

**WHEN I WAS asked to review a helicopter, my first thought was, "No, thank you!" But I have a weakness for small airplane projects, and when I found out that the Lite Machines\* 100+ was powered by a little .06 engine, I decided it was actually my duty to give it a try. As I'm totally unfamiliar with helicopters and what makes them do what they do, I was absolutely dependent on the instruction manual. That dedication to the written word, along with the exploded views and numerous illustrations, resulted in a truly great building experience that produced a rather complicated machine as easily as if one of the designers had been at my elbow the whole time!**

## **FIRST IMPRESSIONS**

Professional! This kit was manufactured by intelligent people who take pride in their work. All mechanical parts were individually packaged and housed in a strong cardboard box and separated from the plastic canopy and plywood parts. Nothing in this kit could cause damage to itself even with fairly rough handling.

This is a completed kit in every sense of the word. Each assembly is packaged together, so there's no digging through unneeded hardware to find the next part. There's even a small box to keep tiny spare parts that you might happen to need at the field. I built the Basic Package, which includes everything from a throttled Norvel engine with spare glow plugs and special glow-plug connector to the proper lubricant for all moving parts.

## **ASSEMBLY**

Most modelers have all the tools necessary to complete assembly, with the exception of liquid thread-lock and some styrene glue for the canopy. Although the kit includes the Allen wrenches needed for bolts and setscrews, ball drivers of the proper size would indeed be welcome.

The construction manual is a thing of beauty - bearing a resemblance to the Heath Kit manuals of old. Every step is illustrated, and the exploded views are almost as good as having someone at your shoulder telling you what to do as well as anticipating things you might do wrong. This is a step-by-step manual, and they suggest that you follow the steps exactly! That I did, and am very glad of it, because it made assembly smooth and fun! So that you don't lose your place between sessions, check boxes are provided after each step.

The manual is divided into sections for each subassembly, and the first step in the construction sequence is the assembly of the plywood keel, which will house all the vital elements (engine, servos, receiver and batteries) along with their connections to all the control and operational mechanics. The instructions suggest sanding the edges of all ply parts and cleaning all the holes, notches and slots, but very little cleanup was needed. The only change I made from the manual was to paint the completed plywood keel with shinned epoxy cement rather than the suggested butyrate dope.

The next step was one of the most difficult! The canopy is in halves and must be cut from the sheet in which the halves were formed. The halves are then cemented together with styrene glue. I followed the instructions exactly, but even so, it was a rather tedious job getting both halves lined up perfectly and cemented together. It would have been a snap for a modeler with nimble fingers.

The main-rotor assembly looked like a tough job, and I was hesitant to start. While putting things together, I kept waiting for the tough part, but it never came! I am happy to report that the toughest

part was tightening screws! This step is where a ball driver would have been a great help, because some of these screws require a lot of turning with small Allen wrenches. Once assembled on the main shaft, balancing the rotors was not difficult at all, and very little fiddling brought the whole mass into balance.

The swashplate is really just a big ball bearing that must be assembled. It's an easy, but messy, job. The balls are slipped into their race one at a time, and then grease is added after they're all tucked in where they belong. I tried to be neat and dab the grease over the balls with a toothpick, but I finally gave up and used my fingers, which I should have done in the first place. From there on, the rest was easy.

The only glue joint outside of the plywood crutch was the fin cemented to the tail-rotor housing to keep the tail rotors away from the ground. The tail rotors practically assembled themselves, and when the tail assembly and boom were bolted to the crutch, everything lined up just right.

Assembling the gears, clutch and engine to the main-rotor shaft and crutch was a one-two-three job by following the checkoff list and the exploded views. The fuel tank is provided and is mounted on the crutch with cable straps. After the gear was bolted to the gear mounts and the cowl was slipped in place, a complete helicopter was sitting there on the bench looking just as pretty as the picture. All it needed was the radio!

Four micros servos are required for this machine, and the mounts have cutouts for the Hitec HS-80s of Futaba S-33s. Others may fit, but those are the only ones I have available. The receiver and battery pack are wrapped in foam and strapped to the forward part of the crutch with rubber bands; the throttle and rudder servos are mounted just behind them. The servos for the main rotor control are mounted just under the rotors to keep control rods short and direct. Because of the Arlton Gyro Stabilizer that is part of the 100+, no electronic gyro need be purchased or installed. All in all, it took less than an hour to install the radio, check alignment and test everything.

Now it was time to move on to the 60- page operator's guide, which does its very best to talk you through preflight preparation and trimming as well as the first few hours of flight. Again, the illustrations are absolutely first-rate, and the text is written to inform rather than impress! After the first few hours of flying, there are some things you should check to be sure the heli is in first class condition. These things are covered in the manual, too.

After a radio-range test (even though I had no intention of flying more than a few feet away), it was time to fire up the 100+! My friend and fellow club member Dan Tips lent me his helicopter flight simulator prior to my first flights, and I highly recommend that approach. In about four or five hours of flying the R/C Aerochopper\* computer flight simulator, I saved at least \$20,000 in busted-up helicopters! Contrary to my first thoughts, helicopters are great fun!

## **FLIGHT PERFORMANCE**

The first phases of testing were conducted between my shop, my house, two fences and my driveway. Since helicopters are vertical takeoff and landing machines, it seemed silly to go all the way to the field for the initial hops. Besides, I had no desire to embarrass myself in front of fellow club members, should my first efforts at helicopter flight be something other than successful.

The glow plug in the Norvel helicopter engine requires 2 volts to heat up and I used two 1.2V batteries in series as a glow driver. The additional 0.4 volt did not seem to cause any trouble at all. However, a glow driver with a way of varying the voltage would be ideal and is recommended.

According to the operating manual, I attached crossed, 3-foot-long, 1/4-inch-diameter dowels tipped with ping-pong balls to the landing gear with plastic strips. The fuel tank is easy to reach and fill; now everything was ready to go. As instructed, I advanced the throttle slightly, grasped the machine as shown and applied the starter.

The Norvel engine fired up and leaned out perfectly! The throttle is of the exhaust-restriction type and is a real beauty. The engine follows the throttle stick as smooth as silk, and speed can be varied by extremely small increments - a feature that is most important in helicopters.

Once the engine was running smoothly, with a beautiful idle, the bullet was bitten and the throttle was slowly advanced to lift off. At the first liftoff, the machine started a rotation to the left, just as mentioned in the instructions, so I throttled back and landed. The second liftoff, with a little right rudder, was smooth with no rotation, and with an elevation of about 1 foot and a 20-second flight, I called the initial test a success and throttled back to a fairly nice landing.

Since then, with several real flights under my belt, it has become obvious that up in the air, in forward flight, there is very little difference between the 100+ and any other R/C airplane. It is stable and will fly itself for short periods of time. Control response is more sensitive in pitch than in either roll or lateral control, and there's a lag between control input and effect (compared with flying a fixed-wing model), so some anticipation is necessary. This lag is especially true with the throttle response, which should have been expected! All in all, it would appear that the 100+ can be mastered by a novice helicopter pilot without too many tense moments.

For me, the novice pilot personified, flying (hovering) around the backyard is the most fun of all! The only damage sustained has been a few nicks to the tail boom caused by downward flexing rotors during hard landings - actually not really damage; just battle scars!

<b>SPECIFICATIONS</b>	
<b>Manufacturer:</b>	Lite Machines Corp.
<b>Type:</b>	helicopter
<b>Name:</b>	Lite Machines 100+
<b>Main Rotor Diameter:</b>	24 in.
<b>Engine:</b>	Norvel Vmax-6 w/Spiralite plug and throttle muffler (included in Basic pack)

<b>Engine/main-rotor gear ratio:</b>	1:11.3
<b>Radio Req'd:</b>	4-channel
<b>Tail-rotor/main-rotor ratio:</b>	1:2.1<.FONT>
<b>List Price:</b>	\$199 (100+); \$268.74 (Basic Pkg.); \$389(Basic Pkg. plus microserves, grease and oil); \$499 (Basic Pkg. Plus complete radio system, grease and oil).
<b>Features:</b>	Very complete instruction manual and easy assembly. The Arlton Gyro Stabilizer eliminates the need for expensive gyro add-ons.
<b>Comments:</b>	Because of its great building and operating manuals, the 100+ (my first helicopter!) was truly a great building experience, and flying the 100+ can be mastered by a novice helicopter pilot without too many tense moments.
<b>Hits:</b>	<ul style="list-style-type: none"> <li>• Overall design</li> <li>• Instruction and operating manuals are first-rate</li> <li>• Easy to assemble</li> <li>• Perfect parts fit</li> </ul>
<b>Misses:</b>	None-found