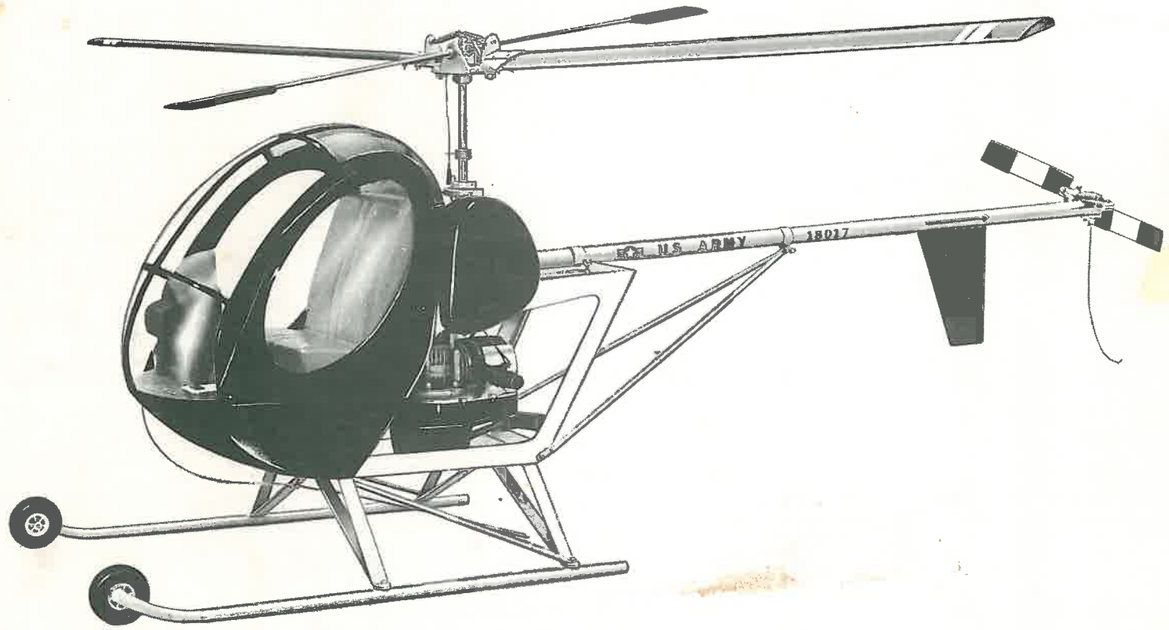
$5.00

ASSEMBLY and *FLYING*

INSTRUCTIONS

Du-Bro **"HUGHES 300"** semi-scale

R/C HELICOPTER



designed and manufactured by

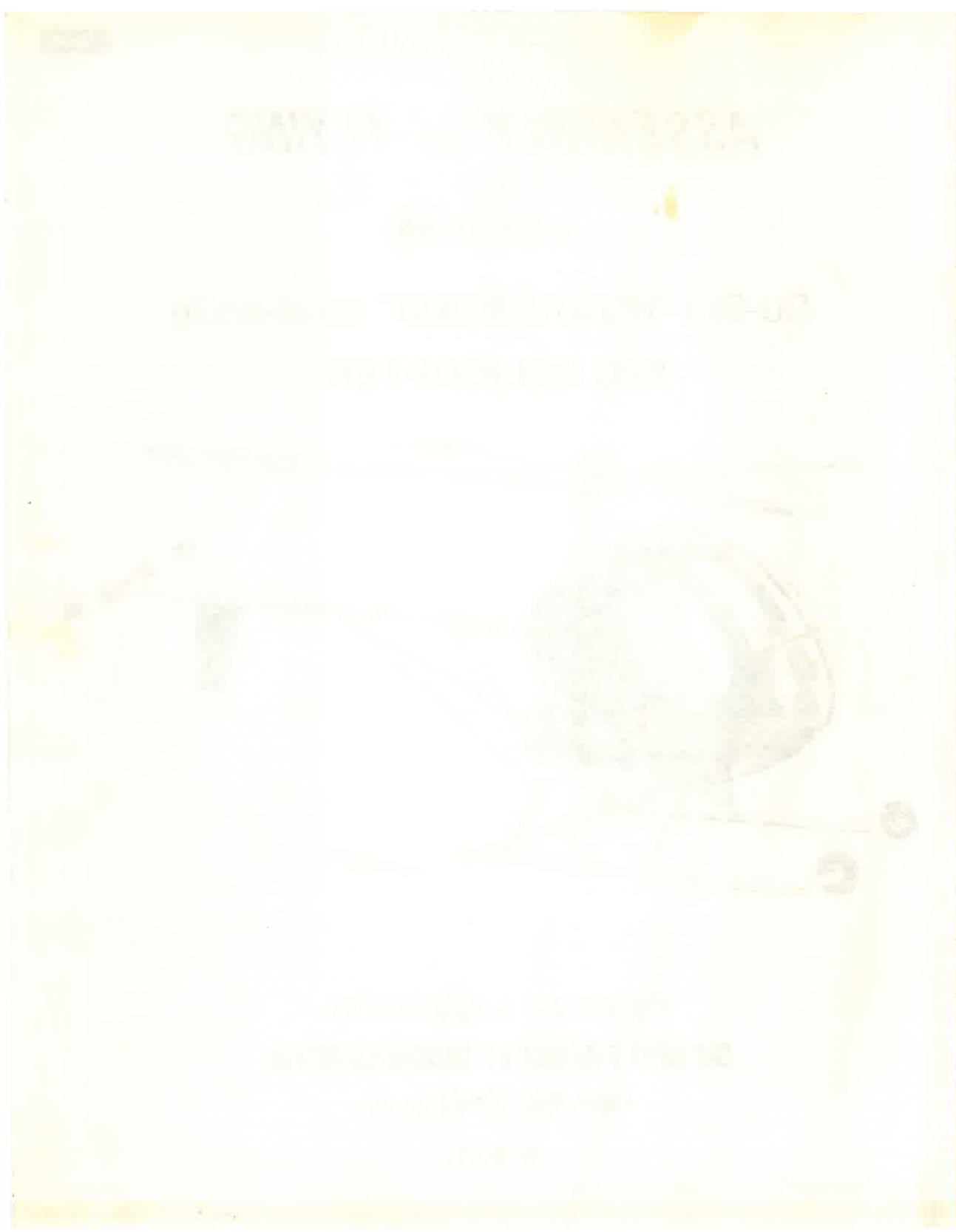
DU-BRO PRODUCTS INCORPORATED

wauconda, illinois 60084

U.S.A.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

printed in U.S.A.



Bag No.	Part No.	Quantity	Description	Price
			BLADE GAUGE	
	160	2	Side	
H-300-20	161	1	Block	$2.00
	162	1	Gauge	
			MISCELLANEOUS	
	163	1	Boom Brace Bracket	
	164	1	Boom Mount	
	165	3	#2 x 1/8 Screws	
	166	8	#6 x 3/4 Screws	
	167	1	4-40 x 1/2 Bolt	
	168	1	4-40 Nut	
H-300-21	169	1	#4 Lock Washer	$3.55
	170	2	1/8" Collar	
	171	1	4-40 x 1 Bolt	
	172	17	#2 x 1/2 Screws	
	173	1	6-32 x 1 Bolt	
	174	1	6-32 Nut	
	175	1	#6 Lock Washer	
			LANDING GEAR	
	176	1	Fuel Tank Mount	
	177	2	Skids	
H-300-22	178	2	Struts	$21.50
	179	2	Braces	
	180	2	1/4" Tubing Braces	
	181	2	1/4" Tail Boom Struts	
H-300-23	182	1	Engine Mounting Plate	$18.00
H-300-24	183	1	Fin	$2.00
H-300-25	184	1	Rotor Hub	$18.00
H-300-26	185	1	Rotor Yoke	$10.00
H-300-27	186	1	Engine, Transmission & Clutch, No Carburetor	$89.50
H-300-28	187	1	Main Shaft	$10.00
H-300-29	188	1	Carburetor	$30.00
H-300-30	189	1	Pack Loctite	$.50
H-300-31	190	1	Instruction Book	$5.00

DU-BRO HUGHES 300

Assembly of your new Du-Bro Hughes 300 is basically a "bolt and nut" procedure. Only the fuselage requires any of the usual wood construction, and this has been kept as simple as possible.

Before actually beginning assembly, we suggest that you take a few minutes to read through the instructions; at the same time, sorting and identifying each part. This will save you time during assembly and greatly reduce any chance of encountering difficulty. These instructions have been broken down into basic assembly groups. You may wish to skip ahead while assembling the fuselage, since here you must wait for the glue to dry.

FUSELAGE

See Pix #1 to #10. Begin by locating the four blocks which will be used to form the lower front (chin). These are as follows: 1 - 3/4 x 2 7/8 Rad. x 7 19/32 pine, 2 - 1 x 3 x 7 19/32 balsa, and 1 - 1 x 4 x 7 19/32 balsa. Starting with pine block, glue one of the 3" wide balsa blocks to the underside, leaving the balsa block extend 7/16" beyond the back (straight) edge of the pine block. Use white glue, Titebond, or other good wood glue. Glue the second 3" block to the underside of the first, this time leaving 7/8" extend beyond the balsa block. The 4" block is now glued to the underside, leaving it extend 2 3/8" beyond the previous block. Before the glue sets, check to be sure that the ends are flush and square. Allow the chin block to dry.

To aid in positioning the four pine cross frames, you may want to mark their location on the sides (use pencil, ball point pen will bleed through most finishes). The 3/4" square is located at the top rear of the cabin (top of seat back), flush with the top, and 1/32" in from the rear edge of the column. The smallest of the three angled strips forms the rear engine plate support, and is positioned so that its top edge is 1/8" below the top rear of the sides, and its angled edge is 1/8" in from the rear of the sides. The rear landing skid mounting strip is positioned flush with the bottom of the sides, and its angled edge 1/8" fn from the rear. Be sure that you use the block with the angled edge that matches the angle of the fuselage rear support. The curved balsa strips are used to support the 1/32" plywood cabin rear. These should be placed parallel to the rear of the cabin area, and 1/32" in from the edge to allow for the sheeting. The remaining pine cross frame, front skid support, is positioned so that its angled edge forms a continuation of the curve of the balsa strips, and its bottom edge is flush with the lower edge of the side. The previously assembled chin block should fit into the front, with its lower edge flush with the bottom, and butted against the front skid block. Although it is not necessary, the "steps" inside the chin can also be carved off, leaving a slanted edge

(the floor covers this area). Carefully position the cross frames and chin block as indicated, and glue into place. A couple of small brads driven through the sides into the ends of these members will hold things together. Be sure to keep the assembly square. The plywood rear plate is now glued between the sides and to the rear engine mount and the rear skid mount. The curved balsa strips should be glued to each side (inside) to support the 1/32 ply rear of the cabin, which can also be glued into place. The pine side engine mount supports are now glued to the inside of each side, leaving 1/8" space at the top. Here again, a couple of brads will help.

The fuselage assembly should now be set aside to dry, after which the chin block is carved and sanded to form a smooth curve into the plywood sides, and in profile.

ENGINE

See Pix #11 to #18. Remove the screws holding the top of the gearbox and carefully remove, being particularly careful not to loose any of the rollers in the bearing immediately beneath. Lift the clutch out of the engine and notice that there is a sharp scraping edge about midway on each shoe. This edge must be removed for proper operation. Use solvent to clean the grease from the shoes (lacquer thinner will do), then carefully file the edge to form a smooth radius. Remove filings, then regrease the shoes, either with Lubriplate or some of the excess grease in the engine, and reinstall the clutch. Replace the upper gearbox, then install the main rotor output shaft and the top cover plate. Be sure you grease the end of the output shaft.

Mount the carburetor to the engine, with the gasket between the carb and the engine. A 6-32 x 1/2 Phillips head screw is used into the tapped hole in the engine and a 6-32 x 1/2 with a lockwasher and nut into the untapped hole.

A baffle must be installed into the exhaust stack. Locate the round slotted baffle plate, the 5/32" slotted shaft, a 5/32" collar, the 4-40 x 3/4" screw, a 3/32 I.D. washer, and a swivel link. Using a pair of needlenose pliers, slip the baffle plate, slot up, into the exhaust stack. You mayhhave to file the plate to make it fit. Now slide the slotted end of the baffle shaft through the hole in the top of the exhaust stack, interlocking the slots in the baffle and the shaft, and out through the hole in the bottom of the stack. Slip the 3/32 washer over the split end of the shaft, then flare the end open so that the washer is locked on. Thread the swivel link onto the 4-40 screw, and install the screw into the collar. Install the collar on the top end of the baffle shaft and temporarilyllock in place by tightening the 4-40 screw.

Bag No.	Part No.	Quantity	Description	Price
			MAIN DRIVE	
	120	1	Bearing Plate	
	121	4	Stand Off	
	122	1	3/8" Collar & Set Screw	
	123	1	Shaft Follower	
	124	2	Follower Pins	
	125	1	1/2" Brass Spacer	
	126	1	1 1/8" Brass Spacer	
H-300-15	127	8	8-32 x 1/2" Bolts	$17.85
	128	8	#8 Lock Washers	
	129	2	4-40 Nuts	
	130	1	#4 Lock Washer	
	131	1	Anti-Rotation Link	
	132	1	Swash Plate Spring	
	133	1	Spring Holder	
			FUSELAGE	
	134	2	Sides 1/8" Ply	
	135	1	Rear Plate 1/8" Ply	
	136	1	Rear Panel 1/32" Ply	
	137	2	Balsa Panel Mounts	
	138	1	Pine Top Cross Brace	
	139	1	Pine Top Rear Cross Brace	
	140	1	Pine Rear L.G. Mount	
H-300-16	141	1	Pine Front L.G. Mount	$30.00
	142	1	Pine Nose Block	
	143	2	3" Balsa Block	
	144	1	4" Balsa Block	
	145	2	Engine Mounting Rails	
	146	1	Pine Servo Tray Strip	
	147	1	Front Canopy	
H-300-17	148	1	Top Canopy	$10.00
	149	2	Side Canopy	
	150	1	Tail Rotor Pitch Gauge	
	151	1	Rear Seat	
	152	1	Floor	
	153	1	Console	$10.00
H-300-18	154	1	Instrument Panel	
	155	2	Gas Tank	
	156	2	Gas Tank Sides	
	157	12	#6 x 3/4 Screws	
	158	4	#6 Lock Washers	
H-300-19	159	2	#2 x 5/8 Screws	$.70

Bag No.	Part No.	Quantity	Description	Price
	78	2	Blade Holders	
	79	1	Blade Hub	
	80	1	Nylon Pitch Control Head	
	81	4	EZ Connector	
	82	4	EZ Connector Washers	
	83	2	3/32 Collars	
	84	6	4-40 Set Screws	
H-300-11	85	2	4-40 x 1/2 Bolts	$15.85
	86	2	4-40 Nuts	
	87	2	#4 Lock Washers	
	88	1	6-32 Set Screw	
	89	2	5-40 x 5/16 Bolts	
	90	4	#5 Lock Washers	
	91	2	Pitch Control Links	
	92	1	Bellcrank Mount	
	93	1	Bellcrank	
	94	1	Bellcrank Bearing	
	95	1	Pitch Control Shaft	
	96	1	Pitch Control Spring	
	97	1	3/32 Collar	
H-300-12	98	1	4-40 x 1/2 Bolt	$4.70
	99	2	4-40 x 3/8 Bolts	
	100	2	#4 Lock Washers	
	101	2	4-40 Nuts	
	102	1	4-40 Set Screw	
	103	1	Tail Skid Mount	
	104	2	6-32 Set Screws	
			TAIL BOOM & DRIVE	
	105	1	Tail Boom	
H-300-13	106	1	Antenna Tubing	$17.40
	107	1	Drive Shaft	
	108	1	.020 Control Wire	
	109	2	Center Bearing Eyelets	
	110	1	Center Bearing, Teflon	
	111	2	Drive Shaft Collars	
	112	1	Bearing Block	
	113	2	Bearings	
H-300-14	114	1	Gear Shaft	$23.40
	115	4	6-32 Set Screws	
	116	2	4-40 x 1/8 Bolts	
	117	5	Gear Spacer Washers	
	118	2	6-32 x 3/8 Bolts	
	119	2	#6 Lock Washers	

Bend a threaded Kwik Link rod to fit between the carburetor and the exhaust baffle. The length should be adjusted so that the baffle is fully closed when the carburetor is in low position (about 1/8" opening) and fully open when the carburetor is open. A solder link is soldered to the carburetor end of the linkage and a swivel link clevis is screwed onto the threaded end at the baffle. Travel of the baffle with relation to the carburetor can be varied by turning the swivel link inoor out on the screw control arm.

Note: Two tubes of Loctite are supplied with this kit; one blue, the other red. The blue is a moderate strength, adequate to prevent loosening, yet allowing easy removal. The blue Loctite should be used for most hardware installation. The red Loctite is a high strength material, requiring considerable force to remove. The red Loctite should be used only for assemblies receiving high stress. Areas where the red should be used will be noted. For best results, all screw threads should be cleaned (lacquer thinner or equivalent) before assembly.

ENGINE PLATE AND ROTOR SHAFT

See Pix #19 to #25. As shown in the photos, attach the four bearing plate posts to the engine plate, using four 8-32 x 3/8 socket head screws, lock washers, and blue Loctite. Also mount the two bellcrank support angles, using two 4-40 x 3/8 pan head screws, lockwashers, nuts and blue Loctite for each angle. Attach a bellcrank to each angle, as shown, using a 4-40 x 3/8 screw, bushing lock washer and nut. The flange on the bushing should be between the bellcrank and the angle, and the flange on the bellcrank should ride on the bushing flange in order to properly position the bellcrank.

There is a single hole near the left rear corner of the engine plate. Install a 4-40 screw through this hole from the underside, locking in place with a nut on top. Place a 3/8" piece of nylon tube into one of the 1/8" I.D. collars, and screw this onto the projecting screw. Do not crush the tubing as this is the guide for the tail rotor pushrod.

Mount the engine to the underside of the plate, using the four engine screws and lockwashers through the top of the plate.

Position the engine plate on the fuselage, and mark the location of the forward engine lug which is against the 1/32 ply rear cabin wall. Cut out the plywood to allow clearance for this lug. Once this has been done, the fuselage shell may be sanded and painted.

Slide the large brass bevel gear onto the rotor shaft, teeth down, followed by the 3/8" I.D. collar. Slide the bearing plate onto

the rotor shaft with the bearing flange down, positioning as shown. Attach the bearing plate to its posts with four 8-32 x 3/8 screws and lock washers. Slide the collar up tight against the bearing, and tighten its setscrew securely against the flat on the shaft. Leave the gear loose for now. Do not put a bind on the main shaft when installing this plate. You may have to bend the bearing plate post slightly so the shaft turns freely.

Lay the swash plate on your bench, with the inner collar up. Position the lower ring so that the three tapped holes are at 9, 12, and 3 o'clock. Using red Loctite, thread a 4-40 x 5/8 stud into the holes at the 9 and 12 o'clock positions. Again using red Loctite, thread the rotation limiter (1" long pin, threaded one end) into the remaining hole. Install a 4-40 x 1/2 screw into the hole in the inner race, from the inside, with red Loctite.

Slip the short (1/2") length of 3/8" I.D. brass tubing onto the rotor shaft, followed by the swash plate (small side up) and then the longer (1 1/8") length of brass tubing. Two threaded pins are installed in the control rod guide, using red Loctite. Then the guide is slid down the shaft and tightened just enough to hold everything in place. It will be adjusted later.

Thread a nut onto the anti-rotation yoke (Loctite red). Slip the cyclic spring clip onto the threaded end, then install through the hole on the right side of the bearing plate and fasten with another nut and blue Loctite. The rotation limiting stud on the swash plate should be positioned in the yoke as the yoke is installed. The small spring is now hooked between the hole in the limiter end and the hole in the clip. Make two linkages with a swivel link clevis on one end and a solder Kwik Link on the other. With the swivel link clevis in the middle of its adjustment range, the linkages should be 2 3/4" between link centers. Screw the swivel link onto each of the threaded arms in the swash plate, positioning the two in the lower ring so that their center pin is 11/32" from the swash plate. The upper swivel will be positioned 9/32" from the swash plate. Install the two linkages between the lower swivels and the bellcranks.

SKIDS

See Pix #26 to #29. Position one fo the skid legs so that it is flush with the rear edge of the forward skid mounting block and centered from side to side. Mark the location for the four mounting screws. From the centerline of these screws, measure back 8 1/4" and mark the centerline for the rear skid legs on the rear mounting block. Drill a 1/16" diameter hole at each screw location, then install both gear legs with eight 6 x 3/4" sheet metal screws, adding a brace tube under the two outermost forward screw heads. Runaa #6 x 3/4" sheet metal screw into each hole in the skids, then remove. Cut 1/8" off the end of the two screws. Now position the skid stabilizer straps under the legs and screw on the skids, using the shortened screws on the front legs and

Bag No.	Part No.	Quantity	Description	Price
	33	1	Baffle	
	34	1	Shaft	
	35	1	Washer	
	36	1	Eyelet	
	37	1	Collar	
	38	1	4-40 x 3/4 Bolt	
	39	1	Carburetor Gasket	
	40	2	6-32 x 1/2 Bolt	
	41	2	#6 Lock Washers	
H-300-7	42	1	6-32 Nut	$8.85
	43	1	Glow Plug Adapter	
	44	1	Adapter Gasket	
	45	1	Transmission Cover	
	46	1	Cover Gasket	
	47	3	Cover Bolts	
	48	1	Bearing	
	49	1	Pull Starter Spacer	
	50	1	10-32 x 1½ Bolt	
	51	1	#10 Lock Washer	
	52	1	Large Brass Gear	
	53	1	10-32 Set Screw	
H-300-8	54	1	Small Brass Gear	$12.00
	55	1	6-32 Set Screw	
			CONTROLS	
	56	1	4-40 x 3/4 Bolt	
	57	7	#4 Lock Washers	
	58	4	Kwik Link - no pin	
	59	1	Solder Link - no pin	
	60	6	Solder Link	
	61	4	Kwik Link	
	62	6	4" Push Rod	
	63	1	6" Push Rod	
	64	1	Kwik Link Coupler	
H-300-9	65	1	2" x 1/16" Brass Tubing	$9.95
	66	1	EZ Connector	
	67	1	EZ Connector Washer	
	68	1	4-40 x 1/8 Bolt	
	69	2	Bellcrank	
	70	2	Bellcrank Bearings	
	71	2	4-40 x 1/2 Bolts	
	72	4	4-40 x 3/8 Bolts	
	73	7	4-40 Nuts	
	74	1	1/8 Collar	
			TAIL ROTOR ASSEMBLY	
	75	1	Gear Box	
H-300-10	76	2	6-32 - 3/8	$29.50
	77	2	#6 Lock Washers	

DU-BRO HUGHES 300 PARTS LIST

Bag. No.	Part No.	Quantity	Description	Price
			MAIN ROTOR	
H-300-1	1	2	Main Rotor Blades	$15.00
	2	2	Tail Rotor Blades	
	3	2	Top Blade Mount	
	4	2	Bottom Blade Mount	
	5	3	6-32 Spade Bolts	
	6	2	Springs	
	7	7	6-32 Nuts	
H-300-2	8	8	4-40 x 3/4 Bolts	$13.80
	9	8	#4 Lock Washers	
	10	8	4-40 Nuts	
	11	2	1/4 20 x 3/4 Bolts	
	12	4	1/4 Washers	
	13	2	1/4 20 Nuts	
H-300-3	14	1	Flybar	$6.00
	15	2	5/8" Flange Bearings	
	16	2	1/2" Flange Bearings	
	17	1	Bearing Mount	
H-300-4	18	1	Bearing Mount Sleeve	$27.30
	19	2	10-32 x 5/16 Bolts	
	20	2	#10 Washers	
	21	1	10-32 x 3/4 Bolt	
	22	1	10-32 Nut	
	23	2	Flybar Paddles	
H-300-5	24	1	Flybar Control Arm	
	25	1	3/16 Collar	$12.10
	26	2	6-32 Set Screws	
	27	1	Kwik Link Pivot	
	28	1	Swash Plate	
H-300-6	29	2	4-40 x 5/8 Studs	
	30	1	Anti-Rotation Bar	$24.20
	31	1	4-40 x 1/2 Bolt	
	32	3	Kwik Link Pivot	

installing the rear of the brace tubes under the rear screws. These four screws have lock washers installed under their heads.

Slip a 2 1/4" diameter Du-Bro wheel (not included) on each forward axle and retain with a wheel collar.

Drill a 1/8" hole through the front skid mounting block in the center and just forward of the skid strap. Install a 4-40 x 1 1/4 screw from inside with a nut on the underside. Screw a 1/8" I.D. collar onto the extending screw. This will serve as an antenna guide.

TAIL BOOM

See Pix #30 to #34. Begin assembly of the tail boom by carefully pressing a 1/4" I.D. x 5/8" O.D. bearing into each end of the forward bearing/mounting block. Find the teflon shaft support bearing and slip the support onto the 1/4" I.D. brass tube tail rotor drive shaft, positioning it in the center of the shaft's length. Slide an eyelet onto each end of the drive shaft, with the eyelet flanges toward the teflon bearing. Position the eyelets against the bearing, so that they hold the teflon bearing in position on the shaft, leaving about 1/16" space between the eyelets and the bearing. Solder the eyelets to the shaft.

Slip a long brass collar onto each end of the tail rotor drive shaft. Fit the drive shaft over the tail rotor gearbox shaft (the one without the hole through it), aligning the threaded holes in the collar with the flat on the gearbox shaft. Install a 6-32 screw into each of the holes in the collar and tighten securely, flattening the tube into the shaft flats. Once this has been done, the screws are removed (one at a time) and replaced with a 6-32 setscrews, securely tightened, with blue Loctite.

Lightly tighten the small bevel gear onto the 3/16" diameter end of the stepped gear shaft, then insert the 1/4" diameter end of the shaft through the forward bearing block (from the square end of the block). Insert this shaft into the forward end of the drive tube. Using the tail boom as a gauge, adjust the drive tube length so that the rear edge of the square on the bearing block is against the front of the boom when the forward edge of the rotor gearbox is against the cutout in the boom. In this position, lock the front gear shaft into the drive tube in the same manner as was done to the gearbox end. Don't forget the blue Loctite.

Remove the bevel gear and the front bearing block. Slide the boom support strap onto the boom tube. Insert the drive shaft into the boom from the rear, pushing the teflon bearing into the boom. You may need some light oil on the O ring to make it slip easier.

Attach the tail rotor gearbox to the boom, at the same time adding the tail skid casting with two 6-32 x 3/8" screws, lockwashers, and blue Loctite. Guide the gear shaft through the bearing block and attach the bearing block to the boom with two 4-40 x 1/8" screws (the two tapped holes in the flat surface must be oriented opposite the tail rotor). Install the spacer washers and small bevel gear on the extending 3/16" diameter shaft, locking the setscrew onto the flat area with Loctite. You may need 3, 4, or 5 washers to space the gear so that it will mesh properly with the large gear. Mount the vertical stabilizer to the underside of the boom with three #2 sheet metal screws as shown. Fit the tail skid into its casting and lock securely with two 6-32 setscrews and red Loctite.

TAIL ROTOR

See Pix #35 to #39. Begin by mounting the bellcrank bracket to the gearbox with two 4-40 x 1/4 screws, lockwashers, and Loctite, positioning the bracket so that it angles forward. Install an EZ connector on the control arm of each blade holder and on each ear of the nylon control bushing. These must be carefully peened in place, flaring the stud just enough to retain the washer. Several light taps with a small hammer will work far better than a heavy pounding. The EZ connectors must rotate freely.

Mount the two blade holders to their collar with 5-40 screws, placing two lockwashers between the holder and the collar. Now position the collar onto the gearbox output shaft and setscrew securely in place. Use red Loctite. Slide a 3/32 I.D. collar onto the long arm of the tail rotor pitch control rod followed by the coil spring. This rod runs through the tail rotor shaft. Install the tail rotor pitch control bellcrank to the underside of its bracket, engaging the control rod in the hole in the bellcrank. You will have to enlarge the hole in the bellcrank so the pitch control rod will fit and be free to move. Secure all hardware with Loctite. On the rod end extending from the rotor shaft, mount a 3/32 I.D. collar, the nylon control bushing (oriented as shown), and a second collar. Fit the two control links (1/16" wire) between the EZ connectors on the blade arms and those on the control bushing. These control links should be flush to 1/64" extended beyond the EZ connectors. Lock in place with 4-40 setscrews and Loctite. Lightly tighten the two collars - they will be adjusted later. Finish the tail rotor blades (film covering or paint) and attach with a 4-40 screw and nut. It is important that the blade holders, blades and control bushing be properly oriented as shown in the photos.

POWERPLANT ATTACHMENT

See Pix #40 to #42. Place the engine mounting plate onto the fuselage and drill a 1/16" diameter pilot hole through the eight mounting holes.

Another thing to watch for is when you are flying out away from you and the copter is 100 feet or more from you, you should not go into a hover because it is very hard to tell which way the copter is facing and what it is doing, so you can't tell what controls to give it to keep it upright. If you should find yourself in this situation, push the stick forward and start moving so you can tell which way is forward.

This copter is capable of very fast forward flight and can handle high wind conditions. But only after much practice. The controls have been designed to give very fast response to cut down on the lag time which is good. But it makes it harder to hold in a dead hover. If you would like to have smoother hovering, you can cut down on the control movement.

designed and manufactured by

DU-BRO PRODUCTS INCORPORATED

wauconda, illinois 60084 u.s.a.

NOTE:

During the thorough testing of the Hughes 300, we found that some of the O & R eompact engines would not hold the top end, even after the break-in period. It was determined that this was being caused by high spots on the piston skirt. Should you encounter this problem, clamp the engine crankcase in a vise and unscrew the cylinder head.

Remove the piston and file off the high (shiny) spots. This may sound a little drastic, but there is really no hazard, assuming that the filings are removed before re-assembly. On rare occassions, this procedure may have to be repeated two or three times before the condition is completely cured (depending somewhat on how ambitiously you file).

That's about it. It's a whole new field, and it will require dedication and perseverance to master it. Proceed slowly and carefully and you will find a new era of enjoyment.

feet of forward motion. This will give you some idea of how steep to come down. OK. Here we go. You are up 30 feet and moving forward. Keep the same forward speed and very carefully back off on the power and watch for the descent to start as before. But this time you should not need to put power back on unless of course you slowed down too much. So just watch the descend to see that it is not too steep. Assuming you are coming in alright, as the copter nears the ground, pull back on the forward control to slow the forward speed and at the same time put on power to slow the descend. When you are good, the copter will stop in a hover about one foot from the ground and then you can let down to a soft landing.

When you have gotten this far it is time to start flying in more wind. As everything else in flying the copter, do this in slow steps. You will find the wind is like another control. It is there and it isn't. If it is a steady wind it is better because it is always there. When flying in the wind you are using your controls alot more than in calm weather. For instance, as you are moving up wind you need less power to keep from climbing, and going down wind you need more power to keep from settling. Remember your forward speed is airspeed, not ground speed we are talking about. If the wind is blowing 10 m.p.h. you are going 10 m.p.h. in a hover. Also the tail rotor is much harder to control in the wind. For instance, if you are hovering and facing into the wind you are holding forward control to stay over one spot. Now if you wish to turn right, you move the control to the right and the tail swings into the wind. It takes more and more control to bring it around into the wind until the body is directly cross wind. Now the wind is coming from the left side of the copter. At this point (if you haven't lost it already) you are holding left stick to stay over the spot and alot of right tail rotor control. Now continuing the turn you will use less tail rotor control as the tail comes around into the wind. At the point where the tail is directly into the wind the controls have again changed. Now you are holding back control to stay over the spot. Also the tail rotor is at its most difficult position to hold because if it moves either left or right and the wind catches it, it will swing around very fast unless you catch it. It takes alot of practice and time, but it can be done. The helicopter is capable of flying in the wind.

When starting out it is best to take off from a hard surface. When you become more proficient at flying you can take off from the grass. But the take off is done a little differently. You increase the throttle until the copter gets light and the rotor is turning at a good speed. Now open the throttle and get off the ground and out of the grass quick.

Raise the large bevel gear and slide the tail boom into place fastening from the underside of the plate with two 6-32 x 3/8 screws, lockwashers and Loctite into the bearing block. Place the "U" bracket over the boom and attach the mounting plate and boom to the fuselage with eight #6 x 3/4" sheet metal screws. Place a strip of bond paper between the bevel gear teeth and press the gears together, locking the large bevel gear to the main rotor shaft with the setscrew against the shaft flat. Remove the paper strip.

Mount the two boom braces loosely to the brace clamp (one on each side) with a 4-40 x 3/4" screw and nut - screw protrudes on the left side. Swing the braces in and attach to the lower corners of the fuselage with #2 sheet metal screws. Now tighten the clamp screw. Put a 3/8" piece of nylon tubing into a 1/8" I.D. collar, and thread this onto the projecting screw (tail rotor control guide).

MAIN ROTOR

See Pix #43 to #50. Press the bearings into the rotor yoke and the blade teeter. Both sets of bearings are installed with their flanges on the inside. The center stabilizer bar housing is positioned between the yoke bearings and held with a 10-32 x 5/16" screw through each yoke bearing. Use red Loctite. There are two small bowed washers supplied, these should be fitted between the center housing and the yoke with the curve around the center housing (one on each side). Place this assembly between the bearings in the blade teeter and insert the steel stabilizer bar sleeve through both bearings and the center housing. Check to bessure that the "head" pivots freely in both axes. The 3/16" diameter stabilizer bar slides through its sleeve and is held in position (approximately centered) by a 3/16 I.D. collar on one side of the head and the blade actuating arm on the other. Tighten these just enough to hold in place. Screw a steering paddle onto each end of the stabilizer bar as far as they will go. Use red Loctite on this installation. The bottoms of both paddles must be parallel. If at all possible, this should be done by tightening the paddles rather than loosening. Two paralled wood blocks set on the bench, one under each paddle, provides a quick adjustment.

The main rotor blades have been carefully selected at the factory to provide reasonable balanced blades. For this reason, we suggest that the blades be lightly sanded and covered with one of the film coverings (Monokote, Solarfilm, etc.), rather than painting. The inboard end, where the holders fit, can be painted. Mount the blade holders with four 4-40 x 3/4" screws and nuts. The straight side of the lower holder is at the leading edge of the blade. The blade tips should be covered with a strip of color film, using a different color on each tip as an aid in adjusting tracking (red and blue work well).

Thread three nuts onto one of the spade lugs and install it into the center of the center housing. Mount the other lugs onto the blade holders with a nut on each side.

RADIO INSTALLATION

See Pix #51 to #53. Using the 5/16" x 3/4" strip wood supplied, build the servo tray as shown, adjusting the space between the rails to fit the servos being used. Short pads must be added to each end of the tray to clear the balsa strip and also to allow the seats to fit into place. Position your servos in the tray such that the control arms being used are directly in line with the two cyclic bellcranks, the engine bellcrank and the tail rotor guide (rear corner of mounting plate). The following are the control directions required - Forward cyclic (down elevator), pull; Left cyclic (left aileron), pull; Low throttle, pull; Increase tail rotor pitch (rudder), pull. Direction of tail rotor operation is your choice. Some pilots prefer to set up so that left tail rotor (rudder) turns the whole helicopter (nose) to the left. Others prefer that left tail rotor turns the tail to the left, thereby steering the tail - again, the choice is yours. The throttle servo is mounted to the underside of the tray. Once the servos have been positioned on the tray, the tray can be located in the fuselage, adjusting its vertical placement so that the servo arms are in line with the bellcranks. Mount the tray with four #2 sheet metal screws, two on each side. Carefully locate the pushrod holes in the rear cabin wall and drill through. The receiver and battery can be held to the cabin floor (pine) with cuphooks and rubber bands (pack in foam first).

INTERIOR

See Pix #54 to #56. Trim the vacuum formed seats and console. Cement the seat back to the seat/floor. Cement the console to the floor and add the instrument panel. Carefully trim the sides of the seat back to clear the ends of the servo tray. The interior is held in place by three #2 sheet metal screws through the top of the seat back and two in the forward floor. The interior may be further detailed if desired (instruments, pedals, stick, etc.). The interior should be painted with enamel paints.

CANOPY

See Pix #57 to #60. Carefully trim and fit the clear forward bubble and the green top bubble. Join using Ambroid, plastic cement, or Testors liquid plastic solvent. Fit the door panels, cementing in place along the forward door hinge line only. Now place onto the cabin and cement the remainder of the door panels. Allow to dry, then paint all window frames with enamel (Testors Pla) to prevent twisting. Incidentally Testors Red Pla spray is a good match for Aero Gloss Stearman Red. Attach the canopy with four #2 sheet metal screws and fiber washers as shown, at the lower forward and top rear corners.

When you can hover or generally stay over or near one spot for an entire tank of fuel, which is about ten minutes, you are ready to try some forward flight. Again, let me say you should be doing all your flying at less than 3 or 4 feet altitude. When starting to make forward flight, do so very slowly. Just bump the stick a little until the copter starts to move forward, then watch to see that it does not move too fast. The moving of the main control stick will control the speed of the copter, not the throttle as on an airplane.

As you get the feel of forward flight, let's try a few simple turns. When you are flying as you are now or down low and moving very slow forward, all turns must be made with the tail rotor control. So move forward and at the same time give a little left tail rotor and the copter should swing around to the left. Sounds easy, doesn't it? Well, keep practicing and soon you will be able to fly back and forth in front of you or stop and hover at will. It is still not a good idea to fly more than 4 or 5 feet up. Up to this altitude if you get in trouble you can just cut the power and drop down without hurting anything. Above that altitude you must fly it back down or crash. And speaking of flying back down, it is about time to start working on landing because you are getting ready to climb higher. As you will find out, going up is easy, but coming down seperates the men from the boys. This maneuver is one which you will have to work into very slowly and get the feel of it. I will try to explain as best I can and then it is up to you. There are three ways to get back down after you have gotten up there. One is to let down slowly over a spot more or less straight down. The second is to fly down by moving forward and descending, which is by far the hardest but the right way. And the third way is to crash. This is the easiest way but the hardest on the copter. To start with, use the first method and try not to use the third.

OK. Here we go. Assume you are 20 feet in the air. For heavens sake don't start that high, but use the same procedure and work up. Hold the copter in a hover and very carefully back off on the throttle watching very closely for the copter to start descending. As soon as it starts to come down, advance the throttle a little, not too much or you will go back up. Just enough to slow down the descent. Practice this maneuver in gradual steps going a little higher as you improve. I would say that if you were up 20 or 30 feet and start down too fast and you think you are losing control, open the throttle all the way and climb back up. If you caught it in time you can save it and try again.

To land or come down as you're moving forward is difficult but very satisfying to be able to do so. To start with let us say you are up 20 to 30 feet. You should be able to set up a descent that would put you on the ground safely in about 50

FLYING AND FLIGHT TRIM

When you are ready for the first flight, we suggest the training landing gear which is available. With it you should be able to get off the ground without breaking anything.

First of all you should understand a little about flying a helicopter. You will not learn how to fly it overnight. It takes alot of practice and patience. There is no such thing as an expert. With a helicopter, everyone is a beginner. Even if you have been flying airplanes for years, you are a beginner when it comes to flying a copter.

You first have to check and adjust the trim controls. Do this by advancing the throttle slowly until the copter lifts. It should lift straight up. Once off the ground, the tail should stay in position without holding control. If not, cut the throttle and adjust the trim until the tail stays straight when you lift off. Also, if the copter moves forward every time you try to lift off, move the fore-aft trim control back slightly. The same for side control. Not much trim control is necessary to make a difference. Now that you feel that the trims are set, lift off and using only the tail rotor control, try to keep the copter pointing in the same direction. The tail rotor control is the hardest control to learn, and you must be able to control the tail before you can use the other controls with any accuracy. The tail will swing as you increase or decrease power due to the torque change. The faster you change power, the more kick you get on the tail. So you will want to make your throttle changes as smooth as possible.

If, after a few tries, you seem to always give the wrong tail control or the control feels backwards, reverse the servo and don't try to fight it. All early flying should be done not more than two feet off the ground, so watch the throttle. Before you are ready to fly higher you must be able to control all four controls at the same time and in coordination with each other. Now if you are able to hold the tail a little bit, try the main controls. If the copter tilts and moves forward, move the control back to straighten up, the same for left and right control. At first you will probably over control and the copter will go in the opposite direction. You will just have to practice and get the feel of it. When starting out just try to hover or keep over the same spot. Do not try to move forward or in any direction. That comes later. For right now, just keep practicing.

We should mention that up to now, and for sometime to come, you should fly the copter when there is no wind if possible. The wind just makes flying that much harder and you have enough to do right now without fighting the wind too.

TANKS

The dummy fuel tanks should be trimmed out and cemented together to make a left and a right tank. Cement a piece of scrap plastic to the inside front of the tank to make this part thicker. Mount one tank on each side. Put a #2 screw through the cabin back and into the tank. The tanks can be painted with Aero Gloss.

FINAL ASSEMBLY AND ADJUSTMENT

See Pix #61 to #64. Make up three pushrods, two to fit between the servos and the cyclic pitch bellcranks, and one between the throttle servo and the carburetor bellcrank. Each of the rods consists of a threaded rod with a Kwik link on one end, and a solder link on the other. Also make up the cyclic control link which consists of a threaded rod with a threaded swivel link clevis on one end and a soldered swivel link clevis on the other. With the threaded link in the center of its adjustment, the clevises should be about 5 1/2" center to center.

Install the two cyclic control linkages. Set your servos to neutral and adjust these links so that the two bellcranks are setting square to the engine plate. That is, the legs connected to the servos should be vertical and the legs connected to swash plate should be horizontal. Now adjust the two swash plate linkages so that the swash plate is perfectly perpendicular to the main rotor shaft - in both directions. This adjustment is best made with the radio turned on - trims in neutral. Take your time and re-adjust until the preceding set up is achieved.

Now slide the main rotor head onto its shaft and fasten with a 10-32 x 3/4 bolt and nut - don't forget the LOCTITE! Loosen the setscrews in the steering arm and collar (on the stabilizer bar). Keep the collar and steering arm in against the head, while sliding the stabilizer bar back and forth through the head. Find the balance point of the stabilizer bar (where it will set dead level), then lock the collar in place. Thread a swivel link onto the steering arm until its center pin is in line with the center of the yoke screw. With the swash plate still in neutral (perpendicular to the rotor shaft), slide the solder clevis end of the cylic link through the hole in the blade teeter and connect it to the steering arm. Loosen the setscrew in the guide collar and position the cylic linkage between its pins. Adjust the length so that, when hooked to the swash plate, the steering arm swivel will be vertically in line with the center of the yoke screw. Position the guide collar so that the control linkage is vertical and then tighten securely using Loctite. Be sure that the collar is pushed down tight against the brass sleeve. Obtain a small level which will read both horizontal and vertical. Place shims under the skids until the main rotor shaft is vertical.

Now place the level on the undersideoof one of the steering paddles and adjust (rotating the entire stabilizer bar, steering arm loose) until it is level (horizontal). Check the other paddle as both must be level. When satisfied, securely lock the steering arm.

These adjustments may sound tedious, but can actually be performed very rapidly and since, if done correctly, they assure that your helicopter will be correctly tirmmed first time out, should be done carefully.

Mount a rotor blade on one end of the Teeter with the blade holder on top of the teeter and the blade perpendicular to the stabilizer bar (1/4-28 x 3/4, 2 washers and nut). Now mount the other blade in the same manner. Adjust the second blade's angle until the stabilizer bar balances horizontal.

Using your transmitter antenna as a gauge, set the transmitter under one blade tip and raise the antenna until it is just under the blade. Now rotate the head and check the other blade. Drive small brads in the lighter blade until balance is achieved. Again, the more carefully this is done the smoother your machine will operate.

When installing the blades, we recommend applying a thin film of epoxy between the blade holder and the teeter. This will hold the blades in position, yet will shear on impact. Tighten the blade screws very securely.

Attach the two damping springs between the blade holders and the lug on top of the head. This is most easily done by removing the lug on the blade holder, then hooking the spring in place and re-installing the lug.

Again, set up your transmitter antenna and by adjusting the nuts on the lugs on the blade holders tighten the springs until the blade tips are again level. Lock the nuts in place.

Assemble the blade pitch gauge as shown. The blade holders have been pre-bent to approximately the correct pitch angle. Hook the legs of the gauge over the stabilizer bar being certain that it is seated into the slots. Raise the gauge against the underside of the blade. Using two adjustable wrenches, one over the blade holders on the blade, the other on the teeter, carefully twist the blade holder until the blade lays flat on the gauge. Repeat for the other blade. Note: It may be necessary to re-adjust the blade position, if much adjustment was made.

Solder a threaded coupler onto one end of the .020" diameter tail rotor control wire. Solder the 1/16" O.D. tubing onto the other end. Thread a Kwik Link onto the threaded coupler and connect to the tail rotor bellcrank. Pass the control wire through the

guide on the boom brace clamp then through the guide on the rear corner of the engine plate and finally through the rear wall of the cabin. Mount an EZ connector on your servo arm, then pass the rod through the EZ connector. With the servo in neutral, adjust the control rod so that the bellcrank is square with the boom and lock in place. You will need very little control on the tail rotor so mount the EZ connector in the inside hole of your servo arm.

Trim out the vacuum formed tail rotor gauge and lay the portion along the boom (inside of the control wire). Rotate the blades until one lays against the gauge and adjust the two collars making the blade lay flat against the gauge. Now check the other blade. Adjust the control rod (between the two EZ connectors) to bring this blade into position.

The tail rotor blades do not normally requiring balancing; however, should you experience excessive vibration the blades may be balanced by removing and balancing the entire assembly (blades, holders, and collar).

Mount a Pylon Brank SS-12 tank into the strap provided and attach with a 6-32 bolt and nut to the top of the lug extending from the right side of the engine. Connect the fuel line to the carburetor.

PRE FLIGHT

If all of the preceding adjustments have been made carefully, your Du-Bro Hughes 300 should be correctly trimmed. Suspend the helicopter from the rotor head. It should hang level to slightly tail high, with no ballast needed. If, however, it should hang tail heavy, add ballast as required.

Weight down or tie down the helicopter securely. Prime the engine (can be accomplished by pinching breather tube and squeezing tank - gently), and using the pull starter, fire it up, holding the rotor head while starting. Caution! Never start in any position but low throttle! Normal position of the needle valve is generally around 8 turns open.

Once running, slowly advance the throttle. At about half throttle, sight across the blades to check their track. If one blade is running higher than the other, determine which blade it is using the colored tips. Stop the engine and adjust by slightly reducing the pitch in the high blade or increasing the low blade (or a little of each). Repeat until both blades track the same path. Run a couple of tanks of fuel through the engine, while checking out the controls and getting the "feel" of your new machine - keeping it securely anchored.

The time has come. You are now ready to fly --