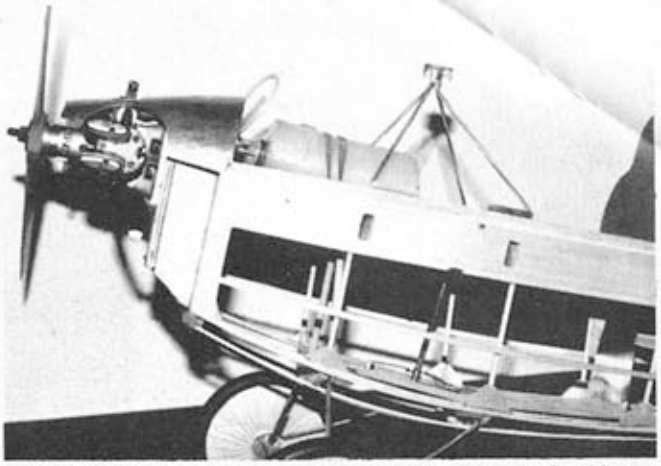
HEATH BABY BULLET

By Bertil Klintbom

Drawn from the original construction article that appeared in the 1930 Flying and Glider Manual

The Baby Bullet was manufactured in one of America's oldest aircraft factories, the Heath airplane factory in Chicago. The Bristol Cherub engine of his "Spokane Super Parasol" had hardly cooled from winning the light and sport plane races of the 1927 National Air Races at Spokane when Ed Heath began to plan a light racing plane which would show its tail to the field at the 1928 National Air Races at Los Angeles.

Heath Baby Bullet's fuselage ready for covering.



This photo shows the working control stick with turnbuckles.

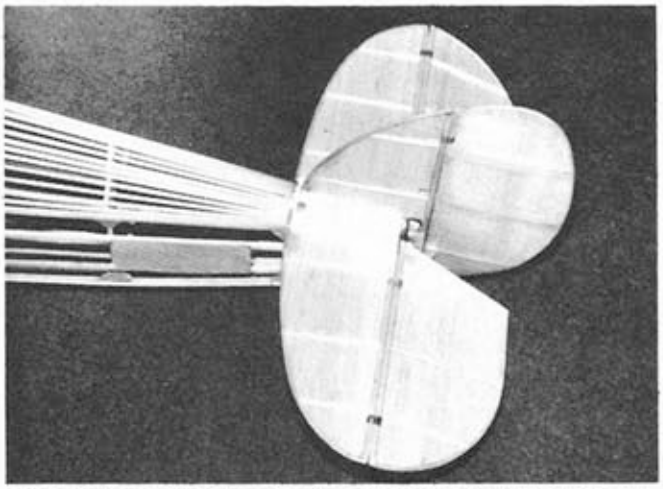
As he made the long trip back across half the continent to Chicago, his mind was not occupied with the race he had just won. He was thinking about the best engineering and the latest knowledge of aerodynamics, plus the experience gained in 20 years of practical aircraft building. He was thinking about a racing plane which should be the smallest practical airplane in the world. It should carry a man and 75 pounds of ballast, in addition to fuel, and should do this at a speed of 145 mph using only 32 hp.

The plane was finally built and ready for its trial flights. It had been seen and admired by the flying men of Chicago, for Ed Heath was never secretive to visitors at his factory. Unfortunately, in the spring of 1928, a disastrous fire burned the main factory and all that was in it. The first Baby Bullet was destroyed. Another factory was set up and another aircraft was constructed. It was put through very gratifying trials August 23, 1928, the day after its completion. It was incredibly fast, and the ship was a sensation.

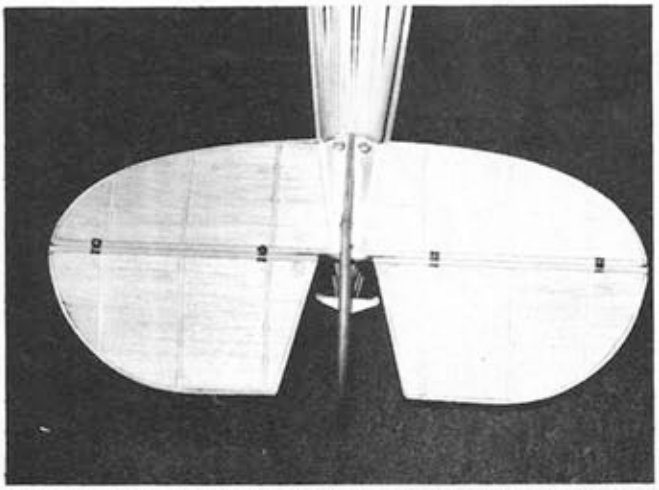
The Baby Bullet was shipped to Los

HEATH BABY BULLET

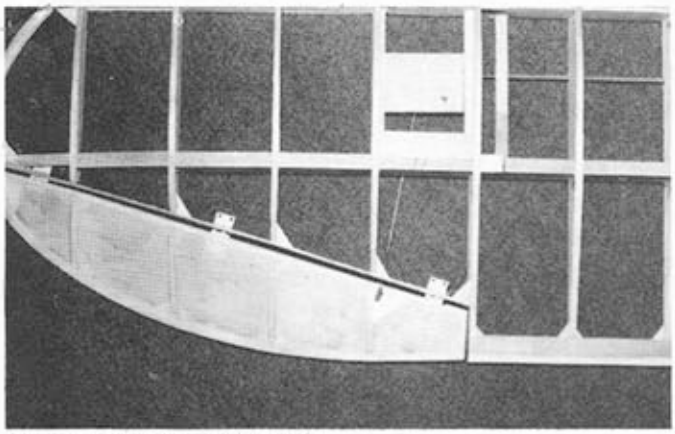
Designed By:
Bertil Klintbom
TYPE AIRCRAFT
1/3 Scale
WINGSPAN
73 Inches
WING CHORD
14 Inches
TOTAL WING AREA
913 Sq. In.
WING LOCATION
Shoulder
AIRFOIL
Scale ST CYR 52
WING PLANFORM
Constant Chord-Elliptical Tips
DIHEDRAL EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
56¾ Inches
RADIO COMPARTMENT SIZE
Spacious
STABILIZER SPAN
20¼ Inches
STABILIZER CHORD (inc. elev.)
7½ Inches (Avg.)
STABILIZER AREA
125 Sq. In. (Approx.)
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5¾ Inches
VERTICAL FIN WIDTH (inc. rud.)
7½ Inches (Avg.)
REC. ENGINE SIZE
.90 — 1.2 4-Stroke
FUEL TANK SIZE
16 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply & Spruce
Wing ..... Balsa & Ply & Spruce
Empennage ..... Balsa & Spruce
Wt. Ready To Fly .. 156 Ozs.(9 Lbs., 12 Oz.)
Wing Loading ..... 24.6 Oz./Sq. Ft.



Tail group installed for checking purposes. Note ply plate on fuselage side is a reinforcement for the closed loop wire exit. Not necessary to build.



Tail group without lightening holes. Tail was made detachable in order to change incidence. It turned out to be not necessary.



Close-up of aileron installation.

Baby Bullet's fuselage and tail group ready to be painted.

and make two fuselage sides. Moisten the dowels for the bottom longerons to make them easier to bend.

Glue on the gussets and be sure to make one left and one right side.

Now make a fuselage box from the two sides using cross dowels as shown on the plans.

Cut out all the formers. The holes in former F2 are designed for former F1 to take the Saito 90T, so if you plan to use another engine you may have to redesign former F1 slightly.

The formers and spruce stringers are then glued to the fuselage box as shown on the plans.

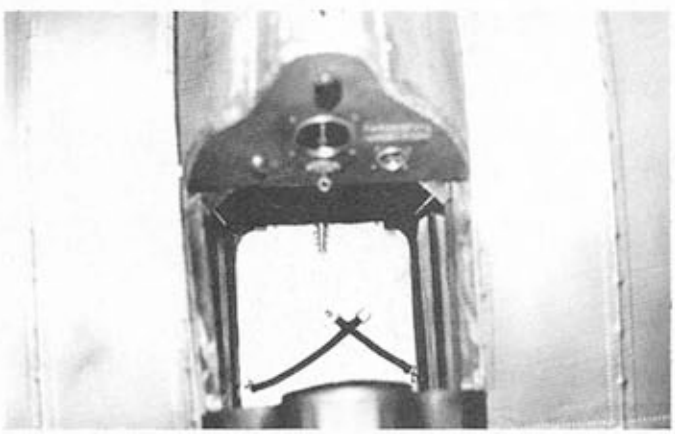
Former F6, with the instrument panel is attached to the music wire cabane with epoxy glue or with aluminum scraps.

Note that for clarity all the top stringers are not shown on the side view. Just glue them in straight from formers F7 to F11.

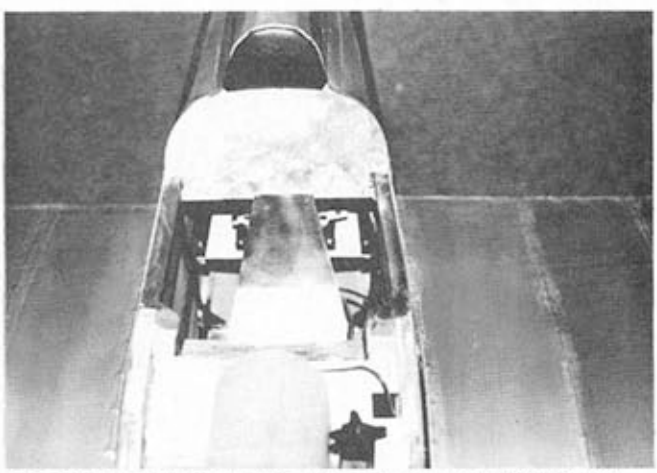
The bottom stringers are glued to F3, F4, and F5. The wing spar boxes B1 and B2 are made from plywood and glued in place, being careful with the alignment. Glue in the hardwood rails for the landing gear.

Fin And Stabilizer:

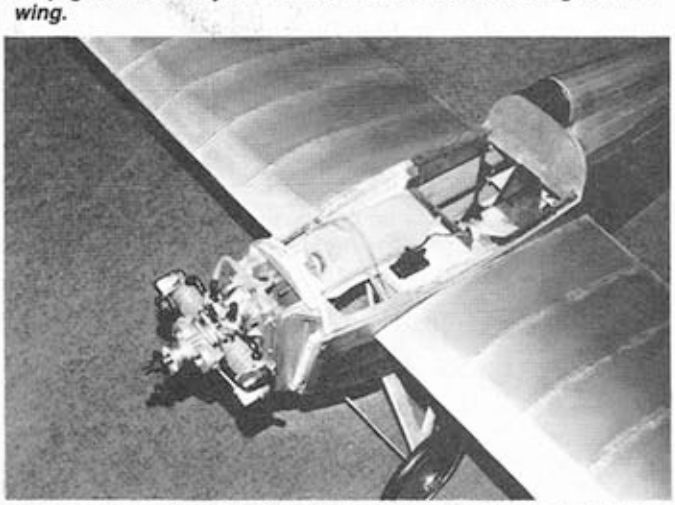
The fin and stabilizer are constructed from a central balsa core with lightening holes and leading and trailing edges made from bent 1/8" spruce dowels. To bend the dowels without cracking them, you have to boil them in hot water. When they are



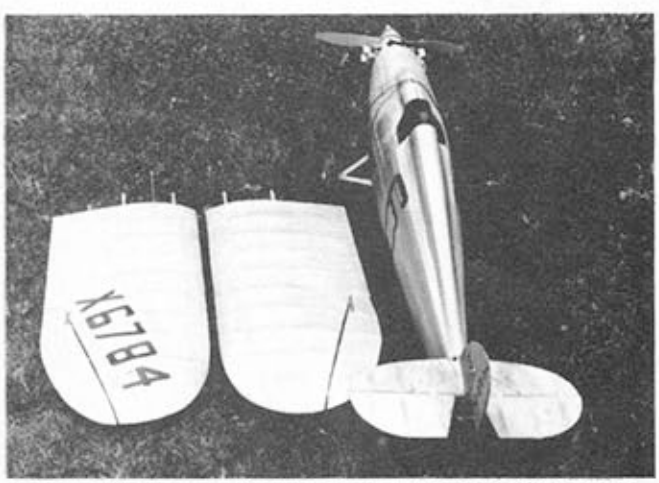
Looking into cockpit shows instrument panel and seat belts. The bump in the middle of the seat is protection for elevator cables to keep grease off of your trousers. Note scale stitching on the wing.



Tank is in foreground, and servos can be seen behind seat.



Top cowling removed showing engine mounting, tank, and throttle servo.



The completed model showing scale wrinkles and weathering.

warm and bend easily, you can glue them in place with cyano glue.

Shown on the plans are scale hinges made from brass strips and small bolts. They make neat and slop-free hinging so I can recommend them.

The control horn for the elevator is in the center and it is actuated inside the fuselage so you can use a stiff pushrod for it.

The rudder is actuated by a conventional closed loop system to the servo.

The stabilizer is rigged on upper and lower surfaces with the fittings shown.

Landing Gear:

You could use a simple music wire arrangement together with vintage wheels but on the plans the scale arrangement is shown.

The gear legs slide into pieces of brass tubing secured to the landing gear rails in the fuselage. The wheels are built up from a central core of plywood with balsa spokes. The tire is black tubing cyano glued together and to the rim.

The hub is made from an inner brass or copper tube firmly attached to the gear legs. The tube should have a filed down area in the middle for graphite grease. Only the ends should serve as wheel bearings.

The center tube on the wheel rides on this wheel hub. Inside the hub you have the sprung end of the spreader wire between the two wheels. The spreader wire should be streamlined and with both ends ready to take a locknut. Make the spreader wire from 1/16" and 1/32" music wire soldered together and filed to section. You get some shock absorbing here.

The hub end plate is machined on a lathe from aluminum stock and should have the holes for the rigging and the retaining screws. The balsa fairings should be taped on with pinked edge tape.

Engine Cowling and Front Cowling:

The cowlings on the fuselage could be made from fiberglass reinforced shells and then painted in silver. Use the formers to get the right shape. For scale you have to form them from sheet aluminum.

Make master plugs from hardwood to the right shape and work the annealed (softened) aluminum with many light taps from a ballpeen hammer. Re-anneal the sheet when it gets hard from your taps.

Remember the aluminum will always need annealing before working. The easiest way is to rub soap over the metal and heat with a blow torch until the soap has turned black all over, then quench it in cold water. Use aluminum sheets 0.025" thick.

When all the aluminum cowl parts are ready, you have to cut them out with metal shears then join the head streamline fairings to the main fuselage fairing with small aluminum rivets.

The nose cowling is screwed to formers F0 and F2 and the two cowling parts should be split on the centerline. For the cowling door, you have to make two piano type hinges from thin aluminum strips. Roll a strip around a 1 mm music wire and cut out the half hinge on that part then, make the other half by cutting out the reverse parts. When you put the music wire through both parts you have your hinge. The correct number of hinge taps are shown on the plans.

Fasten to fuselage with small wood screws and to the cowling door with aluminum rivets. Both doors should be working. Secure them with the lock mechanism shown on the plans. The locking is not scale but it works fine and you cannot see it with the doors closed.

The completed cowling should be polished to a high luster in 5/16" dia. whirls (or swirls). Use a pad of hard eraser on the shaft of a small electric motor for polishing. It is a fair amount of work but it really shows up!

Wing:

The wing is of conventional construction with balsa spars and ribs. The curved wingtips are laminated from balsa and the trailing edge from spruce and thin plywood.

The plywood spars that go into the fuselage wing spar boxes B1 and B2 should be drilled to take 3/16" dowel securing pins. If you plan to make non-scale rigging you should use wing spars protruding 2¾" into the fuselage. Secure the rear spars with two dowels per panel.

Shorter wing spars for working rigging are shown.

Building the aileron is conventional but you have to draw a straight line for the hinge axis to get it correct because of the oblique set of the ailerons. The aileron servo lies in the left wing panel, the right aileron is connected to the servo wheel by a music wire rod which goes through the fuselage.

A small hatch gives access to the servo.

The fittings for the rigging should be on both sides of the wing if you go for functional rigging.

Engine:

The model is designed for the Saito .90 FS twin, but any engine between .90 and 1.2 should do. For a single cylinder engine you have to make a dummy cylinder.

Radio Gear:

The model uses a 4 channel radio to control ailerons, elevator, rudder, and throttle. The rudder and elevator servos are fitted behind the pilot's seat and are mounted to a detachable plywood tray.

You have plenty of space to secure and to hide away the receiver and battery pack.

Covering and Painting:

My model is covered with nylon doped on in the old way, which gives a fine scale look. Any covering that simulates fabric should do as well.

The entire model should be painted with silver paint, I used matt silver sprayed on. The instrument panel is painted light brown.

I have put in all the scale stitching on the wings. The nylon is sewn to the ribs with stitches 1-5/16" apart. Each stitch goes through the wing and around the bottom of the rib and up again. The stitches are knotted on the top side. This gives the right scale look to the wings. All markings are black and painted on with black enamel, hand brushed on.

Rigging:

The rigging could be functional if you use scale streamlined wires for flying and landing wires. The hub center should then be fitted with threads in the hub plate to take the forces of the wires to the wing.

If you chose to make the rigging non-functional you can use shirring elastic to simulate the wires. Remember to build the wing spars to suit your option.

Flying:

The Baby Bullet is a good flier that flies with scale speed and has good characteristics.

Before the first take-off, locate the C.G. as shown on the plans. When you have test flown the model you could move the C.G. slightly backwards if necessary. The take-off is uncomplicated, you just need to hold it on track with a little rudder.

To make good turns you need coordinated rudder and aileron, but it is not excessive and is easily performed. The model has a good glide, and landings are easily performed. But remember that you have very little shock absorbing in the landing gear, so make the landings smooth. There is no problem if you should hit the ground somewhat hard sometimes, as the fuselage is quite strong but it takes its toll on the structure if done too often.

The Heath Baby Bullet captures for me the taste of the glory of the early days of racing aviation, and it also shows that a great amount of engineering skills were available to aviation at that time. Men like Ed Heath contributed strongly to the development of aviation and this model honors him and his fellow contestants from the "golden days of air racing."

To make this model a good looking scale ship takes a fair amount of work, but I can assure you that it pays off. □