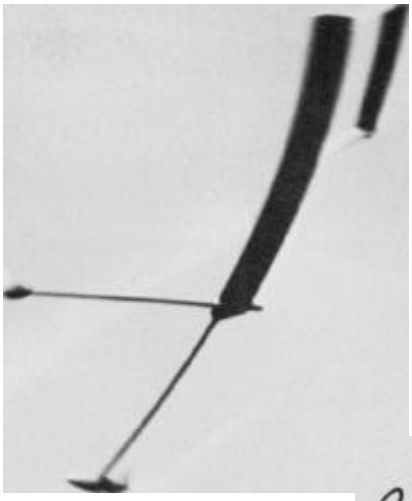
WITH A TWIST OF YOUR WRIST, THIS SINGLE-BLADED, .010 POWERED THING SWISHES ALOFT. GREAT FUN AND EASY TO MAKE.

H.D.M. SHERRERD, JR.





Charybdis

In Greek mythology, Charybdis was an extremely powerful whirlpool off the Sicilian coast. This helicopter is not particularly powerful, but like its namesake, everything revolves at a rather high rate of speed, and to that degree at least the name was appropriately chosen by the inventor, Charles W. McCutchen of Princeton, New Jersey. Charybdis was developed 18 years ago, while McCutchen was living in Cambridge, England, and caused something of a sensation when he took it to the British Nationals of 1954. Since that time, variations on the "McCutchen Machine," as the design is more generally called, have occasionally appeared in European magazines, but a prophet is usually without honor in his own country, and the Charybdis seems to have been completely ignored in the U.S.— a pity, since it is no tougher to build than a good hand-launched glider, and more fun than tying firecrackers to your old flying scales.

Construction

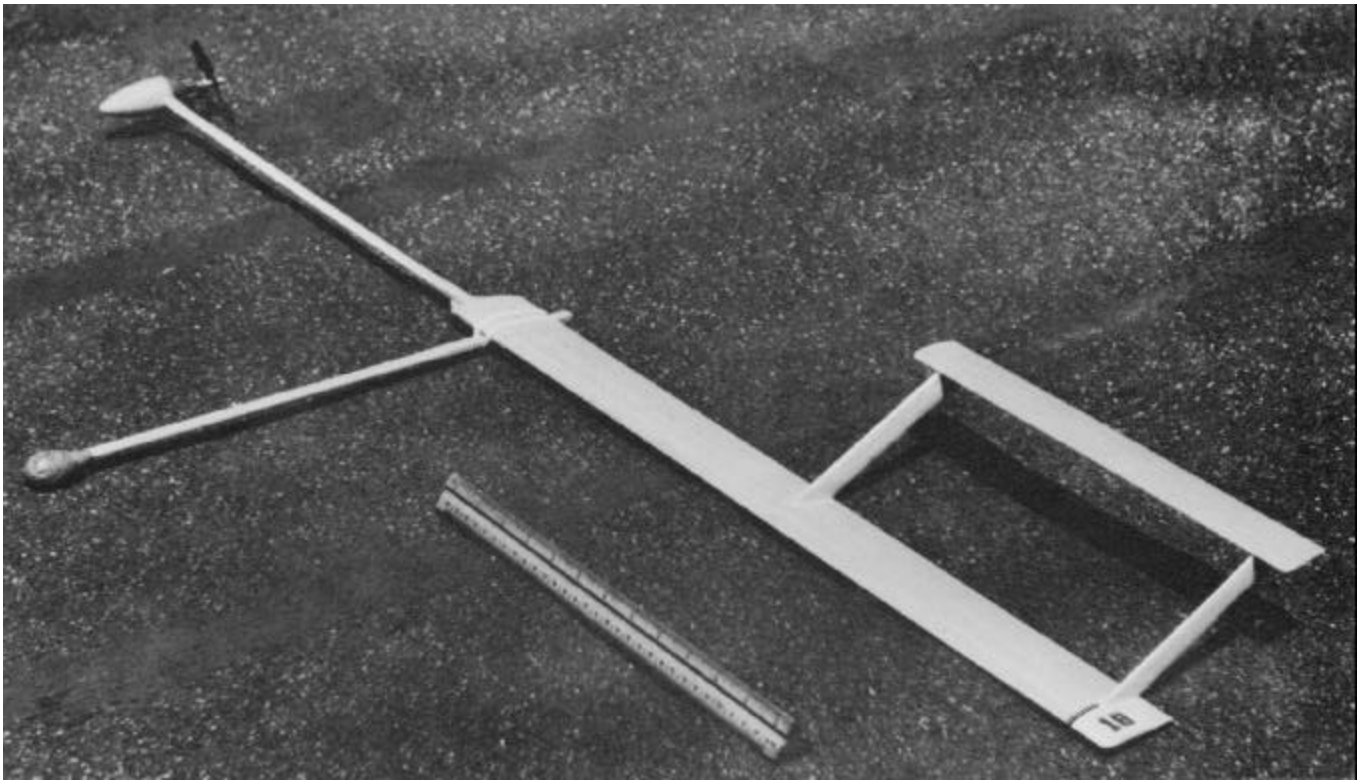
Construction is quite simple, with the emphasis on strength. The blade and stabilizer are of sheet rather than built-up, the motor and balance arms are of spruce, and the hub is reinforced with l/16th plywood. The motor arm is inlaid into the lower surface of the blade, the reinforcing plate double-glued over the joint, and the whole bound with silk or other light cloth. This area is then virtually unbreakable, and also a good flat surface for the balance arm to bear against. You can, of course, glue or even bolt the balance arm in place, but Charybdis is much easier to carry around if the arm is detachable.

The blade is simply a 2' x 2" lath of ¼" in medium sheet balsa, shaped to a constant Clark Y section. No wash-in, no washout, no dihedral breaks; the squarest, easiest wing you ever made. Use a template to maintain section accuracy. Don't try something with under-camber instead. McCutchen tried both under-cambered and curved-sheet airfoils, and found the resulting Charybdis to be unimproved, at best, or just plain unstable, at worst. The stabilizer struts are l/8th hard sheet sanded to a streamline section. Use plenty of glue and perhaps even some silk reinforcing at the strut-to-stabilizer joint, the only vulnerable area of Charybdis.

The stabilizer itself is also l/8th hard sheet, but is given a lifting section. Be careful to set it at an angle of at least -5° or -6° relative to the blade, as this is most important.

The motor pod is so designed mainly because it looks good. The streamlining probably helps a bit, but is really unnecessary. On the other hand, it does provide a solid mass behind the firewall





(if you can call it that) and a little more weight. (The Cox 010 is awfully light.) The 1/8-in. plywood firewall is inlaid into the motor arm, and the pod itself built up from the same 1/4-in. stock used for the blade, or anything else in the scrap box, then carved and sanded to shape With the motor inverted, as shown in the photos, the mounting screws bear through into the spruce arm instead of the soft balsa. Add a wire guard loop if you think it necessary, but the prop generally seems to be enough protection for the glow plug even when landing on bare spots.

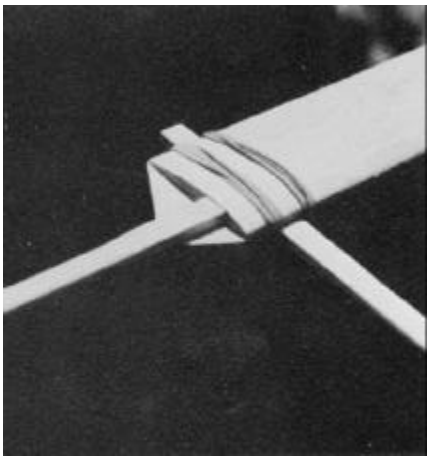
Thinned, clear, hot, fuelproof dope is used on everything except the motor pod and adjacent portion of the motor arm, where straight dope is used for extra protection. Colored dope could be used, of course, and should produce a pretty jazzy effect with Charybdis revolving at the speed it does.

The inverted position of the Cox 010 has been found the best after much painful trial and error. The tank outlet is slightly high, but the fuel line itself is at the extreme outside of the swept circle, and fuel does not have to fight centrifugal force on its way to the needle valve. The other arrangements that seem so obvious either don't work for one reason or another, or offer no particular advantage.

Because of variations in engines, fuels, weather, altitude, etc., finding the proper needle valve setting is something you must do yourself; there is nothing else for it. But there is one peculiarity of the system worth mentioning that makes all the difference in running time: an odd combination of forces and pressures is at work that requires block-

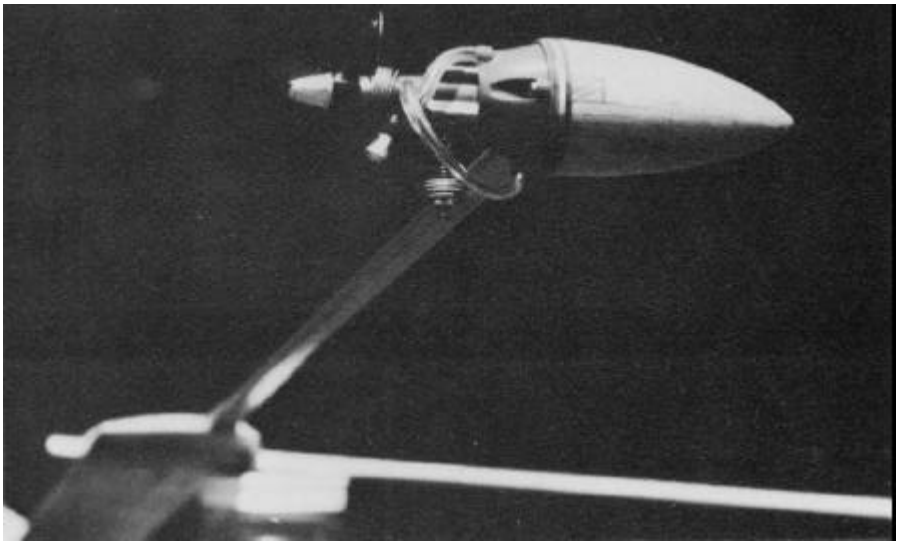
(Continned on page 68)

Above: This has got to be the easiest helicopter type thing yet—only one rotor blade!



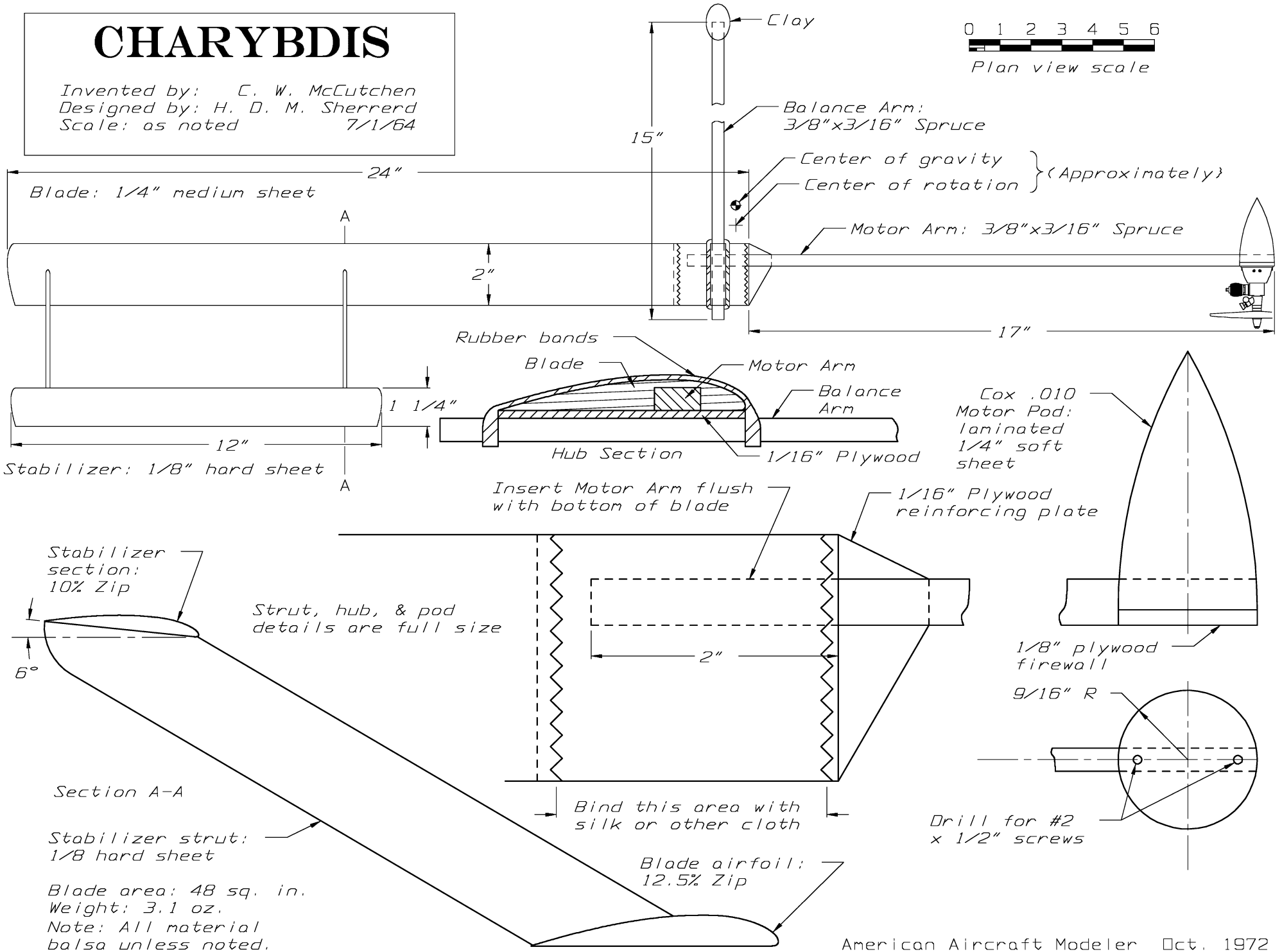
Right: Rubber band mounted weight boom affords easy adjustment of CG and crash protection.

Below: Inverted Cox .010 works much better than if it were upright, but no one knows why. Don't fly over concrete.



CHARYBDIS

Invented by: C. W. McCutchen
Designed by: H. D. M. Sherrerd
Scale: as noted 7/1/64



American Aircraft Modeler Oct. 1972

Charybdis

(continued from page 56)

ing off one of the filler nipples for maximum engine duration. With both nipples open, engine run will be 15 to 20 seconds. With one blocked off, the run will be well over a minute. This can be done with a short length of pinched-off tubing, or a longer piece running to the pressure-tap nipple. With this latter system you don't lose the short piece in the grass while fueling—it stays attached to the pressure-tap. You can, of course, use a control-line tank and find the optimum setup yourself. However, the shortest fuel line is always the best, and use of the integral tank has the advantages of simplicity, strength, and aerodynamic cleanliness.

Flying

Launching may seem a bit hairy at first, but is really no problem if the CG is located approximately as shown. To avoid losing fuel from the inverted tank, turn the Charybdis upside-down and start as usual. Now grasp the hub area with your fingertips on the blade leading edge and thumb on trailing. Raise the whole affair over your head while simultaneously turning it upright; snap your wrist to start rotation, and push upwards. Then duck, and run into the wind, since you probably haven't got the carburetion right to begin with. Try again, until the engine continues to run and Charybdis climbs away like a startled mallard.

An alternate launch method is to gusset the general area of the CG, drill a small hole at the approximate center of rotation, and impale the Charybdis on a headless nail driven into the end of a stick. In this case Charybdis will simply fly itself off once it picks up sufficient speed. McCutchen remarks that this is a good idea while getting the carburetion and balance unscrambled, since it prevents powered crashes while in an unstable condition.

Once properly trimmed, Charybdis is remarkably stable. The rate of climb can be varied by adding or removing clay, and by sliding the balance arm in and out. But this will not make as much difference as you might think, and unless carried to extremes, will not seriously disturb autorotation characteristics following engine shut-down. If the Charybdis is really out of balance, of course it won't take off to begin with. Changing the stabilizer angle, on the other hand, will make a great difference in rate of climb. An adjustable stabilizer, or at least a movable tab on the fixed one, would permit complete freedom of experimentation.

The other factor that most strongly affects performance is power. With the 3 x 1.25 standard .010 prop, time from launch to touchdown averages around a minute and 30 to 45 seconds. Charybdis climbs steadily for several hundred feet, depending on engine run, then descends in autorotation for anything from 30 seconds to a minute. On one memorable flight of this sort, the Charybdis got hung up in a thermal at 100 feet or so and just sat there, silently autorotating over one spot for something close to two minutes. Total time was 3:15 for a rather different max flight.

But to really have a ball with Charybdis, try this: Turn the prop around to reduce thrust, or use a 4.5 x 2 .020 prop, pile more clay on the balance arm, maybe try a masking tape trim tab on the elevator—anything to hold it down. It will take a while to work out, but you can get the Charybdis to hover waist-high. It will first sink to a grass-cutting level, then find an equilibrium altitude in ground effect at two or three feet, and just sit there, drifting with the breeze, following the contour of the ground. McCutchen rigged one to do this so well that it would go down the gentle bank of a stream, cross over, then climb the opposite bank and continue wandering off across the fields. He says it was quite upsetting to casual observers along the flight path.

While hovering like this, Charybdis will produce the weirdest sound you have ever heard outside a science-fiction movie. You'll think the Martians are coming—it is a kind of whoop-whoop-whoop-whoop gradually increasing in pitch and frequency, with an underlying humming note, and the scream of the engine. All this may be only a peculiarity of the author's Charybdis, and may not be true for others—even working from the same plans, everyone builds slightly differently. But for the Charybdis in the photos it's real. And strange.