



ARROWHEAD

by **HENRY COLE**

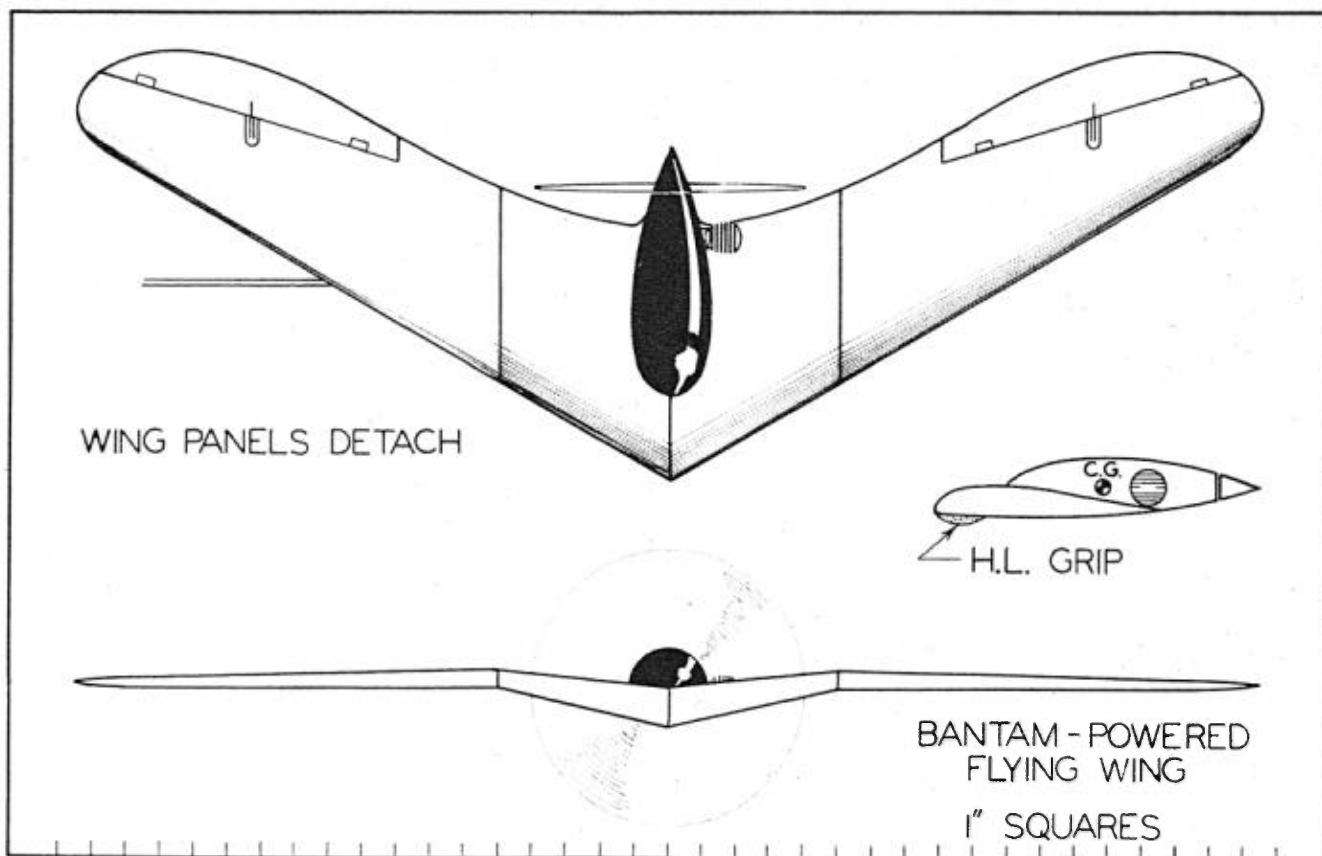
Scientific Leader A.M.A.

**AN OUTSTANDING DESIGNER'S
FLYING WING WILL KNOCK MANY
THEORIES INTO A COCKED HAT**

THE general opinion of control-line flying wings is that they are a novelty and cannot compare in performance to conventional types. Most model builders expect the flight pattern to be erratic, with numerous longitudinal oscillations. Nothing could be further from the truth. A correctly designed flying wing is easy to fly and is exceptionally stable in the air. In fact, the design shown here is recommended for beginners because it is almost impossible to ground loop, and takes off and lands almost by itself.

The story of the development of this design began aboard an aircraft carrier during the Pacific war. Balsa was hacked from a discarded life raft on Samar in the

Philippines, and the job was built in spare time between operations in the Philippines and around Japan. The main problem in the design was deciding between the tractor and pusher arrangement. In favor of the tractor was the simplicity of controls and the ease of keeping the weight forward. In favor of the pusher was elimination of prop wash over the wing and the placement of the motor away from the receiving end of the model. The deciding factor between the two was the fact that the sweepback necessary in the pusher design to bring the C.G. forward of the C.L., a requirement of stability, added to the longitudinal stability, the main bugaboo in control-line flying wings.



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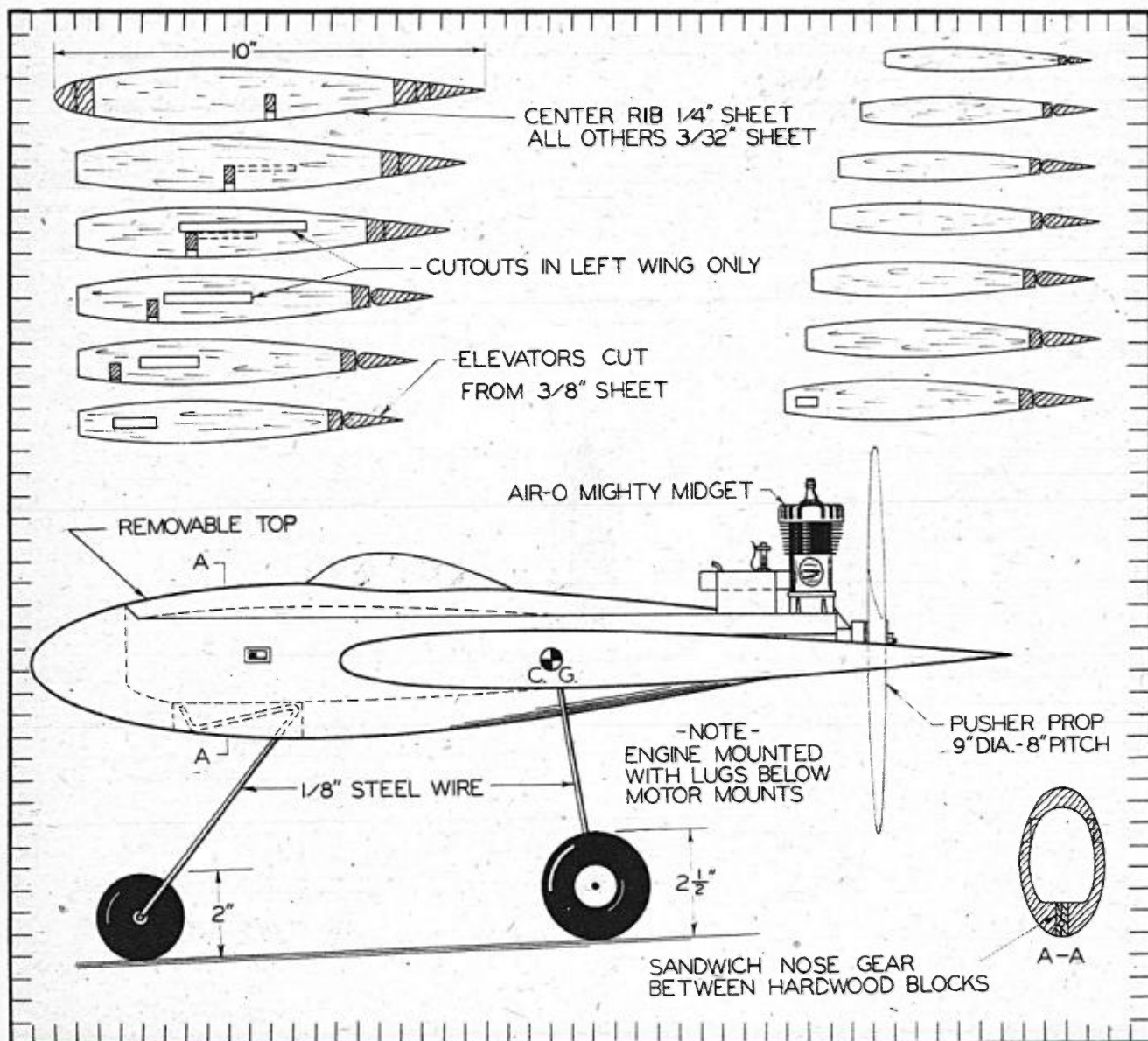
The only trouble with sweepback is that it complicates the controls, because two separate control surfaces must be linked together. Further to complicate the system, the Bantam job had a slight gull dihedral to bring the line of resistance up to the thrust line, and the wing tips were removable so that the model could be packed in a small box. Two bell cranks, two universal joints, four shafts, and five connecting links were necessary in the control system. "Rube Goldberg" couldn't have done better.

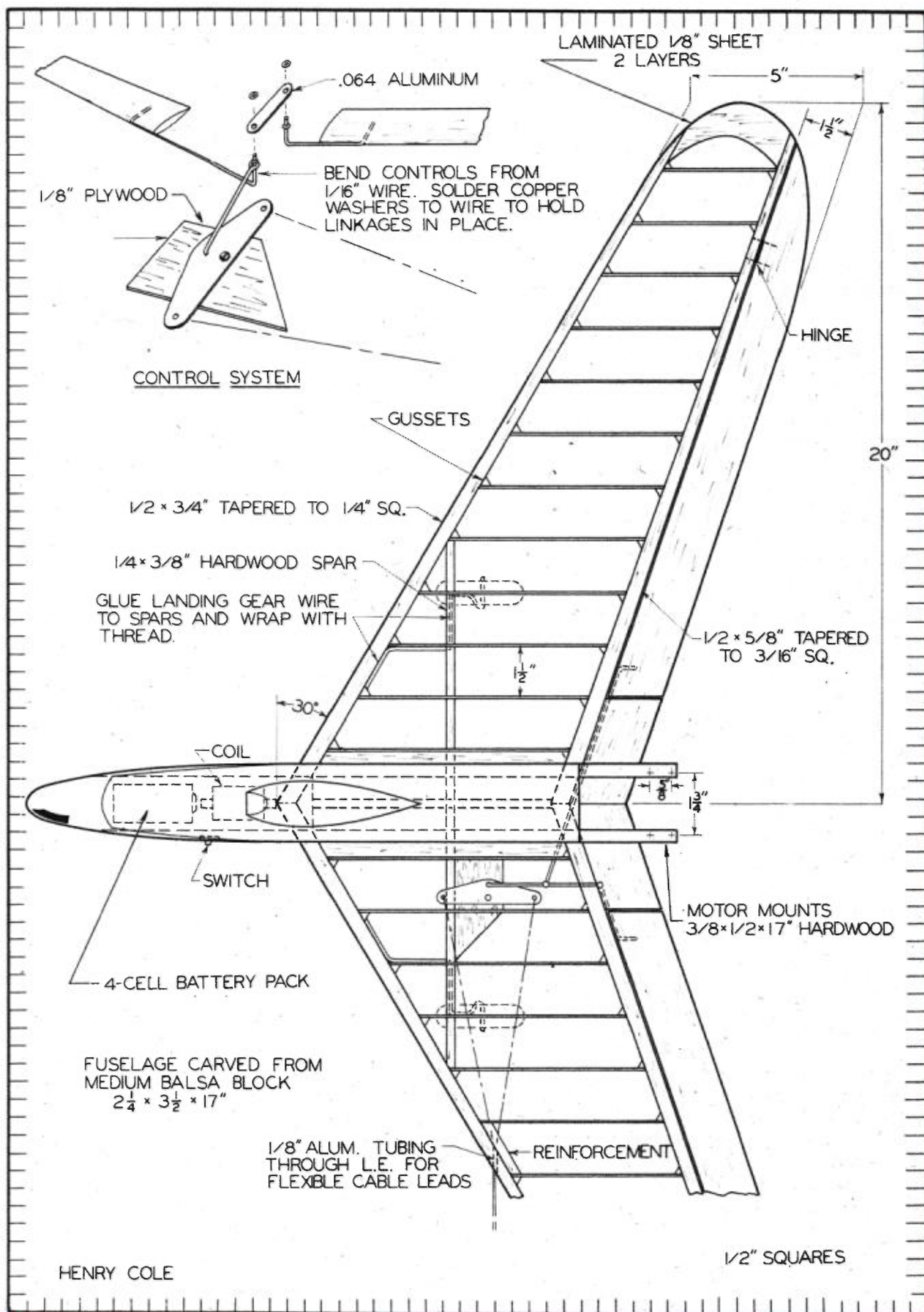
At various stages of construction, arguments would arise with my shipmates as to whether or not it would fly—which resulted in twenty bucks in bets. The wing was finished while we were en route to Hawaii from Japan after the war. On arrival at Pearl Harbor we took the job out on the Navy strip at Ford Island, attached a couple of fish lines to the controls, and let 'er rip. It was not until the job picked up considerable speed that I realized that it was beginning to get dark. In fact, I could barely see the model from the center of the circle

when a voice shouted, "The wing is flying!" The skeptics paid off.

On test flights back in the States, we clocked it at 65 mph, and the job was very steady in flight and a pleasure to land. It was entered in a speed contest, mainly for the laughs. The ground proved too rough for take-off, so we attempted a hand-launch. The lines went slack and the job did two laps free flight before the lines snapped and brought it down. After this experience, a hardwood grip with sandpaper covering was installed at the nose to facilitate hand-launching. At the next two contests, the job placed second with its usual 65 mph, which isn't bad considering the size and weight—26 oz.

The experience with this first flying wing prompted the design of a second wing which was greatly simplified. The powerful Air-o Mighty Midget was selected for a powerplant because it has rings and is less sensitive to overheating on the ground. Most motors tend to overheat on the ground as pushers and so (Turn to page 124)





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the job should be launched as soon as possible after the motor is started. Another point to remember when using motors as pushers is that the thrust is reversed and a thrust washer should be inserted between the rear prop washer and the main bearing to keep the crankshaft in line. On ours, a special rear prop washer was made to accommodate an Ohlsson ball bearing thrust washer.

The construction is simple and should be easy to follow from the plans. The completed model weighs about two pounds. This may sound a little on the sturdy side, but in U-control it pays to build a ship which will stand the hard knocks. The wing was covered with a double layer of Silkspar. Apply the first layer as usual, with the grain running spanwise. Apply one coat of clear dope. The second layer is put on with the grain running chordwise. Stick it only around the edges, then spray with water and it will tighten over the first layer. Then apply dope and you will have as durable a covering as you could ask for.

The success of flying depends a good deal on the location of the C.G., center of gravity. If your job is built right, the C.G. will come out as shown. The batteries and coil are placed in the nose for proper balance. Don't worry about the long high tension lead; it gave us no trouble. In no case should the wing

be flown with the C.G. farther back. Weight should be added to the nose if necessary to bring the C.G. forward. In fact, it is a good idea to add an extra weight to the nose for precision flights and to remove it for stunt. With the C.G. far back the model responds to the slightest control and will perform all the maneuvers in the book with the right pilot at the controls.

The tricycle gear makes this job a pleasure to land and take off. For smooth take-offs, hold the controls slightly down until flying speed is reached, then ease back on the controls and you're in the air. For landings, give a little up when the motor cuts and as soon as the wheels touch the ground give the controls down. In landing and take-off, let the ship do the flying. Whipping and dragging the model sideways on the ground looks very sloppy.

The controls should work easily. To insure this be sure that the shafts to the elevons turn freely in aluminum tubing bearings. The original model has 20 degrees up and down. For real stunting, it should have about 30 degrees.

You will probably be bothered by numerous spectators asking, "Does it fly." There is only one answer to this. Get the job in the air and show them some really smooth flying.