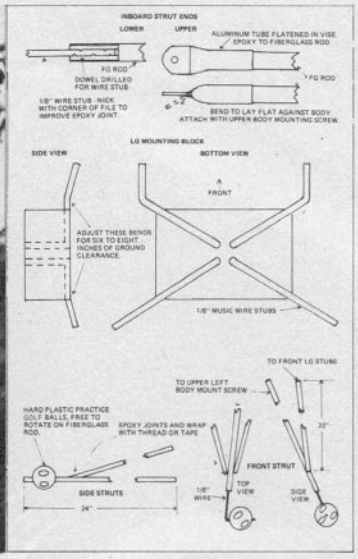
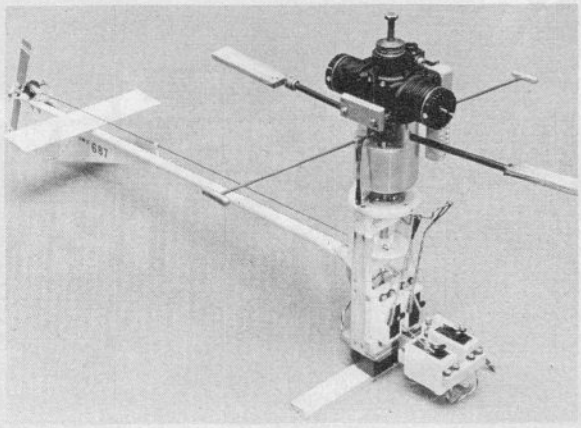
Blue Ribbon Review

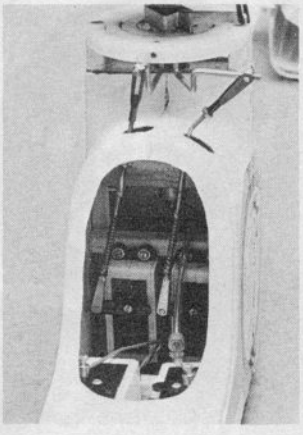
PART II

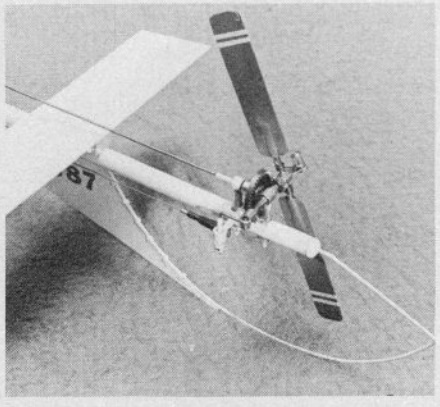
THAT "GOOFY THING" DAVE GREY DESIGNED, DU-BRO'S WHIRLYBIRD 505. BUILDING AND FLYING THIS MODEL WAS PURE FUN AND CHALLENGE

BOB BECKMAN AND ED SWEENEY

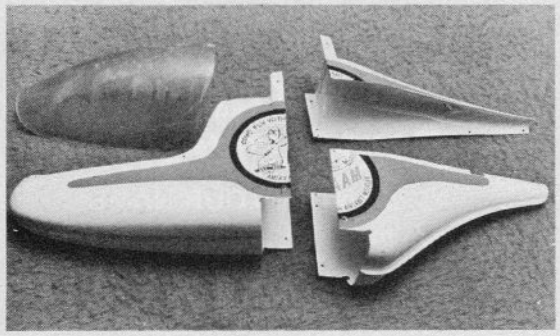


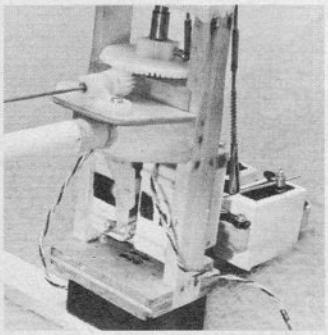






Top: Author with our bird at the time of early testing with tripod gear. Note ideal shape and fit of the O.S. Wankel engine. Spinner for starting only but cooling fan needed. Above Left: Complete frame with Ross engine installed. Short bar of lead on this side of engine balances carburetor and exhaust stacks. All parts are quite serviceable. Above Right: Canopy removed to view inside. Snug body keeps the exhaust mess out fairly well. Incidentally, weight is not critical if you have plenty of available power. Left: Tail rotor operates at nearly zero pitch being used only for rudder function, not anti torque. Since photo was taken, we learned stabilizer should be omitted. Bottom Left: Six piece plastic body is easily assembled and long lasting. Bottom Right: Tail boom is tapering fiberglass rod and main frame is spruce. Sturdy and light.





Building the Du-Bro Whirlybird was sheer delight, for two reasons: First, it was a new experience in modeling. Helicopters are about the last "frontier" left in RC modeling, and it is fascinating to dig into the details of their construction and operation. Second, it's difficult to see how one could improve on the kit itself. It's not an ARF, and several enjoyable hours can be spent building it. The quality of the many metal, wood and plastic parts is excellent; the instructions are complete and easy to follow.

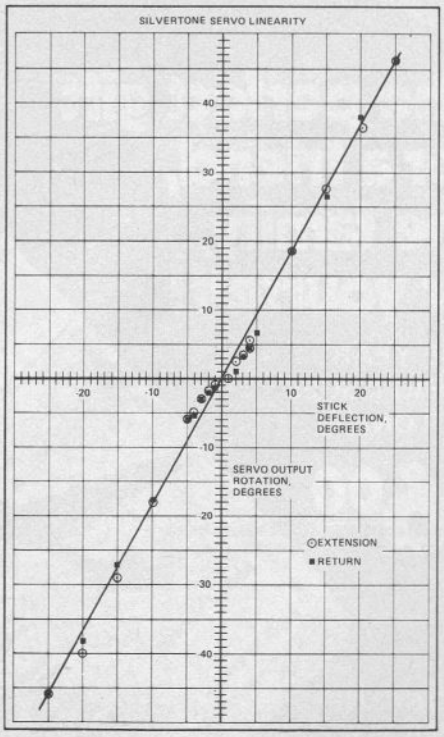
One note of caution: If you don't know how to solder, learn before you start constructing the Whirlybird. Most of the mechanical assemblies depend on solder joints; neat, effective soldering is a must. And keep in mind that this is soldering for mechanical strength, not electrical connection. Sta-Brite low temperature silver solder is recommended.

Construction of the chopper is so well covered in the instruction book that only two comments are needed here. The holes for the mounting screws at the lower end of the cyclic pitch servos should be drilled before installing the mounts for the throttle and tail rotor servos. And it is recommended that the horizontal stabilizer be omitted. Experience, confirmed by Du-Bro, indicates that the bird is more stable in windy conditions without the stab.

Early in the construction of the Whirlybird the decision was made to try the OS Wankel rotary piston engine. This engine seemed to be a natural for this application, even though its nominal displacement is less than the 0.40 called for.

Mounting the engine requires fabrication of a new mounting plate. A piece of 1/8" aluminum sheet is turned to the outside diameter of the Wankel's mounting ring, the same diameter as the fuel tank on the Whirlybird. The new

(Continued on page 75)



BLUE RIBBON REVIEW—PART II

(Continued from page 17)

mounting plate is then attached to the rotor head assembly with counter-sunk 4-40 machine screws. Three 8-32 machine screws hold the Wankel mounting ring to the plate. The engine is located on the plate with the throttle in line with the rotor blades. Final balancing of the rotor assembly is accomplished by placing small pieces of solder in the end of the rotor blade.

Several tanks of fuel were run through the engine before attempting tethered flight. With the chopper firmly anchored (bricks on the landing skid), this engine break in time also afforded an opportunity to check and observe the action of the controls. Final trimming of the flybar linkage was made by observing the disc of the flybar in motion and adjusting for a level condition with all controls in neutral.

Initial flight attempts were made with the two-line tether system described in the instructions. The model weighed just under four lb. dry, and ten oz. of additional weight was attached to the landing gear. The first "flights" were made in Bob Beckman's backyard heliport, using a sheet of plywood as a landing pad. Two things became immediately obvious: There was enough lift from the Wankel; there wasn't enough tail rotor control. A quick trip to the shop to adjust the tail rotor linkage, and we were back to the now greasy plywood.

Several days and many penguin-type flights later we were beginning to wonder. The model obviously got light as power was applied, but it also started jittering and swinging around as soon as it started to lift. Even the most charitable of spectators couldn't say that the model was flying. At times it did seem that we had some control over the bird's gyrations, but for the most part it was just banging back and forth between tethers. We were beginning to question whether the engine had the power to turn the rotor fast enough to provide the necessary control.

At this point we got a break. Dave Gray was in town to help with the AMA demonstrations at TRANSPO '72, and he gave our bird a test flight. After removing the weights and checking over the engine installation, Dave was ready to go. As he didn't feel that Bob's backyard heliport was big enough, we all trooped out into the street in front of the house. The tank was filled, the engine started, and Dave took the bird up. Just like that!

All doubts about the capability of the model were removed. Our difficulty had really been the capability of the pilot. Dave made several flights that evening (we wound up under the street light at the corner) with both the Wankel-powered version and one of his own 40-powered birds. We reached the conclusions that: 1) the Wankel will fly the Whirlybird nicely when it is putting out peak power, but none of the margin of power is available that is so important to helicopter flying; 2) the marginal power situation further complicates the already difficult task of learning to fly a new way. That the power is marginal is not surprising, since the Wankel is a nominal 30. What is pleasantly surprising is that this rotary piston engine produces enough power to fly the Whirlybird smoothly, *once you know what you're doing.*

Dave had another valuable hint regarding the landing gear. Up to this point we had been using the skid gear that came with the kit. This is quite adequate and looks very scale-like, but as Dave pointed out, its narrow tread is what allows the chopper to jitter and bounce around just before it becomes airborne. One of Dave's models was fitted with wide stance, tricycle, training gear. The advantages are: 1) as the throttle is advanced, the model remains stable until adequate control forces have been developed by the main and tail rotors; 2) the wide stance of the gear will help to avoid tipping over and breaking rotor blades; 3) the tether system is not needed. Once the pilot's capability has been developed, the skid-type gear can be used.

Several versions of the training gear have been made, and the final version is shown in the drawings. Construction is simple, but a few words on evolution are in order. The first gear made was fabricated from ¼" dowels with rubber balls on the ends. Looked great, but the rubber balls wouldn't slide so it was hard to move the model around, the dowels were both springy and weak so on a hard landing they either broke or bounced the model over and banged up the rotor. Ping-pong balls were tried in place of the rubber balls, but they were too fragile. Small rubber-tired wheels looked good for a while, but going sideways they would dig in and flip the bird just like the original balls. The final combination of fiberglass rods and plastic practice golf balls seems ideal.

By this time we really had the bit in our teeth on this business of helicopter flying and we wanted to master it. The Wankel was temporarily retired, and we looked around for something with enough power to make our gyro attempts a little easier. The Ross twin looked like the answer. Here we had a setup where the counter-balance has a piston in it to contribute to the power available. Mounting the Ross was simply a matter of making another mounting plate and rigging a balance weight opposite the exhausts.

Flying the Whirlybird with the Ross has been a pleasure. The engine is easy to start, smooth and quiet running, with more than enough power to do the job. The first takeoff resulted in the bird climbing to a six ft. altitude before we realized what was happening. That we got it back down undamaged proved that we were making some progress in learning to handle this new type of RC flight. Since then we have progressed to short duration hovering flights and, more important, learned that we can fly the Whirlybird in moderate wind.

The Du-Bro Whirlybird has proven itself to be a fascinating and successful introduction to RC helicopters. Its greatest value may be as a trainer in preparation for flying other types of choppers. But we have to repeat the oft-stated fact that it takes a lot of time to learn to fly a model helicopter. After about four gallons of fuel we're still a long way from being accomplished RC helicopter pilots. But we'll get there!

Additional comments by the Editor: Many modelers have given up on their Du-Bro 505's and claimed that they are not flyable. This is just not so. They fly well and are a true helicopter even with the torque reaction drive. Think of this as a coaxial helicopter. The Du-Bro is the easiest helicopter to fly, too. I have become a pretty good fixed-wing RC pilot, but I felt like a rank beginner in RC with my first three gallons of fuel through the Whirlybird. It takes about four gallons to achieve smooth hovering.

With a helicopter, four gallons are used surprisingly fast.

Comments by other would-be Du-Bro 505 pilots indicate much misunderstanding of helicopter characteristics. For example, the Du-Bro is not top-heavy just because the engine is on top. Consider where the lift is coming from and realize that all the weight is below the lift. The chopper may seem top-heavy because of marginal control and stability when the rotors slow down or are unpowered when chopping the throttle. Because this model has a low rotor speed, that speed is critical.

Helicopters when within one rotor diameter distance from the ground are flying on a very slippery bubble of air. All control inputs are concentrated on keeping on top of that bubble. When the model is up to five ft., it is riding on a more stable column of air, not just a bubble. Also, the Du-Bro is a rigid rotor design and must be in full free flight off the ground (by at least an inch) before any control inputs are meaningful. Inputs on the ground have no relation to the direction of flight or movement of the model. So, bring the rotors up to speed, then lift off quickly but slightly before expecting controls to take effect.

As mentioned by Bob Beckman in the above text, we switched from the Wankel engine to the Ross to try the model with additional power. I made this conversion after achieving significant power increases. Unfortunately, Bob did not get to fly it with the improved Wankel operation.

The engine loves lots of nitro and K&B 500 seems to be its best fuel. A Fox short idle-bar plug improves rpm by nearly 800 rpm over the original O.S. Wankel plug. The engine overheats and then sags fairly soon after running up to full speed on the helicopter, as there is almost no cooling in this application. Simple aluminum cooling fan of eight blades, 4½ in. dia. mounted just under the flying prop, provides the necessary engine cooling air. Use an 11-4 prop to fly the helicopter.

You just can't beat having extra power and the Ross is the way to overpower the Du-Bro 505. However, by using a high pitch prop (11-7½), more energy is put into the main rotor via torque at liftoff speed. More torque means more rotor rpm and thus both more control and more stability.

The tripod landing gear is quite easy to make either with fiberglass rods into a base block or with bent wires into the original landing gear mounts. We'll sketch the elaborate tripod gear, you can simplify it to suit yourself. Please, build one for your model, it makes learning to fly more successful and possible.