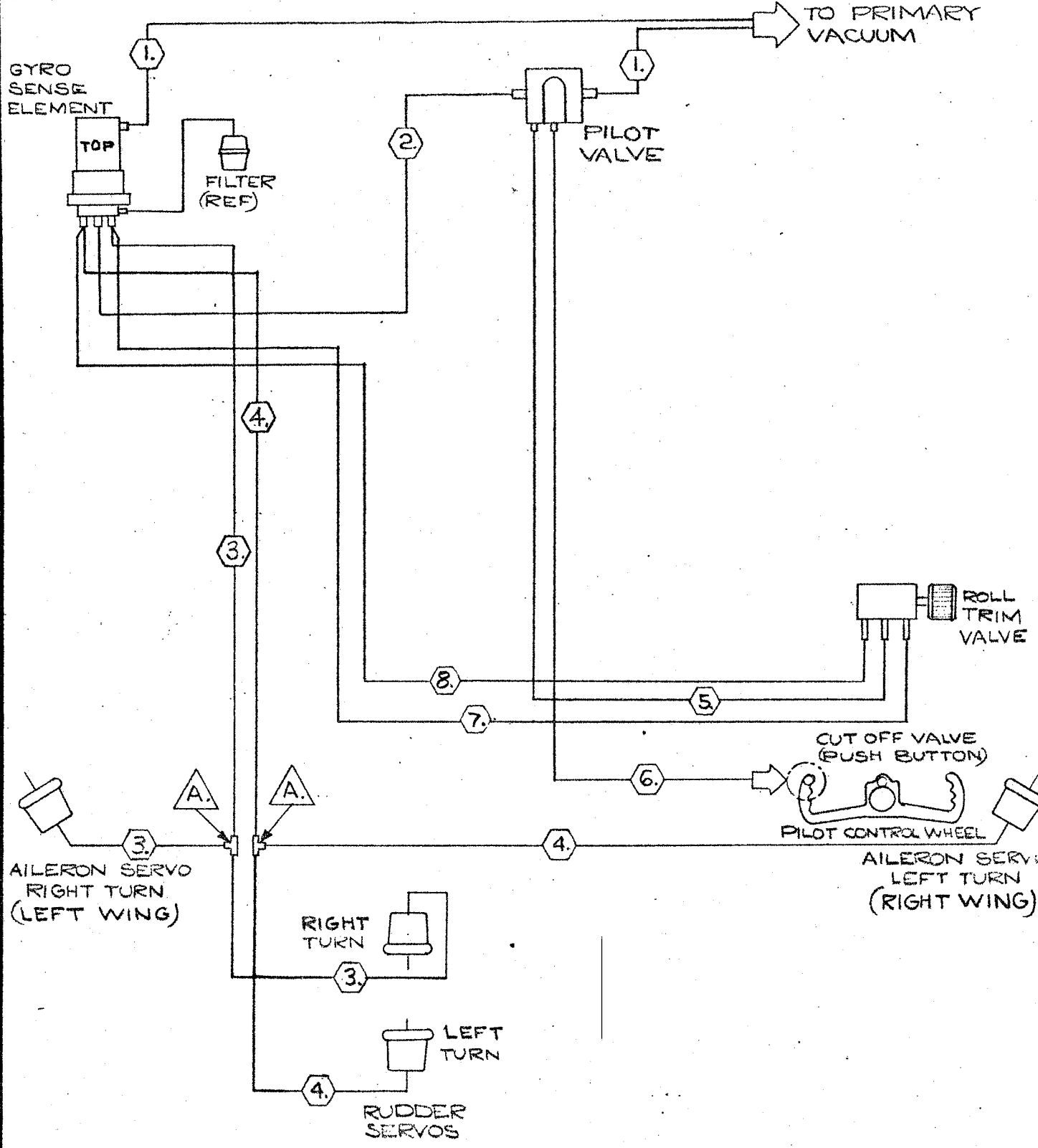
VIEW LOOKING OUT'B'D AT L.H. SIDE FUSELAGE

VIEW A-A

FWD

APPROVED BY: *[Signature]* DATE: 6-9-65
CHECKED BY: *[Signature]* DATE: 6-9-65
DRAWN BY: J.M. DONALDSON DATE: 5-13-65

DATE: _____
CHANGE APPROVED BY: _____



TEE CODING **A.** 11873

- | | |
|----------------------------|----------------------------|
| ① BLACK 3/8" O.D. POLY-FLO | ⑤ BLACK 3/16" O.D. PLASTIC |
| ② GRAY 7/8" O.D. POLY-FLO | ⑥ GRAY 3/16" O.D. PLASTIC |
| ③ RED 3/8" O.D. POLY-FLO | ⑦ RED 3/16" O.D. PLASTIC |
| ④ GREEN 3/8" O.D. POLY-FLO | ⑧ GREEN 3/16" O.D. PLASTIC |