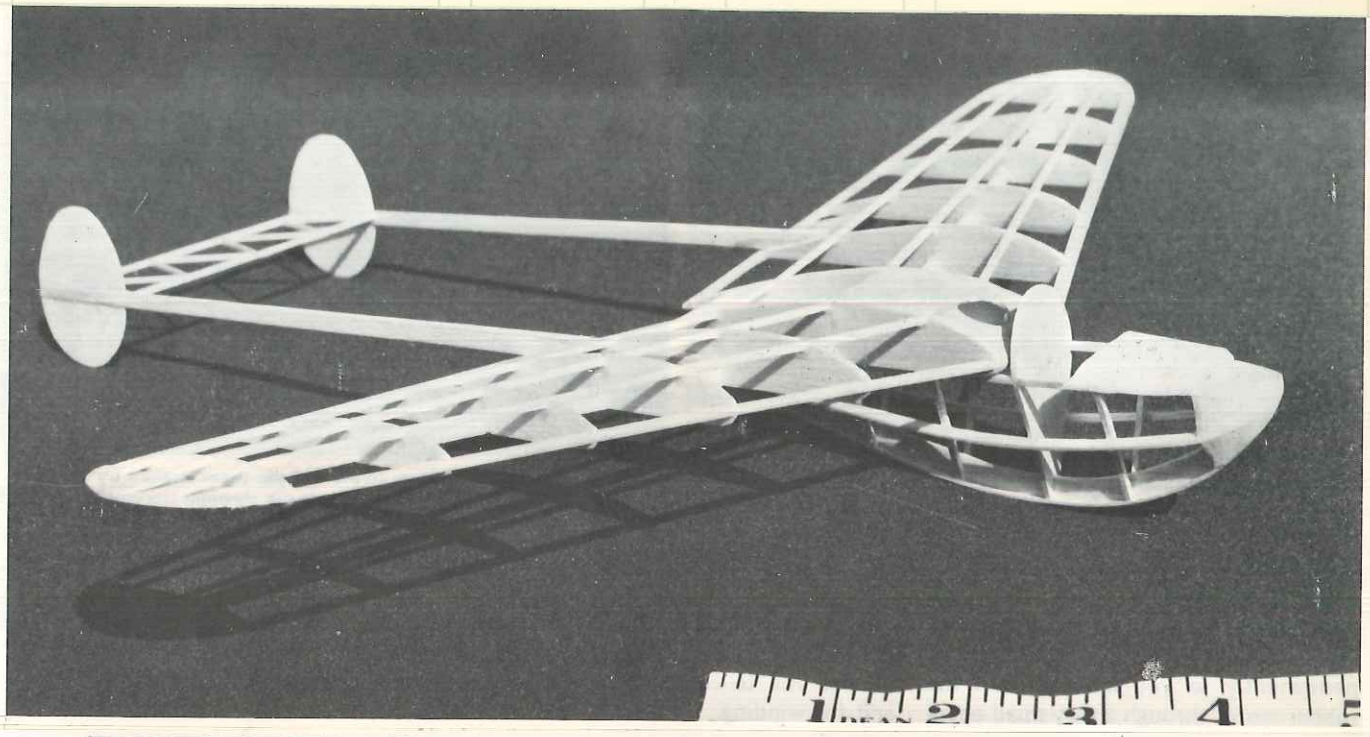
5733



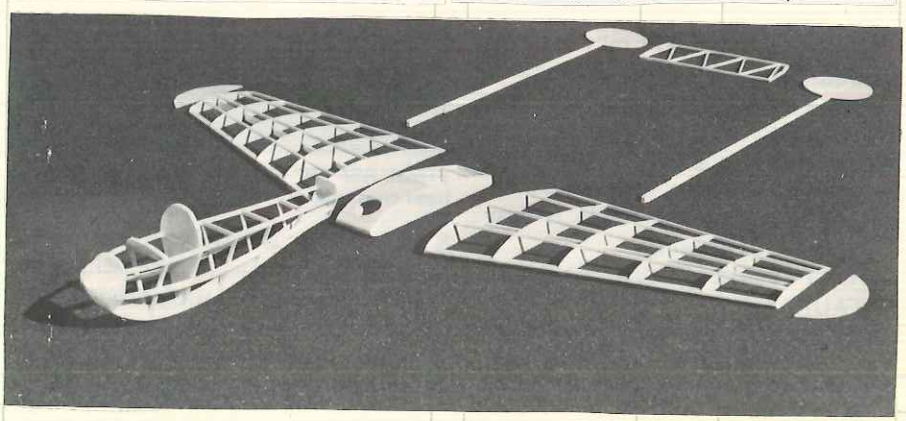
TEA KETTLE

Care to investigate CO_2? Here's a little out-of-the-rut design that affords exellent protection for that little jewel of a Brown engine while you're getting used to it. By DANIEL WALTON.

A long time before his awesome XB-35 and YB-49 ever flew, Mr. John K. Northrop was experimenting with flying wings of a much smaller sort (The N1M and the N9M are two quite successful examples of these). But even before these fabulous machines ever flew, there was one more wing.

In 1929, Mr. Northrop had designed yet another prototype flying wing. This machine employed many of the advanced traits of its later brothers, such as the motor and payload contained within or faired into the envelope of the wing itself. Other features in common were thick symmetrical airfoils, shaft driven propellers, and a gently swept wing with taper. However, this particular plane also had a tail on two long thin booms. This was done as a precautionary measure so as not to unnecessarily risk the valuable prototype. At this point in history, little was known of the performance habits of the tailless type of aircraft, let alone a true flying wing. It is interesting to note that Mr. Northrop himself defined an aircraft of the all wing or flying wing type as " . . . A type of aeroplane in which all of the functions of a satisfactory flying machine are disposed and accomodated within the outline of the aerofoil itself." John K. Northrop, "Development of All Wing Aircraft," Journal of the Royal Aeronautical Society (1947) pp. 276.) This ideal was most closely realized in the XB-35 and YB-49 designs.

In designing the Tea Kettle, the 1929 prototype was used as a base, and was modified to suit the Brown Jr. CO_2 engine. Since the only thing to go by were a couple of pictures of the 1929 prototype, most of the lines and dimensions were laid out by the eye-ball method. Having done this, the next step was to start modifying the plane to a sport-trainer configuration. An aircraft with no center pod as the pictures showed would have been difficult to correctly balance and trim, so a pod was added. The other advantage in doing this was that it permitted the almost vertical position of the tank, without its hanging out in the open. Mr. Brown includes a warning in the instructions about tank positions which will cause flooding, and the inevitable self-destruction of the engine as it chews away on dry ice. The tank position on the plans seems to be best and has never caused any trouble.



To make the construction of the wings easier and the model more efficient, the symmetrical aerofoil on the 1929 prototype was changed to a flat bottomed type, since the former does require a great deal of jigging in the construction stage.

The final modifications were the addition of some more dihedral for greater stability, and the elimination of the landing gear. Unlike most sport

#5733

planes, the Tea Kettle has no wheels and therefore lands on its central skid much like some of the earlier gliders. This assembly is quite simple, strong, and has proven itself well suited for the job. It also makes for a lighter model.

Now comes the patient scrounging for the proper engine accessories and wood. First, the propeller. The Williams Brothers prop which comes with the engine is too big for this model. Instead, remove the prop for future use, trundle down to the Hobby Shop and buy one of the smaller Comet brand kits, 14 inch wing span or under, particularly the larger Struct-O-Speed line. They feature a nifty black plastic propeller which is 3-1/4 inches in diameter. The shaft hole will have to be bored out to a larger diameter in order to fit the engine, but this is no great task.

The next item is wood selection. Cost will depend upon the size and content of your scrap box. The original Tea Kettle was built entirely from scraps. Weight is the most critical factor, so except for the LE, main spar, and the booms (which are of the stiffest balsa possible), go light. The original weighed about three quarters of an ounce trimmed and flying.

Now, the engine mounting screws. The radial mounting holes on the engine are too small for the 0 x 3/8 inch wood screws, but don't touch that drill or epoxy the motor to the firewall! This causes nothing but trouble. Instead, keep your eyes open for broken old $6 watches and the smaller alarm clocks. I obtained the three necessary screws and one to spare from the old watch I had. Watch repair shops, incidentally, don't carry spare screws.

CONSTRUCTION

Although it may not look that way, construction is very simple and conventional. But to save time and prevent confusion, proper sequencing is necessary.

The center pod is first, and is built upside-down over the top view of the center pod. Start by cutting out the keel, F1, F2, F3, and the plywood firewall. Continue by constructing the crutch over the plan with 1/16 inch sq. balsa. (Caution; never actually push the pins through this light balsa, but instead use pins on either side to hold balsa in position). Now add the bottom portions of F2 and F3, making sure they are perpendicular to the board and crutch. When this assembly is thoroughly dry, add the keel, bottom portion of F1 and the 1/16 inch sq. uprights which must fit flush with the top of the keel. Once this point has been reached, leave the center pod alone to dry and go cut out the wing ribs.

Before starting the cap stripping procedure, locate some bobby pins or bend some .025 piano wire to use as spring clamps. Start the procedure at the fore end, using a reasonable amount of glue and work towards the aft end. When dry, remove the pod assembly from the building board and add the 1/16 inch sq. side stringer laminates. Start by putting the first layer so that the ends fit flush with F1 and F3 and follows the contour as shown, then add the second layer to the first and sand so that the stringer starts as a 1/8 x 1/16 inch strip near the cockpit and tapers to 1/16 inch sq. at either end. Glue on the two side portions of the nose block and carve to shape. Do not add the cap block yet. Add the remaining formers and cover from F1 to F2 with typing paper. Before gluing on the firewall, mark the engine position and make the holes using a straight pin. Tap the holes with the screws intended for use and then glue the firewall on as shown.

The wing is built in three sections and is started with the center section. Begin by laying out the framework and cementing together. When dry, remove from the board and add the 1/32 inch sheeting by trimming the wood so that it fits snugly between the ribs. Then glue in place making sure it fits flush with the top and bottom of the ribs. Finally, cut the holes for the tank and check for a snug fit.

Next comes the two main panels, which are built in the usual manner. However, instead of pinning down the LE and TE, pin down the main spar and TE. Glue in all the ribs, making sure ribs R1 and R2 have the necessary angle for dihedral. Add the top spars, and then the leading edges. The wing tips are glued on next. They should go on a line directly from the LE to the TE which means a slight angle relative to the bottom of R6. Prop the tip of the wing tip up about 3/16 inch from the board. Remove the wings from the board when dry and add the tip spars. Finally, glue the wings to the center section.

Cut two booms from the hardest stock of the dimensions shown and taper to the appropriate specifications Check for a good clean fit and then glue on the rudders. When dry, cement the booms in position, gluing well on all areas of contact. Add flush panels and set assembly aside.

As for the stabilizer, keep it as light as you possibly can.

There are now three main sub-assemblies. They are the center pod, the wing with booms, and stabilizer. Any light covering material is possible but colored tissue paper seems best. The original was covered with orange tissue and 4 coats of 50-50 dope-thinner mix with a touch of sanding sealer.

Finish assembling the Tea Kettle and double check all alignments. Add paper turtle deck, trim tab, and install the engine. But before adding cap block, check balance and test glide model. If model shows a further need for nose weight, correct the condition by adding lead ballast to the hole in the nose. Now add cap block, sand and paint if desired, but don't paint portions aft of the CG. Finally, make sure the prop is perpendicular to the wing when the compression stroke starts.

FLYING

On the first time out, the original Tea Kettle gave results which were most gratifying indeed. After two initial adjustment flights the cartridge in the gun was empty so a new one was put in. On the next flight, the model climbed to about 150 to 200 feet at an angle of about 15 degrees, and was in the air well over a minute and a half. Subsequent flights showed one minute plus performances to be the rule rather than the exception, with two minutes possible on a fresh cartridge.

It has been my experience that climatic conditions of the day tend to greatly affect the engine run times on this small engine. For example, the above flights were obtained on a warm (85 degree F+) June day, calm, and the air of a lower pressure than on a chilly day in December or January (60 degree F to 65 degree F) calm, and the air heavier. The second condition tends to decidedly lower engine run times and the flight time also (30-75 sec.). Note that these are averages and will vary from cartridge to cartridge.

When fueling and launching the model the following procedure seems best: First, before fueling, make sure piston is not in compression. When model has been fueled, lay gun down in a shaded area or put it in an enclosed box to keep it cool. Hold model by the wing, fingers on the LE and thumb on TE and flip prop sharply. When engine has started, make sure it is running in the proper direction. Grasp by the center pod near the cockpit area and gently launch with a slight left bank. The model should start climbing in a left handed circle about 25 feet in diameter.

So there you have it. A sporty, simple aeroplane which I hope will perform as well for you as it has for me. ●

#5733