

EXCALIBUR

Instruction Manual



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Excalibur Parts List

Item No.	Description	Quantity
Step 1		
0601-150-8	Main Frame (left & right)	1 set
0601-156-7	Lower Angle	2
0601-162-8	Body Mounting Bolt E	2
0601-152-6	Sub-Frame Excalibur	1
0601-162-8	Body Mounting Bolt F	2
0601-164-7	Cross Member Excalibur	2

Item No.	Description	Quantity
Step 2		
0102-094-6	Inner Shaft	1
0102-100-8	Starter Cone	1
0102-093-8	Shaft Joint Coupler	1
0102-092-8	Bearing Case for Starter w/1910ZZ & 1960ZZ	1
0102-101-6	Pinion Gear for Starter	1
0102-091-8	Clutch Bell for Starter	1
0402-013-8	Slide Ring Holder	1
0402-014-8*	Slide Ring Shaft A	1
0402-014-8*	Slide Ring Shaft B	2
0402-011-8	Slide Ring Assembly	1 set
0402-032-8	Slide Ring Arm Assembly (left & right)	1 set
0402-034-6	Slide Ring Arm B	1
0601-160-8	Bearing Case A w/1910ZZ	1
0601-043-8	Bearing Case C	1
0400-042-8	HG Bell Crank w/RF-830ZZ	1
0400-040-6	Spacer for HG Bell Crank 60	1

Item No.	Description	Quantity
Step 3		
71031	Taper Nut for Starter (OS)	1
71032	Taper Nut for Starter (YS)	1
71033	Taper Nut for Starter (Enya)	1
71016	Taper Collet	1
0102-089-6	Taper Collet Spacer for Webra	1
71034*	Clutch Shoe for Starter	2
71034*	R Washer for Starter	2
0102-099-6	Light Weight Motor Mount for 10T Pinion	1
0102-010-8	Throttle Lever & Spacer (Enya)	1 each
71012	Cooling Fan	1
	Rotor Adjusting Screw for OS Engine	1

Item No.	Description	Quantity
Step 4		
0200-009-6	60 Main Shaft	1
0401-112-8	Elevator Control Ring Assembly	1 set
0401-057-8	Phase Adjusting Ring	1
0400-015-7	Pitch Control Rod (L95)	1
0401-103-8	Scissor Arm C Assembly	1 set
0401-054-8	Pitch Control Ring for Scissor Arm C	1
0401-114-8	Swash Plate Assembly for Scissor Arm C	1 set
0401-097-6	Swash Plate Collar (D10XL14)	1
71003	Rotor Drive Gear	1
0101-043-8	60-B Autorotation Assembly	1 set
0101-045-6	Autorotation Gear Spacer (D12XD14XT2)	1
0101-087-6	Bevel Pinion Gear Excalibur	1
0100-065-8	Tail Joint	1
0100-066-7	Tail Joint Coupler	1
0101-042-8	Bearing Case B	1

Item No.	Description	Quantity
Step 5		
0601-157-8	Side Arms (left & right)	1 set
71010	Cooling Fan Shroud (left & right)	1 set
71013	Cooling Shroud Bracket (flat & angled)	1 set
0601-164-7	Cross Member Excalibur	1
0603-051-8*	Back-Slant Landing Gear Brace	2

Item No.	Description	Quantity
Step 5 - Continued		
0603-051-8*	Landing Gear Skid Cap	4
0603-022-7	Landing Gear Spacer	4
0501-026-8*	Fuel Tank R-470	1
0501-026-8*	Rubber Damper	2
0501-024-8*	M4 X 22 Cap Bolt	1
0501-024-8*	Tank Washer with Thread & without Thread	1 set
0501-024-8*	Tank Weight, Silicon Tube (small)	1 set
0501-024-8*	Tank Cap	1
0501-024-8*	Brass Pipes (1 large & 2 small)	1 set
0501-015-6	Silicon Tube (large)	1
0500-001-7	Fuel Filter	1
0500-005-8	Fuel Clamp	1
	Sponge Tape	2

Item No.	Description	Quantity
Step 6		
73020	Excalibur Inside Tail Gear Assembly	1
0300-011-8*	Tail Pitch Housing with Arm & without Arm	2 sets
0300-011-8*	Spacer	2
0300-011-8*	Outer Spacer	2
0300-011-8*	1030ZZ Ball Bearing	4
0601-139-8	Tail Boom (L755)	1
0100-069-8	D2.2 Tail Drive Wire	1
0601-135-7	D2.2 Piano Wire Guide	5
0100-065-8*	Rear Tail Joint	1
0601-133-7	Tail Boom Retainer	2
0601-145-8	Tail Supporter Pipe	2
0601-108-7	Tail Supporter Ends	4
73018	Tail Gear Support	2
0601-131-7	Sus Tail Clamp	1
06004*	Excalibur Vertical Fin	1
06004*	Excalibur Horizontal Stabilizer	1
06001	P.O. Rod Guide	1 set
0903-005-8	Tail Rotor Blade Wood (L105)	1 set
06004*	Fin/Stabilizer Spacer	4

Item No.	Description	Quantity
Step 7		
0601-154-6	Servo Frame Excalibur A	1
0601-155-6	Servo Frame Excalibur B	1
74001	Servo Set Plate	10
0400-01	Flexible PP Rod	1 set

Item No.	Description	Quantity
Step 8		
0602-106-8*	Excalibur Body Set (left & right, inst. panel)	1 set
0602-106-8*	Excalibur Body Reinforcement Plate	1 set
0602-109-6	Excalibur Canopy	1
0001-004-6	Body Cementing Glue	1

Item No.	Description	Quantity
Step 9		
0204-100-8	K-5 Rotor Head Assembly	1 set
0200-017-8	Stabilizer Stopper	2
0207-036-8	Control Lever	1
0200-018-7	Stabilizer Blade (paddle)	2
0200-022-7	Stabilizer Bar (fly bar) (L500)	1
0204-106-7	Blade Grip Spacer	4
0902-024-8	Main Rotor Blade	1 set

Item No.	Description	Quantity
Accessories		
0001-001-6	Kalt Title	1
	Excalibur Screw Sets (refer to page 4)	1 set
	Excalibur Assembling Instructions	1

0200-017-8	Stabilizer stopper	2	w/M3 x 3 Set B.
0204-101-8	Blade grip assembly	2	w/Brg
0204-102-8	Seesaw assembly	1	w/Brg
0204-103-6	Center hub yoke assembly	1	
0204-105-8	Spindle shaft	1	
0204-106-7	Blade grip spacer	4	
0204-107-7	Spindle spacer	2	
0204-108-6	Center pin	1	
0204-110-7	Seesaw spacer	2	
0204-111-8	Center cap	2	w/M2 x 6 Ph Screw
0207-017-7	Thrust washer	2	

0207-018-8	Hub spindle bolt & washer	2	
0207-032-8	Seesaw arm assembly	2	w/Brg
0207-036-8	Control lever	1	w/M4 x 4 Set B.
0207-075-7	Damper (hardness: 50)	2	
Bearings			
1002-010-6	1680ZZ	4	
1002-050-6	1680 DSG thrust bearing	2	
1002-056-6	LF-840 ZZ	4	
Special bolts			
1101-126-7	M3 x 10 button Cap B.	2	

↑ K-5 Rotor Head

Excalibur Screw Bags List

Description		Quantity	Description		Quantity
Step 1	M3X8 Cap Bolt	12	Step 6	M3X10 Cap Bolt	2
	M3X10 Cap Bolt	2		M3X12 Cap Bolt	2
	M3 Nylon Nut	6		M3X15 Cap Bolt	3
	M3X15 Set Bolt	2		M3X18 Cap Bolt	2
	1.5 Hex Wrench	1		M3X30 Cap Bolt	4
	2.0 Hex Wrench	1		M3X35 Cap Bolt	4
	2.5 Hex Wrench	1		M2.6X8 Cap Bolt	4
	3.0 Hex Wrench	1		M2X10 Phillips Bolt	8
Step 2	M3X8 Cap Bolt	8	M2X12 Phillips Bolt	2	
	M3X10 Cap Bolt	14	M3 Nylon Nut	17	
	M3X27 Cap Bolt	1	M3 Nut	1	
	M2X8 Phillips Bolt	1	M2 Nut	10	
	M2X10 Phillips Bolt	2	M4X4 Set Bolt	7	
	M3 Nylon Nut	1	M3 Flat Washer	10	
	M2 Nut	2	Ball Joint	2	
	Ball Joint	3	Step 7	M3X8 Cap Bolt	8
	Ball Joint Spacer	2		M2.6X10 Cap Bolt	20
	M3X4.5X0.2 Flat Washer	1		M2X10 Phillips Bolt	4
M3X4.5X0.5 Flat Washer	1	M2 Nut		4	
Step 3	Starter Clutch Shoe Installation Bolt	2		M2.3X17 Threaded Rod	2
	M4X12 Cap Bolt	6		M2.3X50 Both Ends Threaded Rod	1
	M4X15 Cap Bolt	4		M2.3X70 Both Ends Threaded Rod	2
	M4 Flat Washer	10		M2.3X80 Both Ends Threaded Rod	1
	M4 Serrated Washer	10		M2.3X100 Both Ends Threaded Rod	1
	M3X25 JIS Cap Bolt	1		M3 Flat Washer	6
	M3 Spring Washer	1	Universal Link	9	
	2.4 Hex Wrench	1	Quick Link	3	
Step 4	M3X8 Cap Bolt	6	Ball Joint	4	
	M3X10 Cap Bolt	4	Step 8	M4X40 Cap Bolt	2
	M3X20 Cap Bolt	1		M3X25 Cap Bolt	1
	M2X10 Cap Bolt	1		M4 Nylon Nut	2
	M3 Nylon Nut	1		M3 Nylon Nut	1
	M3X4 Set Bolt	1		M3X3 Set Bolt	4
	M4X4 Set Bolt	10		M4X4 Set Bolt	1
	Ball Joint	1		M2.3X14 Threaded Rod	2
Step 5	M3X6 Cap Bolt	2		M2.3X80 Both Ends Threaded Rod	2
	M3X8 Cap Bolt	12		M2.3X100 Both Ends Threaded Rod	1
	M3X25 Cap Bolt	4		Universal Link	10
	M2.6X10 Tapping Screw	12	Step 9	M3X12 Cap Bolt	4
	M3 Nylon Nut	14		M2.3X5 Tapping Screw	3
	M4X4 Set Bolt	4		M3 Flat Washer	8
	M3 Serrated Washer	2		Rubber Grommet	4

09020148

Prior to beginning construction:

The construction of this kit is divided into 9 sections. The parts bags and screw sets are numbered according to the section in which they are assembled. Open only the bag required for the section you are constructing, in order to avoid any possibility of mixing up the parts to different sections..

Additional equipment required for construction and flying your EXCALIBUR:

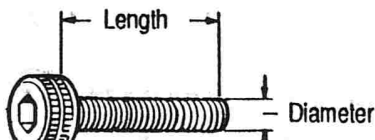
- 5 or more channel R/C equipment for helicopter.
Servo frames included in this kit will accept standard size servos. You cannot install large or special-shaped servos.
- Gyro
EXCALIBUR can be flown without gyro; however, we recommend that you install a gyro for easier piloting.
- Engine: 60 – 61 cu. in.
- Muffler: Kalt Muffler for EXCALIBUR; we recommend a tuned exhaust system. (Optional, not included in kit)
- Fuel tubing and filter. (Optional, not included in kit)
- Engine starting equipment. (Electric starter, batteries etc.)
- Additional tools, etc.
Phillips screwdriver (small and large)
5.5 mm nut driver
Pliers, nippers
Standard screwdriver (small)
Knife
File
Taper reamer
Vinyl tape
Cyanoacrylate adhesive or Kalt Tite
Clips (paper clips or clothes pins)
Kalt Precision Pitch Gauge
Additionally, Kalt Universal Link Snap Pliers and Link Driver are handy.

About the nuts and bolts:

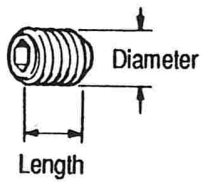
Nuts and bolts used during construction are identified as follows:

- Cap Bolt

It has a hexagonal hole in the head. Tighten with the hex wrench supplied.



Example: M3 X 15 Cap B.
Diameter 3 mm ————
Length 15 mm ———— Abbreviation for Cap Bolt



Example: M4 X 15
 Diameter 4 mm
 Length 15 mm

Set B.
 Abbreviation for Set Bolt

• Self-Locking nut (Locknut)

It has a nylon insert in the center of the nut.



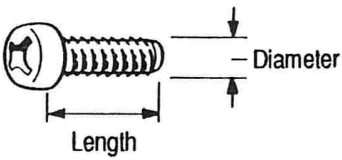
Example: M3
 3 mm

N.N.
 Abbreviation for Nylon Nut

Use the 5.5 mm box wrench to tighten the M3 nuts.

• Tap Tite

These are special self-tapping screws for plastic parts. Do not enlarge the existing holes. They must be a tight fit..



Example: M3 X 10 Tap T.
 Diameter 3 mm
 Length 10 mm

Abbreviation for Tap Tite

• Phillips Bolt

These are pan head Phillips Screws. Use a suitable size screw driver for tightening.



• Serrated Lock Washer

These are lock washers with gripping teeth around the edges.



- All of the nuts, bolts, and washers are called out by number as explained on pages 4, 5.

- Use of hexagon wrenches.

This kit contains 4 sizes of hex wrenches. Use for tightening cap and set bolts as follows:

Dia.	Cap Bolts	Set Bolts
M3	2.5 mm	1.5 mm
M4	3.0 mm	2.0 mm

The necessary nuts, bolts, and washers needed for each construction step are summarized at the end of that step. Be careful to use only the parts that are listed, as all of the nuts, bolts, and washers provided will be used.

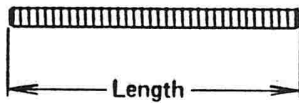
Example:

[M3 X 8 Cap B. (4)] Use 4 M3 X 8 cap bolts.

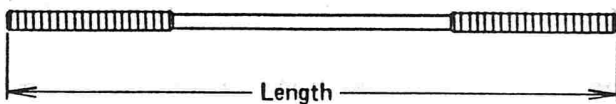
Threaded rods:

Threaded rods used for linkages are identified as follows:

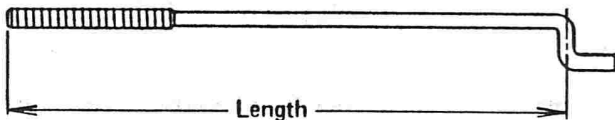
- All threaded rod



- Both ends threaded



- Crank rod



1-1



Step 1. Using (2) M3 X 8 cap bolts with a drop or two of Kalt Tite on their threads, attach the upper body mounts to the main frames. [(2) M3 X 8 Cap B.]

Step 2. Attach the lower angle brace to the main frames using (6) M3 X 8 cap bolts with Kalt Tite on their threads, and (6) locknuts. Leave the front holes open at this time. [(6) M3 X 8 Cap B., (6) M3 N.N.]

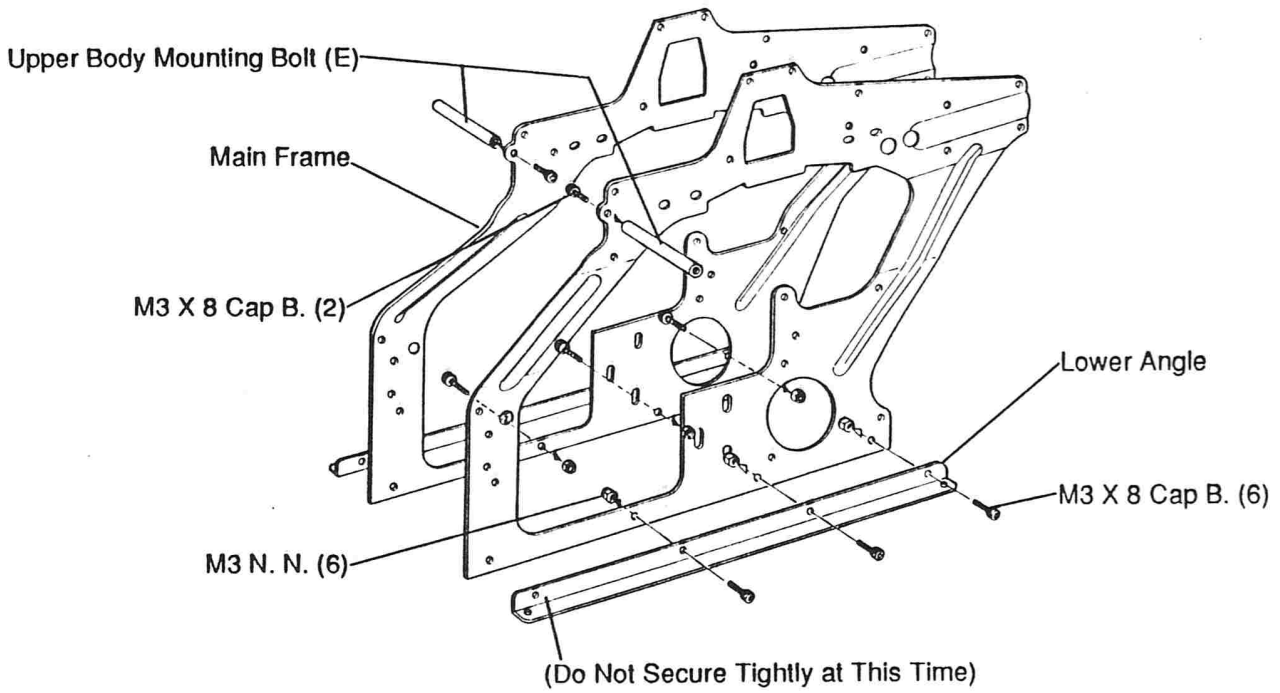


Figure 1-1

1-2



Step 3. Apply Kalt Tite to the threads of (2) M3 X 8 set bolts, and screw each of them into a separate M3 X 15 set bolt, creating (2) lower body mounts. [(2) M3 X 8 Set B., (2) M3 X 15 Set B.]

Step 4. Attach the radio tray to the (2) main frames using the lower body mounts, assembled in step 3, and (2) M3 X 8 cap bolts. Leave bolts finger tight, as they will be tightened in step 14. [(2) M3 X 8 Cap B.]

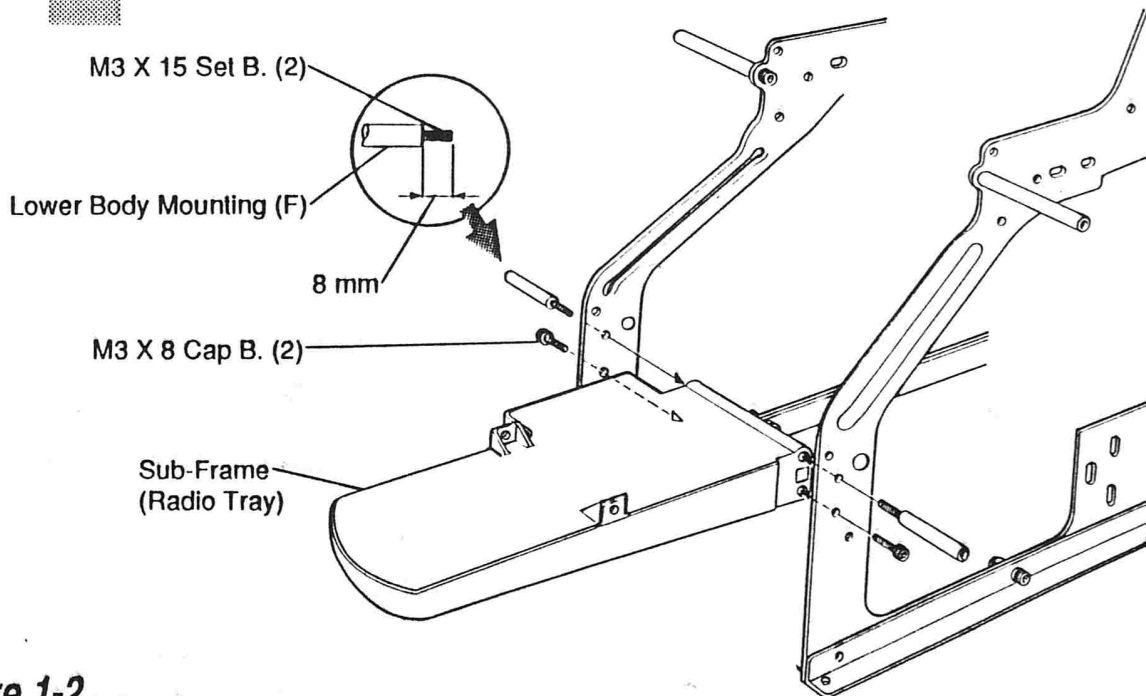


Figure 1-2

1-3

Step 5. Bolt the two cross-members between the main frames using (2) M3 X 10 cap bolts on the front and (2) M3 X 8 cap bolts on the rear. One cross-member is located just below the large hole in the side of the main frames. The other is located in the empty holes of the lower angle brace. Leave these bolts finger tight, as they will be tightened in step 14. *Do not use Kalt Tite on these bolts at this time.* [(2) M3 X 10 Cap B., (2) M3 X 8 Cap B.]

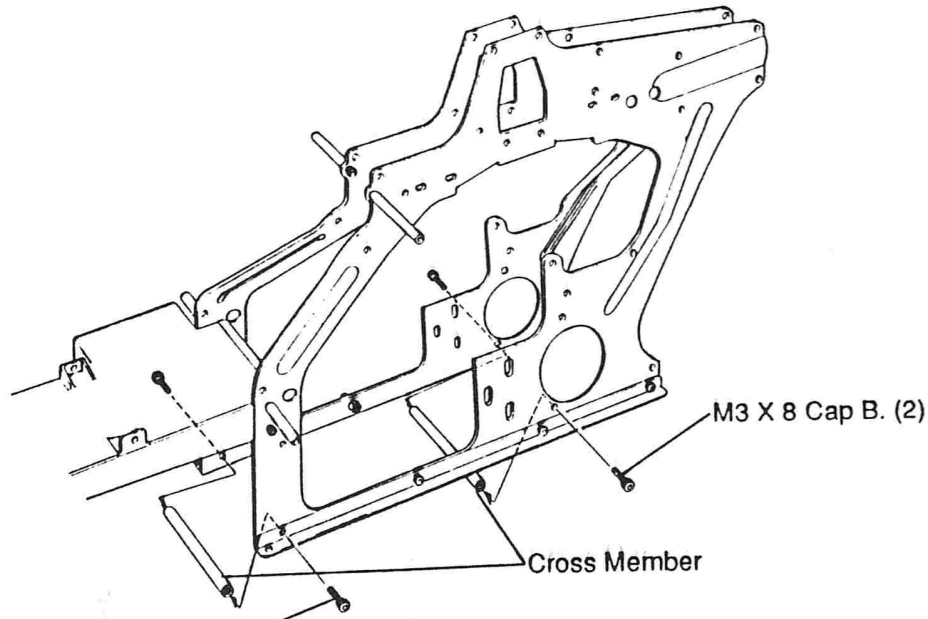


Figure 1-3

M3 X 10 Cap B. (2)

2-1

Step 6. Apply Kalt Tite to the threads of the inner shaft and screw it counter-clockwise into the shaft joint coupler. Tighten securely.

Step 7. The pinion gear screws into the clutch bell. Before assembling, apply a small amount of Kalt Tite to the threads. Now screw the pinion gear into the clutch bell. *Do not* tighten with pliers.

Step 8. Insert the assembled inner shaft into the clutch bell. Insert this assembly into the bottom of the pinion gear bearing case. Make sure that the pinion gear is fully seated into the bottom bearing of the bearing case. Place the starter cone onto the inner shaft from the top, and secure using (2) M4 X 4 set bolts and Kalt Tite. [(2) M4 X 4 Set B.]

Step 9. Using (4) M3 X 10 cap bolts, install the pinion gear bearing block with the smaller (6mm) race on top. Leave bolts finger tight, as they will be tightened when the gear mesh is set in step 39. [(4) M3 X 10 Cap B.]

Figure 2-1a

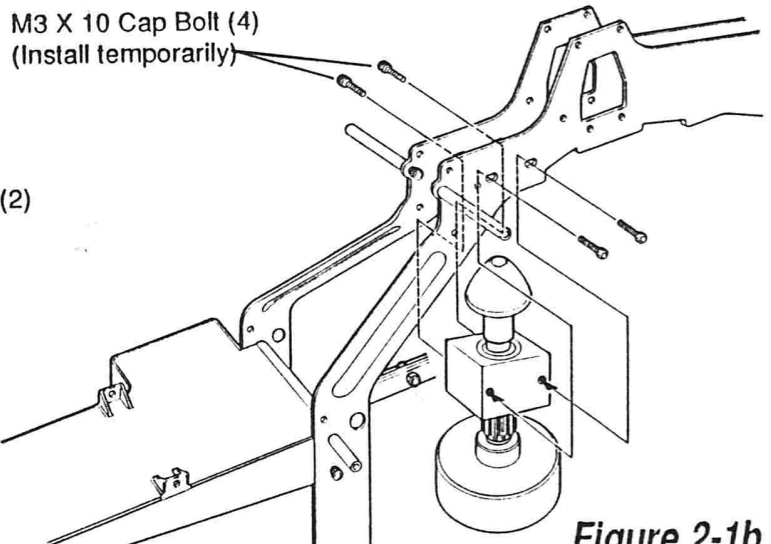
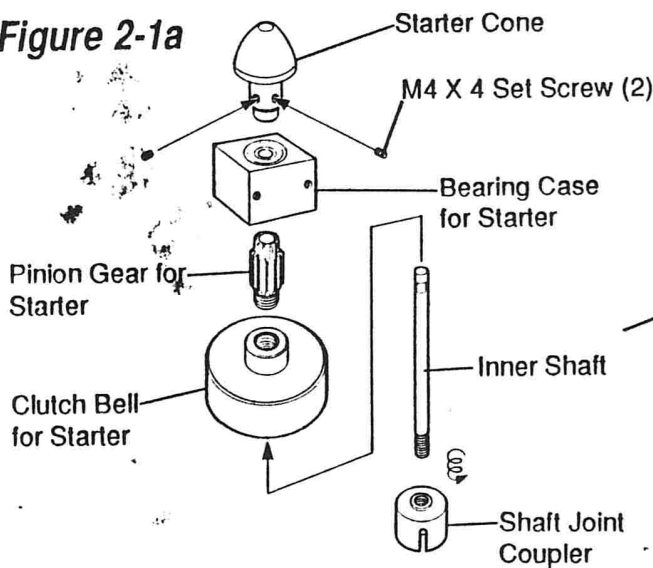


Figure 2-1b

The shaft joint coupler may need sanding to fit loosely in cooling fan; sanding can be done by chucking shaft in drill and sand using 100-220 sandpaper. The shaft joint coupler may need sanding to fit loosely

2-2

Step 10. Insert the slide ring shafts (A) and (B) into the slide ring holder, and attach the holder to the main frame using (2) M3 X 8 cap bolts and Kalt Tite. [(2) M3 X 8 Cap B.]

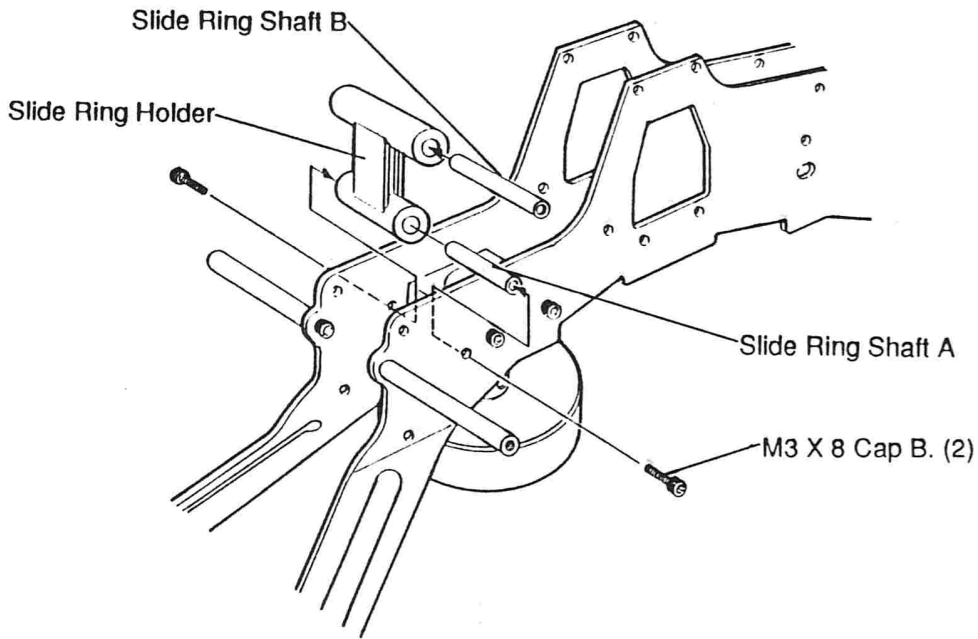


Figure 2-2

2-3

Step 11. Insert the slide ring assembly into the main frames as shown in Figure 2-3. Attach the slide ring arm (A) assemblies using (2) M3 X 8 cap bolts and Kalt Tite. *Do not over-tighten.* [(2) M3 X 8 Cap B.]

Step 12. Attach a ball joint to slide ring (B) using (1) M2 X 8 pan head screw and Kalt Tite. [(1) M2 X 8 Phillips Bolt]

Step 13. Attach one slide ring arm (A) to the right side of the slide ring holder and slide ring shaft (B), using (2) M3 X 8 cap bolts and Kalt Tite. Attach both slide ring arm (A) and (B) to the left side of the slide ring holder and slide ring shaft (B), using (2) M3 X 8 cap bolts and Kalt Tite. [(4) M3 X 8 Cap B.]

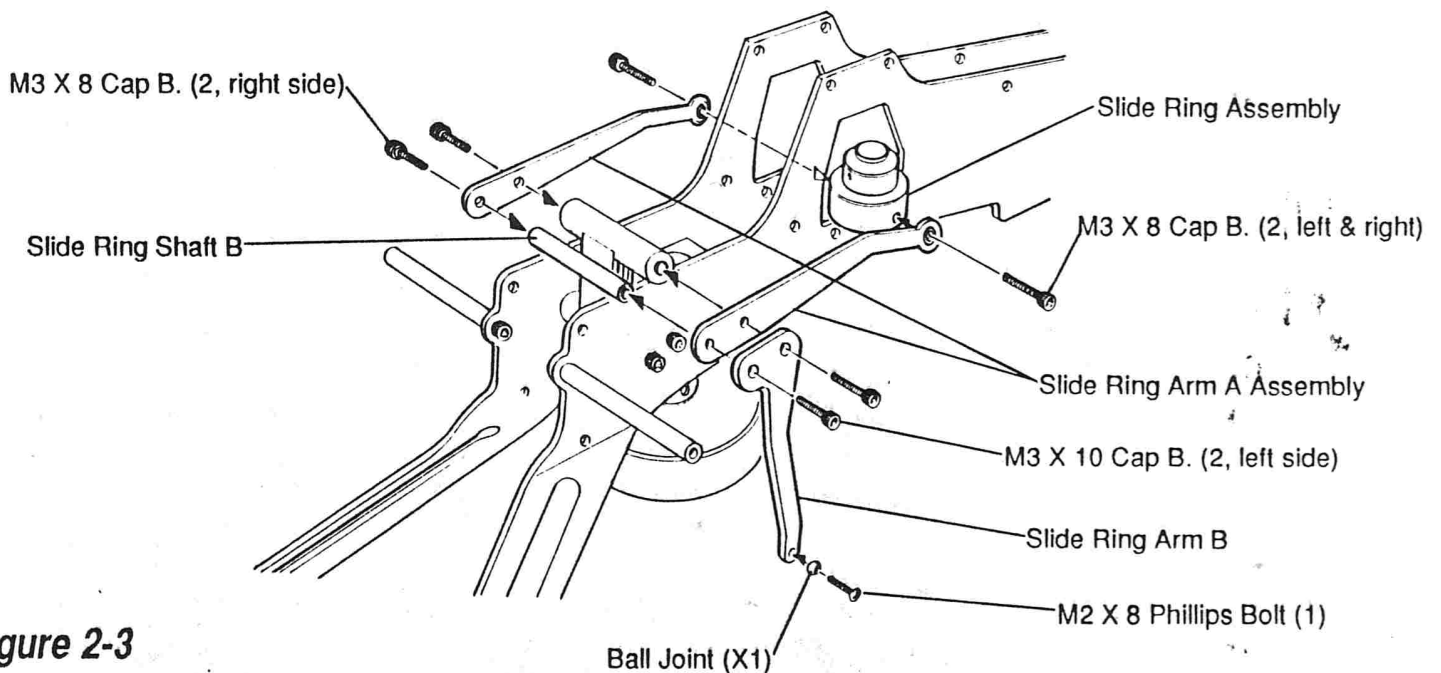


Figure 2-3

2-4

Step 14. Install the upper and lower main shaft bearing cases using (8) M3 X 10 bolts. *Do not use Kalt Tite.*
[(8) M3 X 10 Cap B.]

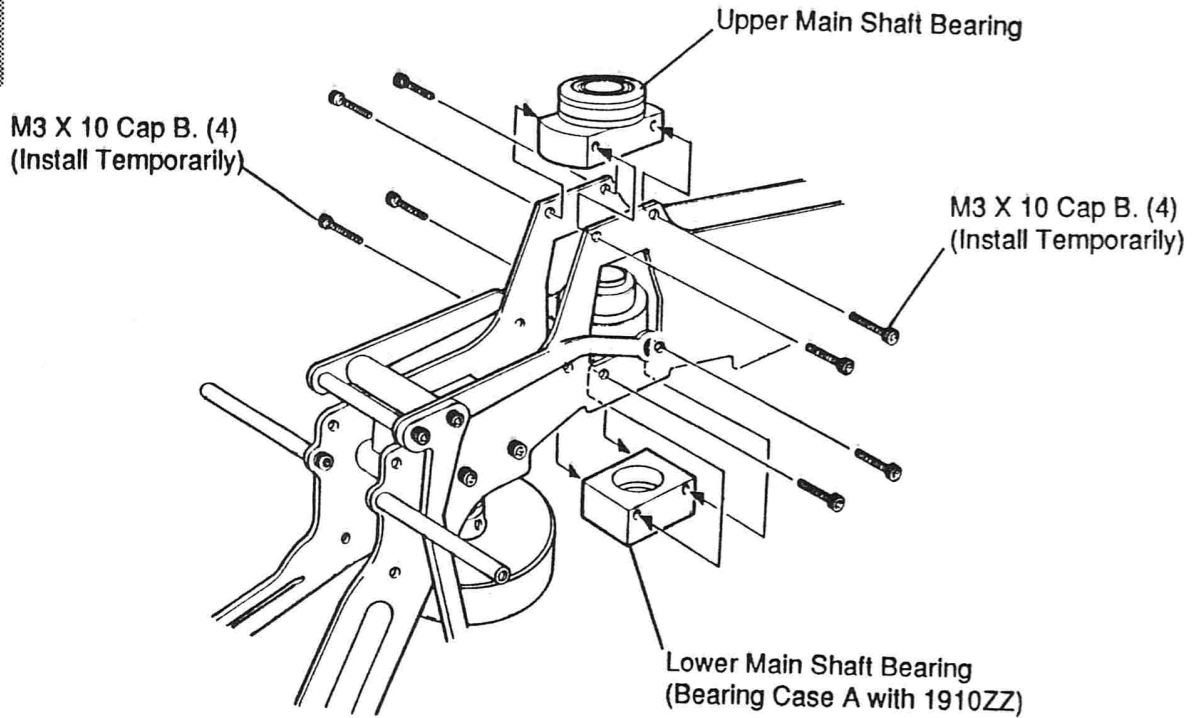


Figure 2-4

2-5

Step 15. Install the bell crank by placing (1) M3 X 4.5 X 0.2 flat washer, (1) bell crank, (1) M3 X 4.5 X 0.5 flat washer, and (1) M3 X 12 spacer onto a long M3 X 27 cap bolt. Attach this cap bolt assembly onto the left side of the main frame using (1) M3 locknut. *Do not forget the washers.* [(1) M3 N.N., (1) M3 X 12 Spacer, (1) M3 X 4.5 X 0.5 Flat Washer, (1) M3 X 4.5 X 0.5 Flat Washer, (1) M3 X 27 Cap B.]

Step 16. Place the main frame assembly on a flat and level surface. Remove the cap bolts from the upper M/S bearing block one at a time. Apply Kalt Tite to their threads, and tighten the bolts securely. Repeat this procedure for the lower M/S bearing block, radio tray, and the cross members. Pay careful attention to the alignment of the frames while securing these bolts. *Do not* tighten the bolts on the pinion gear bearing block at this time.

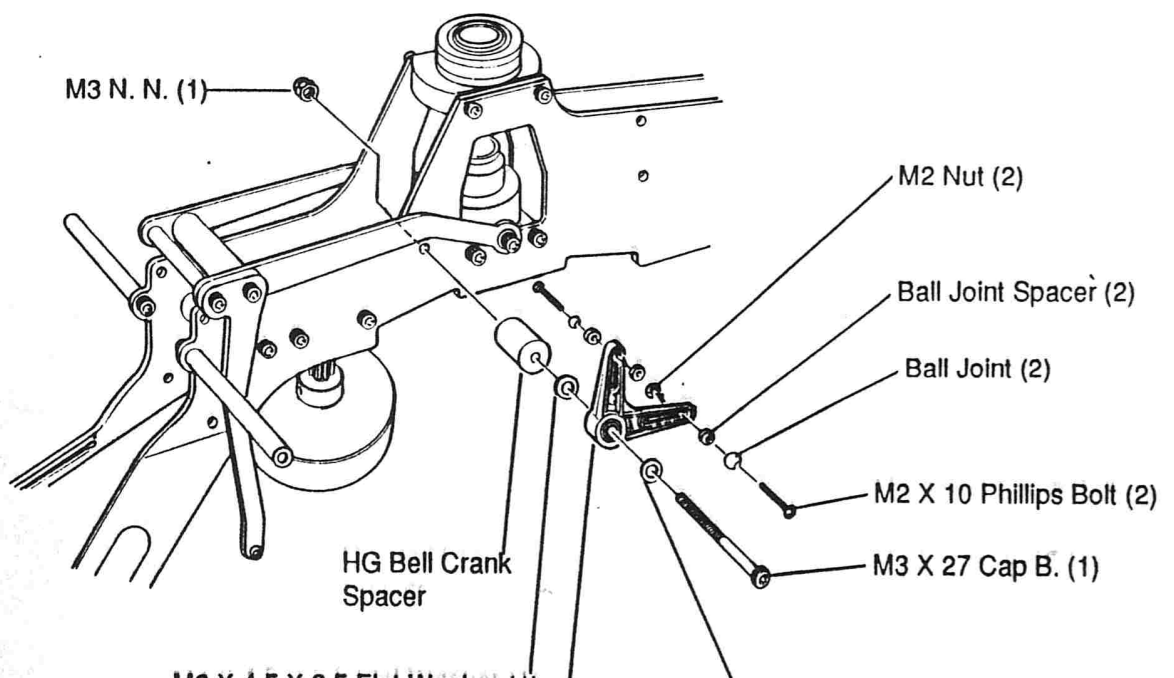


Figure 2-5

using a Y.S. or Webra engine, install the taper collet spacer (supplied) under the collet.

Step 18. Remove the carburetor from the engine (it will be reinstalled later, in step 23), and seal the intake hole with a piece of tape. If using an Enya engine (see Figure 3-2b), remove the throttle lever. Place (1) M3 spring washer, the throttle lever, and the spacer provided on (1) M3 X 25 (JIS) cap bolt. Secure this assembly to the carburetor. If using an O.S. engine (see Figure 3-2c), remove the barrel stop screw from the carburetor, and replace with the special rotor adjusting screw provided. [(1) M3 X 25 JIS Cap B.]

Step 19. Clean any dirt or oil from the machined surfaces of the cooling fan and crankshaft. Install the fan onto the crankshaft, and secure using the tapered nut provided. Nuts are supplied for 1/4", 7mm, and 8mm crankshafts.
Note: Do not over tighten.

Step 20. Install the two clutch shoes onto the flywheel using the special bolts and square washers provided in the clutch assembly bag (see inset). Pay close attention to the direction the washers are facing. One side of the washer is concave and should be positioned such that it will match the curve of the clutch shoe.

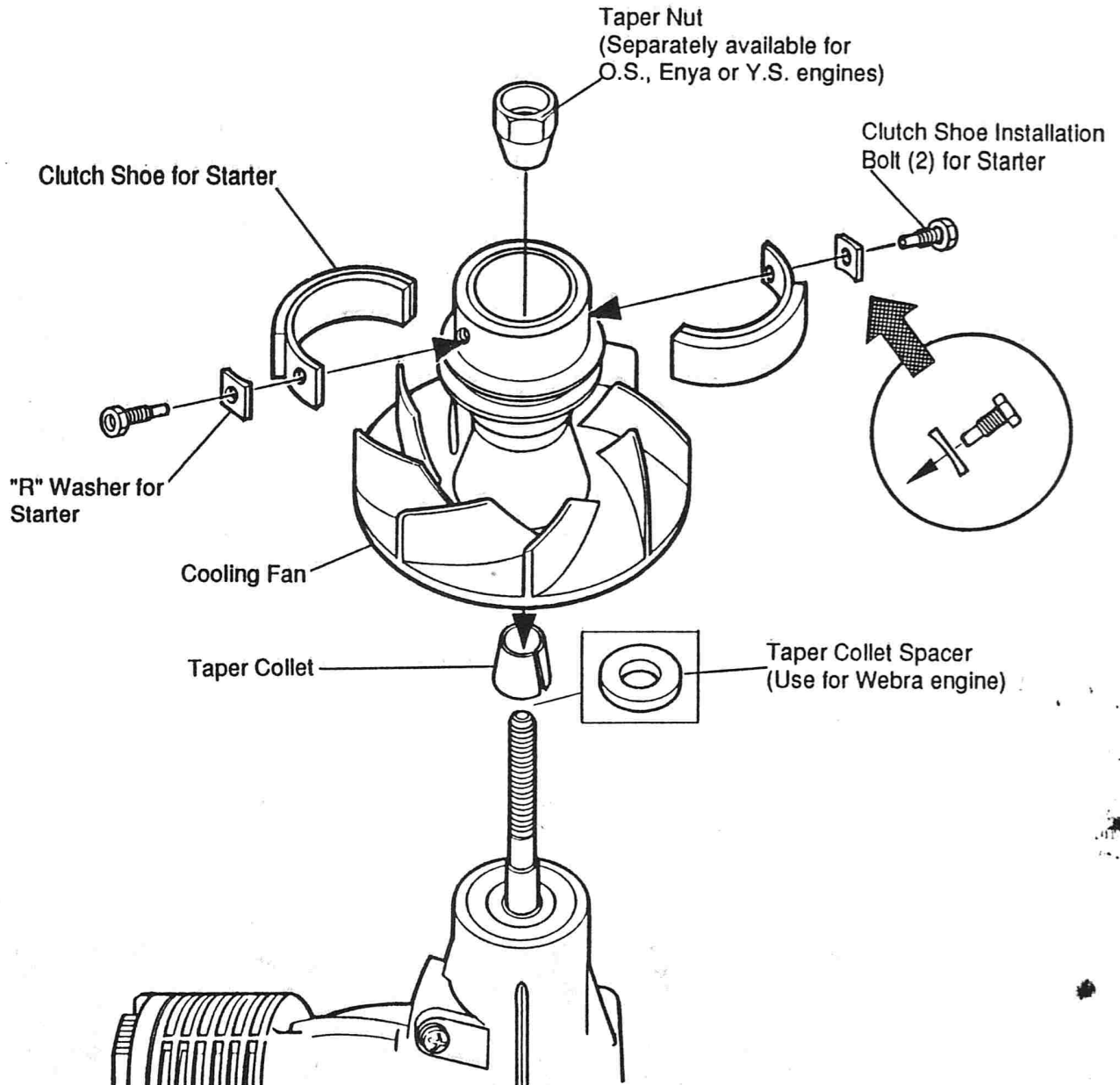


Figure 3-1

3-2

Step 21. Bolt the engine to the motor mount using (4) M4 X 15 cap bolts, (4) M4 lock washers, and (4) M4 plate washers. The circular cut-out on the motor mount should be on top. [(4) M4 X 15 Cap B., (4) M4 Lock Washers, (4) M4 Plate Washers]

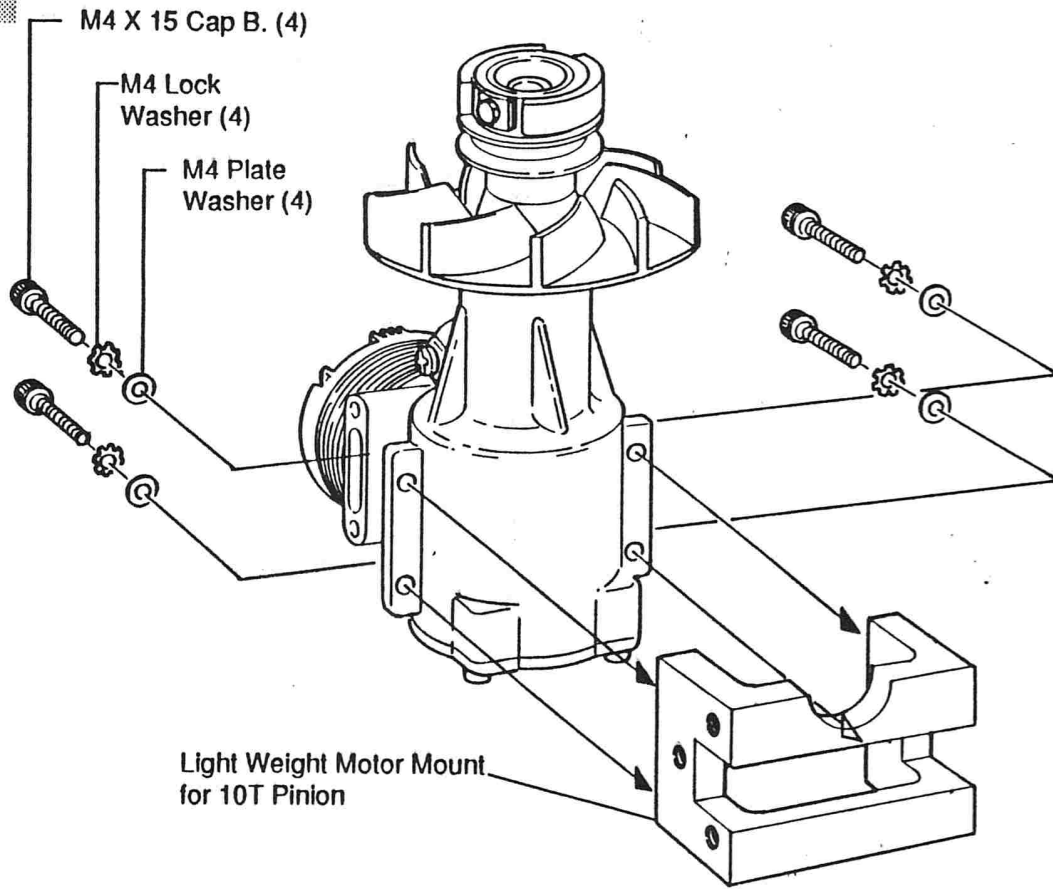


Figure 3-2a

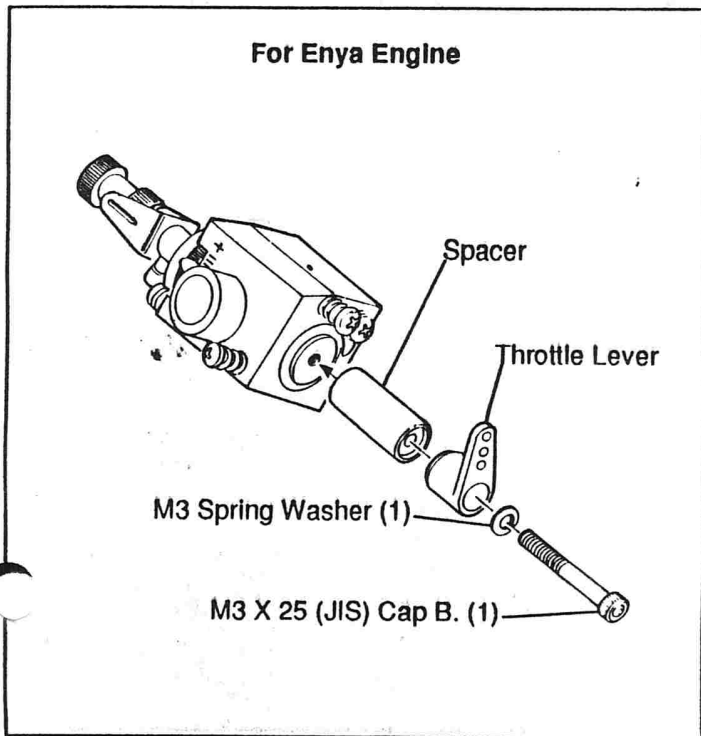


Figure 3-2b

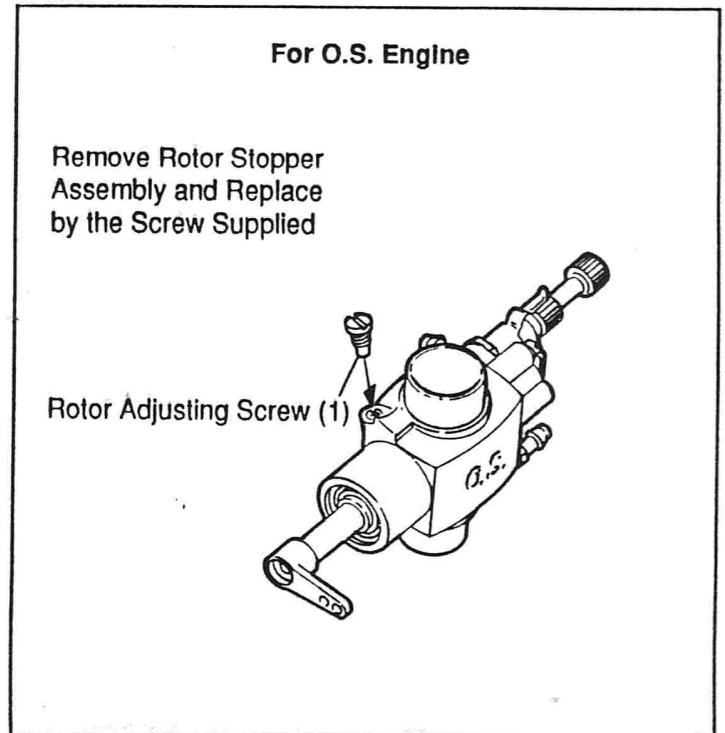


Figure 3-2c

3-3

Step 22. Install the assembled power unit into the main frames paying careful attention to the alignment of the fan and clutch bell. To achieve proper clearance between the clutch bell and the top of the fan, press the power unit all the way to the top of the clutch bell and then pull the power unit down 1mm. Secure using (6) M4 X 12 cap bolts with (6) plate and (6) lock washers. Leave these bolts finger tight for now, as they will be tightened when the gear mesh is set in step 37. [(6) M4 X 12 Cap B.]

Step 23. Reinstall the carburetor. Align the throttle lever with the throttle barrel so that the lever is in the 12:00 position when the barrel is precisely 50% open. (not pictured)

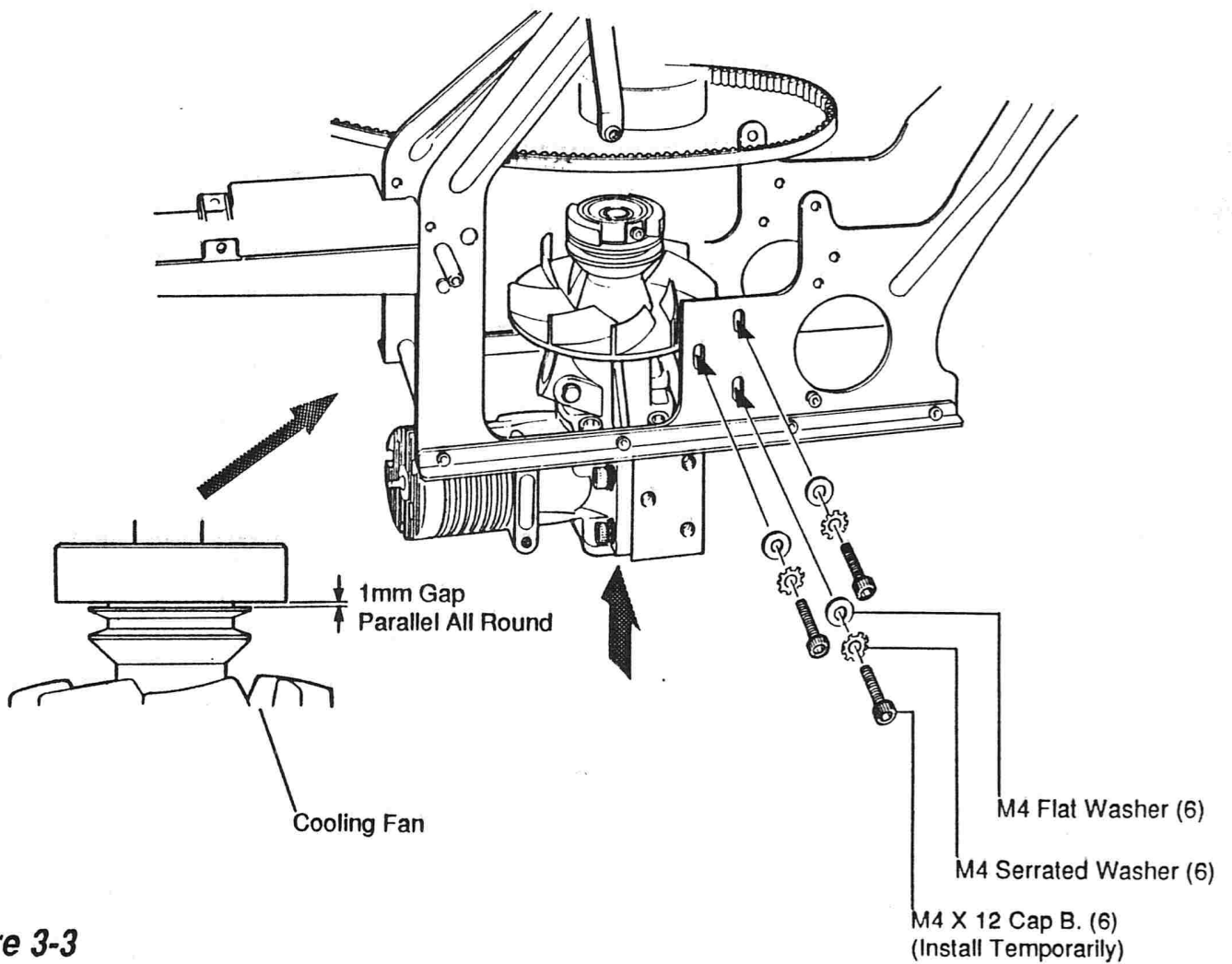
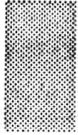


Figure 3-3

4-1



- Step 24. Attach the elevator control ring to the phase adjusting ring using (2) M3 X 8 cap bolts and Kalt Tite. [(2) M3 X 8 Cap B.]
- Step 25. Bolt a ball joint to the lever of the elevator control ring using (1) M2 X 10 cap bolt. [(1) M2 X 10 Cap B.]
- Step 26. Place the phase adjusting ring onto the upper main shaft bearing block (see figure 4-2). Temporarily position using (4) M4 X 4 set bolts. *Do not* tighten the set bolts yet, they will be tightened at step 34. [(4) M4 X 4 Set B.]
- Step 27. Insert one end of the pitch control rod into the pitch control ring. Slide the rod into the groove in the main shaft, and secure it to the control ring using (1) M3 X 4 set bolt. The pitch control ring *must* move freely on the main shaft. If you feel any friction when rotating it, check the bend in the control rod to insure that it is *exactly* 90°. Also, check for any burrs that might prevent the control rod from fully seating into the control ring. File the inside of the bend, as necessary, to ensure a proper fit. [(1) M3 X 4 Set B.]
- Step 28. Slide the pitch control rod about half way down the main shaft. Insert the scissors arm (C) assembly, swash plate, and swash plate collar – in that order – from the bottom of the main shaft. Pay close attention to the proper position of the scissors arms, so as not to install upside down.

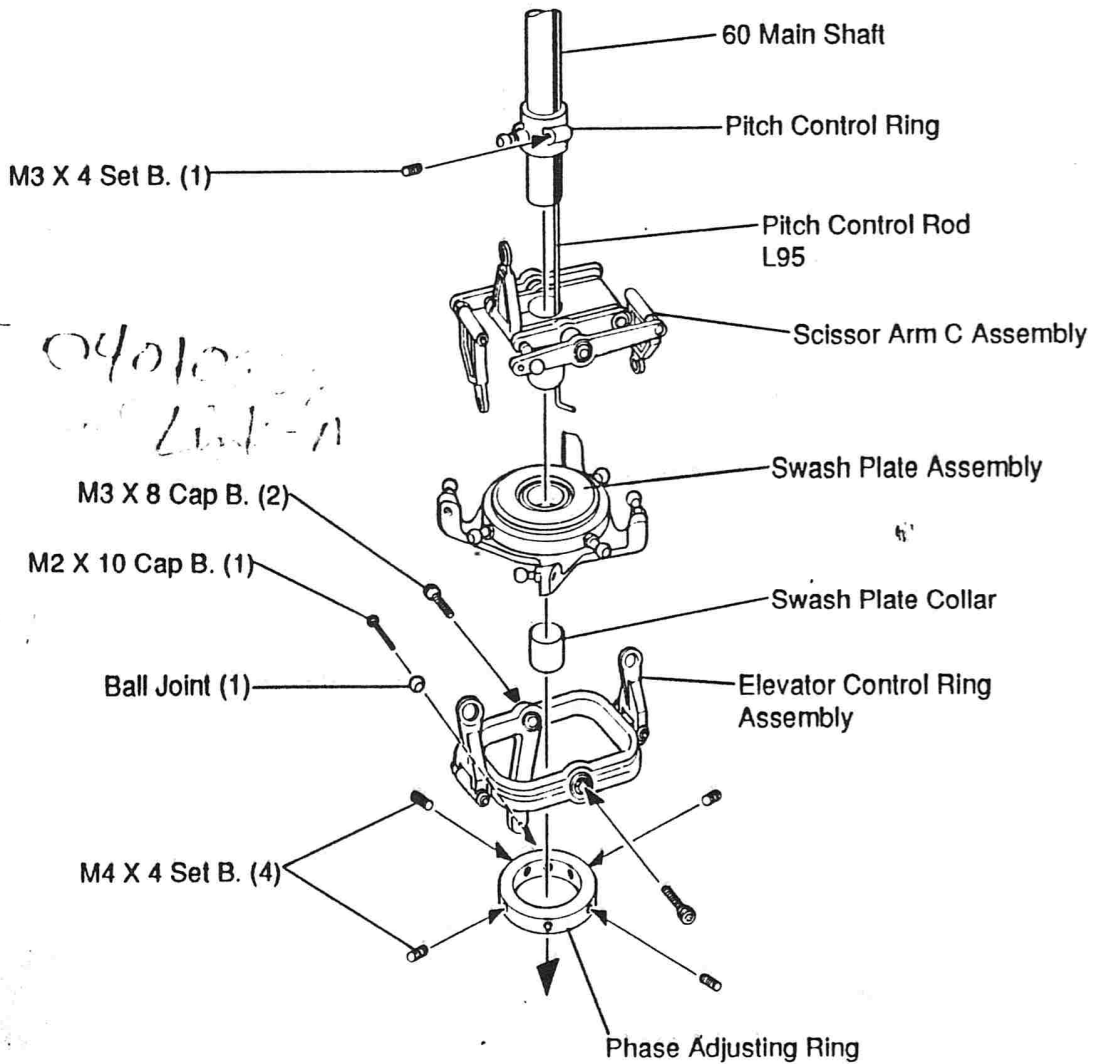


Figure 4-1

4-2

Step 29. Insert the bent end of the pitch control rod into the 2 mm hole of the slide ring assembly. Drop the main shaft down thru the upper main shaft bearing block, slide ring assembly, and lower main shaft bearing block.

Step 30. Install the main rotor drive gear onto the main shaft, using (1) M3 X 20 cap bolt and (1) M3 locknut.
[(1) M3 X 20 Cap B., (1) M3 N.N.]

Step 31. Snap the two universal links on the elevator control ring onto the swash plate.

Step 32. Snap the three universal links of scissors arm unit onto the swash plate.

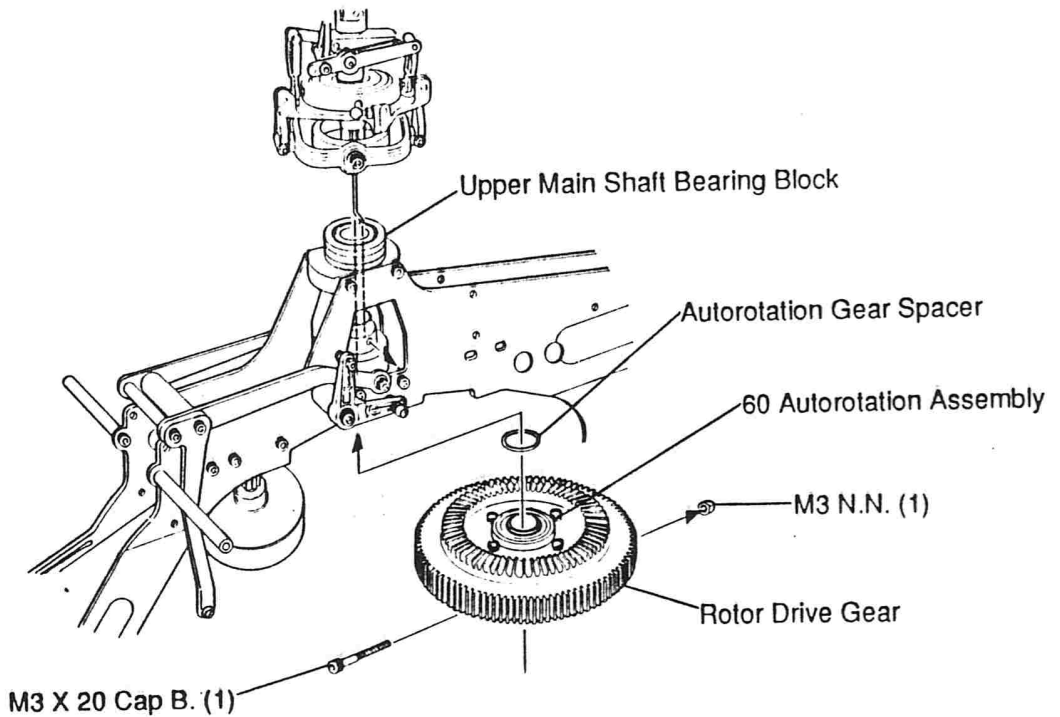


Figure 4-2

4-3

Step 33. While pulling up on the main shaft, push down on the center block of the scissors arm unit and secure the M3 cap bolt into the center block using Kalt Tite. Pay close attention to the alignment of the scissors arm unit with the main shaft. *Don't* overtighten the center block. With a pair of pliers, *lightly* squeeze the outside rings of the ball links, and allow them to move smoothly.

Step 34. Swing the elevator control ring back and forth several times, and then secure the phase adjusting ring to the upper main shaft bearing block using the four M4 set bolts already installed and Kalt Tite. At this time set the phase of the swash plate to 0 degrees. Pay careful attention to the movement of the swash plate and elevator control ring. If any binding occurs, it is because the M4 set bolts were not tightened *evenly*. The M4 set bolts must be cross-tightened. *Don't* overtighten; you may cause roughness in the bearing.

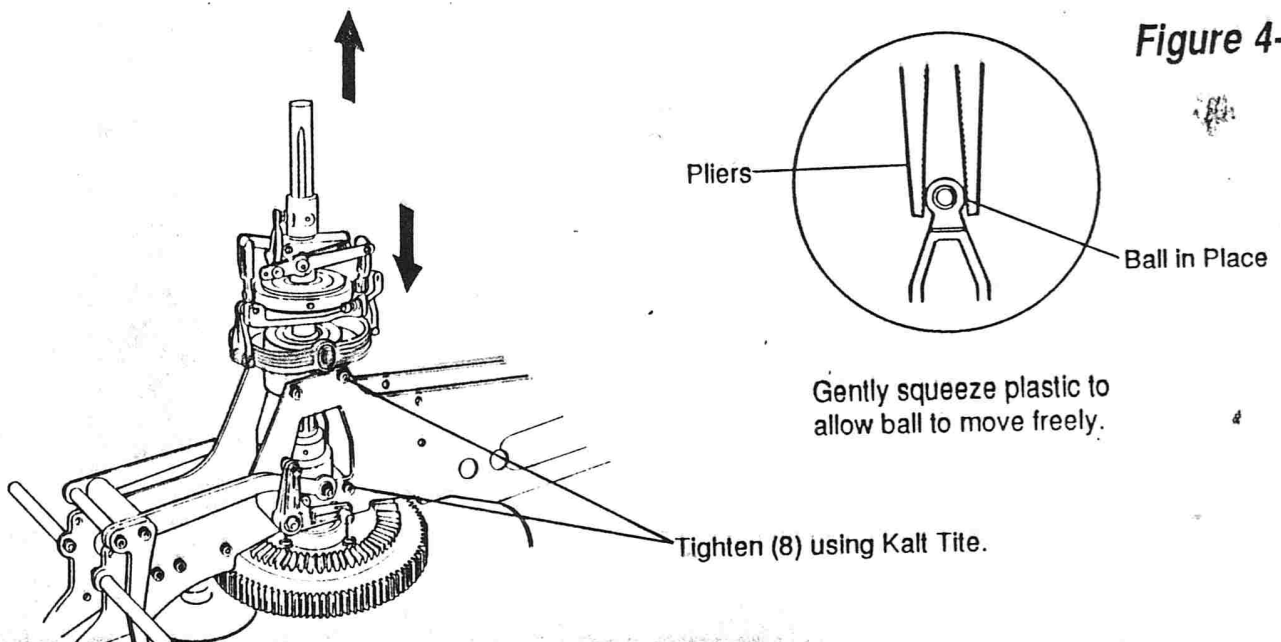


Figure 4-3b

4-4

Step 35. Insert the shaft of the bevel pinion gear into the bearing case (B). Attach the front tail joint to the shaft of the bevel pinion gear using (3) M4 X 4 set bolts and Kalt Tite. Insert the T/R drive shaft adapter into the tail joint and secure using (3) M4 X 4 set bolts and Kalt Tite. [(6) M4 X 4 Set B.]

Step 36. Install this assembly into the main frames using (4) M3 X 8 cap bolts and Kalt Tite. At this time adjust the gear mesh between the bevel pinion gear and the main rotor drive gear. Pay careful attention to this alignment. The bevel pinion gear *must* be exactly 90 degrees to the main gear. [(4) M3 X 8 Cap B.]

Step 37. Adjust the gear mesh between the pinion gear and the main rotor drive gear and secure (4) M3 X 10 cap bolts in the pinion gear bearing block using Kalt Tite. Double-check the alignment of the fan and clutch bell, and tighten the (6) M4 X 12 cap bolts in the engine mount. [(4) M3 X 10 Cap B.]

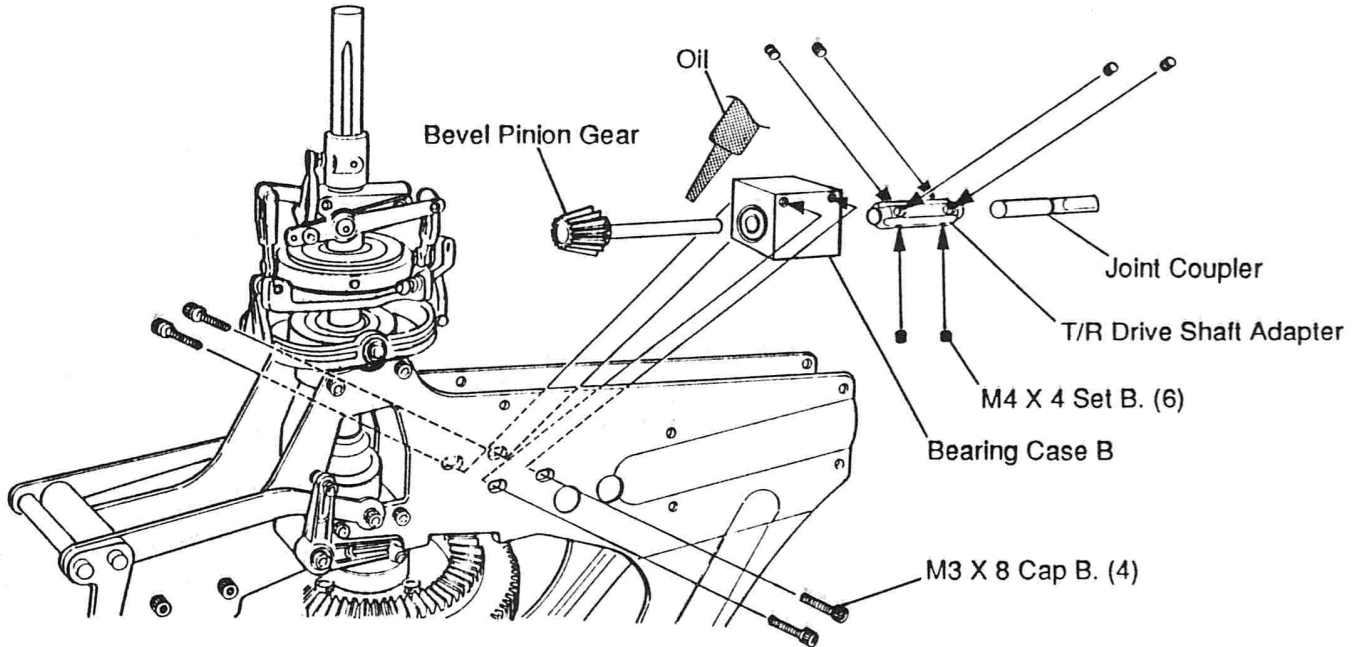


Figure 4-4

Section 5. Frame Area Parts, Landing Gears and Fuel Tank Assembly

5-1

Step 38. Attach the left and right side arms using (8) M3 X 8 cap bolts and (8) M3 nylon nuts. Note: the bent portion of the flange faces the rear. [(8) M3 X 8 Cap B., (8) M3 N.N.]

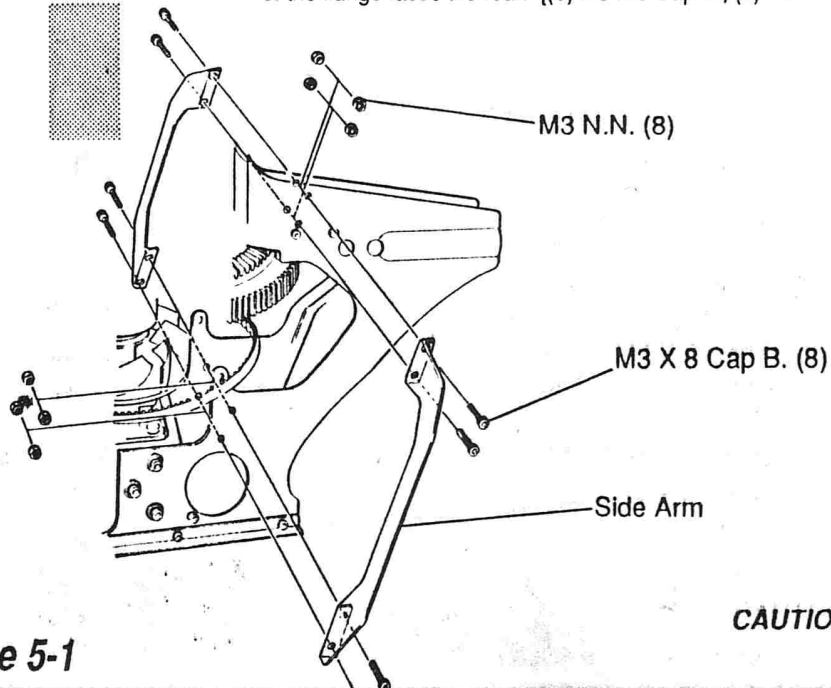


Figure 5-1

CAUTION Left and right Side Arms are unique – the bent portion of the flange faces the rear of the helicopter.

5-2



Step 39. Using an X-acto knife, trim off the molded tabs that are adjacent to the mounting holes for the fan shroud brackets. (This will allow the fan shroud to be adjusted later. See figure below.)

Step 40. Attach the fan shroud halves to the main frames. Check that the carburetor has sufficient clearance. If carburetor contacts the fan shroud, remove and trim the shroud wherever it contacts the engine or carburetor. Re-install the fan shroud, bolting the halves together using (4) M2.3 X 10 self-tapping screws. Ensure that the two halves mate properly. [(4) M2.3 X 10 Tap T.]

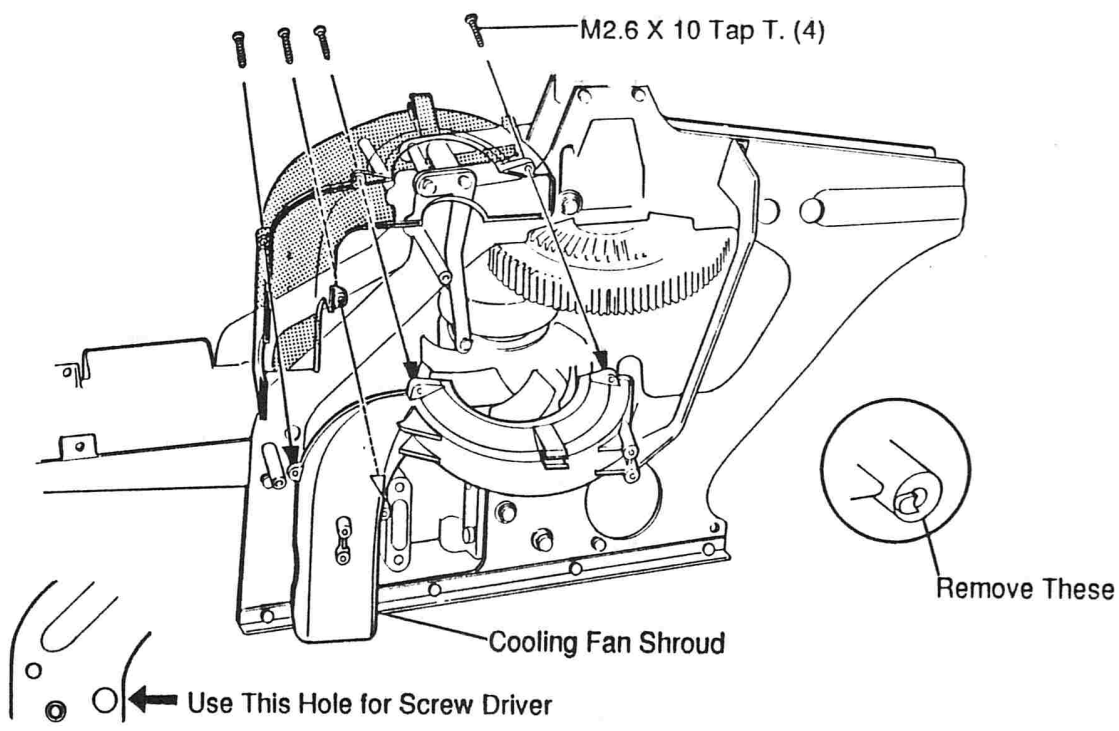
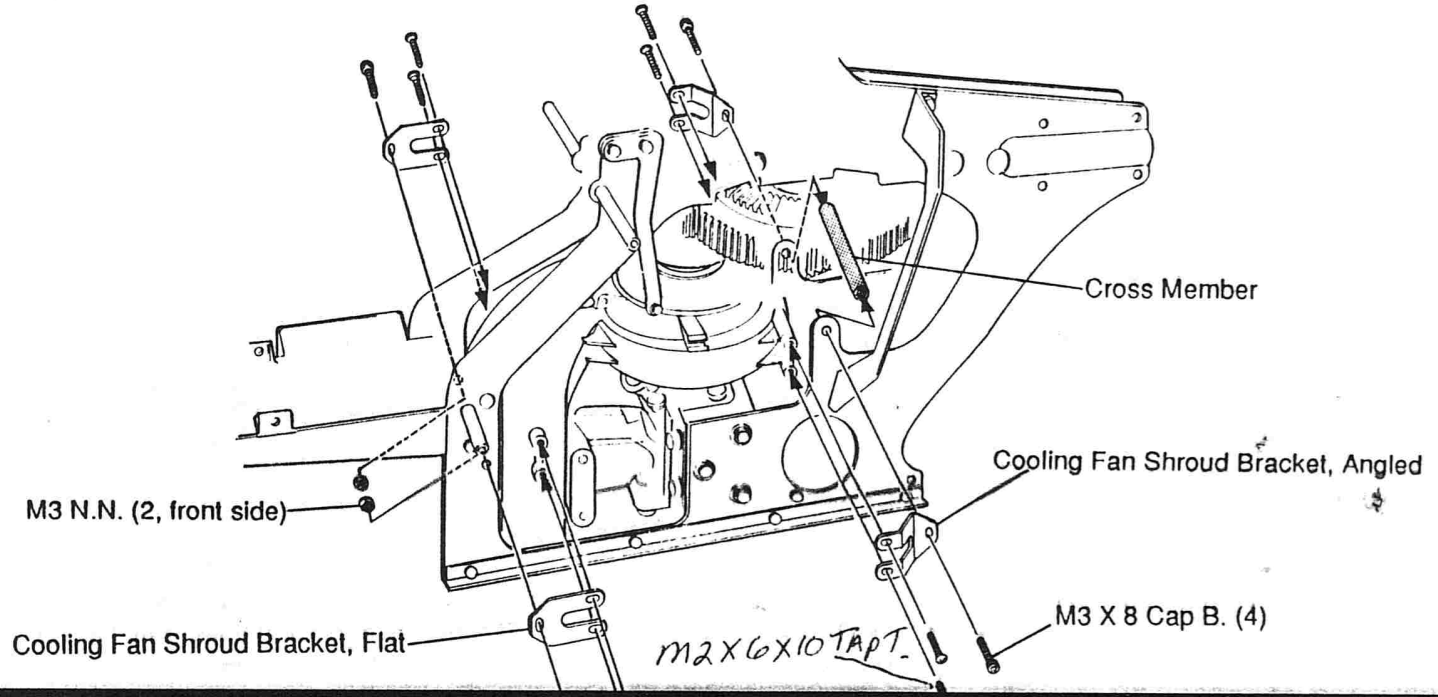


Figure 5-2

5-3



Step 41. Attach the fan shroud mounting brackets to the fan shroud using (8) M2.3 X 10 self-tapping screws. Leave these screws loose until the shroud is aligned with the fan. Attach the fan shroud brackets to the main frames using (2) M3 X 8 cap bolts with M3 nylon nuts, and (2) M3 X 8 cap bolts which are threaded into a cross-member (see diagram below) using Kalt Tite. While tightening these bolts and screws, align the fan shroud with the fan so as to ensure that the fan *does not* contact the shroud when the engine is running. [(8) M2.3 X 10 Tap T., (4) M3 X 8 Cap B., (2) M3 N.N.]



5-4

Step 42. Attach the landing gear struts to the main frames using (4) M3 X 25 cap bolts and (4) M3 x 25, M3 lock nuts, and (4) plastic spacers between the struts and landing gear brackets. [(4) M3 X 25 Cap B., (4) M3 N.N.]

Step 43. Press a plastic skid cap into the ends of each of the landing gear skids. Insert the skids through the two struts, and secure with (4) M4 X 4 set bolts. [(4) M4 X 4 Set B.]

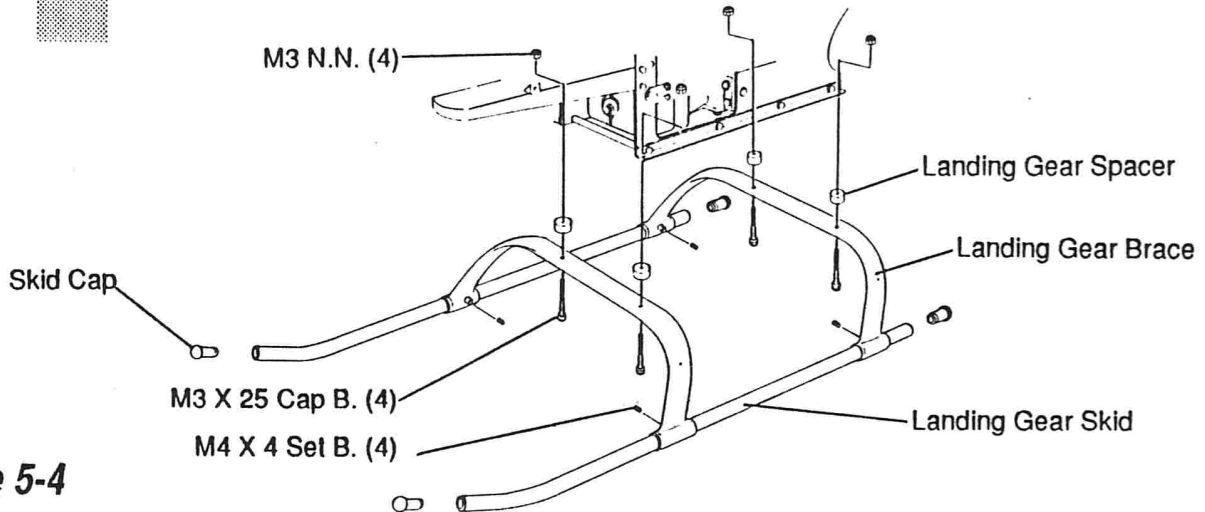


Figure 5-4

5-5

Step 44. Assemble the fuel tank as shown in the drawing, ensuring that the weight in the fuel tank fits all the way to the back of the fuel tank, but does not get caught. When bending the fuel tubing, do so slowly and carefully in order to avoid kinking.

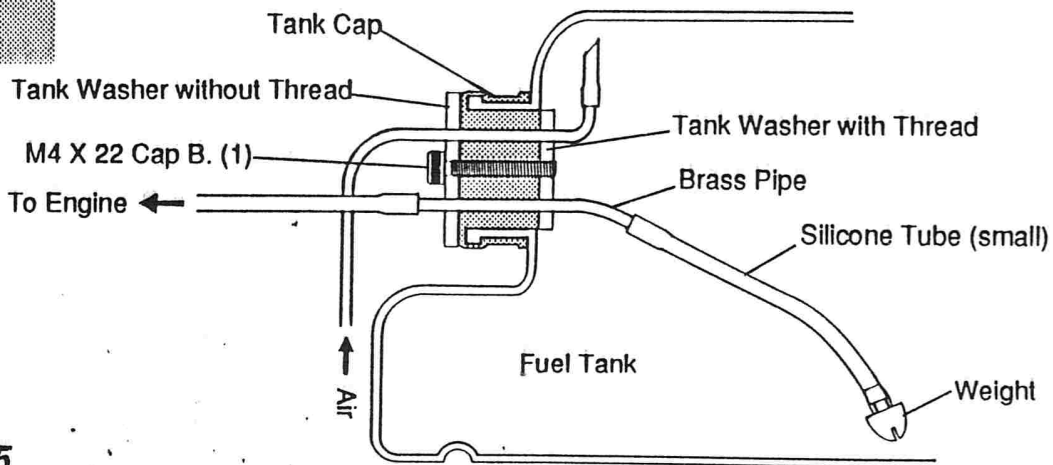
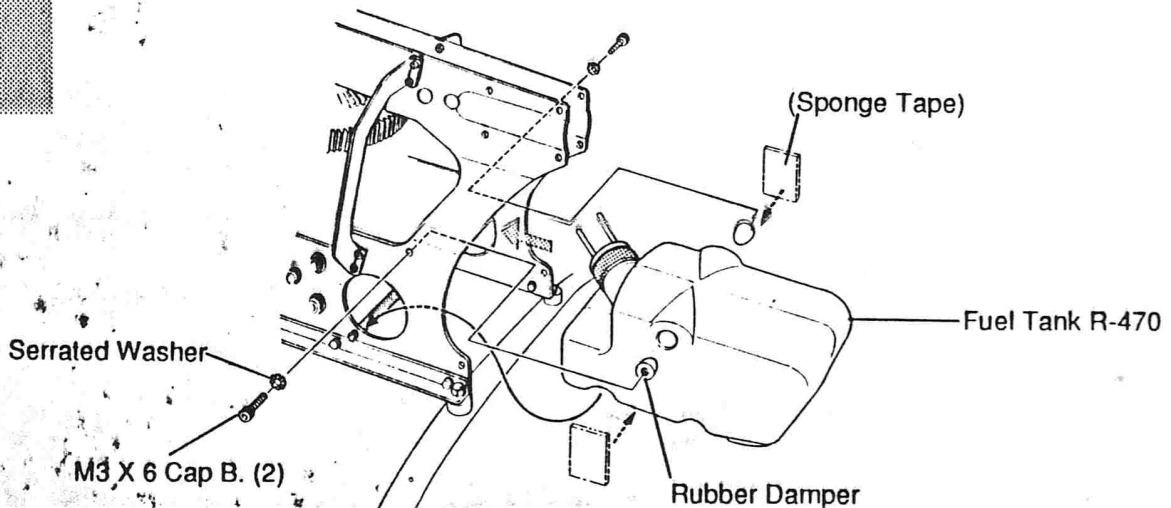


Figure 5-5

5-6

Step 45. Attach two pieces of self-adhesive sponge tape to the sides of the fuel tank. Install the fuel tank into the main frames using (2) M3 X 6 cap bolts along with (2) serrated washers. [(2) M3 X 6 Cap B.]



Step 46. Install the bearings and spacers in the tail rotor blade grips, and bolt the blade grips together using (8) M2 X 10 pan head screws with M2 nuts and Kalt Tite. [(8) M2 X 10 Pan Head Screw, (8) M2 Nut]

Step 47. Bolt a ball joint to each of the tail rotor blades using (2) M2 X 12 pan head screws and (2) M2 nuts and Kalt Tite. [(2) M2 X 12 Pan Head Screws, (2) M2 Nut, (2) Ball Joint]

Step 48. Attach the tail rotor blade grips to the tail rotor hub using (2) M3 X 18 cap bolts and Kalt Tite. Snap the universal links from the tail rotor pitch change system onto the ball joints of each blade grip. [(2) M3 X 18 Cap B.]

Step 49. Cut (4) blade reinforcements (exact size shown in the diagram) for the tail rotor blades. Sand each side of the tail rotor blade until the thickness of the root is 3.5 mm. Glue the reinforcements to the tail rotor blade using instant glue. Press the aluminum collar into the blade and finish with paint or heat shrink.

Step 50. Attach the tail rotor blades to the blade grips using (2) M3 X 15 cap bolts and (2) M3 nylon nuts. [(2) M3 X 15 Cap B., (2) M3 N.N.]

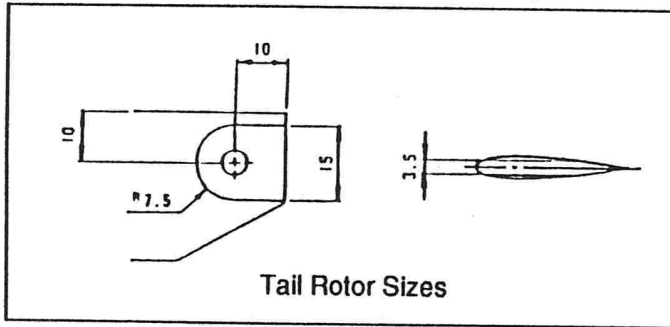


Figure 6-1a

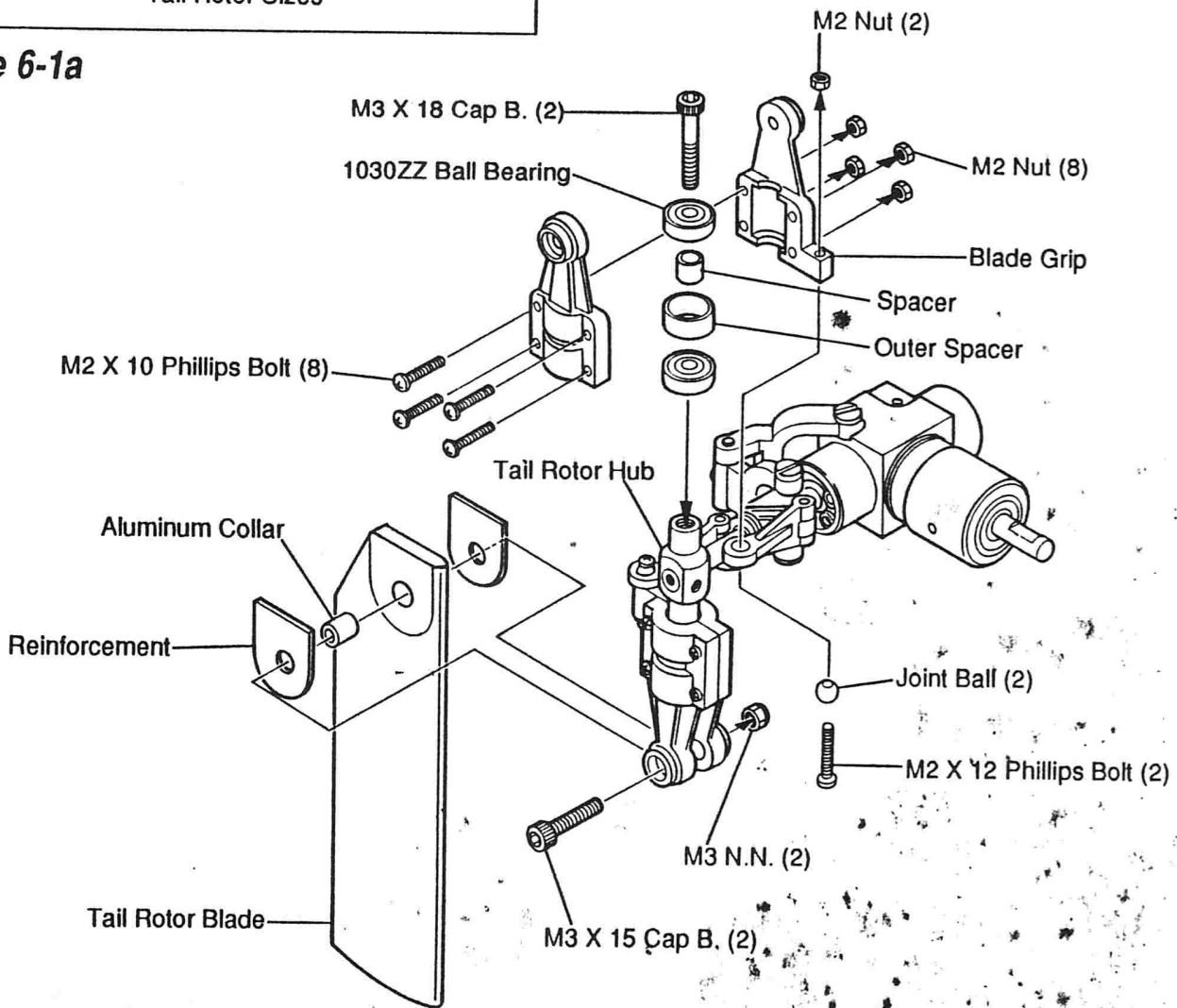


Figure 6-1b

6-2

Step 51. Install the rear tail joint coupler onto the input shaft of the tail rotor gear box. Secure using (3) M4 X 4 set bolts and Kalt Tite. [(3) M4 X 4 Set B.]

Step 52. Apply a small amount of grease to one of the tail rotor drive shaft guides. Starting from the unnotched end of the tail boom, press the guide into the boom, and position it as shown in the drawing. Repeat this procedure with the remaining 4 guides equally spacing them throughout the tail boom. Pay careful attention to the direction of the guides. Cone shape must face to the rear of boom.

Step 53. Cut the tail rotor drive shaft to a length of 29 inches. *Do not cut the oval shaped end of the drive shaft.*

Step 54. Apply a small amount of grease to the tail rotor drive shaft. Insert the drive shaft into the tail boom, starting from the notched end. Insert the round end of the tail rotor drive shaft into the rear tail joint. Secure using (4) M4 X 4 set bolts and Kalt Tite. The set bolts must be tightened evenly. Check the drive shaft for any excessive run out, and re-adjust if necessary. [(4) M4 X 4 Set B.]

Important: Please note direction of spacer!

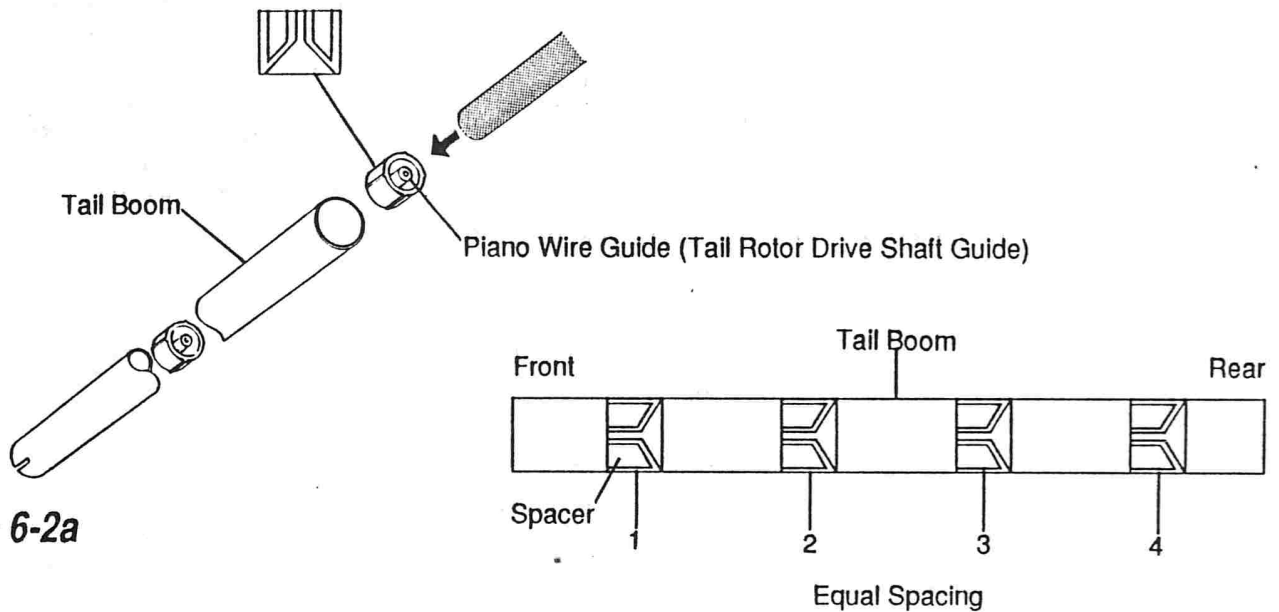


Figure 6-2a

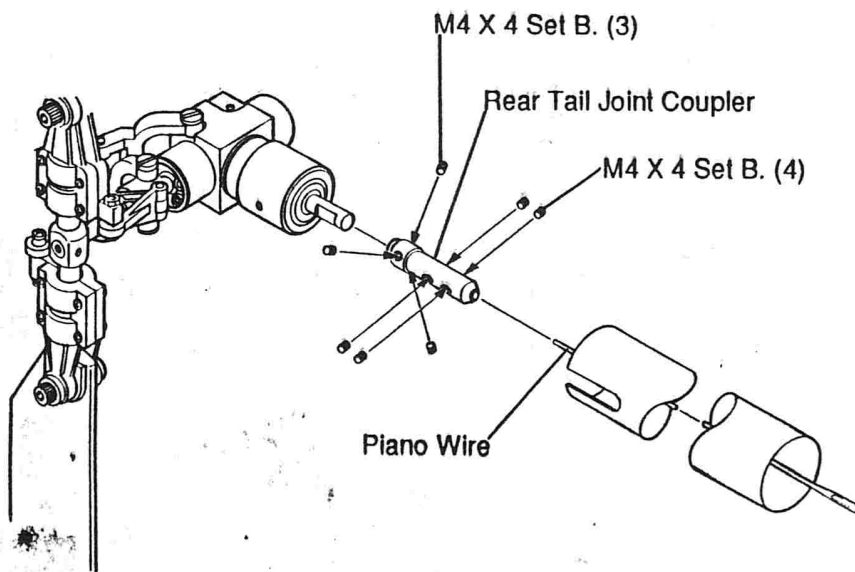


Figure 6-2b

6-3

Step 55. Install the two halves of the tail boom retainer into the main frames using (4) M3 X 30 cap bolts and M3 nylon nuts. Leave these bolts finger-tight, as they will be tightened in step 57. Note: the tail boom retainer has a lip on the inside of each half, which must be in front. [(4) M3 X 30 Cap B., (4) M3 N.N.]

Step 56. Insert the plain end of the tail boom into the tail boom retainer, and slide the boom all the way to front of the retainer, ensuring that the tail drive wire engages into the tail joint coupler.

Step 57. Slide the tail support clamp onto the tail boom.

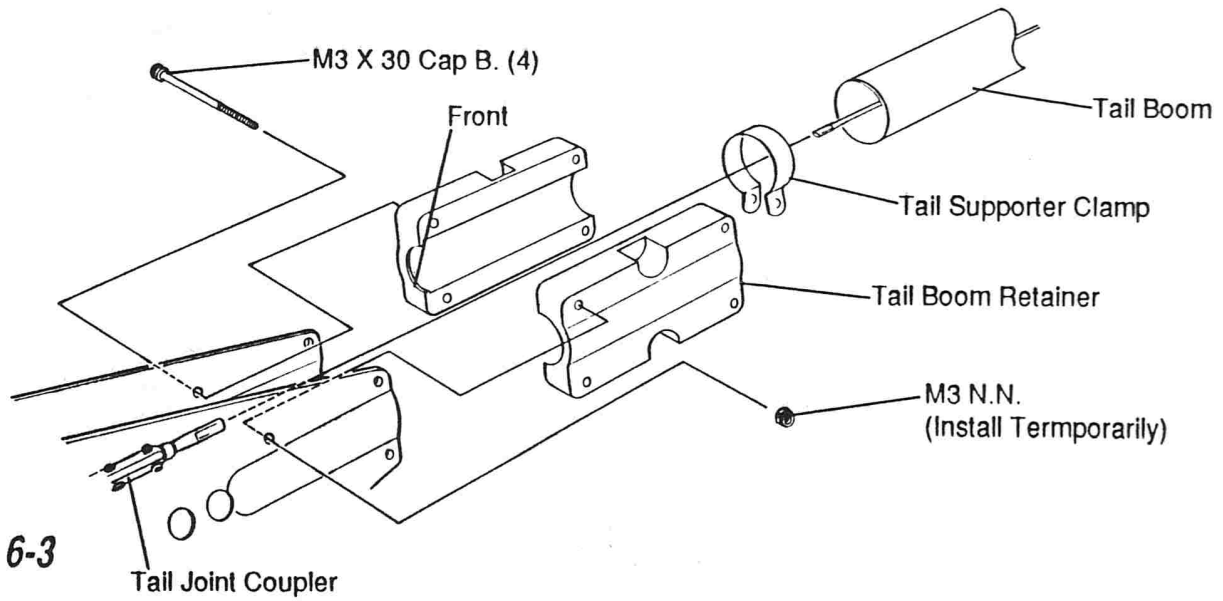


Figure 6-3

6-4

Step 58. Assemble the halves of the tail rotor gear box clamp around the tail boom and bolt them together, using (4) M3 X 35 cap bolts with M3 nylon nuts. At this time, align the output shaft of the tail rotor gear box so that it forms a 90° angle with the main shaft. Now tighten the bolts holding the tail boom retainer. [(4) M3 X 35 Cap B., (4) M3 N.N.]

Step 59. Install the vertical fin using the (4) nylon fin spacers, (4) M3 nylon nuts, and (4) M3 flat washers (see diagram). [(4) Nylon Fin Spacers, (4) M3 N.N., (4) M3 Flat Washer]

Step 60. Install the horizontal fin onto the tail boom using the horizontal fin clamp. The distance from the trailing edge of the fin to the rear of the tail rotor gear box should be 7 1/2 inches. [(2) M3 X 12 Cap B., (2) M3 Flat Washer, (2) M3 N.N.]

Step 61. Remove the cap from the rear of the tail rotor gear box. Apply a liberal amount of grease to the gears, and replace the cap.

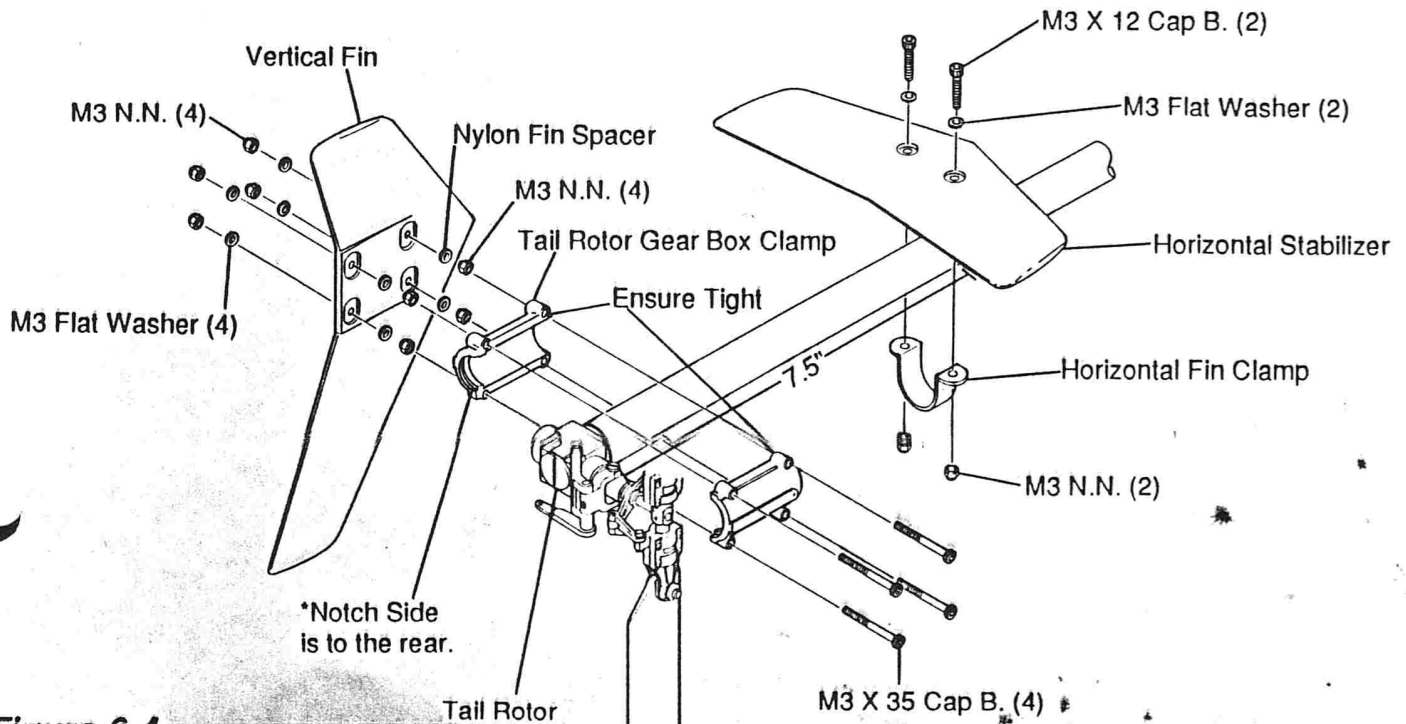
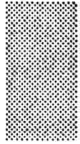


Figure 6-4

6-5



Step 62. Press a plastic tail support end into each end of the two tail support pipes and secure them using (4) M2.6 X 8 cap bolts. [(4) Tail Supporter End, (4) M2.6 X 8 Cap B.]

Step 63. Attach each tail support to the main frames using the (2) M3 X 10 cap bolts with (2) plate washers and Kalt Tite. The bolts thread into the remaining cross-member. [(2) M3 X 10 Cap B., (2) M3 Flat Washer]

Step 64. Attach the other end of each tail support to the tail support clamp (see diagram below). Install (1) M3 X 15 cap bolt and (1) M3 plate washer into the right hand support end, and with (1) M3 nut sandwiched between the tail clamp, thread all the way through, and tighten. Now place the left hand support onto the protruding stud, and thread (1) M3 plate washer and (1) M3 nylon nut onto bolt and tighten. [(1) M3 X 15 Cap B., (2) M3 Flat Washer, (1) M3 Nut, (1) M3 N.N.]

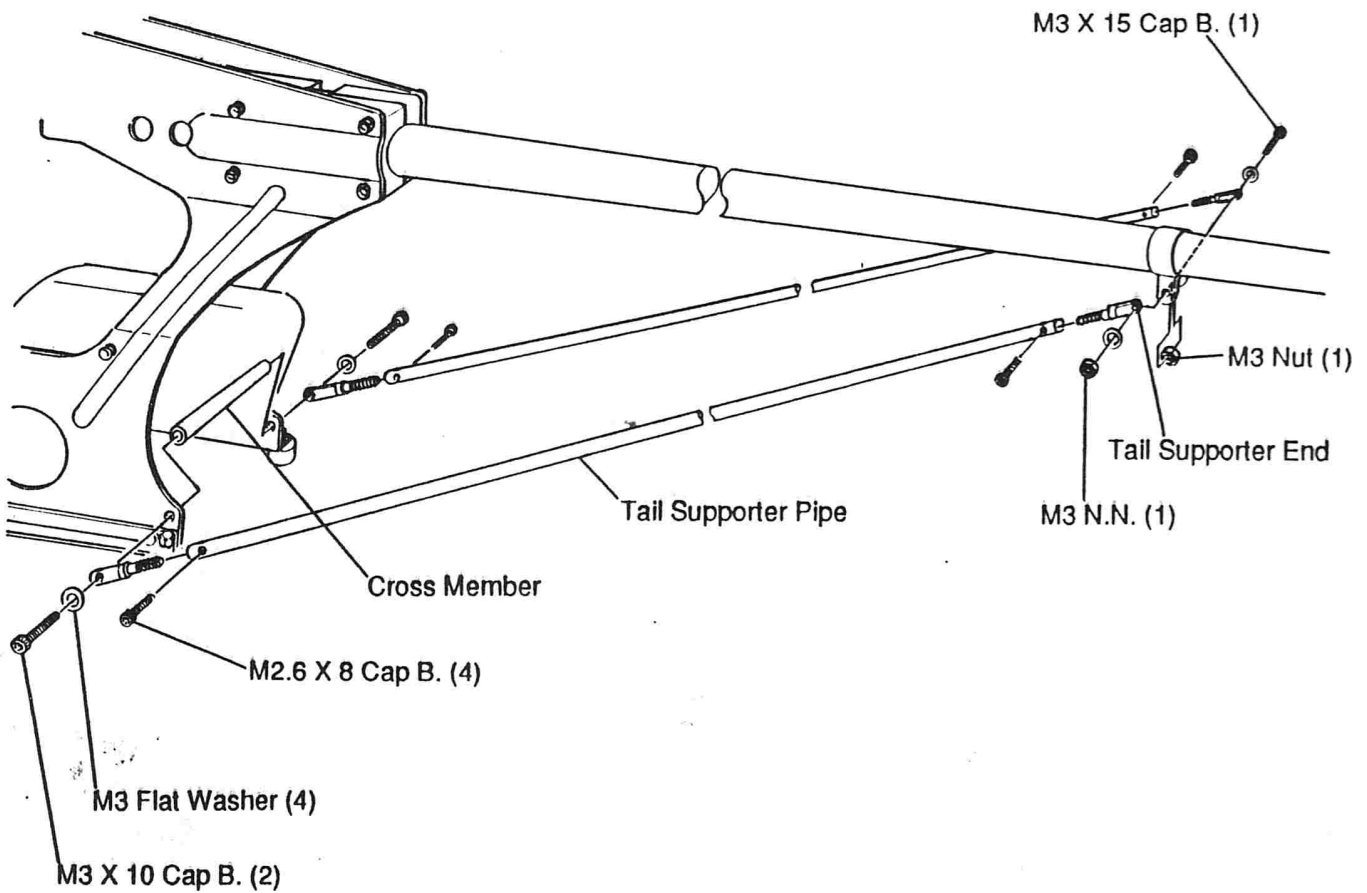


Figure 6-5

7-1

- Step 65. Install the throttle servo into the servo tray using (4) M2.6 cap bolts, (2) servo set plates, and Kalt Tite. Route the servo lead through the eyelet found in the front of the radio tray. [(4) M2.6 X 10 Cap B., (2) Servo Set Plates]
- Step 66. Install the collective servo into the servo tray using (4) M2.6 cap bolts, (2) servo set plates, and Kalt Tite. Route the servo lead through the eyelet found in the front of the radio tray. [(4) M2.6 X 10 Cap B., (2) Servo Set Plates]
- Step 67. Install the tail rotor servo into the servo tray using (4) M2.6 cap bolts, servo set plates, and Kalt Tite. [(4) M2.6 X 10 Cap B., (2) Servo Set Plates]
- Step 68. Install the aileron and elevator servos into the upper servo tray using (4) M2.6 cap bolts, servo set plates, and Kalt Tite. [(8) M2.6 X 10 Cap B., (4) Servo Set Plates]

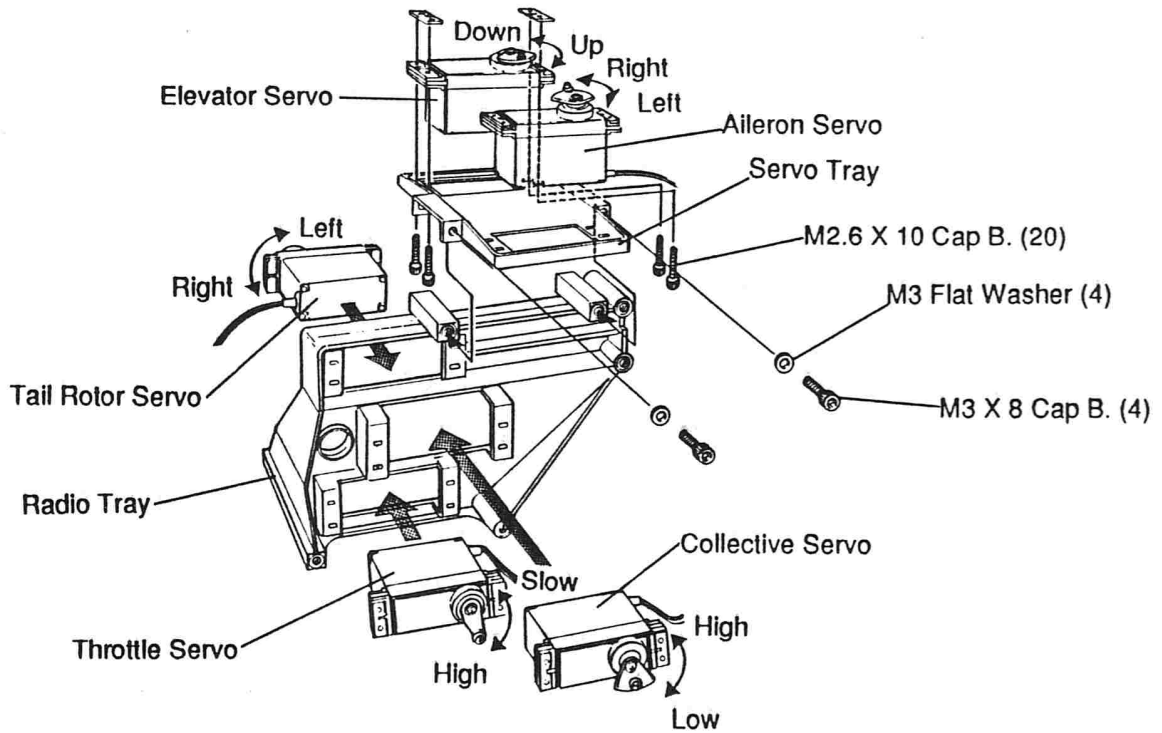


Figure 7-1

7-2

- Step 69. Attach the servo tray to the radio tray using (4) M3 X 8 cap bolts with (4) M3 washers. [(4) M3 X 8 Cap B., (4) M3 Flat Washer]

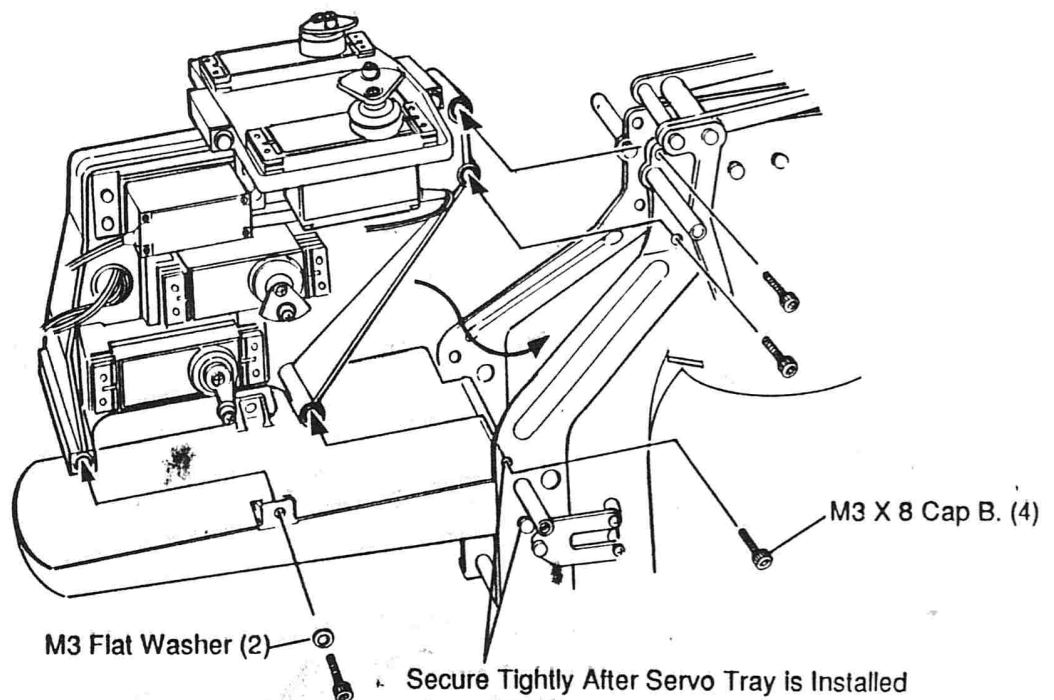


Figure 7-2



Step 70. Mark a hole on the throttle servo arm approximately 12 mm from the center of the arm. This length will vary according to the radio equipment used. Plug the servo lead into the receiver and switch the radio system on. Set the throttle/collective stick on the transmitter to exactly 50%. Install the servo arm to the servo with the arm in the 6:00 position. Advance the stick to 100%. The servo arm should move clockwise. If it moves in the opposite direction you *must reverse* the servo direction using the reversing switch on the transmitter, or by using a reversed servo. Screw a quick link onto each end of a 90 mm rod. Install the rod between the servo and throttle arm, adjusting its length, so that the throttle arm is in the 12:00 position when the servo is in the 6:00 position. Switch the radio system off. [(2) Quick Link]

Step 71. Attach a ball joint to the collective servo wheel approximately 9 mm from the center of the wheel. Plug the collective servo lead into the receiver and switch the radio system on. Adjust the high and low pitch curves on the transmitter to 100%. Set the throttle/collective stick to exactly 50%. Attach the servo wheel to the servo with the ball joint in the 5:30 position. Advance the throttle/collective stick to 100%. The servo wheel should move counter-clockwise. If it moves in the opposite direction, you *must reverse* the servo direction as in step 70. Screw a universal link onto each end of the 70 mm rod. Install the rod between the servo and the pitch lever, adjusting its length so that there is 13 mm between the bottom of the slide ring assembly and the bottom of the cut-out in the main frames. Turn the radio system off. [(1) Universal Link]

Step 72. Install a ball joint in the outer hole of the tail rotor pitch lever. Plug the tail rotor servo lead into the receiver and switch the radio system on. Turn the ATS system of the transmitter off and set the throttle/collective stick to the right – check that the servo moves counter-clockwise. If it moves in the opposite direction, the servo *must be reversed* as in step 70. Screw a universal link onto one end of the flexible PP rod using a 2.3 mm set bolt. Attach this link to the ball joint of the tail rotor pitch lever and secure the PP rod along the length of the tail boom by fastening the molded PP rod supports to the boom with instant glue. The rod supports should be placed evenly along the boom. The front support should line up with the center of the boom when viewed from the right side of the helicopter. Cut the other end of the PP rod and screw on a quick link using a 2.3 mm set bolt. Attach the quick link to the servo arm 15 mm from the center of the arm. The length of the PP rod should be adjusted so that the tail rotor pitch lever is parallel with the tail rotor gear box, with the servo arm in the 6:30 position. Turn the ATS system on and set the ATS direction to the right, with 50% up and down mix. The ACC mix should be set to zero. Switch the radio system off. [(2) M2.3 Set B., (1) M2 X 10 Phillips Bolt, (1) Ball Joint, (1) Universal Link, (1) Quick Link]

Step 73. Cut two servo wheels to the shape shown in Figure 7-3. Bolt a ball joint to each wheel 14 mm from the center of the wheel. Plug the aileron and elevator servo leads into the receiver and switch the radio system on. Install a servo wheel onto the elevator servo with the ball joint in the 3:00 position when viewed from the front of the helicopter. Push the cyclic stick forward and check that the elevator servo moves counter-clockwise. Install the other servo wheel onto the aileron with the ball joint in the 9:00 position. Move the cyclic stick to the right and check that the servo moves counter-clockwise. If the servos move in the opposite direction you *must reverse* their directions as in step 70. Screw a universal link onto each end of the 110 mm rod. Install this rod between the elevator servo and the elevator control ring, adjusting its length so that the swash plate is level when the servo is in the 3:00 position. Screw a universal link onto each end of the 85 mm rod. Install this rod between the aileron servo and the bell crank, adjusting its length so that the bell crank is 90 degrees when the servo wheel is in the 9:00 position. Screw a universal link onto each end of the 50 mm rod. Install the rod between the bell crank and the swash plate, adjusting its length so the swash plate is level when the bell crank is 90 degrees. [(2) Ball Joint, (4) M2 Nut, (2) M2 X 10 Phillips Bolt, (4) Universal Link]

Step 74. Wrap the receiver and battery pack with foam rubber and install on the front bed using rubber bands. Now turn radio on; check all controls for free movement and proper direction.

1. Throttle collective – move stick from low to high. Throttle servo will move counterclockwise. Collective slide ring will move up.
2. Rudder – Move stick to the right. The lever on the tail rotor box will move in towards the box.
3. Aileron or Roll – Move stick to the right. The swash plate will move toward the right side of the helicopter.
4. Elevator or Pitch – Move stick forward. The swash plate will move to the front of helicopter.
5. Gyro System – If used, it is mounted on the right side behind the throttle servo using servo tape. To check direction, move nose left. Servo will move counterclockwise. If not, reverse gyro, *not the servo*.
6. Turn radio off. Check all servos to make sure they have screws in their servo arms.

Step 75. Building Main Rotor Blades (see Figure 7-3c)

Lightly sand each blade with 320-400 grit sandpaper. Sand away all the sharp edges. The blade grid may be rounded if desired. Place the blade covering over the blade (see figure 7-3c)

Use a heat gun or steam to shrink the covering. Pull on end for finishing tip and root sections. Trim the coverings leaving a 1/4 inch overhang. Seal both ends with cyanoacrylate glue when dry. Note: For best results, use steam.

Trim or sand edges until flush with ends.

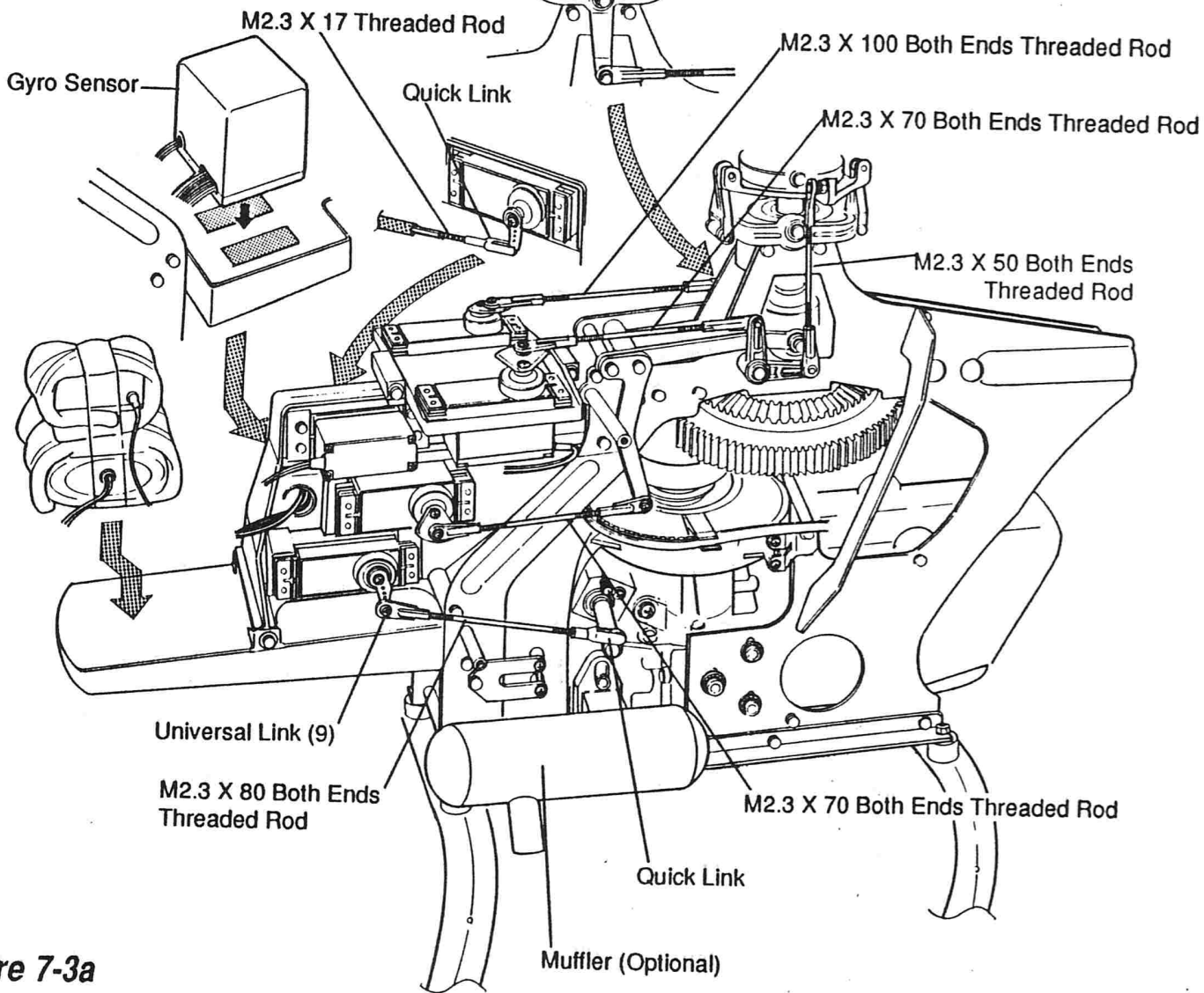


Figure 7-3a

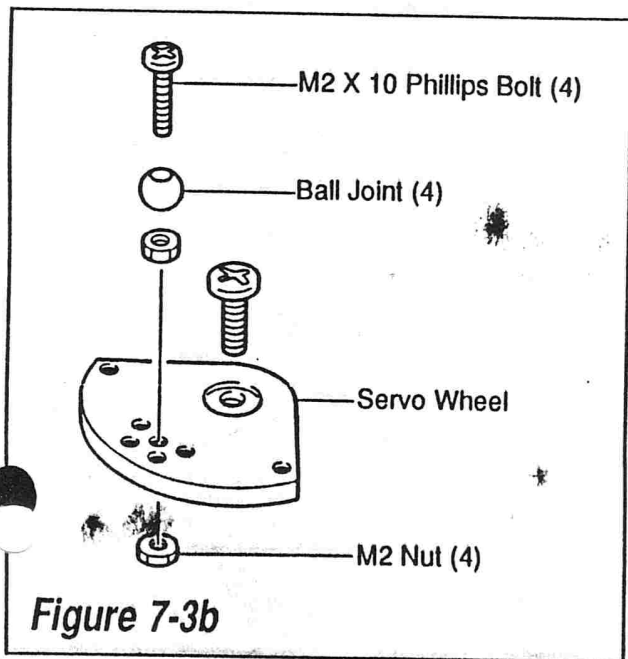


Figure 7-3b

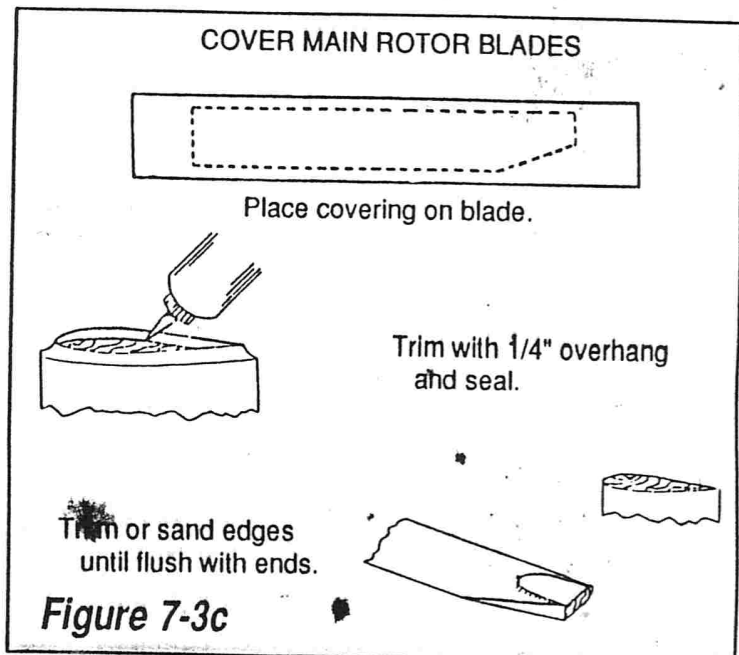


Figure 7-3c

bar through both the seesaw assembly and the control lever. Make sure the stabilizer bar passes through the control lever. Screw (2) M3 X 3 set bolts into each stabilizer stopper and install one on each side of the seesaw assembly to temporarily hold the stabilizer bar in place. Place a mark 25 mm from each end of the stabilizer bar. [(1) M4 X 4 Set B., (2) M3 X 3 Set B.]

Step 77. Screw a stabilizer blade onto each end of the stabilizer bar, and tighten it up to the mark. Twist the stabilizer blades until their chords are parallel.

Step 78. Loosen the set bolts in the stabilizer stopper. Move the stabilizer bar back and forth until the distance between each paddle and the stabilizer stopper is equal. Remove and place a small amount of Kalt Tite on each set bolt, reinstall, and tighten securely. Check to insure the distance is still equal. If not, readjust, and then tighten securely. (Leave a slight amount of play between the seesaw assembly and the stabilizer stopper to allow free and unrestricted movement. However, this should not be sloppy.)

Step 79. Remove the set screw from the control lever, apply a small amount of Kalt Tite on the threads, and reinstall. Adjust the control lever so that the ball link is in line and parallel with the chord of the stabilizer blades. Check the side-to-side clearance of the seesaw assembly. Insure that its movement is unrestricted. Tighten the control lever set bolt securely.

Step 80. Insure the root thickness of the main rotor blades is 17 mm. If not, sand the root section until the thickness is 17 mm. Insert a M4 X 40 cap bolt through the blade grip and the main rotor blade, and install a M4 nylon nut. Tighten this bolt until the blade is snug, yet still moves back and forth with ease. [(1) M4 X 40 Cap B., (1) M4 N.N.]

Step 81. Hold the completed rotor head assembly by the stabilizer bar to check the balance of the rotor head. The main rotor blades should balance perfectly level. If not, apply a piece of vinyl tape to the light (higher) blade until a perfect balance is achieved. Even if the blades balance correctly, apply different colors of tape to each tip, in order to allow tracking of the blades during flight set-up.

Step 82. Install the completed rotor head onto the main rotor shaft. Make sure that the control lever ball link lines up with the corresponding ball link on the swash plate. Install a M3 X 25 cap bolt, and secure tightly with Kalt Tite and a M3 nut. [(1) M3 X 25 Cap B., (1) M3 Nut]

Step 83. Cut approximately 5 mm off of 4 universal links, as shown in Figure 8-1b. Screw a universal link onto each end of a M2.3 X 14 threaded both ends rod. Combine two of these assemblies, and adjust them until you achieve an overall length of 37 mm. Connect these links in two places: (1) between the inside ball link on the seesaw arm assembly and (2) on the ball link on the blade grip assembly. [(2) M2.3 X 14 Threaded Both Ends Rod]

Step 84. Screw a universal link onto each end of a M2.3 X 100 threaded both ends rod. Install this link between the swash plate and the control lever. Adjust the links until the stabilizer blades and the swash plate are perfectly level and parallel to one another. [(1) M2.3 X 100 Threaded Both Ends Rod]

Step 85. Screw a universal link onto each end of a M2.3 X 80 mm threaded both ends rod. Make two of these links and connect the scissor arm to the seesaw arm so that the scissor arms are perfectly level and parallel. [(2) M2.3 X 80 Threaded Both Ends Rod]

Step 86. Turn on your radio. Set the throttle to 50% and the pitch to 4 - 5 degrees for each blade. Adjust the short linkages on the rotor head to get a correct pitch setting. Now go to full throttle. Make sure the pitch end-point in your transmitter is set to 100%. Set the pitch to 8 degrees using end point adjustments. Now set to low throttle. Make sure the end point is set to 100%. Set the pitch to -3 degrees. The main rotor RPM will be 1600 - 1650 RPM. When you enter forward flight, you will want to unload the main rotor. When properly set, you will hear a slight increase in rotor speed. This is only a starting point, and adjustments will change with each engine, muffler set-up, and personal set-up.

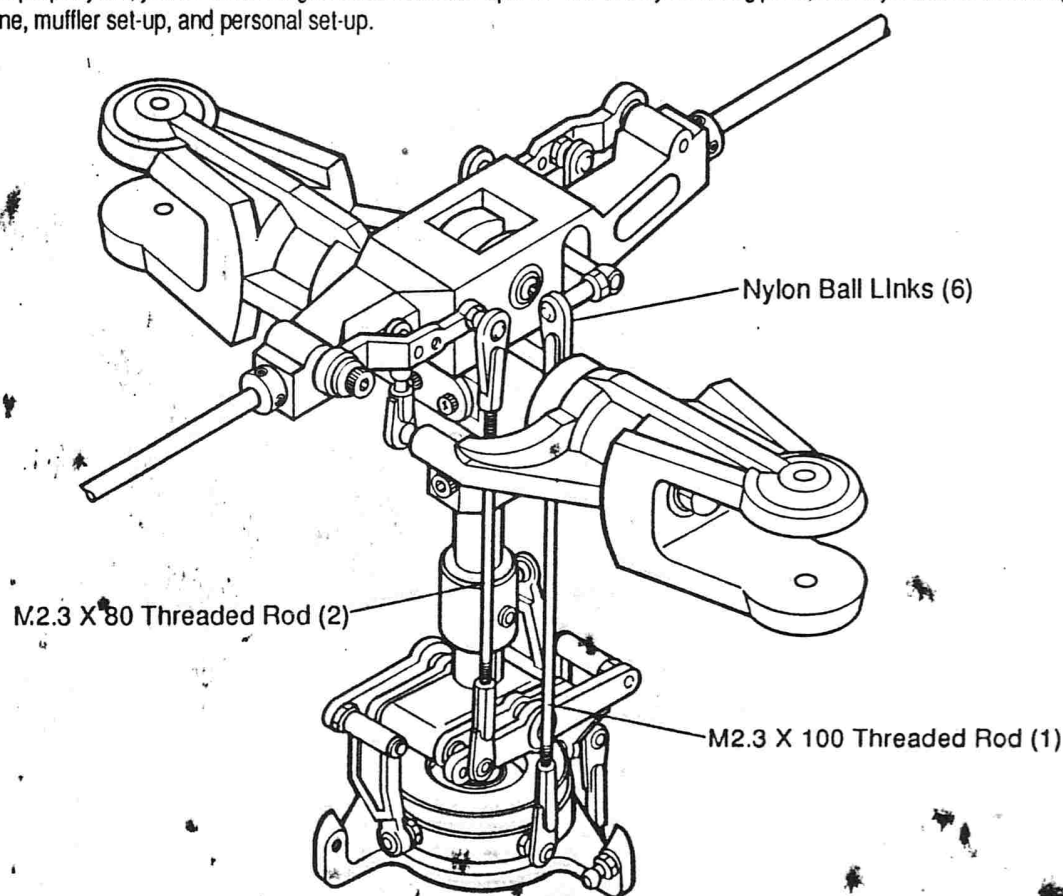
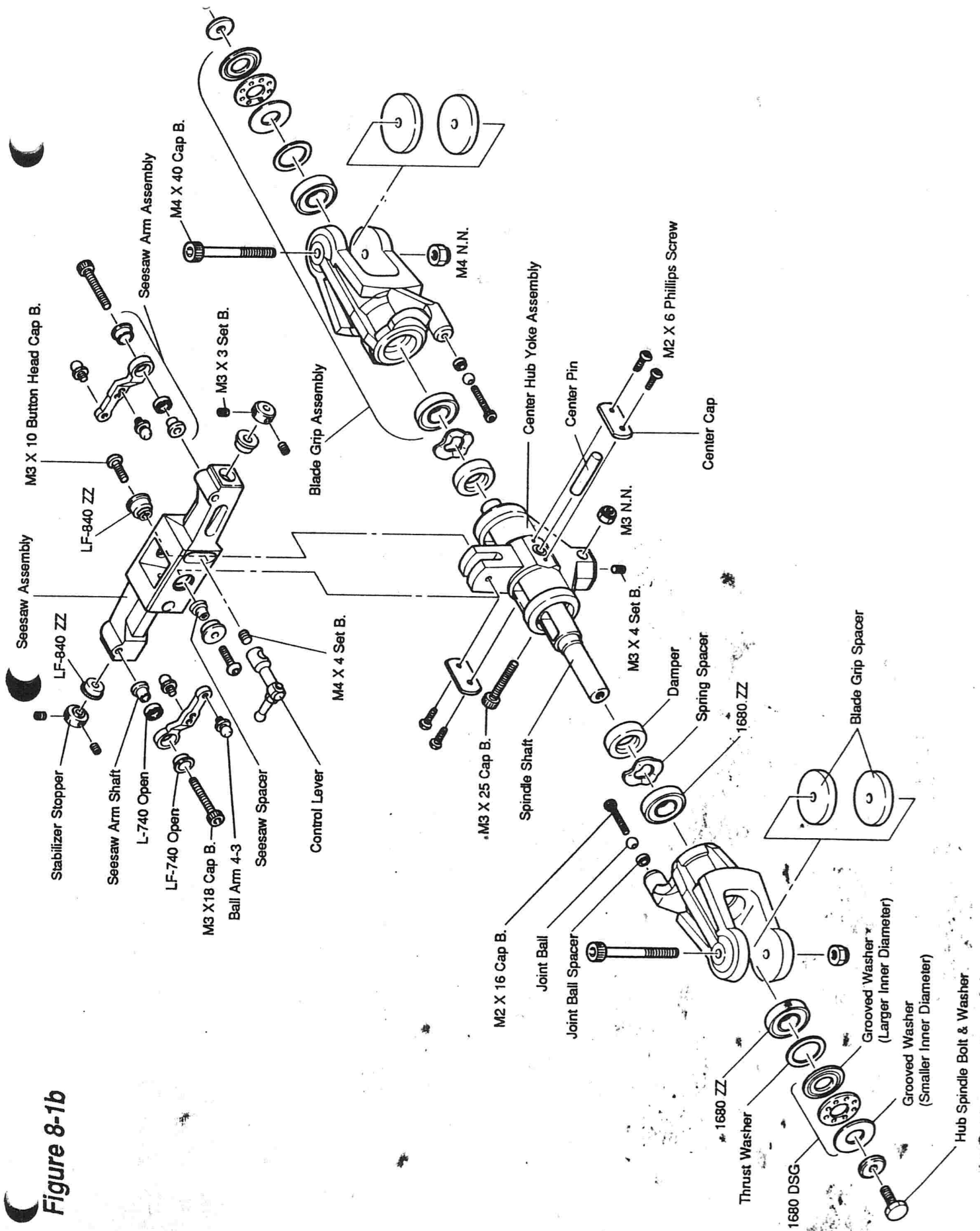


Figure 8-1a

Figure 8-1b



Section 9. Fuselage Assembly

9-1

Step 87. First, fit the two body sides together and carefully look over the seams. Remove any excess flash or plastic that would interfere with a smooth seam. After you have ensured a good fit, use tape to assemble the two body sides together. Using a small brush and working from the inside, apply Kalt cement to the seam. Work in small sections, because the cement evaporates very quickly.

Step 88. Position the bottom reinforcement into place, and apply glue around the seam. Place the instrument panel into place, and apply cement around the outside.

Step 89. Drill (4) 6 mm holes in the centers of the indented body mount areas on each side of the body. Press a rubber grommet in each of these (4) holes. Place a small amount of instant glue on the inside of the grommet, and then place a 3 mm washer onto the grommet as shown in Figure 8-1.

Step 90. Temporarily install the canopy onto the body and check the fit to ensure no gaps exist. Trim canopy if needed, and then tape it into place. Using a 2 mm diameter drill, drill one hole in the front through the canopy and body. Drill a hole in each side near the rear along the bottom. See Figure 9-1. Note: If muffler slot is not needed, glue the plastic insert (supplied in the kit over the slot. The canopy may be painted, but the test paint on scrap plastic first.

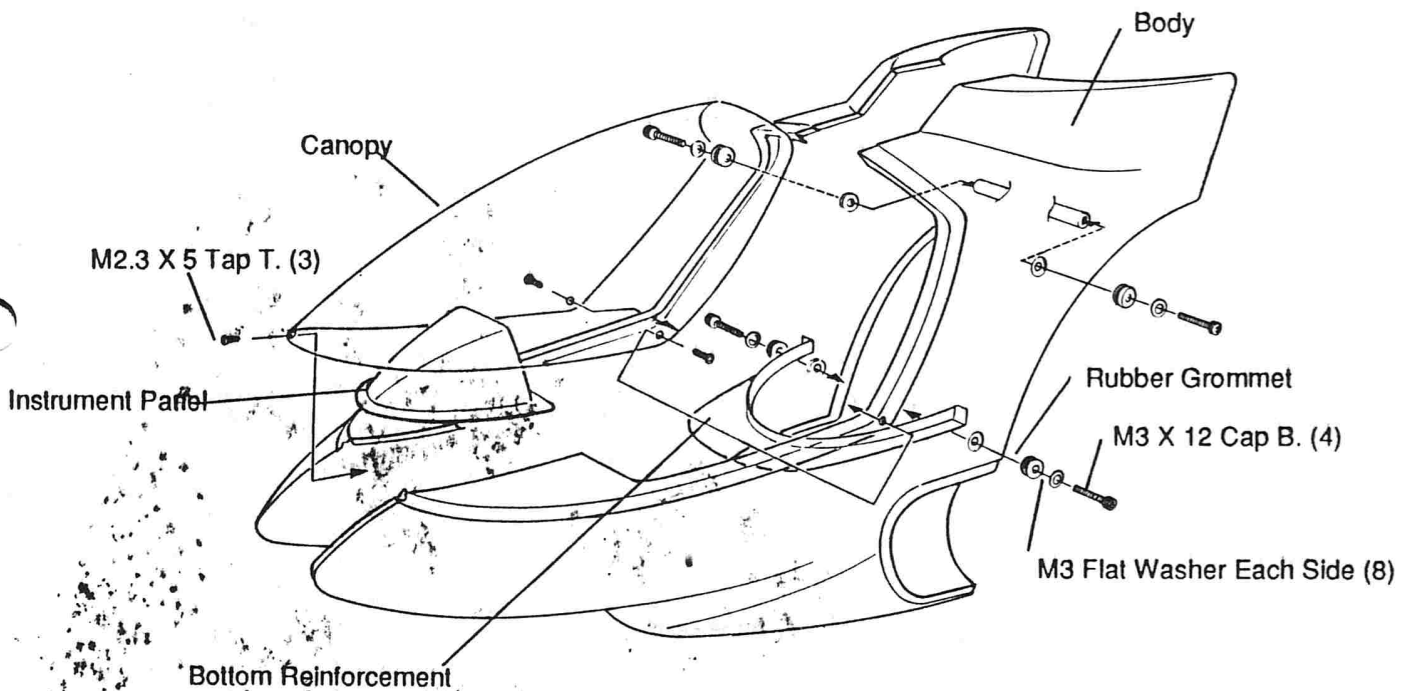


Figure 9-1a

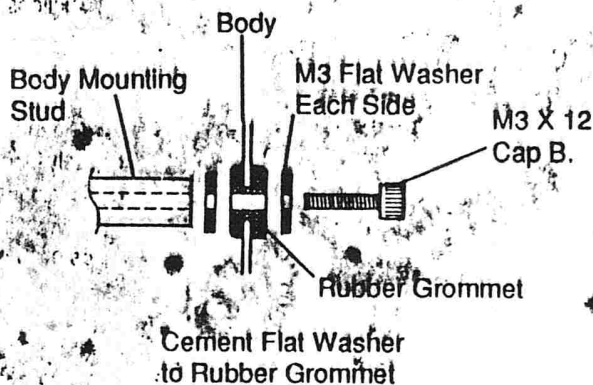
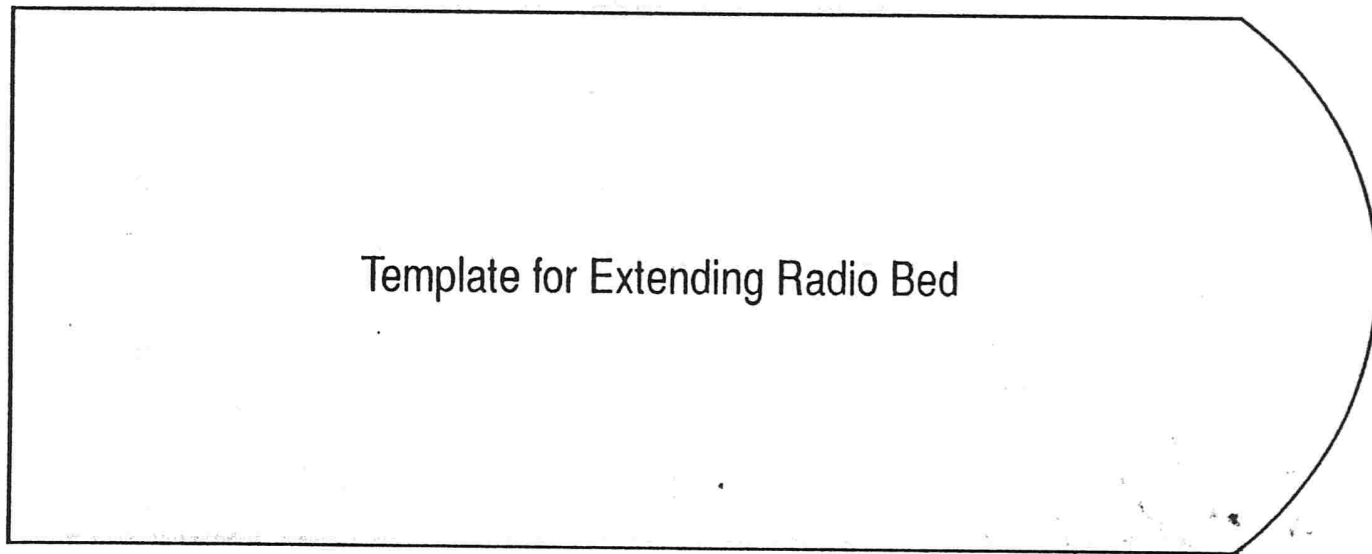


Figure 9-1b

Upon completion of this kit, go back over every step to make sure that there are no loose nuts or bolts, misaligned or bound moving components. Check all linkages for proper movement using your transmitter.

- **Center of Gravity Adjustment**

This adjustment is very critical. Lift helicopter by holding onto the flybar. It will hang nose-low without fuel. The rear skids will raise off the ground approximately 3/8" before the front skids lift. Note: If weight is needed, we recommend extending the radio bed using a 3/32 to 1/8 inch plywood tray. Move the receiver and battery pack forward until the proper center of gravity is achieved. Use this drawing as a template if necessary.



- **Main Rotor Pitch Adjustment**

Follow the instructions for your rotor head. Pitch may vary according to such factors as total weight, engine power, main blade diameter and your own preferences. For the initial set-up, we recommend that you set a pitch of 0 degrees at minimum power, and approximately 8 degrees at maximum power.

In-Flight Adjustment

Range check your R/C equipment prior to starting the engine.

- **Tracking of Main Rotor Blades**

Gradually open up the throttle, and when the helicopter is almost ready to lift off, watch the rotor blades to see if they are tracking the same. If not, adjust the pitch of one blade, so that then, they will both track the same.

- **Needle Valve Adjustment**

Adjust mixture control screw and needle valve according to the manufacturer's instructions. If, after your first flight, fine adjustment is required, make sure that it is not adjusted too lean.

- **Tail Rotor Pitch**

Face the helicopter into the wind, and gradually open the throttle. If the tail boom moves to the right (nose moving left) increase the pitch; and if it moves the opposite direction, decrease the pitch. To adjust the tail mixing system of your transmitter, refer to the manufacturer's instructions.

Flight Safety

If you are new to R/C helicopter flying, please seek assistance from an experienced R/C helicopter pilot. Initial helicopter adjustments are not easy and a mistake in construction could result in a serious accident. In case your helicopter should crash, or be damaged, inspect it closely for other damage not readily visible. Replace all damaged or suspect parts prior to re-flying. You should not, repeat NOT, track your main blades by holding you helicopter by the tail boom while lifting it into the air. This is an extremely dangerous practice and is strongly discouraged. Since the control of your helicopter is accomplished using relatively weak radio signals, and they are subject to disturbances by electric noise, do not fly near buildings or where people or spectators are nearby. Be alert and safety-conscious at all times.

Spare Parts

Spares can be obtained from your dealer, using the part number and name. Follow this instruction manual when repairing.