SALVAGE M-20B, C, D, E, F & G MODEL EMPENNAGE ASSYS. FOR USE IN THE M20, 20A METAL EMPENNAGE MODIFICATION

Replacement of an M20/20A wood empennage with a salvage M-20B, C, D, E, F, or G Model Empennage Assy (other than the 480000-509 Empennage Assy called-out in the M20-170-1 kit) is possible provided ALL of the following items are met:

I. The Salvage Replacement Metal Empennage Assy must:

1. Use Beaded Elevators P/N 430026-501 & -502
2. Use Beaded (short) Rudder P/N 460043-501
3. Use Existing or New M-20/20A Trim Assist Bungees P/N 740044 (7038)
4. Use Bellcrank P/N 740081 (7227)
5. Use Elevator Horns P/N 430009-1 & -2
6. Use Stinger Assy. P/N 420000-952

   NOTE: Empennage Assys. which use the Long Rudders may be used by installing the Stinger Assy., thereby adapting empennage for use of the short Rudder Assy.

7. Meet all above Requirements and conform to all pertinent FAA regulations relating to the use of aircraft salvage parts. Approval must be granted by the FAA Administrator or His Designee.

II. Follow all Installation Instructions & use all parts (Empennage Assy. Optional) noted on attached M20/20A Metal Empennage Modification 20-170 Instructions.

ATTACHMENTS:

I: M20, M20A Metal Empennage Modification Instructions

II: List of Materials (20-170-1 Kit)

I. M20, M20A METAL EMPENNAGE MODIFICATION INSTRUCTIONS

A. Removal Instructions

1. Remove wood empennage.

2. Remove stabilizer trim system (including forward trim actuator).

3. Drill out rivets attaching skins to rear bulkhead. Remove and discard rear bulkhead.

4. Drill out rivets attaching top and bottom aft tailcone skins and remove skins (salvage for reinstallation).

5. Drill out rivets attaching P/N 3088, 3089-1, 3089-2, 3090-1, and 3090-2 clips to aft end of longerons, right and left sides (discard).

6. Countersink unused holes in longerons and plug holes using AN426-4 rivets $\downarrow 4$.

7. Remove aft elevator and rudder control tubes. (Not to be reused).

8. Remove P/N 3038 (740044) bungee trim assist units from wood empennage. (Salvage for installation on metal empennage.).

B. Installation of Metal Empennage

Reference: Drawing 20-170

1. Level aircraft laterally and longitudinally.

NOTE: The use of a transit is recommended for leveling the aircraft. However, P/N 20-170-21 blocks may be located on top of main spar at wing station 21 or place a straight edge across the main spar to fuselage attach points. A spirit level may then be used to level the aircraft laterally. The aircraft should be raised on jacks to clear the wheels and should be supported longitudinally by means of a propeller yoke-jack. Level the aircraft longitudinally by placing the spirit level on the upper edge of the side skin (constant water line) and raising or lowering the propeller jack.

2. With the aircraft leveled, locate P/N 350000-903 bulkhead assembly so that aft bulkhead face is oriented vertically at 90° from constant water line (upper edges of side skins). Place spirit level along top edge of empennage attach fitting to check horizontal alignment of bulkhead. Measure angle of top longeron to bulkhead face should be (6° 8'). Sandwich longerons between bulkhead attaching parts.

3. Align existing hole patterns in side skins on center of pilot holes on bulkhead flange.

4. Mark bulkhead flange through existing holes in side skins. There shall be no double holes allowed on bulkhead flange and not more than three doubles in each skin. If excess double holes or holes with less than 4 D pitch (distance between holes) result in skin, plug excess holes in skin using AN426-4 ▽ 4 rivets and add .032 2024T-3 Alclad straps as shown on 20-170 drawing. Attach straps to skin by adding a staggered row of rivets immediately forward of existing hole patterns.

5. Backdrill rivet holes through pilot holes in bulkhead flange and through straps, and/or skin. Installation must have at least the minimum number of rivets through skins and bulkhead flange as shown on 20-170 drawing. 4 D pitch and ED must be maintained on all rivet patterns. ⌐5 Monel blind rivets may be used in areas inaccessable for bucking rivets. One blind rivet to be added between existing rivets in pattern.

6. Install tail skid intercostal P/N 350076, tail skid attachment P/N 350074 and tailskid strap P/N 350075-501. Backdrill through pilot holes, through skin and attach intercostal to skin and longerons with ⌐5 rivets.

7. Drill four 1 inch holes in side skins for access to aft trim actuator attach bolts. (See 20-170 drawing).

8. Install forward trim control actuator and P/N 20-170-9 doubler using existing mounting holes. Route universal joint tubes through existing cutouts. Install guide blocks (3) and cover as shown on 20-170 drawing, using indicated hardware. Install spacer to separate forward ends of actuator attach brackets; remove spacer after installation of top and bottom skins.

NOTE: Cutouts may be enlarged as required to facilitate routing. Locate 20-170-13 Guide Block so that trim tube does not interfere with gear retraction mechanism.

9. Install 915010-501 Rudder Control tube, attaching aft end bearing of tube to center hole in 20-170-17 bulkhead rudder bellcrank. Install 710022-001 Elevator Control tube. Use hardware indicated on 20-170 drawing.

10. Reinstall aft tailcone top & bottom skins as outlined in previous steps 4 & 5. Install tail skid tiedown eyebolt. Use next larger diameter rivets in oversize rivet holes.

11. Install metal empennage use AN174-20A bolts and AN363-428 nuts. Use AN960-516 washers to limit lateral maximum motion to .010. Install P/N 480008-17 pins in hinge at bulkhead and empennage using P/N 440019-000 washers to hold maximum lateral motion to .010. Install cotter keys in hinge pin ends.

12. Rig controls as follows:

    a. With the aircraft level, set stabilizer trim control wheel stops for extreme travel.

    b. Adjust trim screw at rear bulkhead for excess trim travel.

    c. Set stops at trim wheel actuator for maximum positive stabilizer setting of +1 1/2° +0° -1/2° and maximum negative stabilizer setting of -3 1/2° + -1/2°.

    d. Set elevator up travel stops for 24° ± 1/2°.

    e. Set elevator down travel stops for 10 1/2 ± 1°.

    f. Adjust trim assist units, with trim control at full nose up travel, so that elevators are at 18° to 20° up travel with no spring tension. With trim control at full nose down position, elevators should be at 0° to 3° down travel.

    g. Adjust rudder travel stops for 18° ± 1/2° right and left. The rudder should neutralize at 1° right travel.

13. Weigh aircraft and compute new empty weight center of gravity. Use Weight & Balance Forms provided to determine new allowable loading schedules.

14. Complete FAA Form 337.

1. 480000-509 empennage assy ('68-C beaded control surfaces) except for following parts to be used in place parts c/o on assy.

   A. Blck 7227

   B. M20 and M20A bungees

2. Add all P/N's c/o on dwg.

350000-963 BULKHEAD ASSY

Consisting of:	350055-007	Stiffener, LH (1)
	350055-008	Stiffener, RH (1)
	350056-000	Stiffener, (1)
	350057-007	Stiffener, LH (1)
	350057-008	Stiffener, RH (1)
	350058-007	Stiffener, LH (1)
	350058-008	Stiffener, RH (1)
	350059-000	Intercostal (1)
	350060-007	Fitting, LH (1)
	350060-008	Fitting, RH (1)
	350061-007	Fitting, LH (1)
	350061-008	Fitting, RH (1)
	350062-000	PLATE (2)
	350063-000	Attachment Assy (1)
	350066-001	Plate Assy, LH (1)
	350062-002	Plate Assy, RH (1)
	350067-000	Strap (2)
	350068-000	Stiffener Plate (1)
	350069-000	Stiffener Plate (1)
	350071-000	Stiffener (1)
	350072-000	Attachment (1)
	350000-925	Bracket Assy (1)
	350084-000	Attachment (1)
	480003-007	Hinge Assy (1)
	480003-019	Hinge Assy (1)
	M20-170-17	Bellcrank (1)
	913031-000	Bellcrank, Elevator (1)

350073-000 TAIL SKID

Instl with:	350122-003	Eyebolt (1)
	AN4-11A	Bolt (1)
	AN960-416	Washer (2)

350076-000 Tail Skid Intercostal

350074-000 Tail Skid Attachment

350075-501 Strap Tail Skid

740021-000 Actuator (1)

740170-000 Block (1)

914017-000 Bushing (1)

AN5H-15 Bolt (1)

AN5H-32 Bolt (1)

AN960-516 Washer (3)

AN310-5 Nut (2)

740156-003 Duct (1)

AN4-31A Bolt (2)

AN363-428 Nut (2)

915026-959 Tube Assy (1)

Consisting of:	740029-000	Slip Joint (1)
	740009-007	Joint (1)
	915026-019	Bushing (1)
	915026-021	Tube (1)
	AN3-11	Bolt (2)
	AN310-3	Nut (2)
	915026-017	Tube (1)
	MS20270-B8	Joint (1)
	AN392-25	Pin (4)
	AN380-2-2	Pin (4)
	AN960-4L	Washer (8)

20-170-3 Tube Assy (1)

Consisting of:	20-170-5	Tube (1)
	915026-017	Bushing (2)
	MS20270-B8	Joint (1)
	Pins	

915026-953 Tube Assy (1)

Consisting of:	915026-009	Tube (1)
	915026-017	Tube (2)
	MS20270-B	Joint (1)
	AN392-25	Pin (2)
	AN380-2-2	Pin (2)
	AN960-4L	Washer (4)

915026-951 Tube Assy (1)

Consisting of:	915026-007	Tube (1)
	915026-017	Tube (2)
	MS20270-B	Joint (1)
	AN392-25	Pin (2)
	AN380-2-2	Pin (2)
	AN960-4L	Washer (4)

AN392-25 Pin (6) AN380-2-2 Pin (6) AN960-416 Washer (12)

740078-000 Trim Wheel Assy (1)

20-170-9 Plate (1)

20-170-7 Cover (1)

Instl with: PK 4 x 3/8 (4)

AN392-19 Pin (1)

210118-001 Guide Assy (1)

20-170-11 Guide Assy (1)

Instl with:
AN3-14A Bolt (2)
AN960-10 Washer (2)
AN970-3 Washer (2)
AN365-1032 Nut (2)

20-170-13 Guide Block

Instl with:
AN3-12A Bolt (2)
AN960-10 Washer (2)
AN970-3 Washer (2)
AN365-1032 Nut (2)

915010-501 Tube Assy, Rudder Control (1)

Instl with:
AN3-11A Bolt (2)
AN960-10 Washer (2)
AN363-1032 Nut (2)

710022-001 Tube Assy Elevator (1)

Instl with:
AN3-11A Bolt (2)
AN960-10 Washer (2)
AN365-1032 Nut (2)

480008-901 Hinge Assy (1)

Consisting of:
480008-005 Hinge (1)
480008-007 Hinge (1)
480008-009 Hinge (1)
480008-011 Hinge (1)

480008-015 Pin (1)

480008-017 Pin (2)

440019-000 Washer (7)

AN381-2-6 Cotter Pin (6)

AN174-20A Bolt (2)

AN363-428 Nut (2)

AN960-416 Washer (6)

480001-000 Fairing (2)

470002-008 Fairing (1)

470002-007 Fairing (1)

913041-503 Stops (2)

913041-501 Stops (2)
420000-952 Stinger (1)
Rivets (1#)
20-170-21 Leveling Blocks (2)

M20

M20A

	DESCRIPTION		
	Emp Assy	2670.00	4
0 Fellc	ank installed in place of 740189	16.30	1
1 Eleva	or pack separate	316.35	1
2 Eleva	or pack separate	316.35	1
1 Rudde	pack separate	316.35	1
3 Tube	nstalled in tail	46.50	1
5 Tube	nstalled in tail	47.97	1
1 Tube	nstalled in tail	50.28	1
15 Tube	nstalled in tail	47.71	1
on Plate	to match Stinger enclosed		
003	Tube	34.26	1
007	Cover	2.63	1
009	Plate	2.63	1
011	Block	7.40	1
013	Block	3.70	1
085	Decal	.44	1
001	Guide Assy	9.87	1
963	Bulkhead w/20-170-17 Inst.	254.69	1
901	Rib Assy 350076-000 350075-501	16.48	1
000	Skid	10.62	1
000	Block	4.98	1
003	Tie Down Bolt	5.34	1

Tail Conversion Kit

M20-170-1

QTY	CODE NO.	PART NO.	DESCRIPTION	
1		420000-952	Stinger Tip	67.15
7		440019-000	Spacer	1.26
1		470002-007	with teflon tab	6.07
1		470002-008	with teflon tab	6.07
1		480001-001	Fairing	3.12
1		480001-002	Fairing	2.98
1		480008-901	Hinge Assy	58.14
1		480008-015	Pin	3.55
2		480008-017	Pin	3.21
1		740021-501	Trim Screw 740021-000	137.15
1		740078-000	Trim Wheel	101.13
1		740156-003	Cover	6.01
1		740170-000	Link	8.09
3		913041-501	Stop	5.52
1		913041-503	Stop	5.52
2		914020-024	Bushing	1.97
1		915008-001	Tube	41.57
1		915038-501	Tube 915010-501 710022-001	44.25
1		915026-951	Tube Assy	52.36
1		915026-953	Tube Assy	75.49
1		915026-959	Tube Assy	95.53

Tail Conversi[illegible]t

M20A

M20-170-1

QTY	CODE NO.	PART NO.	DESCRIPTION		
8	100040	AN3-5A	Bolt	.01	1
22	100120	AN3-11A	Bolt	.04	1
4	100140	AN3-12A	Bolt	.05	1
7	100160	AN3-13A	Bolt	.09	1
2	100180	AN3-14A	Bolt	.07	1
1	100460	AN3-41A	Bolt	.59	1
1	100260	AN3-20A	Bolt	.13	1
2	101120	AN4-23A	Bolt	.17	1
2	101130	AN4-31A	Bolt	.23	1
1	101600	AN6H-15	Bolt	.37	1
1	101675	AN6H-32	Bolt	.69	1
2	108115	AN23-21A	Bolt Clevis	.10	1
2	110920	AN174-20A	Bolt	.39	1
2	112310	AN310-5	Nut	.14	1
6	112565	AN363-428	Nut	.13	1
25	112635	AN363-1032	Nut	.08	1
6	112730	AN380-2-2		.01	1
6	112900	AN381-2-6		.01	1
5	113025	AN392-25	Pin Clevis	.09	1
13	118420	AN960-4	Washer	.01	1
27	118450	AN960-10	Washer	.01	1
50	118455	AN960-10L	Washer	.01	1

Tail Conversion Kit

M20A

M20-170-1

QTY	CODE NO.	PART NO.	DESCRIPTION	
6	118460	AN960-416	Washer	.01
3	118470	AN960-516	Washer	.01
8	225050		4 x 3/8 Screw	.01
1		Blank Wt. & Balance for aircraft.		
1			20-170 Special Instructions	
1			20-170 Copy	
		CRATING CHARGE IF SHIPPED.		

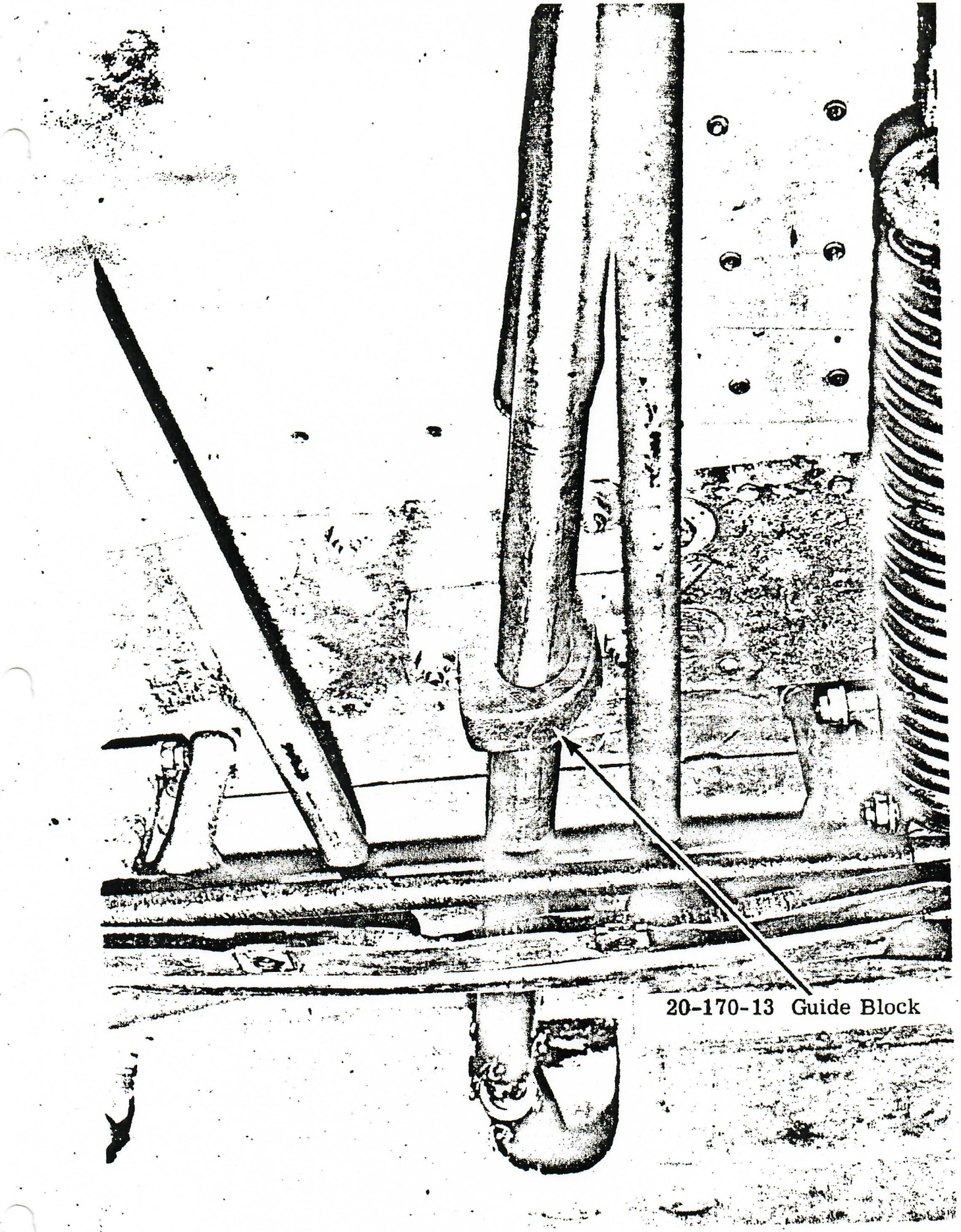

Figure 1

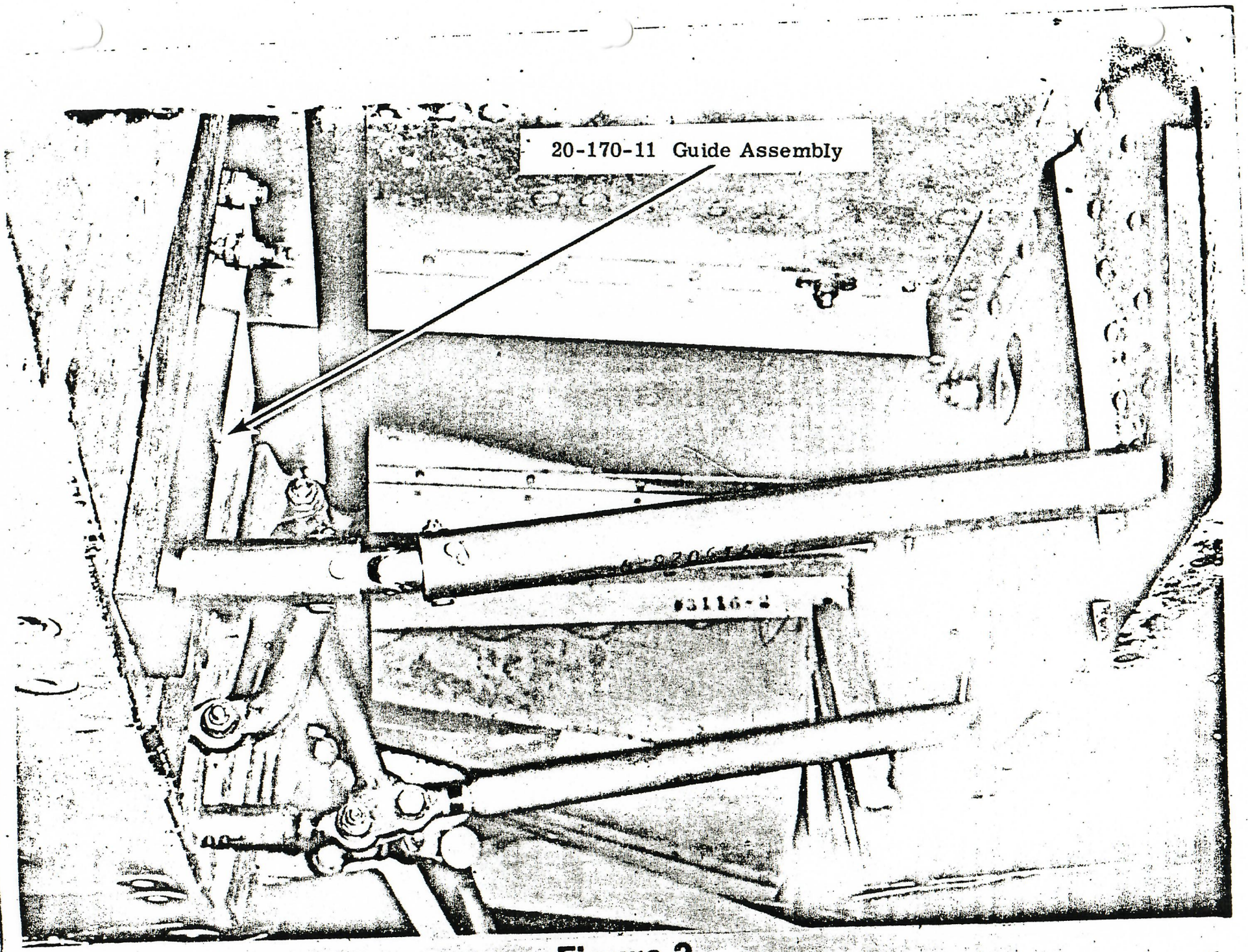

Figure 2

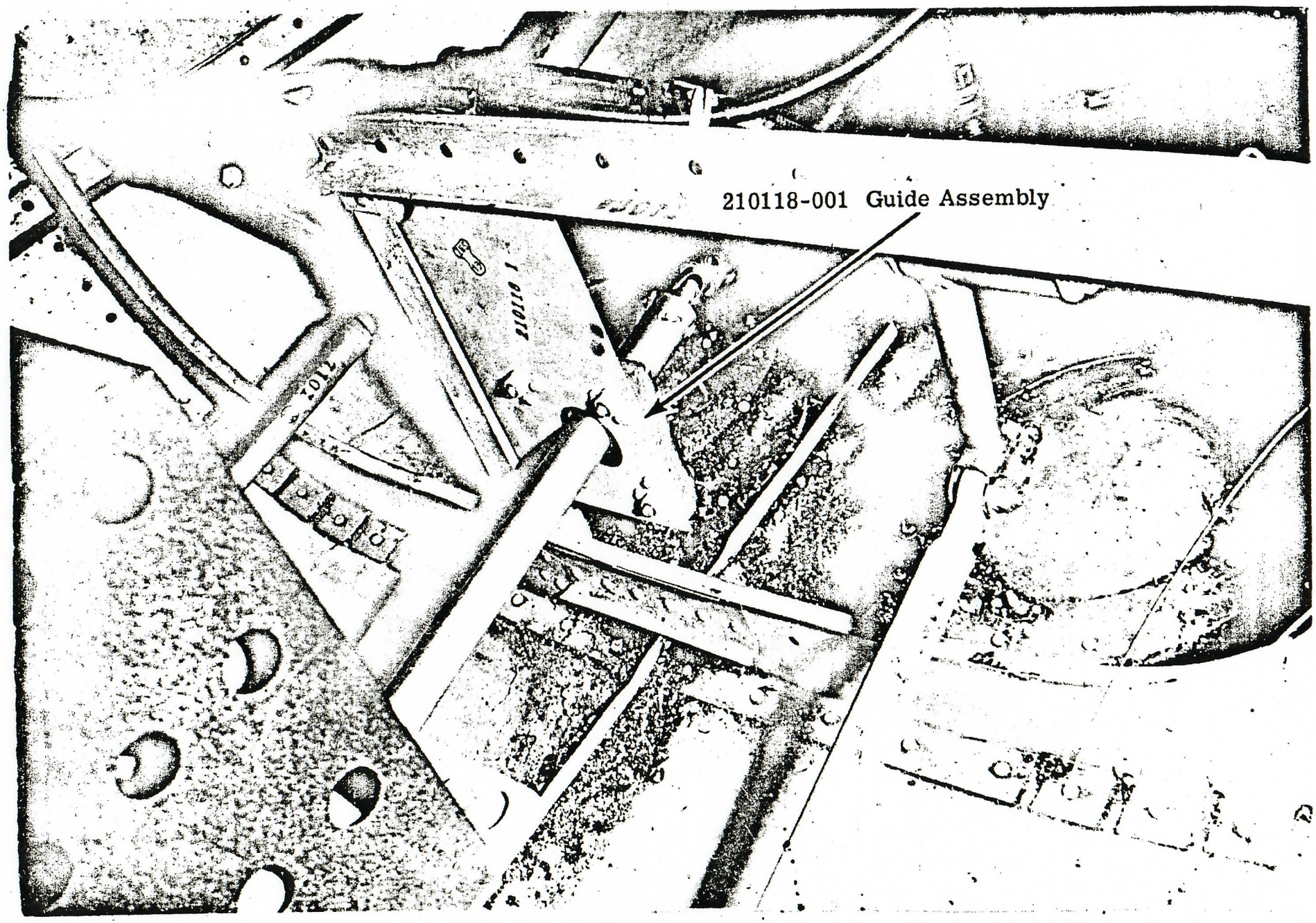

Figure 3