

ROTORWAY INTERNATIONAL

EXEC 90

MAINTENANCE MANUAL

The RotorWay "EXEC 90" Maintenance Manual has been designed to provide the owner-operator the lowest operating cost possible while maintaining the flight characteristics and safety of their helicopter.

WARNING

The construction and operation of "Home-Built Aircraft" of this type is demanding and could inflict serious injury and possible death. No such operation, construction or undertaking should be initiated unless thorough and complete knowledge, preparation and instruction are available and utilized. The seller (and its agents, servants, employees, contractors, successors, and assigns) makes no warranties express or implied regarding the clarity or correctness of the plans, ease of construction or operation nor the safety of this aircraft or any part thereof. Furthermore, buyer (and his heirs, administrators and assigns) releases and holds said seller (and its agents, servants, employees, contractors, successors, and assigns) harmless from any and all liability, damages, and causes of action which may be incurred by buyer or any third party as a result of the purchase, use, construction and/or operation of said aircraft (or any part thereof) or plans for same. Buyer assumes all risk and responsibility relative to the construction and/or operation of said aircraft. Seller admits no liability by publication of this warning.

INTRODUCTION

This Maintenance Manual is divided into 20 main sections of the aircraft with some larger sections divided into sub-sections. Each section consists of a brief description outlining the materials used in construction of the components and what should be observed during the inspection. An "Inspection Chart" provides part numbers with descriptions and shows the proper Inspection Interval, Recommended Change Out time (R.C.O.), and a Service Reference. The Service Reference will provide the proper procedure to be followed for each inspection. Either a section of the Construction Manual or a Service Description Note will be referenced.

Many parts listed are given a specific lifetime for that component and must be replaced at the R.C.O. time specified in the Inspection Chart. Even though on visual inspection these items may not appear to be worn out, they may have a fatigue life that requires their replacement before visual evidence appears. This policy provides a part safety factor to enable its replacement before failure.

It is also possible for a part to fail prematurely. Even though close quality control procedures are adhered to, a part can prematurely fail from incorrect manufacturing procedures, builder errors, environmental operation and storage conditions. Because premature failures can happen, it is important to monitor major components during pre- and post-flight inspections.

In order to help monitor these parts, a phrase called "on condition" or O.C. has been utilized in this manual. This condition means the part should be monitored and replaced if suspect prior to the R.C.O. time of the component. The R.C.O. time represents the lifetime of the component as recommended by the manufacturer. Common examples of parts that qualify for O.C. replacement are bearings and belts. When these parts are not correctly installed or not cleaned properly, they can fail prematurely.

Clearances and tolerances for proper inspection will be noted in the section, if applicable, for part replacement. Other data such as crankshaft tolerances, rod clearance and cam dwell, etc., is proprietary information. If the need arises for the builder to have this information, a technical representative from the factory should be contacted.

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SECTION I: AIRFRAME

The airframe is constructed of various size tubes consisting of geometric shapes which will allow the airframe to flex at key areas during operation and still maintain a high structural integrity. The tubing is aircraft industry standard 4130 chrome-moly. Where tubing requires bending, a mandrel bender is used and tubes are scribed, cut, and coped to a tolerance of .062 inch. The oxygen acetylene gas method of welding is used and all weldments are air cooled to retain the original strength of the alloy.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E10-1000	Airframe	100 HR	2000 HR/OC	I-1
E00-2415	AN4-24A Bolt	100 HR	2000 HR/OC	Torque
E00-2601	AN6-10A Bolt	100 HR	2000 HR/OC	Torque
E11-3121	Rear Landing Gear	100 HR	2000 HR/OC	I-2
E13-3120	Engine Mount Rubber	50 HR	2000 HR/OC	I-3
E00-2507	AN5-10A Bolt	100 HR	2000 HR/OC	Torque
E11-3130	Landing Gear Skid	500 HR	2000 HR/OC	I-4
E11-3131	Landing Gear Skid	500 HR	2000 HR/OC	I-4

Reference prints: E10-2000
E13-2000

SECTION I: AIRFRAME**SERVICE NOTES:**

1. Remove all inspection panels including the two upper panels that are held on by nut plates. Using a flashlight or a suitable source of illumination and a mirror, inspect for cracks on the round and square tubes, paying close attention to the welded areas. If a small hairline crack appears, remove the paint from the airframe at that position to further verify the crack. It may be necessary to apply a pressure or load in such a manner as to help open up the crack to verify. If close inspection verifies the crack, contact the factory for further assistance. If verification is negative, repaint the suspect area and reassemble.
2. Remove skid pants. Inspect the rear landing gear, gear gusset, the area 6 inches above and below the landing gear step (part no. E11-3141, refer to print E10-2000) and the rear landing gear attachment bracket. These are critical inspection areas. Approximately 80% of the total aircraft weight is transferred on the rear gear. After inspection, reinstall skid pants.
3. Removal of the two rear lower fiberglass panels (part no. E32-7130 and E32-7140) will allow you access for a visual inspection of the Engine Mount Rubber, part no. E13-3120. This part must be kept clean from oil and grease. Allowing the part to become contaminated will deteriorate the rubber over a short period of time, changing the alignment of the secondary to engine height. If in question, check secondary and engine alignment. The tolerance is plus or minus 1/8". Refer to the engine installation section of the Construction Manual for further assistance.
4. Because the helicopter can be operated in many different terrains and will experience various landing conditions, the landing gear skid will remain an on-condition inspection item. Lift the front skid off the ground approximately 10 inches and block it up with a 2X4 board. Look for a flat wear area across the bottom of the skid. If a flat area appears and measures more than 1/2" in width, replace the skid tube. Keeping the helicopter in the upright condition, remove the two (2) front skid shoe bolts (part no. E00-2414) on the right front skid shoe and drop the skid 3" below the shoe. This will allow an inspection on top of the skid which is normally hidden by the shoe. Check the holes for an oblong condition and any cracks in the skid tube. Also, inspect the bolts for wear prior to reinstalling the skid back on to the landing gear shoe.

SECTION II: TAIL BOOM

The main purpose of the tail boom in all conventional helicopters is to provide a source of mounting for the anti-torque system or tail rotor. Its secondary purpose is to mount the vertical and horizontal trim fins which are used to stabilize the aircraft in forward flight opposing aerodynamic forces from the windscreen and body.

The material used in the tail boom is aircraft industry standard, grade T-3 aluminum and is .025 thick. The sheet is rolled in a cone shape to provide structural integrity.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E09-****	Tail Boom	100 HR	2000 HR/OC	II-1
E09-6131	Horizontal Trim Fins	100 HR	2000 HR/OC	*
E00-2301	AN3-5A Bolt	100 HR	2000 HR	Torque
E00-2305	AN3-11A Bolt	100 HR	2000 HR	Torque
E09-6110	Vertical Trim Fin(Upper	100 HR	2000 HR/OC	*
E09-6120	Vertical Trim Fin(Lower	100 HR	2000 HR/OC	*
E09-3252	Vert. Trim Fin Bracket	100 HR	2000 HR	II-2
E00-2414	AN4-23A Bolt	100 HR	2000 HR	Torque
E00-2309	AN3-17A Bolt	100 HR	2000 HR	Torque
E00-2432	AN4-12A Bolt	50 HR	2000 HR	Torque
E00-2303	AN3-6A Bolt	50 HR	2000 HR	Torque
E00-2300	AN3-4A Bolt	50 HR	2000 HR	Torque
E00-2307	AN3-13A Bolt	50 HR	2000 HR	Torque

Reference prints: E09-2000
E09-2001

* Rivet Inspection

SECTION II: TAIL BOOM**SERVICE NOTES:**

1. The tail boom is subject to most of its stress under the take off and landing condition. The skin and its associated parts are subject to high frequency vibration that can cause stress cracks and generate loose rivets and bolts.
 - A. Stress Cracks: Upon inspection of the tail boom skin, if you find that stress cracks have started, drill a small hole at the very end of the crack. This hole will stop any further migration of the crack. The size of the drilled hole will depend on the severity of the crack.
 - B. Loose Rivets: Depending on the size and head diameter of the rivet, use the appropriate drill and drill out the head by rotating in an elliptical manner. This procedure will remove the head from the rivet before drilling through the hole to remove the rivet spud. Use a rivet shank or a small punch and knock out the remainder of the rivet spud. Clean the area and deburr the hole if necessary. Replace the rivet using the original type and size.
2. Inspect the Vertical Fin bracket at bend areas for cracks. Also inspect the mounting holes outward to the edge of the bracket.

SECTION III: BODY

The body for the EXEC 90 helicopter consists of several separate panels that when assembled make up a solid egg shape structure which provides for a very efficient and aerodynamic airflow. Each panel is made using the hand lay-up squeeze method to give the piece the maximum strength to weight ratio. A gel coat is applied to the mold prior to the fiberglass lay-up so that the parts are ready for light sanding and paint.

INSPECTION CHART

<u>PART NO.</u>	<u>INSPECTION DESCRIPTION</u>	<u>SERVICE INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E32-****	Body	100 HR	OC	III-1
E32-7210	Eyebrow Window, Pass.	100 HR	OC	III-2
E32-7220	Eyebrow Window, Pilot	100 HR	OC	III-2
E32-7231	Windscreen	100 HR	OC	III-2
E32-1300	Seat Upholstery	100 HR	OC	III-3
E32-1310	Headliner	100 HR	OC	III-3
E45-****	Skid Pants	100 HR	OC	III-4
E32-1281	Flex Hose	100 HR	OC	*
E54-4010	Push/Pull Cable	100 HR	OC	**
E32-3130	Floor Pan/Instrument Pod	100 HR	OC	Insp
E32-6110	Seat Bulkhead	100 HR	OC	Insp
E32-7100	Tub	100 HR	OC	Insp
E32-7111	Fuselage (Right Front)	100 HR	OC	Insp
E32-7112	Fuselage (Right Rear)	100 HR	OC	Insp
E32-7121	Fuselage (Left Front)	100 HR	OC	Insp
E32-7122	Fuselage (Left Rear)	100 HR	OC	Insp
E32-7130	Fuselage (Lower Right)	100 HR	OC	Insp
E32-7140	Fuselage (Lower Left)	100 HR	OC	Insp
E32-7152	Dog House (Front)	100 HR	OC	Insp
E32-7272	Dog House (Rear)	100 HR	OC	Insp
E32-1110	Cyclic Boot	100 HR	OC	Insp
E32-7160	Bracing Panel	100 HR	OC	Insp
E32-7170	Bracing Panel	100 HR	OC	Insp
E32-7180	Roof Panel	100 HR	OC	Insp
E32-7190	Fresh Air Collector	100 HR	OC	Insp

Reference print: E32-2000

* Tighten hose clamps

** Oil/20w

SECTION III: BODY

SERVICE NOTES:

1. Care of the body panels is very minimum. However, two factors which may damage them are heat and prolonged exposure to gas and oil from lack of cleaning. When doing pre- and post-flight inspections, avoid exposing any removed panels to excess heat or direct sunlight. Stand the panels upright and avoid placing them in an abnormal position. Prolonged exposure to excessive heat or sunlight in an abnormal position could result in a deformed panel.

Fiberglass is resistant to most chemicals; however, prolonged exposure to gas and oil over long periods of time will eventually weaken that piece. Oil and gas should be wiped off of the panels using a dry cloth which will absorb or remove the petroleum. After removal of all foreign substances, take a cloth moistened with acetone and wipe the part clean from any residue. **CAUTION** should be used when using acetone because of its high flammability.

Check to make sure that all metal parts protruding through the fiberglass have a minimum of 1/4" clearance. If the clearance requires enlarging, this process can be done by using a round or flat file or an air or electric grinder.

2. Care and cleaning of Parts:
 - A. Cleaning: A mild soap and water solution on a cloth can be used to remove dirt and fingerprints. A plastic cleaner such as Meguiar's #2 can be used to remove over spray and oxidation and #9 should be used to preserve and protect the windscreen and to bring up a high gloss.
 - B. Care should be taken so that the windscreen screws are not over tightened. This condition can cause stress cracks that could result in a major crack down or across the windscreen. If a stress crack appears, stop drill with the appropriate size drill bit. If a cover is used while trailering, make sure the cover has a soft inside lining and fits tight enough to the body to avoid flapping.
3. Interior and headliner: Use any commercially available upholstery cleaner on the seats or cabin interior if they become soiled. Carefully read the instructions on the cleaner to obtain desirable results. This will help prevent any shrinkage from occurring.
4. Check to make sure that the skid pants do not chafe against the body tub or the landing gear. If contact is present, file the fiberglass to make clearance between the two parts.

SECTION IV: TAIL ROTOR DRIVE

The tail rotor drive on the EXEC 90 helicopter utilizes a V belt design drive rather than a drive shaft with gear boxes to transmit power to the tail rotor. This design provides a simple effective drive train process with simplified low maintenance.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E18-6130	Idler Pulley Mt.Scissors	250 HR	2000 HR	IV-1
E18-1130	Idler Pulley Brg. Assy.	250 HR	250 HR/OC	IV-2
E18-2012	Tail Rotor Idler Pulley	100 HR	2000 HR/OC	IV-3
E18-1150	Tail Rotor Belt	100 HR	250 HR	
E18-1160	Tail Rotor Belt	100 HR	250 HR	

Reference print: E09-2000

SECTION IV: TAIL ROTOR DRIVE**SERVICE NOTES:**

1. Remove the two bolts (part no. E00-2405) that attach the idler pulley assembly to the tail boom and slide the idler pulley scissor mount down and out of the tail boom (see note 2 below for inspection of idler pulley assembly). Place a small amount of grease on each of the mating surfaces and reinstall the pulley back to its original position. Tighten the nuts on the bolts only enough to hold the part firmly. The part should not swing loosely but require slight pressure to move it. (Refer to Construction Manual.)

2. Tail Rotor Idler Pulley Assembly (part no. E18-2012).
 - A. Remove the pulley by removing bolt part no. E00-2604.
 - B. Remove two (2) snap rings.
 - C. Heat the pulley in an oven or another appropriate means to 225-275 degrees F. **CAUTION:** Do not exceed 300 degrees F or heat treating will be affected.
 - D. Using appropriate tools, fixtures, and presses, press out the old bearing.
 - E. Let the pulley air cool, then clean the inner mating surface with acetone.
 - F. Clean the outer surface of the bearing with acetone and position the bearing ready for reinstallation.
 - G. Apply a thin even film of loctite #609 to the outer surface of the bearing only. (Do not use your fingers.)
 - H. Install one snap ring.
 - I. Heat the pulley to 225-275 degrees and drop the bearing in place. If a press is necessary, use light pressure to insure contact of the bearing to the snap ring. (When using a press, press only on the outer race of the bearing and not the inner race.) Wipe off remaining loctite.
 - J. Install the second snap ring and let the assembly cool.
 - K. Check to see that both snap rings have seated completely and that there is no play between the bearing and the pulley.
 - L. Install the pulley making sure the correct spacers are in their proper place and torque the bolt.
 - M. Rotate the pulley in its new bearing and check the feel with your fingers for ease of rotation and smoothness.

3. Inspect for wear and anodizing on the pulley. Also inspect for cables and wires that may have shifted or come loose in the tail boom, allowing them to rub on the pulley.

SECTION V: TAIL ROTOR

The tail rotor's function is to counter the torque of the power plant and keep the aircraft from rotating. It also provides the ability to turn the aircraft while hovering by adjusting the pitch of the tail rotor blades through use of the directional controls.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E17-1260	FS3 PP Bearing	100 HR	250 HR/OC	** V-1
E17-1290	Snap Ring	100 HR	250 HR	**
E00-2605	AN176-24A Bolt	100 HR	250 HR/OC	**
E17-6125	Carriage Slider Assy.	100 HR	1000 HR/OC	**
E17-1300	Carriage Slider Bearing	100 HR	500 HR/OC	**
E17-1210	Rod End 5/16 Teflon	100 HR	1000 HR/OC	**
* E17-6000	Tail Rotor Blade Assy.	100 HR	500 HR/OC	** V-2
E17-5120	Pitch Actuator Arm Pivot	100 HR	2000 HR	** V-3
E17-1340	Bearing Assy.	100 HR	250 HR/OC	Inspect
E17-5110	Pitch Horn	100 HR	250 HR	
E17-1350	Slider Act. Arm Clevis	100 HR	2000 HR	
E17-6150	Tail Rotor Shaft	100 HR	2000 HR/OC	**
E17-1360	Bearing Plt. Slider Rail	100 HR	2000 HR	
E17-5101	Tail Rotor Pulley	100 HR	2000 HR/OC	**
E16-1200	Female Rod End	100 HR	1000 HR/OC	**
E17-1280	Thrust Bearing Assy.	50 HR	250 HR/OC	** V-4
E17-1270	Alignment Bearing Assy.	50 HR	250 HR/OC	** V-4

Reference prints: E17-2000
 E17-2001

** For replacement details refer to Construction Manual.

SECTION V: TAIL ROTOR

SERVICE NOTES:

1. Remove bolt (part no. E00-2605) from the tail rotor barrel. Using a knife or a tool with a sharp edge, pry under the lip of the bearing (part no. E17-1260) removing the bearing from the barrel. Replace with new bearings and insert the bolt, tightening it only enough so that the head of the bolt can be rotated slightly by your fingers. Check end play by using your hand and fingers, pushing the barrel from side to side to confirm proper end play.
2. Use this procedure to remove tail rotor blades (part no. E17-6000) and pitch pins (part no. E17-6173):
 - A. First, mark each blade and pitch horn assembly as A and B and indicate identity on the tail rotor barrel so reassembly will be the same to maintain tail rotor balance.
 - B. Remove the two bolts that hold the blade to the pitch pin (part no. E00-2305 and E00-2308).
 - C. Carefully grasp the tail rotor blade and barrel with your hand and rotate while pulling outward.
 - D. Remove the snap rings and deburr the snap ring hole if needed. **CAUTION:** Be careful while doing this procedure not to mark or scratch the inner tail rotor barrel.
 - E. Grasp the pitch pin and pull it out of the barrel. It may be necessary to insert a bolt in the tail rotor pin to lightly tap on for removal. NOTE: A slide hammer may be fabricated to facilitate the removal of the pitch pin. See drawing below.
 - F. After removal of the pitch pin, remove the alignment bearing assembly (part no. E17-1270) and the thrust bearing assembly (part no. E17-1280). Immerse parts in a solvent to clean and remove the grease. After inspection of parts, reassemble according to original procedures as outlined in the Construction Manual and on prints E17-2000 and E17-2001.

NOTE: When changing out the tail rotor blades and spars, refer to the tail rotor balancing procedures in the Construction Manual.



3. Remove bolt (part no. E00-2311) and two washers. Then slide the actuator arm to one side and place a small amount of grease on the bolt hole in the pivot casting. Reassemble actuator arm with bolt and check for security of nut with cotter pins.
4. Every 50 hours, add grease to the fitting on the tail rotor barrel until the grease comes out near the pitch horns, and wipe off excess. Drill a 3/16 inch hole in each blade tip cap so that grease thrown out by centrifugal force will not build up inside the blade.

SECTION VI: CONTROL ASSEMBLIES

The Control Assemblies of the EXEC 90 helicopter transfer control inputs from the pilot and passenger to the associated location on the helicopter. The four areas that require control inputs are:

- A. Directional Controls
- B. Cyclic Controls
- C. Collective Controls
- D. Throttle Controls

Coordinated inputs of these controls allow the pilot to maintain control of the helicopter throughout all its maneuvers.

INSPECTION CHART

DIRECTIONAL

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E16-6131	Cross Shaft Bushing	1000 HR	2000 HR	VI-1
E16-6130	Scissor Mt. Bushing	1000 HR	2000 HR	VI-2
E16-1200	3/16" Female Rod End	100 HR	1000 HR/OC	VI-3
E16-1130	1/4" Male Rod End	100 HR	1000 HR/OC	VI-4
E16-1140	1/4" Female Rod End	100 HR	1000 HR/OC	VI-5
E16-1212	Directional Control Cable	100 HR	2000 HR/OC	VI-6

Reference prints: E16-2000
E17-2000

INSPECTION CHART

CYCLIC

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E14-6131	Cross Shaft Mt. Bushing	1000 HR	2000 HR	VI-7
E14-1241	Nylon Bushing	1000 HR	2000 HR	VI-8
E14-1150	5/16" Male Rod End	100 HR	2000 HR/OC	VI-9
E14-1210	Cyclic Control Cable	100 HR	2000 HR/OC	VI-10
E14-1220	Cyclic Control Cable	100 HR	2000 HR/OC	VI-11

Reference print: E14-2000

INSPECTION CHART**COLLECTIVE**

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E15-6131	Cross Shaft Mt. Bushing	1000 HR	2000 HR	VI-12
E15-1230	5/16" Male Rod End	100 HR	2000 HR/OC	VI-13
E15-6130	Collective Rod End Plug	100 HR	2000 HR/OC	
E49-1400	Collective Control Rod	100 HR	2000 HR/OC	

Reference print: E15-2000
 E49-2002

INSPECTION CHART**THROTTLE**

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E15-3150	Pilot Throttle Shaft	1000 HR	2000 HR	VI-14
E15-3170	Transfer Shaft	1000 HR	2000 HR	VI-15
E15-3220	Main Throttle Shaft	1000 HR	2000 HR	VI-16
E15-1150	1/4" Male Rod End	100 HR	2000 HR/OC	VI-17
E24-7530	Throttle Cable Assy.	100 HR	500 HR/OC	

Reference print: E15-2000

SECTION VI: CONTROL ASSEMBLIES

SERVICE NOTES:

1. Remove the cross shaft bushing (part no. E16-6131) by clipping the safety wire from the bolt (part no. E00-2501) and then removing the bolt. Lift up on the end of the foot pedal cross shaft (part no. E16-3101) just enough to remove the cross shaft bushing. Clean and apply a small amount of grease on the bushing and reassemble. Re-torque the bolt and safety wire. Do this procedure for both pilot and passenger sides.
2. Remove the scissor mount bushing (part no. E16-6130) by removing bolt (part no. E16-2406). Lower the bushing away from the scissor beam (part no. E16-3120). Clean, grease lightly, and reassemble. Check clearance between head of bolt (part no. E16-2406) and front frame tube. There should be a minimum of 1/16" clearance. If proper clearance cannot be obtained, shim under nylon scissor beam pivot bushing (part no. E16-6120) to achieve clearance.
3. Remove bolt (part no. E00-2305) and the locking nut and rod end (part no. E16-1200). Then count the number of turns to remove, and install the new rod end with the same number of turns. Tighten the locking nut, replace the bolt and verify the cable travel. Refer to the Construction Manual for detailed procedures.
4. Remove bolts (part no. E00-2406) and remove both rod ends. Using calipers, measure and note the distance from center to center. Reinstall the new rod end with the same measurement. Refer to the Construction Manual for detailed procedures.
5. See note VI-4 above.
6. **CAUTION:** Under no conditions should any type of lubrication or oil be used on the sliding inner cable.
7. Grease cross shaft pivot bushing. See Construction Manual for detailed procedures.
8. Remove bolt (part no. E00-2414) and the two large fender washers. Place a small amount of grease (Mystik JT-6) on the bolt, bushing and mating surfaces. Reinstall the bolt and two fender washers. Tighten the bolt enough to hold firmly while still allowing the cyclic clevis to move easily without any end play.

9. Remove bolt (part no. E00-2510) and pull the rod end away from clevis. Loosen the locking nut and on the rod end and unscrew it, counting the number of turns. Install the new rod end with the same number of turns. Tighten locking nut and install bolt. Refer to the cyclic control section and rigging procedures for the elastomeric rotor hub in the Construction Manual to verify adjustments.
10. **CAUTION:** Under no conditions should any grease or lubricant be used on the sliding inner cable.
11. See Note VI-10 above.
12. Cut safety wire and remove bolt (part no. E00-2501). Lift collective control shaft (part no. E15-3120) enough to remove the cross shaft mounting bushing (part no. E15-6131). Clean and lightly grease with Mystik JT-6 grease. Reassemble bushing, position collective control shaft and insert the bolt. Torque bolt and add safety wire.
13. Refer to prints E49-2002 and E15-2001.
 - A. Remove the bolt (part no. E00-2516) that holds the rod end to the collective actuator fork.
 - B. Remove the rod end spacer (part no. E49-1410) and spring bracket (part no. E49-1470). Relax spring tension.
 - C. Remove bolt (part no. E00-2514) from the "G" control arm. Remove the collective control rod (part no. E49-1400) from the helicopter.
 - D. Measure and remove the old rod ends from the collective control rod, counting the number of turns it takes to remove them.
 - E. Reinstall the new rod ends using the same number of turns as in step D, then confirm this position by measurement.
 - F. Reconnect the lower rod end first and torque the bolt.
 - G. Inspect the upper bolt (part no. E00-2516) then reassemble the spring bracket and rod end spacer and align the hole in the rod end to the hole in the actuator fork.
 - H. Pull the spring assembly and insert the bolt. Reinstall the remaining rod end spacer and torque the bolt.
 - I. Reconfirm collective pitch setting by reviewing collective rigging procedures in the Construction Manual.
 - J. Make sure rod end lock nuts are firmly in place.
14. Remove bolt (part no. E00-2306). Remove "B" control arm (part no. E15-5110). Remove washer (part no. E00-4600) and slide pilot throttle shaft (part no. E15-3150) out toward the front of the helicopter. Lightly grease the throttle shaft where the nylon bushing makes contact on the shaft. Reassemble by inserting the throttle shaft through the bushing. Reassemble the washer and "B" control arm in their respective positions. Reinstall the bolt in the control arm casting and torque.

15. Remove bolt (part no. E00-2306). Remove both "B" control arm castings (part no. E15-5110), marking their position. Remove washer (part no. E00-4600) and slide the transfer shaft (part no. E15-3170) out toward the front of the helicopter. Lightly grease the transfer shaft where the nylon makes contact on the shaft. Reassemble by inserting the transfer shaft back through the bushing the washer and both "B" control arm castings in their respective positions. Insert bolts back through the castings and torque.
16. Removal or inspection of the throttle grip is easily done by placing an air hose nozzle into the hole on the front of the rubber grip and blowing air into the grip at a high velocity. The grip will expand and can be pulled off. Note: Do not cut off any length of the rubber grip. The part of the grip that extends past the throttle and onto the non-rotating part of the collective stick will help act as a friction lock for the throttle. Removal of the throttle shaft is done by removing the bolt (part no. E00-2306) and the "B" control arm castings (part no. E15-5110). Slide the throttle shaft completely out of the pilot collective stick. Place a small amount of grease on the throttle shaft (part no. E15-3150) and also on the plastic bushings. Re-install the throttle shaft back in the collective stick and rotate several times until the throttle moves freely. Finish assembly.
17. Remove bolts (part no. E00-2407). Measure center of rod ends on Throttle Connector (part no. E15-3160). Loosen lock nuts and count the number of turns to remove the rod ends (part no. E15-1150). Install new rod ends using the same number of turns and check C/L measurement. Confirm throttle settings by referring back to the Construction Manual.

SECTION VII: OIL SYSTEM

The powerplant in the EXEC 90 utilizes a dry oil sump. The oil is circulated from the oil sump through the engine, to the oil coolers, through the oil filter, and back into the oil sump.

This oil cooler design allows for lower operating oil temperatures providing longer oil and component lifetimes.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E28-7100	Oil Sump Assy.	50 HR	OC	VII-I
* E28-1190	Valve Cover Drain Hose	100 HR	500 HR/OC or	5 yrs
* E28-1230	Main Oil Drain Hose	100 HR	500 HR/OC or	5 yrs
E28-1110	Oil Filter	25 HR	25 HR/OC	VII-2
* E28-6141	Hose	100 HR	500 HR/OC or	5 yrs
* E28-6111	Hose	100 HR	500 HR/OC or	5 yrs
* E28-6121	Hose	100 HR	500 HR/OC or	5 yrs
* E28-6132	Hose	100 HR	500 HR/OC or	5 yrs
E28-1150	Oil Cooler Assy.	100 HR	2000 HR/OC	VII-3
E36-1200	Oil Pressure Cap. Tube	100 HR	1000 HR/OC or	5 yrs
E36-1170	Oil Pressure Gauge	100 HR	OC	

Reference print: E37-2000

* NOTE: All hoses are general change out one for one. Refer to Construction Manual.

The rubber oil drain hoses should normally be replaced at 500 hours, five years, or on condition, whichever comes first. Shelf life, or time before entering service, is not included if the hoses have not been exposed to the environment and have not been affected by aging.

SECTION VII: OIL SYSTEM**SERVICE NOTES:**

1. To change oil in sump:
 - A. Run engine to achieve at least 140 degrees F on oil temperature gauge. Shut engine off.
 - B. Remove drain plug and drain oil from sump.
 - C. Replace drain plug and fill sump with recommended type and grade oil (see Engine Manual). Fill sump to 2-5/8" from the bottom of the tank. Helicopter must be on level ground when measuring.

2. To change the oil filter:
 - A. Remove the lower right side body panel.
 - B. Unscrew the oil filter and dispose of it properly.
 - C. Spread a little clean oil around the o-ring on the filter with your finger tip. Fill the filter with oil of the appropriate grade and type. Screw the filter on to the mount. After the rubber gasket makes contact, turn the filter an additional 2/3 turn to insure proper seal.

3. Wash the outside only of the oil cooler assembly with a warm soap and water solution using a low to medium pressure. Rinse out with clean fresh water. If the radiator has oil deposits on or in between the cooling fins, use a degreaser first, then rinse out with clean fresh water. If any of the fins have been bent over or flattened to such a point so that air cannot flow through the coil, straighten the fins to allow proper airflow.

SECTION VIII: COOLING SYSTEM

The EXEC 90 power plant is a water cooled engine. The water pump circulates coolant from the engine through the radiator system. A fan is located over the closed radiator system to force cooler outside air across the radiators for effective cooling.

Utilization of a water cooled system (as opposed to air cooled) allows the operating temperature of the power plant to be maintained at a constant level, providing consistent horsepower and power plant longevity.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E30-1160	Radiator	100 HR	2000 HR/OC	VIII-1
E34-1180	Radiator Cap	100 HR	500 HR/OC or 2 yrs	
* E34-1230	Hose	100 HR	500 HR/OC or 5 yrs	
* E34-1191	Hose	100 HR	500 HR/OC or 5 yrs	
* E34-1200	Hose	100 HR	500 HR/OC or 5 yrs	
* E34-1221	Hose	100 HR	500 HR/OC or 5 yrs	
* E34-1280	Hose	100 HR	500 HR/OC or 5 yrs	
* E34-1150	Hose	100 HR	500 HR/OC or 5 yrs	
E29-1000	Water Pump	100 HR	1000 HR/OC	VIII-2
E29-5100	Pulley	100 HR	2000 HR/OC	VIII-3
E29-1130	Belt	100 HR	500 HR/OC	

Reference print: E37-2000

* NOTE: The rubber coolant hoses should normally be replaced at 500 hours, five years, or on condition, whichever comes first. Shelf life, or time before entering service, is not included if the hoses have not been exposed to the environment and have not been affected by aging.

SECTION VIII: COOLING SYSTEM

SERVICE NOTES:

1. Spray the radiators with mild soapy water solution using soft to medium pressure. A hard stream of water may damage the fins. If radiators are covered with oil or grease, use a mild degreaser which will not harm or have any effect on plastic. Wash off with a mild soapy solution and dry.
2. If the helicopter is stored for a long period of time without operation, place a small amount of oil (#10W non-detergent) on the shaft seal assembly. For replacement of the water pump, refer to the Construction Manual and prints E30-2000 and E31-2000. For replacement of the water pump seal and bearings, follow these procedures:
 - A. Remove the water pump.
 - B. Remove the water pump pulley (part no. E29-5100). Deburr the bolt hole as necessary.
 - C. Remove the impeller housing by removing the 7 bolts on top of the water pump body.
 - D. Place the pulley end of the shaft in a soft jaw vise. Using a belt wrench or appropriate tool, turn the impeller counter clockwise to remove it from the shaft. BEFORE REMOVING THE IMPELLER, NOTE HOW THE SEAL IS INSTALLED SO THAT THE REPLACEMENT CAN BE REINSTALLED IN AN IDENTICAL MANNER. Be careful not to damage the impeller or shaft. (A bolt may be inserted into the pulley bolt hole of the shaft to help keep the shaft from rotating.)
 - E. Determine if the bearings need replacement by checking the smoothness of operation and the side-end play. Also examine the condition of the shaft itself checking for excessive corrosion or other damage. The shaft and bearings are an assembly and are replaced as such. If you determine the shaft assembly to be bad, it must be replaced using water pump shaft and bearing, part no. E29-2100. Before removing the shaft, measure the distance from the "face" of the water pump body to the end of the shaft where the impeller "bottoms" when installed. Record this number for use when installing the replacement shaft assembly. Proceed to step F below if the shaft assembly is to be replaced. If the shaft assembly appears to be in good condition, proceed to step H.
 - F. Place the water pump body in an oven and heat to 250-275 degrees F. **CAUTION:** DO NOT EXCEED 300 DEGREES F. Remove the water pump body and place it on a surface where the shaft assembly can be pressed out of the casting. Do not use excessive force as it could damage or crack the aluminum casting. (The seal will be pressed out with the shaft assembly.)

- G. Install the new shaft assembly by first cleaning the water pump body thoroughly. Pre-coat the bearing O.D. and the body I.D. with a light film of Anti-seize. The shaft must be reinstalled by using light pressure ONLY. You will need to fabricate a bushing which allows you to press ONLY on the outer race of the bearing. Do not install by pressing on the shaft itself. Press the shaft assembly in until the height dimension recorded in step F is matched. Proceed to step I.
- H. Using fine emery cloth or equivalent, sand and deburr the shaft eliminating any corrosion and burrs. Hold the water pump body in a vise and carefully tap out the seal assembly using a punch and hammer. (Be careful not to damage the shaft or water pump body.)
- I. Before installing the new seal (part no. E29-1150), thoroughly clean the shaft and water pump body. Put a light coat of silicone on the seal surface which will contact the body. Install the seal until the outer flange of the seal bottoms and sets flat. Wipe off excess silicone.
- J. The shaft, seat counter bore, and rubber members of the seat should be lubricated with a light oil or grease. Check seal surfaces to be sure they are free of any dirt or grit. **CAUTION:** Do not damage seal contact surfaces.
- K. Carefully position and align the two mating seal pieces.
- L. Fill the threads of the impeller with silicone. Screw the impeller on clockwise until tight; check for proper alignment of the seal during this process. It must remain centered on the shaft as the impeller is installed. Using a belt wrench, tighten the impeller and wipe off any excess silicone. (Be careful not to damage or scratch the impeller.)
- M. Place a new gasket (part no. E29-1140) on the body and install the impeller housing using four bolts only. Fabricate a shim by cutting and bending a strip of shim stock to measure the clearance between the impeller and impeller housing. This clearance should be .015" to .025". If the clearance is out of tolerance, special thickness gaskets are available to achieve the proper clearance. Call a factory service representative for assistance. NOTE: Have current gasket thickness and the assembled impeller clearance measurements at hand when you call.
- N. Prior to installing the remaining three bolts, apply a coating of silicone to the threads, then install and torque to 120 in. lbs. Remove the four bolts initially installed for taking the clearance measurement and reinstall them using the same procedure as used on the last three bolts.
- O. Install the water pump pulley and tighten the bolt.
- P. Install the water pump assembly. Refer to the Construction Manual for installation details.
- Q. Install alternator belt.

SECTION IX: ENGINE & EXHAUST SYSTEM

The EXEC 90 Engine has been designed specifically for the RotorWay Helicopter. RotorWay International manufactures the entire engine. Refer to the Engine Manual for further information.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E24-9710	Exhaust Gasket	100 HR	500 HR/OC	IX-1
E24-7530	Throttle Cable	100 HR	500 HR/OC	
E24-9840	Heat Wrap	100 HR	2000 HR/OC	
E24-9760	Battery	100 HR	2 yrs/OC	IX-2
E24-9801	Stainless Steel Muffler	100 HR	2000 HR/OC	
E24-9810	Stainless Steel Header	100 HR	2000 HR/OC	
E24-9720	Electronic Ignition Units	100 HR	2000 HR/OC	*
E24-1250	Spring	100 HR	1000 HR/OC	
E24-9831	Heat Shield	100 HR	2000 HR	
E27-1160	Rod End	100 HR	1000 HR/OC	
E27-1240	Rubber Insert	100 HR	2000 HR/OC	or 3 yrs
E27-3110	Torque Link Assy.	100 HR	2000 HR/OC	IX-3
E24-0162	Engine	25 HR		*
E24-9940	Spark Plug Wires	250 HR	500 HR	
E24-9948	Spk.Plug Wire Separator	100 HR	500 HR	
E24-9740	Spark Plug	50 HR	100 HR	
E24-7553	Air Filter	25 HR	250 HR	
E24-1600	Engine Pulley	100 HR	1000 HR	

Reference Prints: E25-2000
E27-2000

* See Engine Manual

SECTION IX: ENGINE & EXHAUST SYSTEM**SERVICE NOTES:**

1. Check around exhaust gasket for leaks when engine is idling. Failure to replace a leaky gasket can result in water hose failure and other engine related items. Cut safety wire securing header flange bolts (part no. E00-2504). Remove the bolts and hold the header flange up high enough to slip a new gasket in place. Reinstall the bolts, torque and safety wire.
2. Replace battery every two years or when battery will not take or hold a charge. Check acid level periodically to insure battery plates are covered with acid. Keep terminal posts clean and free from corrosion and dirt.
3. Remove the bolt (part no. E00-2517) that holds the torque link and remove the rod end bolt (part no. E00-2513). Remove the torque link assembly and inspect for cracks. If replacing rubber insert (part no. E27-1240), remove the aluminum insert (part no. E27-6160). Remove old rubber and insert new rubber around the aluminum insert and press back into torque link attachment tube (part no. E27-3100). Reinstall the torque link and tighten and torque the bolts. Verify for correct engine clearance on the passenger side near the oil filter bracket and the pilot side near the valve oil drain fitting.
4. Check engine pulley for anodizing wear. (See Engine Manual for greasing and replacement information.)

SECTION X: DRIVE TRAIN

The drive train is a series of reduction pulleys and sprockets that transmit power from the engine to the main rotor system. No transmissions, gear boxes or drive shafts are used. The system is simple to monitor and maintain.

INSPECTION CHART

PRIMARY

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E49-6172	Main Sprocket	100 HR	1000 HR/OC	* X-1
E49-7010	Sprocket Hub	100 HR	1000 HR/OC	* X-1A
E00-2608	Bolt 3/8 x 3-1/8	500 HR	2000 HR	Torque
E00-2450	Bolt 1/4 x 1-1/4	100 HR	500 HR	Torque
E00-3410	Thin Locknut	100 HR	500 HR	Torque
E00-9028	Hose Clamp	500 HR	2000 HR	*
E24-5110	Upper Clevis	500 HR	2000 HR/OC	*
E24-5100	Upper Engine Mount Cup	500 HR	2000 HR/OC	*

Reference print: E49-2001

* Inspect

INSPECTION CHART

SECONDARY

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E23-1000	Secondary Pulley Assy.	100 HR	1000 HR/OC	* X-2
E23-5000	Upper Bearing Assy.	25 HR	1000 HR/OC	X-2A
* E23-1240	Lower Bearing	100 HR	100 HR/OC	* X-3
E23-1210	Main Drive Belts	50 HR	500 HR/OC	X-4
E23-7141	High Temp Fan	100 HR	2000 HR/OC	X-5
E23-1170	Snap Ring	500 HR	2000 HR	*
E23-8000	Fan Pulley Assy.	500 HR	2000 HR/OC	X-6
* E23-1220	Fan Pulley Bearing	100 HR	100 HR/OC	
E23-6180	Key, Secondary Sprocket	1000 HR	2000 HR/OC	X-7
E23-6190	Retainer Plate	1000 HR	2000 HR	*

Reference print: E23-2000

* Inspect

INSPECTION CHART**OIL BATH**

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E33-7100	Top Rear Cover	100 HR	OC	*
E33-7121	Lower Oil Bath Pan	100 HR	OC	*
E33-7110	Top Front Cover	100 HR	OC	*
E33-1170	Rear Oil Seal Assy.	100 HR	500 HR/OC	* X-8
E33-1140	Tension Spring	100 HR	2000 HR	*
E33-3000	Rain Shield	100 HR	2000 HR	*

Reference print: E33-2000

* Inspect

INSPECTION CHART**CHAIN**

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E49-1290	Drive Chain W/Link	100 HR	100 HR/OC	X-9

INSPECTION CHART**CLUTCH IDLER ASSEMBLY**

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E27-6100	Idler Pulley Assy.	100 HR	2000 HR/OC	X-10
E27-6100B	Idler Pulley Bearing	100 HR	500 HR/OC	
E27-1160	Rod End	100 HR	2000 HR/OC	*
E27-1210	Idler Spring	100 HR	1000 HR	* **
E27-2160	5/16 Rod End	100 HR	2000 HR	*
E27-6131	Clutch Tube Assy.	100 HR	2000 HR/OC	X-11
E27-3170	Pulley Mt. Arm Weldment	100 HR	2000 HR	X-12
E27-5100	Clutch Arm Casting	100 HR	2000 HR/OC	*
E00-2522	Bolt	100 HR	2000 HR	*

Reference print: E27-2000
E49-2001

* Inspect

** Grease

SECTION X: DRIVE TRAIN

SERVICE NOTES:

1. Inspect the main drive sprocket for any noticeable wear around the teeth. First indication of wear will be an abnormal amount of aluminum flakes and dust in the oil bath and oil lubrication. Contact the factory for further inspection and instructions.
 - A. Check sprocket hub for backlash against the main drive shaft. This can be done by grabbing the main rotor shaft and applying pressure against the standard rotation of the rotor system. Monitor the relationship of the main rotor shaft to the sprocket hub for any movement. If any movement is apparent, contact the factory.

2. The secondary unit comes as a complete assembly and should not be tampered with or opened at any time. A visual inspection and a lock up inspection of the overrunning clutch should be done during the pre-flight inspection. Any other adjustment and work performed must be done by the factory service center at RotorWay
 - A. The upper bearing assy. (part no. E23-5000) should have 1 shot of Mystik JT-6 grease every 25 hours.
 - *B. At the 100 hour inspection intervals, inspect the lower secondary shaft. This requires removal of the fan pulley, tail rotor drive pulley and lower mount bearing from the secondary shaft. Both the fan pulley bearing and the lower mount bearing should have been Loctited to the shaft during construction. A gear puller and heat will be needed to remove these bearings. Excessive heat should be avoided, which may damage the shaft or other components (the shaft can be damaged if shaft temperatures exceed 400 degrees Fahrenheit). Bearings should not be reused on reassembly. The shaft should be visually inspected for surface imperfections and also by using a dye penetrant, looking for surface cracks. Recommended penetrant inspection kits are Met-L-Check Penetrant Kit or Magnaflux Spotcheck Test Kit, available from suppliers such as Aircraft Spruce. Either kit will last for many years. Your local FBO may also be able to supply the kit or inspect the shaft.

- * 3. The lower bearing, part no. E23-1200, is removed at 100 hour intervals for lower secondary shaft inspection. The bearing must be replaced at 100 hours; do not re-use the old bearing. See Service Note 10-2B above.

4. The main drive belts are replaced by following the procedures listed below. Pay close attention because you will follow the reverse procedures for reassembly.
 - A. Clean new belts with a clean rag lightly saturated with acetone.
 - B. Cut old belts off with aviation shears or a sharp knife. Be careful not to damage any of the parts.

- C. Remove radiator assembly by bracing the tail boom with a stand or other appropriate method. Remove the radiator hoses from the radiators and necessary oil lines. Refer to print E30-2000 and E37-2000. Remove the tail boom support tube bolts and remove the entire radiator assembly. Plug the oil lines and water inlet and outlet manifolds. Place the assembly out of the way until future installation.
 - D. Index the fan to the fan hub assembly and remove the fan from the hub.
 - E. Remove the two bolts that hold the lower bearing flange to the square drive tube. Then remove the two bolts that hold the lower bearing flanges together so you can lower the bottom flange, and move it from the square drive tube.
 - F. Remove bolts (part no. E00-2524) and lower the upper engine mount cup (part no. E24-5100) into the upper engine pulley on the engine. Loosen the belt tension by backing out the all thread adjustment bolt (part no. E00-2525).
 - G. Remove bolts (part no. E00-2531 and E00-2416). Remove the upper frame clevis casting.
 - H. Take one of the four belts and slip the belt between the secondary unit and the square drive frame tube. Pull the belt forward, up and over the pulley. **CAUTION:** Do not damage the belts. Repeat this procedure with the remaining three belts. Align all belts in the correct order on both the engine and secondary unit pulleys.
 - I. Reassemble all parts by following the disassembly procedure in reverse. Follow the belt tensioning procedures shown in the Construction Manual.
5. Check high temp fan for stress cracks on blades. Do not confuse stress cracks with excess resin cracks. Stress cracks will penetrate the fiberglass and resin cracks will be on the surface only.
6. Check pulley for wear of anodizing and for chip or sand erosion. For bearing replacement do the following:
- A. Remove the fan pulley assembly by removing the lower snap ring and lowering the pulley. It may be necessary to use a puller, as the pulley was originally assembled using loctite.
 - B. Remove snap rings on either side of the pulley.
 - C. Preheat the pulley in oven at 250 to 275 degrees F. **CAUTION:** Do not exceed 300 degrees.
 - D. Lightly press out the old bearing with a press or vise. Note which end of the bearing had the lock ring.
 - E. Clean the pulley inner surface with acetone and then clean the new bearing.
 - F. Again reheat the pulley to 250-275 degrees F.
 - G. Insert snap ring into the pulley groove and make sure it is seated.
 - H. Place the pulley on a flat surface and apply a thin coat of loctite #609 to the inner surface of the pulley and the outer surface of the bearing.

- I. With the bearing in the correct position, lightly press the bearing into the pulley until the bearing contacts and sits against the snap ring. **CAUTION:** If a press is required, make sure you press against the outer race of the bearing and not the inner race.
 - J. Replace the second snap ring in the pulley and let air cool. NOTE: Use loctite upon final assembly of this part to the secondary shaft assembly.
7. Check for close tolerance fit against the secondary shaft and secondary sprocket.
 8. For removal of rear oil seal:
 - A. Remove chain and secondary shaft.
 - B. With heat gun or propane torch, heat surrounding area where glue exists. **CAUTION:** Use only enough heat to pop the seal out with a screwdriver.
 - C. Clean the lower oil bath pan with acetone and lightly sand any glue or uneven protrusions from the pan.
 - D. Sand mating surface of the seal with 400 grit paper and clean with acetone. **CAUTION:** Do not touch the rubber seal with sand paper.
 - E. Mix blade glue at the proper ratios and apply to both parts.
 - F. Place a little oil on the rubber seal and shaft.
 - G. Slide the oil seal down (correct side up) pressing down with light finger pressure until the seal seats on the oil bath. Oil seal pressure must be applied evenly.
 - H. Wipe off excess glue with a dry rag. Let the glue cure for 12 hours.
 9. Refer to print E49-2001 and chain installation instructions in the Construction Manual.
 10. Refer to Note X-6 for the same procedure. Also refer to the Construction Manual and print E27-2000.
 11. Inspect at every 100 hours. Grease at every 500 hours. Remove pop rivets on the end of the clutch spring tube and unbolt the rod end from the clutch arm casting (part no. E27-5100). Remove the clutch tube piston (part no. E27-6131). Make a visual inspection for wear. Grease the piston and clutch spring tube. Compressing the piston a slight amount, replace the two rivets back in the existing rivet holes. Reconnect the clutch arm casting and check for smooth operation.
 12. Remove the pulley mounting arm bolt (part no. E00-2522). Place a thin film of grease on the bolt and mating surfaces. Reinstall the bolt and tighten it enough to allow the swing arm to pivot.

SECTION XI: FUEL SYSTEM

The fuel system in the EXEC 90 helicopter has two fuel tanks. The fuel tanks are tied together so that both provide fuel to the power plant at the same time and remain equalized as the fuel is consumed. The fuel flows from the tanks through a shut off valve, and then through a filter. After the filter, the fuel flows through 2 electric fuel pumps piped in parallel to the fuel pressure regulator and then to the power plant. A fuel drain valve is provided for fuel contamination checks. There is a small screen filter on the carburetor (refer to Engine Manual). The fuel capacity is monitored by an electronic fuel sender and gauge that provides an accurate means of fuel verification for the pilot.

INSPECTION CHART

INSPECTION		SERVICE			
<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>	
E25-6110	Fuel Tank, Passenger	100 HR	2000 HR/OC	*	
E25-6101	Fuel Tank, Pilot	100 HR	2000 HR/OC	*	
E25-6121	Fuel Gauge & Sender	100 HR	OC		
E25-1191	Fuel Valve	100 HR	2000 HR	*	
E25-1380	Fuel Pump	100 HR	1000 HR/OC	*	
* E25-1390	Fuel Hose	100 HR	500 HR/OC or 5 yrs		
E25-2101	Fuel Cap	100 HR	2000 HR/OC	XI-1	
E25-1370	Fuel Pressure Regulator	100 HR	2000 HR/OC	XI-2	
E25-1360	Fuel Filter	50 HR	100 HR/OC		

Reference print: E37-2000

* Inspect

* NOTE: The rubber fuel hoses should normally be replaced at 500 hours, five years, or on condition, whichever comes first. Shelf life, or time before entering service, is not included if the hoses have not been exposed to the environment and have not been affected by aging.

SECTION XI: FUEL SYSTEM**SERVICE NOTES:**

1. Check fuel cap for proper venting by placing a vacuum pump hose over the vent inlet. Turn the pump on. If the vent is inoperative, the vacuum pump will draw down. If the vent is good, the pump will remain at a constant speed and pressure.
2. Check the Engine Manual for fuel calibration procedures. Regulator should be set at 4 to 4.5 reading.
3. Replace the fuel filter every 100 hours or OC. Check for contamination by cutting the used fuel filter in half and inspect the inlet side of the filter element. If the element is contaminated, remove the fuel tanks and wash them out with gasoline until clean. Install the new filter in the proper flow direction and verify fuel flow as described in the Engine Manual.

SECTION XII: FAN DRIVE

The fan drive system is a series of pulleys and belts providing the proper speed reduction for the fan design.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E31-1120	Bearings	100 HR	500 HR/OC	XII-1
E31-1130	Belt (Upper)	100 HR	500 HR/OC	XII-2
E31-1141	Belt (Lower)	100 HR	500 HR/OC	XII-2
E31-5100	Pulley (Upper)	100 HR	2000 HR/OC	*
E31-5120	Pulley (Lower)	100 HR	2000 HR/OC	*
E31-6100	Shaft	500 HR	2000 HR/OC	*

Reference print: E31-2000

* Inspect

SERVICE NOTES:

1.
 - A. Remove the fan assembly from the helicopter.
 - B. Loosen set screws from the locking collar, tap with hammer and punch in the opposite direction from the original set position.
 - C. With a torch or heat gun, lightly heat the bearing so the loctite will release the bearing from the shaft.
 - D. Clean the shaft and install new bearings (part no. E31-1120) on the shaft in the correct position. Loctite the new bearings to the shaft, allowing time for the loctite to cure before tightening the lock rings and set screws.
 - E. Reassemble the fan assembly on the helicopter following the procedures in the Construction Manual and print E31-2000.

2. New belts should be cleaned with acetone and properly tensioned following the procedures outlined in the Construction Manual.

SECTION XIII: MAIN ROTOR BLADES

The main rotor blades are one of the key components of the helicopter. Proper maintenance and care of the main rotor blades will increase their longevity.

The main rotor blades are made from aluminum alloys, and are constructed from 3 pieces: the main spar (C section) and an upper and lower aluminum skin. The spar is an aluminum alloy extrusion with a series of various heat treatments. The skins are of T6 aluminum and are bonded to the spar with a high strength adhesive, then riveted at specified intervals. After construction, the blades are quality inspected and measured at specific intervals. This allows two blades with the identical airfoils to be matched and sold as a pair.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E20-3000	Retention Strap Assy.	25 HR	1000 HR/OC	**
* E20-1010	Asymmetrical Rotor Blade	25 HR	1500 HR/OC	XIII-1
* E20-1011	Asymmetrical Rotor Blade	25 HR	1500 HR/OC	XIII-1
E00-2800	Bolt (9/16)	100 HR	1000 HR/OC	XIII-2
E00-3800	Nut (9/16)	100 HR	1000 HR/OC	XIII-3
E20-3170	Tip Weight	25 HR	1000 HR	XIII-5
E20-6000	Aligner Block Assy.	100 HR	1000 HR/OC	XIII-6
E20-6180	Pitch Horn Clevis	100 HR	1000 HR	**
E20-6190	Pitch Horns	500 HR	1000 HR	**
E00-2523	Bolt	100 HR	1000 HR	**Torque
E20-1220	Aligner Block Bearing	100 HR	100 HR/OC	**

Reference prints: E20-2000
 E49-2000

** Inspect

SECTION XIII: MAIN ROTOR BLADESSERVICE NOTES:

1. Check for blade skin delamination by taking a small solid metal object like a nickel and tap along the rivet line (the seam where the skin is bonded to the spar) the full length of the blade on both the upper and lower skins. You should notice a solid sound resonating from the blade. Tap repeatedly along the seam listening for noticeable sound changes. If the sound changes from a solid to hollow sound, the blade skin may have delamination from the spar at that location and the factory should be notified. The tap test should be performed once every 25 hours, every three months, or after flying in violent weather conditions. A low rotor RPM on the helicopter can cause a wrinkling of the blade skins to the outboard side of the fiberglass doublers. If these conditions have occurred, contact the factory for further information. Blade fatigue is very difficult for a new and low time pilot to sense. Listed are some symptoms of blade fatigue:
 - A. Change in blade droop (while in its static position) from previous inspection.
 - B. Flight response controls seem sluggish and insensitive.
 - C. During an autorotation flare the blade will develop a shake that will not stop until collective pitch can be reduced.
 - D. Blade tracking seems to keep moving in and out and cannot stabilize.

CAUTION: Blade fatigue is a dangerous condition and can result in a serious incident if left undetected.

Newly painted blades can develop paint blisters or have blade paint erosion due to the type of conditions the helicopter is flown in. This can cause out of tracking conditions or a vibration in the rotor system. Keeping the leading edge smooth can be done by wet sanding the edge of the blade with 400 grit wet and dry sand paper and feathering the paint to a smooth edge. Tracking and vibration should return to a normal condition.

2. It is important to keep this bolt torqued to 65-70 ft. lbs.
3. After the nut has been removed four or more times, it should be replaced with a new nut (part no. E00-3800). Torque to specs.
4. Inspect the elastomeric bearing (part no. E20-1400 and 1401) for signs of any delamination or separation. This bearing must be kept dry and free from grease, oil and solvents. If any question exists as to the condition of the bearing, the factory should be contacted.
5. Check tip weight bolts (part no. E00-2404) for tightness every 25 hours. It is not necessary to remove the end plug from the blade unless the bolts become loose.

6. Removal of aligner block bearing (part no. E20-1220) is as follows:
 - A. Remove the blades from the helicopter.
 - B. Remove the aligner block bolts (part no. E00-2523). Loosen the adjustment bolt (part no. E00-2417) two to three turns counter clockwise and remove the aligner block assembly.
 - C. Place in oven and heat to 225-250 degrees F. **CAUTION:** Do not exceed 300 degrees F.
 - D. Place on a press and press out the bearing with light pressure. Do not back out the adjustment bolt more than 2 or 3 turns because of damage to aluminum block threads.
 - E. Clean bearing hole in the aligner block with acetone.
 - F. Clean the new bearing (part no. E20-1220) with acetone and prepare to reinstall bearing into aligner block.
 - G. Place a small amount of loctite on the outer race of the bearing with a Q-tip. Press the bearing into the block with light pressure, leaving the bearing protruding .050" from the face of the block. (Check for all thread bolt clearance of bearing.)
 - H. Let the block assembly air cool. Then reinstall the block on the blade according to the directions in the Construction Manual.

ADDITIONAL NOTES: Check the lead-lag pin on the root end of the main rotor blades. If this pin is deformed and shows signs of the lead-lag bolts being over torqued, contact the factory for further information.

SECTION XIV: WIRING & ELECTRICAL

The Electrical System on the EXEC 90 requires little maintenance if inspected properly. The three largest problems are corrosion, vibration of connectors, and chafing of wires.

INSPECTION CHART

WIRING

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E35-8220	Inline Fuse Holder	100 HR	OC	XIV-1
E35-8230	Panel Mount Fuse Holder	100 HR	OC	XIV-2
E35-8240	Toggle Switch	100 HR	OC	XIV-3
E35-8320	Fuses	100 HR	2000 HR/OC	*
E35-8410	Battery Terminal Eyelet	100 HR	2000 HR/OC	XIV-4
E35-8520	Starter Relay	100 HR	1000 HR/OC	XIV-5
E35-8530	Starter Key Switch	100 HR	2000 HR/OC	*
E35-8540	Push Button Switch	100 HR	2000 HR	*
E35-8200	Plugs	100 HR	2000 HR/OC	*
E35-8595	LED Indicator Light(Grn)	100 HR	2000 HR/OC	*
E24-9760	12 Volt Battery	100 HR	2 yrs/OC	XIV-6

Reference prints: E35-2000
E35-2001

* Inspect

INSPECTION CHART

ALTERNATOR

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E42-1301	Alternator Belt	100 HR	250 HR/OC	XIV-7
E42-2021	Voltage Regulator	100 HR	1000 HR/OC	XIV-8
E42-1000	Alternator Assy.	100 HR	2000 HR/OC	XIV-9

Reference Print: E31-2000

SECTION XIV: WIRING & ELECTRICAL**SERVICE NOTES:**

1. Fuse holders can develop corrosion resulting in poor connections. Remove the fuse from the holder and make a visual inspection. If corrosion is found, clean or replace the fuse holder and fuse.
2. See note XIV-1 above.
3. Check the toggle switch by first disconnecting the power leads from the battery terminals. Then actuate the toggle switch on and off. The switch should have a good solid snap action in both directions. If in doubt, check the switch with a an ohm meter. Using a scale of high resistance, measure the in and out going controls of the switch. A 10% maximum loss is acceptable. If greater, replace the toggle switch.
4. Check the bottom and top of eyelets for corrosion. Poor contact will cause excessive heat buildup and could result in hard starting.
5. Check spade connections for corrosion and poor connections. Check relay for operating action. Do this by removing the spade terminal that goes to the starter solenoid and activate the starter button. The relay should have a small clicking action (be sure the battery is connected and the key switch is on). If the relay chatters, check the voltage going to the relay. Voltage should be a strong 12 volts from the battery. Then check to see if a good grounding source is applied to the relay body or mounting bracket. If a problem still exists, replace the starter relay (part no. E35-8520).
6. Replace battery every two years or when battery will not take or hold a charge. Check acid level periodically to insure battery plates are covered with acid. Keep terminal posts clean and free from corrosion and dirt.
7. Check for cracking and dry rot. Belt tension and alignment is important for longevity of belt operation. Refer to the Construction Manual for installation and alignment details.

8. To check the voltage regulator for normal operation, monitor the voltage meter during a normal run-up of the helicopter. If the regulator is working, a voltage jump will be noticed on the meter during the run-up procedure. If the meter does not show a positive voltage charge, check the following:
 - A. Alternator switch is on.
 - B. Alternator gauge is working.
 - C. Alternator belt is on and turning.
 - D. Fuse blown on output side or field side.

If all of the procedures above are determined to be in normal operating condition, replace the voltage regulator. If a problem still continues, it is possible the alternator is defective. See Note XIV-9.

9. Check the alternator pulley for wear. This pulley is not anodized and if operated in a dirty and sandy condition, the pulley may experience abnormal wear. Check the alternator output with the helicopter in full operating condition with the alternator switch on. The output should be 14.5 - 15.0 volts, with a 16 volt maximum. If proper output cannot be achieved, the alternator will need to be removed and serviced or repaired.

NOTE: This alternator is reworked at the factory to achieve our specifications and requirements. Replace only with an O.E.M. part.

SECTION XV: INSTRUMENTATION

Instrumentation on the EXEC 90 is normally maintenance free. It is, however, extremely important to keep in perfect operating condition. The instrumentation provides the pilot continuous information on all the helicopter systems conditions.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E36-1100	Hour Meter	100 HR	OC	Insp
E36-1120	Water Temp Gauge	100 HR	OC	Insp
E36-1130	Carb. Temp Gauge	100 HR	OC	Insp
E36-1170	Oil Pressure Gauge	100 HR	OC	Insp
E36-1220	Volt Meter	100 HR	OC	Insp
E36-3000	Dual Engine/Rotor Tach	100 HR	OC	Insp
E36-4010	Altimeter	100 HR	OC	Insp
E36-4020	Vertical Speed Indicator	100 HR	OC	Insp
E36-4030	Air Speed Indicator	100 HR	OC	Insp
E36-4040	Compass	100 HR	OC	Insp
E36-4050	Manifold Pressure Gauge	100 HR	OC	XV-1
E08-1400	Photo Tach	100 HR	OC	XV-2

Reference templates: E32-2

SERVICE NOTES:

1. If the manifold pressure gauge fills up with gas, drain the gas from the tube. Re-route the tube so that it is directed upward after it leaves the carburetor and mounted as high as possible.
2. This check should be done every 100 hours or when in question.

NOTE: If a transponder is used, a static air port must be incorporated into the system. (Check transponder installation information.)

SECTION XVI: GROUND HANDLING WHEELS

The Ground Handling Wheels on the EXEC 90 were designed for the sole purpose of ground handling the helicopter when the rotors are not turning. This system allows you to handle the helicopter on asphalt, concrete and grass.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E37-4090	Wheel and Tire	500 HR	2000 HR/OC	XVI-1
E37-0000	Tire Track	100 HR	OC	XVI-2

Reference print: E37-2000

SERVICE NOTES:

1. Refer to tire for inflation information. If handling over rough ground, reduce tire pressure to help absorb the shock being transmitted to the rotor system.
2. Tire track is important for maintaining longevity of the rear landing gear. If the tires track outward, this will put abnormal stress on the landing gear which can result in landing gear failure. Check tracking every 500 hours. At NO time ground handle the helicopter fully grossed out or with anyone in the cabin.

SECTION XVII: BALLAST WEIGHT

The ballast weight and ballast weight transport system was designed to keep the helicopter within its operating limitations during solo and dual flight configurations.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E22-****	Ballast Weight Assy.	100 HR	2000 HR/OC	XVII-1 *
E22-1000	Support Tubes	100 HR	2000 HR/OC	*
E22-1060	Mount Tubes	100 HR	2000 HR/OC	*
E22-1040	Mount Attachment Plate	100 HR	2000 HR/OC	*
E22-1050	Gusset	100 HR	2000 HR/OC	*
E22-4110	Steel Pin	100 HR	2000 HR/OC	*
E22-4120	Safety Clip	25 HR	100 HR	*

Reference print: E22-2000

* Check all welds

SERVICE NOTES:

1. For proper location of weight, refer to the Flight Manual for Center of Gravity limitations.

CAUTION: All weldments should be inspected thoroughly. If a weldment fails and causes the ballast weight to depart the ship during flight, the weight and balance of the helicopter could move outside the operating limitations.

SECTION XVIII: PAINT

The choice of paint is left up to the owner/builder of the helicopter. Any maintenance required should follow the paint manufacturers recommendations.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
	Paint	100 HR	OC	XVIII-1

SERVICE NOTES:

1. The body panels on the helicopter are manufactured with a gel coat finish. We recommend the use of a 2 part paint that will give you years of trouble free and very low maintenance operation.

NOTE: The lighter the color of paint used, the less heat will be absorbed into the cabin and engine compartment, resulting in cooler operating conditions. The shades we found best are light colors such as white, light blue, and tan.

SECTION XIX: ROTOR HUB

The Rotor Hub Assembly is comprised of sub-assemblies that make up the rotor system. These assemblies are the main shaft, swash plate and the rotor hub assembly. It comes from the factory as a completed assembly.

INSPECTION CHART

ROTOR HUB ASSEMBLY

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E49-6141	Rotor Hub Plate	100 HR	1000 HR	XIX-1
E49-5100	Teeter Block Assy.	100 HR	1000 HR/OC	XIX-2
E49-5110	Teeter Block Bearing	100 HR	500 HR	XIX-2
* E49-6281	Delrin Shim	100 HR	OC	XIX-3
* E49-6341	Stainless Steel Shim	100 HR	OC	XIX-4
E00-2607	AN 3/8 x 2-1/4 Bolt	100 HR	2000 HR/OC	Torque
* E49-6301	Main Rotor Drive Pin	100 HR	250 HR/OC	XIX-5
E00-4802	Thin Washer	100 HR	1000 HR	
E49-5131	Snap Ring	100 HR	100 HR/OC	
E49-6200	Thrust Blocks (M-S)	100 HR	2000 HR/OC	
E49-6210	Thrust Washer	100 HR	2000 HR	
E49-1340	Thrust Blk. Align Brng.	100 HR	100 HR/OC	XIX-6
E20-1400	Elastomeric Thrust Brng.	100 HR	1000 HR/OC	XIX-19
E49-1360	Thrust Block Liner	100 HR	2000 HR/OC	
E49-1170	Rod End (Left Hand)	100 HR	1000 HR/OC	
E49-1190	M/R Blade Pitch Link	100 HR	1000 HR/OC	
E00-2800	AN 9/16 x 4-1/4 Bolt	100 HR	1000 HR/OC	Torque
E00-9300	Set Screws 1/4 x 1/4	100 HR	1000 HR	Torque
E00-9301	Set Screws 1/4 x 5/8	100 HR	1000 HR	Torque
E00-9305	Set Screws 1/4 x 3/16	100 HR	1000 HR	Torque
E49-6310	Pitch Pin (Outboard)	100 HR	100 HR/OC	XIX-7
E49-6320	Pitch Pin (Inboard)	100 HR	100 HR/OC	XIX-7
E00-2417	AN 1/4 x 2 Full Thd.	100 HR	1000 HR/OC	XIX-8
E00-2523	AN 5/16 x 3-1/4 Bolt	100 HR	1000 HR/OC	XIX-9
E49-7000	Main Shaft	100 HR	1000 HR/OC	XIX-10
E49-5140	Grease Fitting	25 HR	2000 HR	XIX-11
E49-1331	Dust Cap	100 HR	2000 HR	

INSPECTION CHART

SWASH PLATE ASSEMBLY

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>R.C.O.</u>	<u>SERVICE REFERENCE</u>	
		<u>INTERVAL</u>				
E49-3610	Non-Rotating Swash Plate	100	HR	2000	HR/OC	*
E49-3520	Swash Plate Bearing	100	HR	2000	HR/OC	*
E49-3540	Snap Ring Non-Rotating	100	HR	2000	HR/OC	*
E49-3510	Rotating Swash Plate	100	HR	2000	HR/OC	*
E49-3230	Slider Ball Adj. Collar	100	HR	2000	HR/OC	XIX-12
E49-4010	Cyclic Cable Mount	100	HR	2000	HR/OC	*
E49-4100	Cyclic Mount Bearing	100	HR	2000	HR/OC	*
E49-4110	Snap Ring Cyclic Mount	100	HR	2000	HR/OC	*
E49-3530	Snap Ring Rot.Swash Plt.	100	HR	1000	HR/OC	*
E49-3210	Collective Slider Ball	100	HR	1000	HR/OC	* Lube
E49-3220	Spherical Bushing	100	HR	1000	HR/OC	
E49-1530	Slider Ball Clamp	50	HR	2000	HR/OC	XIX-13
E49-1520	Slider Ball O-ring	100	HR	1000	HR/OC	*
E49-3240	Snap Ring Slider Ball	100	HR	1000	HR	*
E00-9302	Set Screw (10-32)	100	HR	2000	HR	Torque
E49-4610	Swash Plate Scissor	100	HR	2000	HR	*
E49-4710	Scissor Clevis	100	HR	2000	HR	*
E49-4720	Male Rod End 5/16 x 3/8	100	HR	1000	HR/OC	
E49-4810	Nylon Scissor Bushing	100	HR	1000	HR/OC	XIX-14
E49-4210	Collective Actuator Fork	100	HR	2000	HR	*
E49-4310	Collective Scissor	100	HR	2000	HR	*
E49-1380	Collective Scissor Mount	100	HR	2000	HR	XIX-15
E14-6120	Control "T"	100	HR	2000	HR	
E14-1150	5/16 Male Rod End	100	HR	1000	HR/OC	
E49-4510	Counter Balance	100	HR	2000	HR/OC	*
E15-1230	5/16 Male Rod End	100	HR	1000	HR/OC	
E49-1410	Rod End Spacer	100	HR			
E49-1470	Spring Bracket	100	HR			
E49-1430	Tension Spring	100	HR	2000	HR/OC	
E49-4800	Delrin Washer (Scissor)	100	HR	1000	HR/OC	

Reference print: E49-2002

* Factory Service Item

INSPECTION CHART

SWASH PLATE ASSEMBLY CONTINUED

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE REFERENCE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	
E49-4830	Scissor Spacer 1-1/2"	100 HR	2000 HR	
E49-4820	Clevis Spacer 1/2"	100 HR	2000 HR	
E49-1180	Male Rod End 5/16"	100 HR	1000 HR/OC	
E49-1510	Dust Boot	100 HR	1000 HR/OC	*
E49-1500	Rubber Shaft Protector	100 HR	2000 HR/OC	*
E49-1700	Lower Brg. Backing Plate	100 HR	2000 HR	
E49-1220	Main Thrust Bearing	100 HR	1000 HR/OC	XIX-16
E49-1230	Main Bearing Flange	100 HR	1000 HR	XIX-17
E49-1260	Main Shaft Safety Spacer	100 HR	1000 HR	
E49-1240	Lower Shaft Bearing	100 HR	500 HR	

Reference print: E49-2002

* Factory service item

SECTION XIX: ROTOR HUB

SERVICE NOTES:

1. Although the hub plate appears to be a very substantial and solid part, it can be damaged. **CAUTION** should be taken to prevent gouges, nicks, and deep scratches to the hub plate.
2. The teeter block (part no. E49-5100) has a grease fitting that should have 4 shots of Mystic JT-6 grease every 25 hours. The grease should come through the bearing and be visible on the outer race of the bearing. Wipe off the excess grease to prevent it from being slung onto the blades during operation.
- * 3. Check hub alignment every 100 hours. If the alignment falls within the prescribed limits, it is not necessary to re-shim the hub.

The delrin shims are ready to install on the main drive pin. During final assembly of the hub to the main rotor shaft, if you find the allowable tolerance is impossible to achieve, you may lightly sand the delrin shim with 400 grit wet and dry sand paper to remove .0005 to .001 inch of material. This final adjustment will allow you to shim the hub within the .001 T.I.R. (total indicated reading) on final assembly.

- * 4. Check hub alignment every 100 hours. If the alignment falls within the prescribed limits, it is not necessary to re-shim the hub.

The stainless steel shims come in a variety of thicknesses, each with its own part number:

<u>PART NO.</u>	<u>THICKNESS</u>
E49-6343	.020"
E49-6344	.021"
E49-6346	.023"
E49-6347	.024"
E49-6348	.025"

When ordering replacement shims, order the shim kit, part no. E49-6330. This kit contains 10 stainless steel shims (2 each of the above sizes) plus 4 delrin shims, part no. E49-6330. This will give you a variety of sizes so that the exact combination of shims can be chosen.

NOTE: If your hub was originally equipped with "peel-off" shims, they will be replaced with stainless steel shims at replacement time. Peel-off shims are no longer available from the factory.

- * 5. Check hub alignment every 100 hours. If the alignment falls within the prescribed limits, it is not necessary to re-shim the hub. However, the main drive pin (part number E49-6301) must be removed and inspected carefully for grooves caused by contact with the stainless steel shims. To remove the main drive pin without removing the shims, follow these procedures:
- A. Remove the blades from the hub.
 - B. Remove the four (4) set screws located on the main shaft knuckle. (There are two set screws in each hole.)
 - C. Remove the snap rings (part no. E49-5131) and thin washers (part no. E00-4802) from both sides of the hub.
 - D. Carefully support the hub plate and drive out the main drive pin with a hammer and drift punch. Do not remove the shims.
 - E. Inspect the main drive pin. If any grooves or scratches are present, the pin must be replaced with a new one. Otherwise, it may be re-used for up to 250 hours total time.
NOTE: The 250 hour lifetime applies ONLY to the 3/4 inch diameter main drive pin (part number E49-6301). Early Exec 90 helicopters were equipped with a smaller 9/16 inch diameter main drive pin (part number E49-6300) which must be replaced every 100 hours.
 - F. Place a small amount of grease in the hole and re-install the drive pin, thin washers, snap rings, and set screws.
 - H. Upon re-assembly, check to make sure that the hub is centered within .001 T.I.R. and that the hub pressure is 8 to 12 lbs.
6. Replacement of alignment bearing is as follows:
- A. Remove thrust block assembly from the hub.
 - B. Remove the elastomeric bearing and thrust block liner.
 - C. Remove the dust cap (part no. E49-1331).
 - D. Heat the block to 250 degrees and press the old bearing out of the thrust block with a small press.
 - E. Clean the service area where the bearing makes contact with the thrust block.
 - F. Lightly coat the bearing and block with loctite and reheat the thrust block to 250 degrees.
 - G. Press the new bearing (part no. E49-1340) into the thrust block until it is even with the thrust block shoulder. (Refer to the rotor hub shimming procedure later in this section.)
 - H. Let air cool and replace the dust cap, liner, and elastomeric bearing. **CAUTION:** Make sure all original parts are marked before disassembly to insure they are reassembled in their original location.

7. Removal of Inboard and Outboard Pitch Pins:
 - A. Remove bolts part no. E00-2422 and part no. E00-2424.
 - B. Grasp outboard pitch pin (part no. E49-6310) with a pair of pliers and a soft cloth to prevent damaging the outer surface of the pin. Pull directly outward removing the pin from the hub. NOTE: The pin should normally slide out with very little pulling force, however, sometimes a light tapping motion with a plastic mallet must be used.
 - C. Tip the hub so it is at a 30 degree angle to the main shaft.
 - D. Insert a long punch and tap the inboard pin out. **CAUTION:** Try not to tap the thrust washer out at the same time. If the washer does come out, clean all mating surfaces with acetone and loctite and put the thrust washer back in place. (It may be necessary to tap with a mallet to insure seating.)
 - E. Before installing the new pins, insure the holes in the hub are clean and free from dirt and grit.
 - F. Lightly grease the pitch pins and insert the inboard pitch pin into the inboard hub hole. Keeping the flats of the pin upward, insert the pin to .785 (\pm .005 inch) from the thrust washer. Reinstall bolt (part no. E00-2424) and torque. Tighten locking nut securely.
 - G. Re-insert the outboard pin using the same procedure as the inboard pin but hold a tolerance of .750 (\pm .005 inch) from the outboard edge of the hub. Tighten bolt (part no. E00-2422) and lock the locking nut. Torque as required.
 - H. Re-check measurements:
 - Inboard pitch pin, part no. E49-6320 .785 (\pm .005)
 - Outboard pitch pin, part no. E49-6310 .750 (\pm .005)

8. If this bolt requires replacement before the R.C.O. time of the aligner block assembly, follow these procedures:
 - A. Remove the aligner block assembly from the blades.
 - B. Clamp the aligner block in a vise using wood shims to prevent damage to the block.
 - C. Use a small die grinder or a high speed sanding disc to grind the tip of the all thread bolt completely off, about 1/4" from the tip.
 - D. Dressing up the threads with a good file or sand paper, back the all thread bolt completely out of the aligner block. Some friction will be felt, however, if the pressure is too great, damage to the aluminum block and threads will occur.
 - E. Clean the threaded hole and pass a tap through the hole to clean up the threads. (Be sure to use a fair amount of thread cutting oil.) Blow out the hole with air.
 - F. Install the new all thread bolts (part no. E00-2417) with a light film of all purpose grease. After the final adjustment has been made, torque to 7-9 ft. lbs.

9. Aligner block bolts (5/16 x 3 1/4 part no. E00-2523) should be loosened and re-torqued only 3 or 4 times before replacement. Torque requirement on these bolts is 20-22 ft. lbs.
10. See the Construction Manual for replacement of the rotor system and shaft. **CAUTION:** Under NO condition attempt to change, alter, modify or fabricate a main rotor shaft for this helicopter.
11. Part no. E49-5140 requires 3-4 shots of grease every 25 hours. Refer to Service Note XIX-2.
12. Adjustment of the slider ball adjustment collar (part no. E49-3230) is performed as follows:
 - A. Center the swash plate fore and aft and laterally.
 - B. Back off the two set screws (part no. E00-9302) three full turn counter clockwise.
 - C. Turn the slider ball adjustment collar (part no. E49-3230) counter clockwise until it can be easily turned with your fingers.
 - D. Now turn the slider ball adjustment collar clockwise until the nut comes to a stop, using finger pressure only.
 - E. Index the slider ball adjustment collar and the non-rotating swashplate with a pencil or marker.
 - F. Back off the slider ball adjustment collar with a counter clockwise turn 1/2" from the original index mark.
 - G. Tighten the set screws (part no. E00-9302). Use of some silicone on the set screws will help lock the set screw in position and prevent it from backing out. (Do NOT use loctite.)

This procedure may have to be done occasionally if the helicopter is exposed to severe or radical temperature changes.

13. Place a small amount of grease on slider ball clamp (part no. E49-1530) and on the lower ears of the collective slider ball (part no. E49-3210). Move the collective up and down several times to insure grease coats all related surfaces.
14. Replace the nylon scissor bushing (part no. E49-4810) on condition when the lateral play exceeds 1/8" total travel and cannot be taken up by tightening bolts (part no. E00-2516 and E00-2427). **CAUTION:** Do not exceed two flats past the position you can turn the nut with your fingers.
15. Check for cracks at the base of the 90 degree bends on the collective scissor mount (part no. E49-1380).

16. This bearing (part no. E49-1220) should be checked for side play at every 100 hour interval. The procedure is as follows:
 - A. With a dial indicator on a magnetic base, measure the amount of side play by first mounting the magnetic base to the steel hood bracket and centering the indicator on the upper steel race of the main bearing. Using a spring scale, pull 20 pounds toward the passenger side of the helicopter and mark the dial indicator reading. Using the same method, pull 20 pounds toward the pilot side and mark the reading. Total the two readings. The maximum amount of travel allowed is .010 of an inch. If your measurement is greater than .010, replace the main thrust bearing. This bearing is an On Condition item and should be monitored on pre and post flight inspection for condition and temperature.

17. **WARNING:** Under NO condition should the main bearing flange (part no. E49-1230) be heated up in an oven or with an oxygen/acetylene torch.

ROTOR HUB: SHIMMING

The EXEC 90 Rotor System will require hub shimming at different intervals depending upon how smooth you keep the rotor system adjusted. This section uses the "See-Do" concept like the Construction Manuals for clarification of the maintenance to be performed.

SERVICE NOTES:

1. The following list of tools are required to preform the hub shimming process:
 - * 3/8" torque wrench in ft. lbs. capable of 30-35 ft. lbs.
 - * micrometer in thousandths of an inch
 - * 3/8" drive ratchet with 9/16" socket
 - * 9/16" box and open end wrench
 - * 1/4" punch with a 3" shank
 - * steel hammer and or plastic hammer
 - * snap-ring pliers that will fit the ring holes
 - * spring scale
 - * set of allen wrenches or at least one 1/4" and one 1/8" allen wrench
 - * a clamp that spans the distance across the teeter blocks and has 4" jaws minimum.
 - * one test fixture (see page 63 in this manual for drawing of fixture with dimensions and specifications).
 - * one dial indicator with a 4" reach that reads in thousandths.

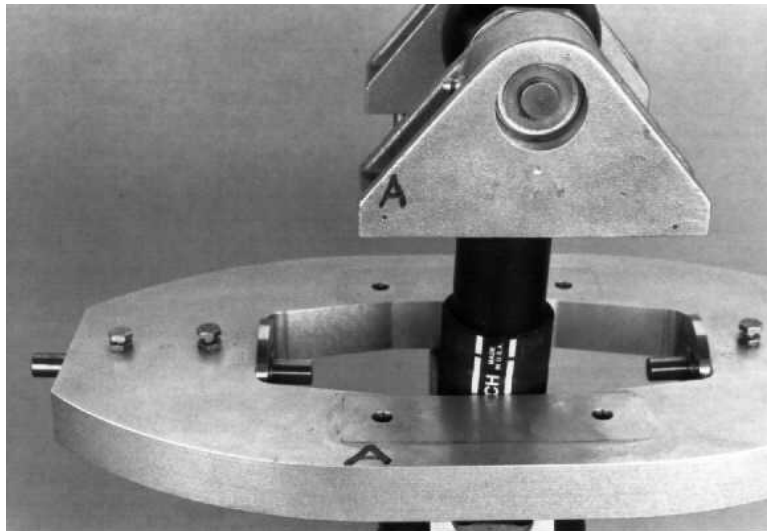
Photo 1.



2. Start by removing the blades from the helicopter. Set the blades on their sides or on the leading edge. (Never set the blades on the trailing edge.)

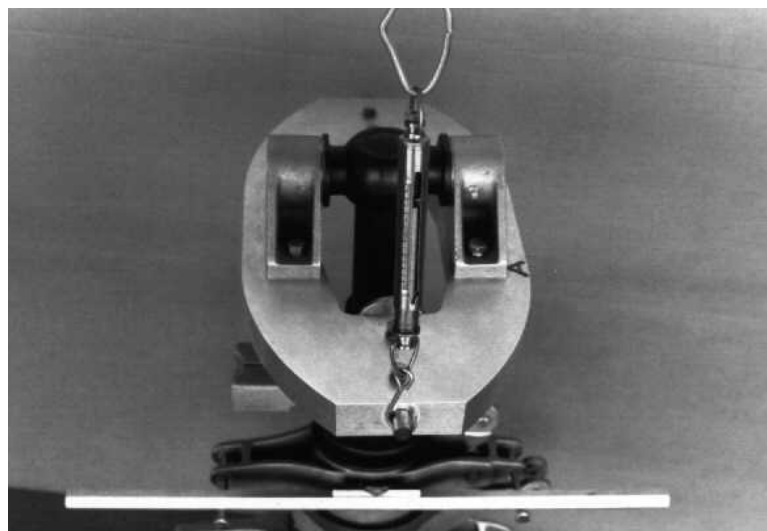
3. Turn the hub so that the numbers stamped on the hub plate are on the pilot side and the hub is aligned fore and aft to the helicopter. It makes no difference which side of the helicopter the numbers are on, but it is good practice to establish a normal and routine procedure.
4. Next mark the hub and pitch links with a marker pen so they can be put back on exactly the way they were removed. Mark the pitch links indicating which blade (master or slave) they attach to and also the up or down position. Then set aside.
5. Next using the same marking on the hub, mark the shaft in relation to the hub and the riser blocks. See photo 2.

Photo 2.



6. Place the spring scale on the outboard pin and pull up or down until the hub plate starts to move. Read the scale and record the reading for later reference. See photo 3.

Photo 3.

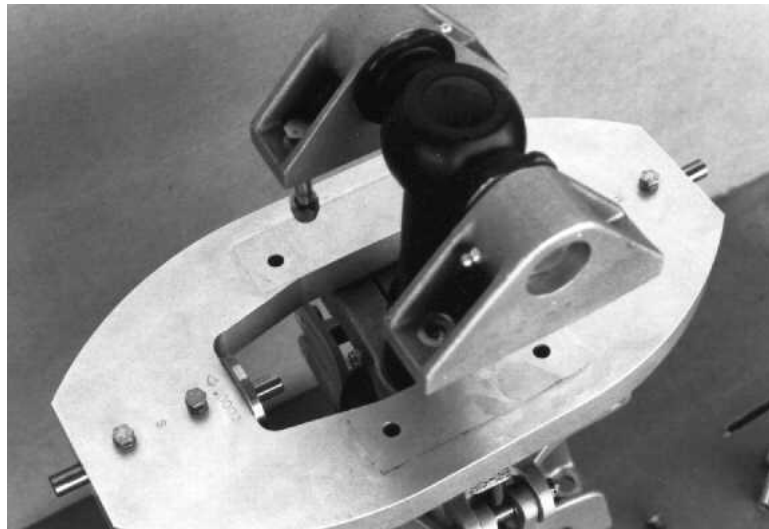


7. Place the "C" clamp across the teeter blocks so that the clamp jaws clamp at the base and close to the center of the block (photo 4). Using the 9/16" socket wrench and open end wrench, remove the locking nut from the bolt. After the nut has been removed and washers taken off, place the box wrench on the teeter block bolts and turn the wrench so that when you tighten the "C" clamp slightly, the wrench will begin to move easily. Tighten the clamp down by feel so that you find the spot the wrench wants to move the easiest. Place a small amount of grease on the bolt threads and drive the bolts out through the hub plate with the hammer and punch. **CAUTION:** If the teeter block bolts do not move easily, some of the aluminum will be galled out of the hub plate holes. After the teeter block bolts have been removed, you can now remove the "C" clamp. Remove the two remaining teeter block bolts from the other teeter block and set the hub plate on the counter weight just below the shaft knuckle. Be careful not to scratch or damage the hub plate. See photo 4 and 5.

Photo 4.

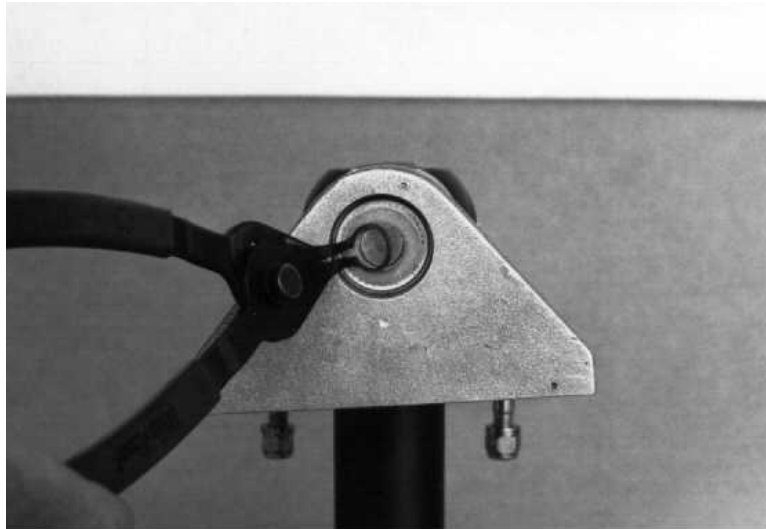


Photo 5.



8. Next remove the two snap rings and the large thin washer from the main drive pin. See photo 6.

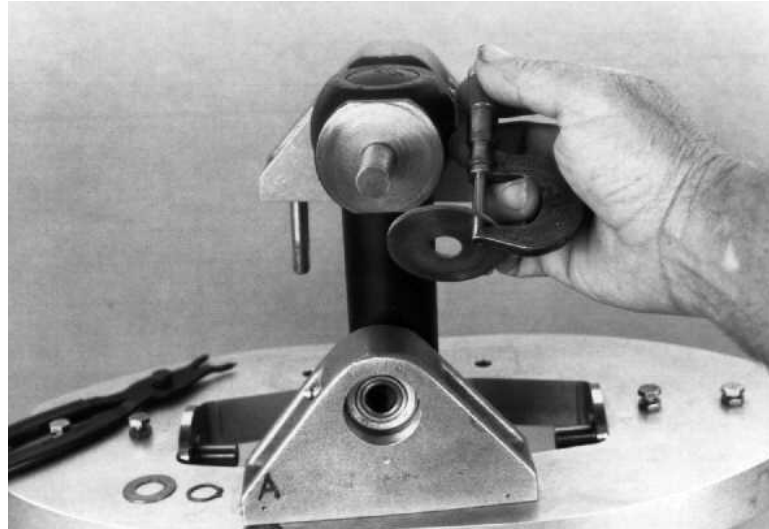
Photo 6.



9. Deburr the edge of the snap ring grooves and edge of the pin with 400-600 wet and dry sandpaper.
10. With hand pressure or a light tap from a plastic mallet, remove the teeter blocks from the main drive pin. **CAUTION:** If shims come off with the teeter block, carefully put them back on the drive pin in exactly the same way they came off. Inspect the teeter block for any cracks and galling the shims may have caused.
11. If the bearing replacement is necessary in the teeter blocks either by R.C.O. time or On Condition, follow the next steps. If the bearing is OK, skip the next sequence and go to step 12.
 - A. Clean teeter block in acetone or equivalent solution.
 - B. Heat block to 250 degrees in an oven and press the old bearing out of the block. The bearing should come out with light pressure.
 - C. Clean all mating bearing surfaces and place a small amount of loctite #609 on both the outer race of the bearing and the inner hole of the teeter block. **CAUTION:** Do NOT let the loctite get into the greased holes in the center of the bearing.
 - D. Reheat to 250 degrees and press the new bearing in place using a tool or spacer that will allow you to press on the outer race of the bearing and not the inner race.
 - E. Keeping on a flat surface, press the bearing until flat with the inside of the teeter block. Let cool and check the bearing for smoothness with your fingers.
 - F. Give the bearing 3-4 shots of grease through the grease fitting on the teeter block and wipe off excess grease. Repeat process for the other teeter block.
 - G. Remove the hub plate, inspect the condition and clean. Do not remove your identification markings.

12. Next, carefully remove the steel and delrin shims from the main drive pin. Find a smooth spot on these parts and measure all shims together with a micrometer. (Remember not to mix the pilot and passenger side shims.) See photo 7.

Photo 7.



13. Remove the four (4) allen set screws on top of the shaft knuckle. NOTE: There are two (2) screws in each hole. Failure to remove all four set screws will result in damage to the main drive pin. Lightly tap the pin out with a plastic hammer.
14. Inspect the shaft knuckle hole and clean with acetone.
15. After cleaning all parts, align them in sequence for re-assembly as shown on print E49-2000.

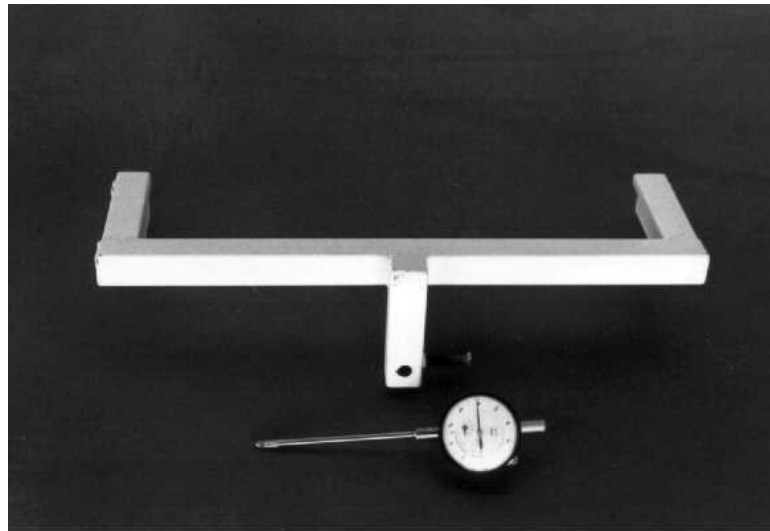
16. Place a light coat of grease on the main drive pin and in the shaft knuckle hole. Install the new drive pin in the knuckle with the flats in the up position. Position pin so there is equal pin on either side of the knuckle. DO NOT insert allen set screws at this time.
17. Place the delrin shims on both sides of the appropriate stainless steel shim and measure with a micrometer. You should choose shims that will give you the same thickness as measured in step 12. Place a thin coat of grease on the outer surface of the shaft knuckle and on all shims.

NOTE: If your hub was originally equipped with "peel-off" shims, they will be replaced with the stainless steel shims as described here.

18. Place the steel and delrin shims on the main drive pin. All shims should have a light coat of grease on every side. Do this to shims on both sides of the hub knuckle. Refer to print E49-2000.
19. Place the clean hub plate back on the shaft in the correct position according to your earlier marks. Refer to photo 2.
20. Place one teeter block on the main drive pin with the bearings closest to the knuckle. Checking to insure that the reassembly is the same as the disassembly (check your identification marks), align the holes with the hub plate and insert the bolts through the teeter blocks and through the hub plate. Torque the bolts to 24 ft. lbs.
21. Place the other teeter block on the main drive pin following the same assembly procedures.
22. Replace the clamp on the teeter blocks and tighten slightly as in Note 7 and Photo 4. Replace the bolts through the holes with grease and using the clamp, align the holes. Use a plastic hammer to drive the bolts through the holes. (If the bolts drive hard, adjust the clamp pressure so that they go in with ease.)
23. Torque the bolts down to 24 ft. lbs. and remove the "C" clamp.
24. Rock the hub back and forth 15 to 20 times to set the shims and grease in their respective positions.
25. After reassembly, two objectives must be reached:
 - A. The hub must be on center of the main shaft.
 - B. The hub pressure must be between 8 to 12 lbs.
(This process is difficult to achieve on the first attempt).

26. Measure the hub pressure. Place a spring scale on the outboard pitch pin and pull up or down very slowly until the hub breaks loose and moves. Note the poundage of pull required.
27. Measure the hub to shaft center position by using the hub fixture shown in Photo 8. See print on page 63.

Photo 8.



This fixture is easy to fabricate and will give you very accurate results. Place the fixture on the hub. Push the fixture up against the outboard pitch pins and hold the fixture down on the 3 rivet point contacts located on the bottom. Securely hold the fixture on the hub and rock the hub slightly back and forth until the needle on the indicator stops moving in a central position. Then zero the indicator. Carefully remove the fixture and place it on the other side of the hub using the same procedures. Repeat the steps and determine how far the hub is off center, if any, and which direction it needs to move. If all procedures were done correctly, you should not be any more than .002 to .004 off center and hub pressure will still be within tolerance. Make a note on paper and determine which teeter block should be removed to center the hub on the shaft. Change the stainless steel shims as necessary, following the procedures as previously outlined. The tolerance and specs that must be achieved are:

- A. Hub centering is within .001 T.I.R.
- B. Hub pressure should be 8 to 12 lbs.

When the hub is correctly centered and hub pressure is within the limits specified, final assemble the hub. See photos 9 through 13.

Photo 9: HUB ALIGNMENT FIXTURE

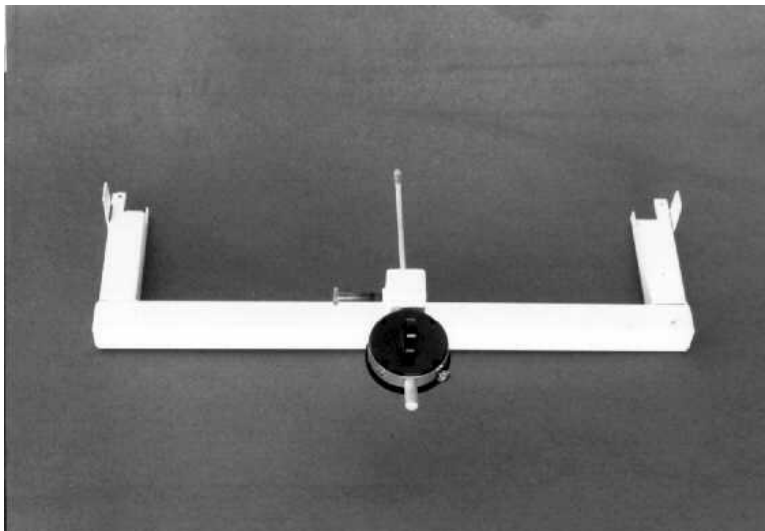


Photo 10: HUB FIXTURE LOCATED ON HUB

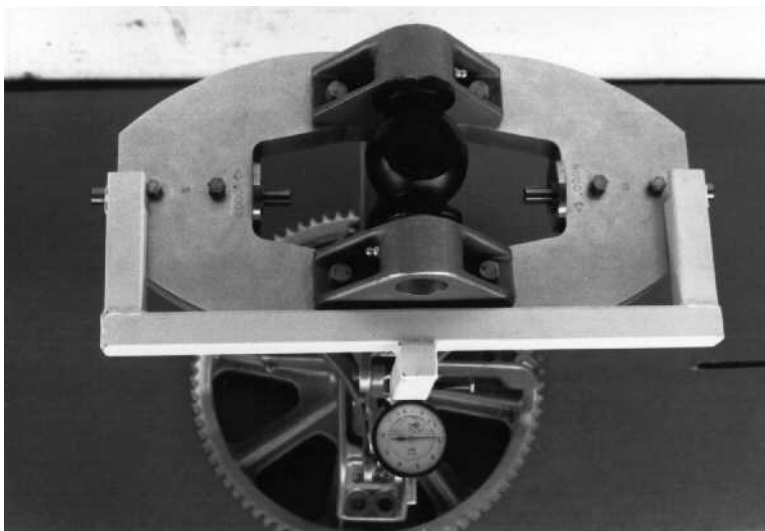


Photo 11: PROPER PLACEMENT OF HUB FIXTURE

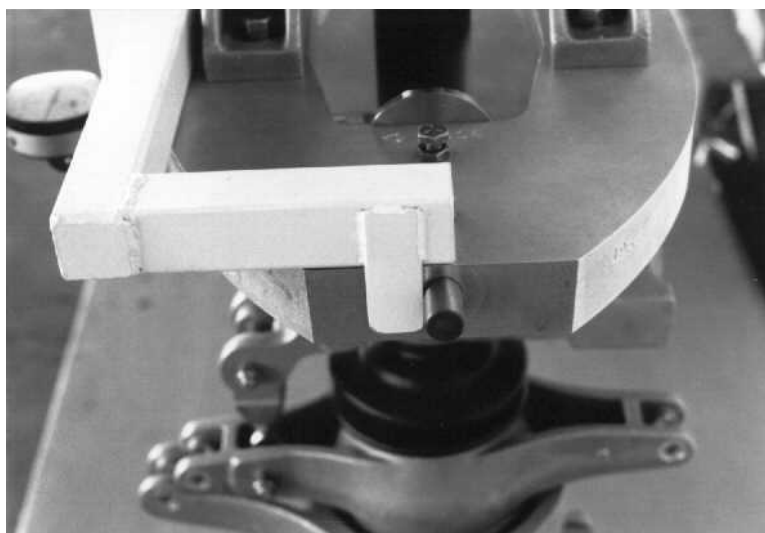
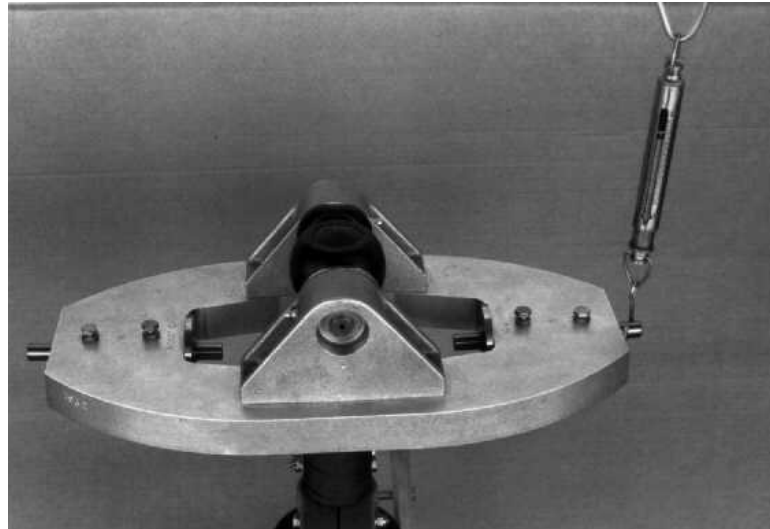


Photo 12: DIAL INDICATOR READING ON CENTER OF MAIN SHAFT.



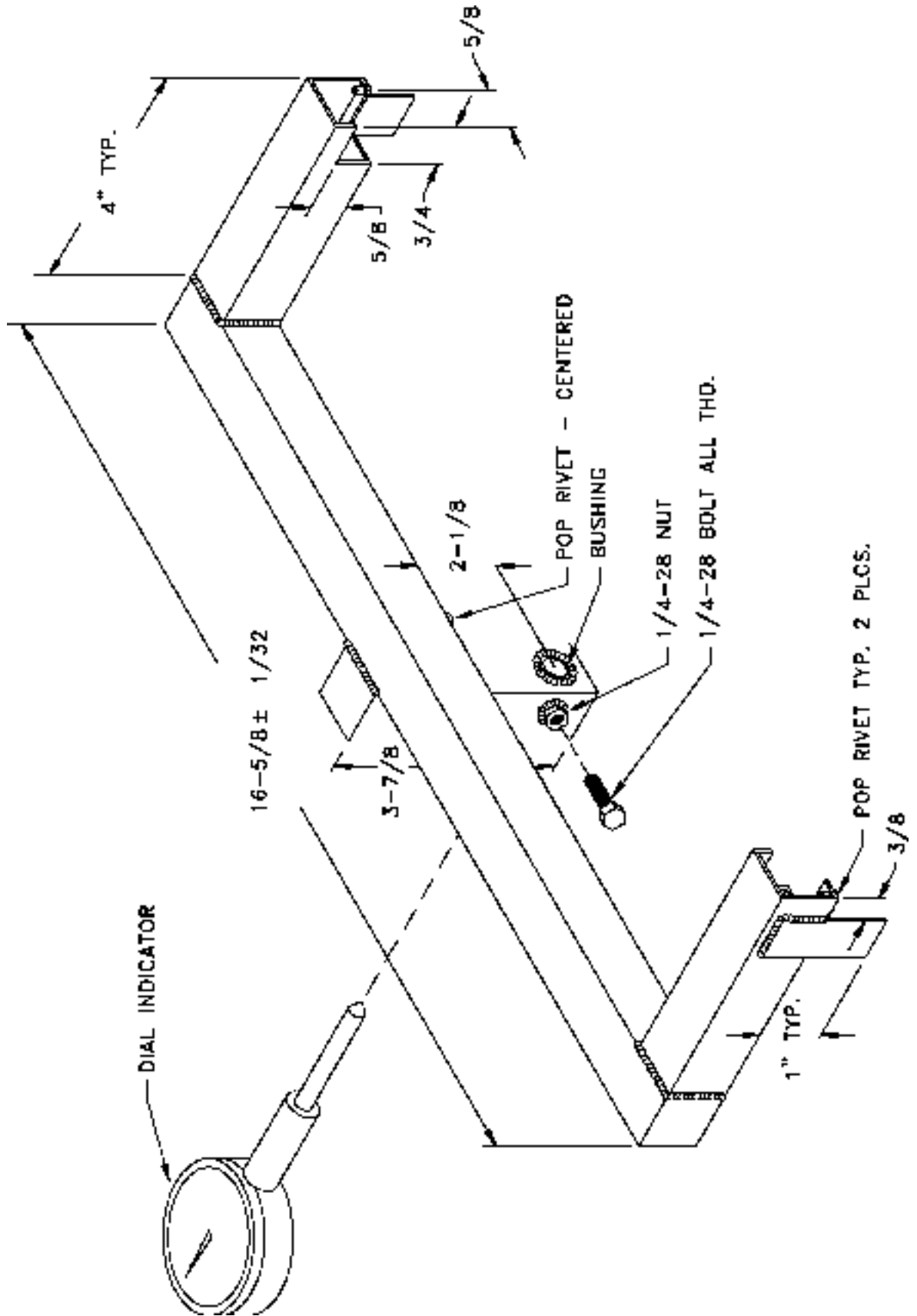
Photo 13: READING POUNDAGE FULL ON HUB.



28. Replace new large flat washers and snap rings on the main drive pin. **CAUTION:** Be sure you place the correct side of the snap ring towards the outside of the pin. Refer to the Construction Manual Tail Rotor section for the correct snap ring procedures.
29. After rocking the hub back and forth 10 to 15 times, replace the 4 set screws on the top of the knuckle. Tighten the first set screws against the main drive pin and the second set of screws against the first set of screws as a safety lock. (Do NOT use loctite on these screws.)
30. Recheck the torque on the teeter block bolts and recheck the hub centering.

This concludes the hub shimming procedures.

HUB SHIMMING FIXTURE DRAWING



ROTOR HUB: SLIDER BALL ADJUSTING COLLAR

The Slider Ball Adjusting Collar (part no. E49-3230) is adjusted and set on the swash plate assembly at the factory. However, this particular adjustment may have to be adjusted occasionally if the helicopter is exposed to severe or radical temperature changes.

1. Using a protractor level, set the swash plate perpendicular to the main shaft by placing the level on top of the rotating swash plate on the machined surface. Rotating the blades may help you in achieving the fore and aft angles. If a protractor level is not available, centering the cyclic stick should place the swash plate at a relative perpendicular angle to the shaft. Loosen the two set screws (part no. E00-9302 Ref. 16 on print E49-2002) and turn the adjusting collar approximately 2 full turns in a counter clockwise direction loosening the slider ball. Next, using your fingers, turn the knurled collar in a clockwise direction until the collar comes to a stop. Make a reference mark on the adjusting collar and slider ball and back off the adjusting collar counter clockwise 1/2". Then tighten the two set screws. See Photos 14 - 16.

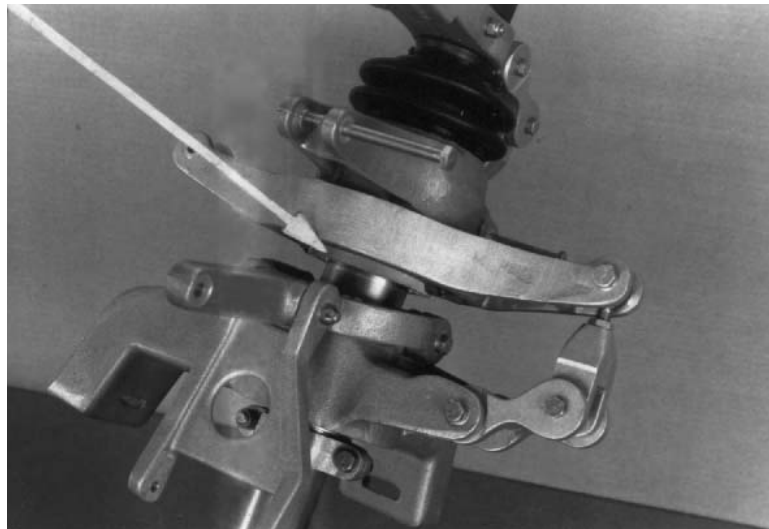
Photo 14: PLACING AN INDEX MARK.



Photo 15: VIEW AFTER KNUCKLE COLLAR HAS BEEN BACKED OFF.



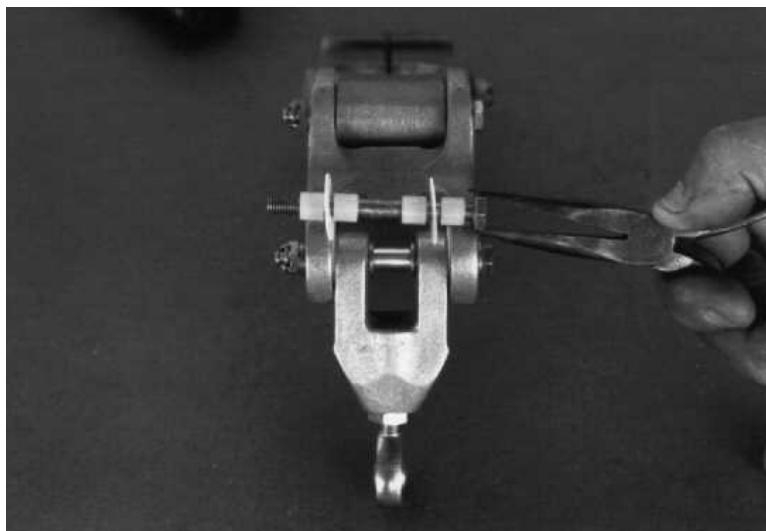
Photo 16: TIGHTEN SET SCREWS IN COLLAR.



If incorrectly adjusted, the slider ball adjusting collar will produce a feedback through the cyclic controls that feels like the cyclic wants to travel in any one direction independent of any input from the pilot. Depending on how much feedback the pilot feels will depend on how much the collar is incorrectly adjusted. (Feedback usually means the collar is too tight rather than too loose). If feedback through the cyclic continues, you may back off the adjusting collar another 1/4", total 3/4" maximum from starting index mark. If an undesirable condition still exists contact the factory.

Photo 17 illustrates the positioning of the nylon bushings in the swash plate assembly. To determine if the castings need new bushings, measure the lateral deflection of the parts. If a total of .135 inch or greater is indicated, the nylon bushings should be replaced. The maximum the castellated nut can be tightened down is two flats after the nut can be turned tight by your fingers. Further tightening can damage the aluminum castings.

Photo 17.



SECTION XX: DOORS

The EXEC 90 can be operated with the doors either on or off depending upon the weather and pilots discretion.

INSPECTION CHART

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>INSPECTION</u>		<u>SERVICE</u>
		<u>INTERVAL</u>	<u>R.C.O.</u>	<u>REFERENCE</u>
E41-7100	Door (Pilot Side)	100 HR	OC	
E41-7101	Door (Passenger Side)	100 HR	OC	
E41-7110	Door Stiffener	100 HR	OC	
E41-7111	Door Stiffener	100 HR	OC	
E41-3110	Door Hinge	100 HR	OC	
E41-3120	Body Hinge	100 HR	OC	
E00-2300	AN3-4A Bolt	100 HR	OC	XX-1
E00-2302	AN507-1032R10 Screw	100 HR	OC	XX-1
E00-2304	AN3-7A Bolt	100 HR	OC	XX-1
E54-4050	Vent	100 HR	OC	

SERVICE NOTES:

1. Check bolts (part no. E00-2300, E00-2302 and E00-2304) for tightness.

CAUTION: If the doors were to come off in flight, serious damage could occur to the helicopter.

SECTION XXI: TORQUE REQUIREMENTS

<u>BOLT SIZE</u>	<u>INCH LBS.</u>	<u>FT. LBS.</u>
6-32	7 - 10	
8-32	12 - 15	
AN3 3/16-32	32 - 50	
AN4 1/4-28	50 - 70	5 - 7
AN5 5/16-24	100 - 140	9 - 12
AN6 3/8-24	160 - 190	14 - 16
AN9 9/16-18	800 - 1,000	65 - 82

NOTE: These torque requirements are standard for "AN hardware" and should be used for general construction techniques for the helicopter. Special torque values for a part or bolt that may have different torque requirements can be found in the specific section of the manuals where that part is mentioned.

SECTION XXII
HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION I: AIRFRAME

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E10-1000	AIRFRAME			*				R
E00-2415	AN4-24A BOLT			*				R
E00-2601	AN6-10A BOLT			*				R
E11-3121	REAR LANDING GEAR			*				R
E13-3120	ENGINE MOUNT RUBBER		*					R
E00-2507	AN5-10A BOLT			*				R
E11-3130	LANDING GEAR SKID					*		R
E11-3131	LANDING GEAR SKID					*		R

* INSPECT
R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION II: TAIL BOOM

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E09-****	TAIL BOOM			*				R
E09-6131	HORIZONTAL TRIM FINS			*				R
E00-2301	AN3-5A BOLT			*				R
E00-2305	AN3-11A BOLT			*				R
E09-6110	VERTICAL TRIM FIN (UPPER)			*				R
E09-6120	VERTICAL TRIM FIN (LOWER)			*				R
E09-3252	VERT. TRIM FIN ATTACH. BKT.			*				R
E00-2414	AN4-23A BOLT			*				R
E00-2309	AN3-17A BOLT			*				R
E00-2432	AN4-12A BOLT		*					R
E00-2303	AN3-6A BOLT		*					R
E00-2300	AN3-4A BOLT		*					R
E00-2307	AN3-13A BOLT		*					R

* INSPECT
 R REPLACE

SECTION XXII
HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION III: BODY

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E32-****	BODY			*				
E32-7210	EYEBROW WINDOW, PILOT			*				
E32-7220	EYEBROW WINDOW, PASSENGER			*				
E32-7231	WINDSCREEN			*				
E32-1300	SEAT UPHOLSTERY			*				
E32-1310	HEADLINER			*				
E45-****	SKID PANTS			*				
E32-1281	FLEX HOSE			*				
E54-4010	PUSH/PULL CABLE			*				
E32-3130	FLOOR PAN/INSTRUMENT POD			*				
E32-6110	SEAT BULKHEAD			*				
E32-7100	TUB			*				
E32-7111	FUSELAGE (UPPER RIGHT FRONT)			*				
E32-7112	FUSELAGE (UPPER RIGHT REAR)			*				
E32-7121	FUSELAGE (UPPER LEFT FRONT)			*				
E32-7122	FUSELAGE (UPPER LEFT REAR)			*				
E32-7130	FUSELAGE (LOWER RIGHT)			*				

* INSPECT
R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION III: BODY CONTINUED

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E32-7140	FUSELAGE (LOWER LEFT)			*				
E32-7152	DOG HOUSE (FRONT)			*				
E32-7272	DOG HOUSE (REAR)			*				
E32-1110	CYCLIC BOOT			*				
E32-7160	BRACING PANEL			*				
E32-7170	BRACING PANEL			*				
E32-7180	ROOF PANEL			*				
E32-7190	FRESH AIR COLLECTOR			*				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION IV: TAIL ROTOR DRIVE

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E18-6130	IDLER PULLEY MT. SCISSORS				*			R
E18-1130	IDLER PULLEY BEARING ASSY.				R			
E18-2012	IDLER PULLEY			*				R
E18-1150	TAIL ROTOR BELT			*	R			
E18-1160	TAIL ROTOR BELT			*	R			

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION V: TAIL ROTOR

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E17-1260	FS3 PP BEARING			*	R			
E17-1290	SNAP RING			*	R			
E00-2605	AN176-24A BOLT			*	R			
E17-6125	CARRIAGE SLIDER ASSY.			*			R	
E17-1300	CARRIAGE SLIDER BEARING			*		R		
E17-1210	ROD END 5/16 TEFLON			*			R	
** E17-6000	TAIL ROTOR BLADE ASSY.			*		R		
E17-5120	PITCH ACTUATOR ARM PIVOT			*				R
E17-1340	BEARING ASSY.			*	R			
E17-5110	PITCH HORN			*	R			
E17-1350	SLIDER ACTUATOR ARM CLEVIS			*				R
E17-6150	TAIL ROTOR SHAFT			*				R
E17-1360	BEARING PLATE SLIDER RAIL			*				R
E17-5101	TAIL ROTOR PULLEY			*				R
E16-1200	FEMALE ROD END			*			R	
E17-1280	THRUST BEARING ASSY.		*		R			
E17-1270	ALIGNMENT BEARING ASSY.		*		R			

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION VI: CONTROL ASSEMBLIES

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E16-6131	CROSS SHAFT BUSHING						*	R
E16-6130	SCISSOR MOUNT BUSHING						*	R
E16-1200	3/16" FEMALE ROD END			*			R	
E16-1130	1/4" MALE ROD END			*			R	
E16-1140	1/4" FEMALE ROD END			*			R	
E16-1212	DIRECTIONAL CONTROL CABLE			*				R
E14-6131	CROSS SHAFT MT. BUSHING						*	R
E14-1241	NYLON BUSHING						*	R
E14-1150	5/16" MALE ROD END			*				R
E14-1210	CYCLIC CONTROL CABLE			*				R
E14-1220	CYCLIC CONTROL CABLE			*				R
E15-6131	CROSS SHAFT MT. BUSHING						*	R
E15-1230	5/16" MALE ROD END			*				R
E15-6130	COLLECTIVE ROD END PLUG			*				R
E49-1400	COLLECTIVE CONTROL ROD			*				R
E15-3150	PILOT THROTTLE SHAFT						*	R
E15-3170	TRANSFER SHAFT						*	R
E15-3220	MAIN THROTTLE SHAFT						*	R
E15-1150	1/4" MALE ROD END			*				R
E24-7530	THROTTLE CABLE ASSY.			*		R		

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION VII: OIL SYSTEM

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E28-7100	OIL SUMP ASSY.		*					
E28-1190	VALVE COVER DRAIN HOSE			*		R		
E28-1230	MAIN OIL DRAIN HOSE			*		R		
E28-1110	OIL FILTER	R						
E28-6141	HOSE			*		R		
E28-6111	HOSE			*		R		
E28-6121	HOSE			*		R		
E28-6132	HOSE			*		R		
E28-1150	OIL COOLER ASSY.			*				R
E36-1200	OIL PRESSURE CAPILLARY TUBE			*			R	
E36-1170	OIL PRESSURE GAUGE			*				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION VIII: COOLING SYSTEM

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E30-1160	RADIATOR			*				R
E34-1180	RADIATOR CAP			*		R		
E34-1230	HOSE			*		R		
E34-1191	HOSE			*		R		
E34-1200	HOSE			*		R		
E34-1221	HOSE			*		R		
E34-1280	HOSE			*		R		
E34-1150	HOSE			*		R		
E29-1000	WATER PUMP			*			R	
E29-5100	PULLEY			*				R
E29-1130	BELT			*		R		

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION IX: ENGINE & EXHAUST SYSTEM

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E24-9710	EXHAUST GASKET			*		R		
E24-7530	THROTTLE CABLE			*		R		
E24-9840	HEAT WRAP			*				R
E24-9760	BATTERY			*				
E24-9801	STAINLESS STEEL MUFFLER			*				R
E24-9810	STAINLESS STEEL HEADER			*				R
E24-9720	ELECTRONIC IGNITION UNITS			*				R
E24-1250	SPRING			*			R	
E24-9831	HEAT SHIELD			*				R
E27-1160	ROD END			*			R	
E27-1240	RUBBER INSERT			*				R
E27-3110	TORQUE LINK ASSY.			*				R
E24-0162	ENGINE	*						
E24-9940	SPARK PLUG WIRES				*	R		
E24-9948	SPARK PLUG WIRE SEPARATOR			*		R		
E24-9740	SPARK PLUG		*	R				
E24-7553	AIR FILTER	*			R			
E24-1600	ENGINE PULLEY			*			R	

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
 EXEC 90

REFERENCE SECTION X: DRIVE TRAIN

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E49-6172	MAIN SPROCKET			*			R	
E49-7010	SPROCKET HUB			*			R	
E00-2608	BOLT					*		R
E00-2450	BOLT			*		R		
E00-3410	THIN LOCKNUT			*		R		
E00-9028	HOSE CLAMP					*		R
E24-5110	UPPER CLEVIS					*		R
E24-5100	UPPER ENGINE MOUNT CUP					*		R
E23-1000	SECONDARY PULLEY ASSY.			*			R	
E23-5000	UPPER BEARING ASSY.	*					R	
* E23-1240	LOWER BEARING				R			
E23-1210	MAIN DRIVE BELTS		*			R		
E23-7141	HIGH TEMP FAN		*					R
E23-1170	SNAP RING					*		R
E23-8000	FAN PULLEY ASSY.					*		R
* E23-1220	FAN PULLEY BEARING				R			
E23-6180	KEY (SECONDARY SPROCKET)						*	R
E23-6190	RETAINER PLATE						*	R

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION X: DRIVE TRAIN CONTINUED

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E33-7100	TOP REAR COVER			*				
E33-7121	LOWER OIL BATH PAN			*				
E33-7110	TOP FRONT COVER			*				
E33-1170	REAR OIL SEAL ASSY.			*		R		
E33-1140	TENSION SPRING			*				R
E33-3000	RAIN SHIELD				*			R
E49-1290	DRIVE CHAIN W/LINK			R				
E27-6100	IDLER PULLEY ASSY.			*				R
E27-6100B	IDLER PULLEY BEARING			*		R		
E27-1160	ROD END			*				R
E27-1210	IDLER SPRING			*			R	
E27-2160	5/16" ROD END			*				R
E27-6131	CLUTCH TUBE ASSY.			*				R
E27-3170	PULLEY MOUNT ARM WELDMENT			*				R
E27-5100	CLUTCH ARM CASTING			*				R
E00-2522	BOLT			*				R

* INSPECT
 R REPLCE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XI: FUEL SYSTEM

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E25-6110	FUEL TANK, PASSENGER			*				R
E25-6101	FUEL TANK, PILOT			*				R
E25-6121	FUEL GAUGE & SENDER			*				
E25-1191	FUEL VALVE			*				R
E25-1380	FUEL PUMP			*			R	
E25-1390	FUEL HOSE			*		R		
E25-2101	FUEL CAP			*				R
E25-1370	FUEL PRESSURE REGULATOR			*				R
E25-1360	FUEL FILTER		*	R				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XII: FAN DRIVE

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E31-1120	BEARINGS			*		R		
E31-1130	BELT (UPPER)			*		R		
E31-1141	BELT (LOWER)			*		R		
E31-5100	PULLEY (UPPER)			*				R
E31-5120	PULLEY (LOWER)			*				R
E31-6100	SHAFT					*		R

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIII: MAIN ROTOR BLADES

P/N	DESCRIPTION	25	50	100	250	500	1000	1500	2000
E20-3000	RETENTION STRAP ASSY.	*					R		
** E20-1010	ASYMMETRICAL ROTOR BLADE	*						R	
** E20-1011	ASYMMETRICAL ROTOR BLADE	*						R	
E00-2800	BOLT 9/16"			*			R		
E00-3800	NUT 9/16"			*			R		
E20-3170	TIP WEIGHT	*					R		
E20-6000	ALIGNER BLOCK ASSY.			*			R		
E20-6180	PITCH HORN CLEVIS			*			R		
E20-6190	PITCH HORNS					*	R		
E00-2523	BOLT			*			R		
E20-1220	ALIGNER BLOCK BEARING				R				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIV: WIRING AND ELECTRICAL

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E35-8220	INLINE FUSE HOLDER			*				
E35-8230	PANEL MOUNT FUSE HOLDER			*				
E35-8240	TOGGLE SWITCH			*				
E35-8320	FUSES			*				R
E35-8410	BATTERY TERMINAL EYELET			*				R
E35-8520	STARTER RELAY			*			R	
E35-8530	STARTER KEY SWITCH			*				R
E35-8540	PUSH BUTTON SWITCH			*				R
E35-8200	PLUGS			*				R
E35-8595	L.E.D. INDICATOR LIGHT			*				R
E24-9760	12 VOLT BATTERY			*				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIV CONTINUED: ALTERNATOR

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E42-1301	ALTERNATOR BELT			*	R			
E42-2021	VOLTAGE REGULATOR			*			R	
E42-1000	ALTERNATOR ASSY.			*				R

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XV: INSTRUMENTATION

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E36-1100	HOUR METER			*				
E36-1120	WATER TEMP. GAUGE			*				
E36-1130	CARB. TEMP. GAUGE			*				
E36-1170	OIL PRESSURE GAUGE			*				
E36-1220	VOLT METER			*				
E36-3000	DUAL ENGINE/ROTOR TACH			*				
E36-4010	ALTIMETER			*				
E36-4020	VERTICAL SPEED INDICATOR			*				
E36-4030	AIR SPEED INDICATOR			*				
E36-4040	COMPASS			*				
E36-4050	MANIFOLD PRESSURE GAUGE			*				
E08-1400	PHOTO TACH			*				

* INSPECT

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XVI: GROUND HANDLING WHEELS

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E37-4090	WHEEL AND TIRE					*		R
	TIRE TRACK			*				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XVII: BALLAST WEIGHT

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E22-****	BALLAST WEIGHT ASSY.			*				R
E22-1000	SUPPORT TUBES			*				R
E22-1060	MOUNT TUBES			*				R
E22-1040	MOUNT ATTACHMENT PLATE			*				R
E22-1050	GUSSET			*				R
E22-4110	STEEL PIN			*				R
E22-4120	SAFETY CLIP	*						R

* INSPECT
 R REPLACE

SECTION XXII
HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XVIII: PAINT

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
	PAINT			*				

* INSPECT

SECTION XXII
 HOURLY SERVICE CHARTS
 EXEC 90

REFERENCE SECTION XIX: ROTOR HUB

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E49-6141	ROTOR HUB PLATE			*			R	
E49-5100	TEETER BLOCK ASSY.			*			R	
E49-5110	TEETER BLOCK BEARING			*		R		
** E49-6281	DELTRIN SHIM			R				
** E49-6341	STAINLESS STEEL SHIM			R				
E00-2607	AN 3/8 X 2-1/4 BOLT			*				R
** E49-6301	MAIN ROTOR DRIVE PIN			R				
E00-4802	THIN WASHER			*			R	
E49-5131	SNAP RING			R				
E49-6200	THRUST BLOCKS (M-S)			*				R
E49-6210	THRUST WASHER			*				R
E49-1340	THRUST BLOCK ALIGNMENT BEARING			R				
E20-1400	ELASTOMERIC THRUST BEARING			*			R	
E49-1360	THRUST BLOCK LINER			*				R
E49-1170	ROD END (LEFT HAND)			*			R	
E49-1190	M/R BLADE PITCH LINK			*			R	
E00-2800	AN 9/16 X 4-1/4 BOLT			*			R	
E00-9300	SET SCREW 1/4 X 1/4			*			R	

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIX: ROTOR HUB CONTINUED

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E00-9301	SET SCREW 1/4 X 5/8			*			R	
E00-9305	SET SCREW 1/4 X 3/16			*			R	
E49-6310	PITCH PIN (OUTBOARD)				R			
E49-6320	PITCH PIN (INBOARD)				R			
E00-2417	BOLT AN 1/4 X 2 FULL THD.			*			R	
E00-2523	AN 5/16 X 3-1/4 BOLT			*			R	
E49-7000	MAIN SHAFT			*			R	
E49-5140	GREASE FITTING	*						R
E49-1331	DUST CAP			*				R
E49-3610	NON-ROTATING SWASH PLATE			*				R
E49-3520	SWASH PLATE BEARING			*				R
E49-3540	SNAP RING NON-ROTATING			*				R
E49-3510	ROTATING SWASH PLATE			*				R
E49-3230	SLIDER BALL ADJUSTMENT COLLAR			*				R
E49-4010	CYCLIC CABLE MOUNT			*				R
E49-4100	CYCLIC MOUNT BEARING			*				R
E49-4110	SNAP RING CYCLIC MOUNT			*				R
E49-3530	SNAP RING ROTATING SWASH PLATE			*			R	

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIX: ROTOR HUB CONTINUED

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E49-3210	COLLECTIVE SLIDER BALL			*			R	
E49-3220	SPHERICAL BUSHING			*			R	
E49-1530	SLIDER BALL CLAMP		*					R
E49-1520	SLIDER BALL O-RING			*			R	
E49-3240	SNAP RING SLIDER BALL			*			R	
E00-9302	SET SCREW (10-32)			*				R
E49-4610	SWASH PLATE SCISSOR			*				R
E49-4710	SCISSOR CLEVIS			*				R
E49-4720	MALE ROD END 5/16 X 3/8			*			R	
E49-4810	NYLON SCISSOR BUSHING			*			R	
E49-4210	COLLECTIVE ACTUATOR FORK			*				R
E49-4310	COLLECTIVE SCISSOR			*				R
E49-1380	COLLECTIVE SCISSOR MOUNT			*				R
E14-6120	CONTROL "T"			*				R
E14-1150	5/16 MALE ROD END			*			R	
E49-4510	COUNTER BALANCE			*				R
E15-1230	5/16 MALE ROD END			*			R	
E49-1410	ROD END SPACER			*				

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XIX: ROTOR HUB CONTINUED

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E49-1470	SPRING BRACKET			*				
E49-1430	TENSION SPRING			*				R
E49-4800	DELTRIN WASHER (SCISSOR)			*			R	
E49-4830	SCISSOR SPACER			*				R
E49-4820	CLEVIS SPACER			*				R
E49-1180	5/16 MALE ROD END			*			R	
E49-1510	DUST BOOT			*			R	
E49-1500	RUBBER SHAFT PROTECTOR			*				R
E49-1700	LOWER BEARING BACKING PLATE			*				R
E49-1220	MAIN THRUST BEARING			*			R	
E49-1230	MAIN BEARING FLANGE			*			R	
E49-1260	MAIN SHAFT SAFETY SPACER			*			R	
E49-1240	LOWER SHAFT BEARING			*		R		

* INSPECT
 R REPLACE

SECTION XXII
 HOURLY SERVICE CHARTS
EXEC 90

REFERENCE SECTION XX: DOORS

P/N	DESCRIPTION	25	50	100	250	500	1000	2000
E41-7100	DOOR (PILOT SIDE)			*				
E41-7101	DOOR (PASS. SIDE)			*				
E41-7110	DOOR STIFFENER			*				
E41-7111	DOOR STIFFENER			*				
E41-3110	DOOR HINGE			*				
E41-3120	BODY HINGE			*				
E00-2300	AN3-4A BOLT			*				
E00-2302	AN507-1032 R10 SCREW			*				
E00-2304	AN3-7A BOLT			*				
E54-4050	VENT			*				

* INSPECT
 R REPLACE