MITSUBISHI Ki-15 "BABS"

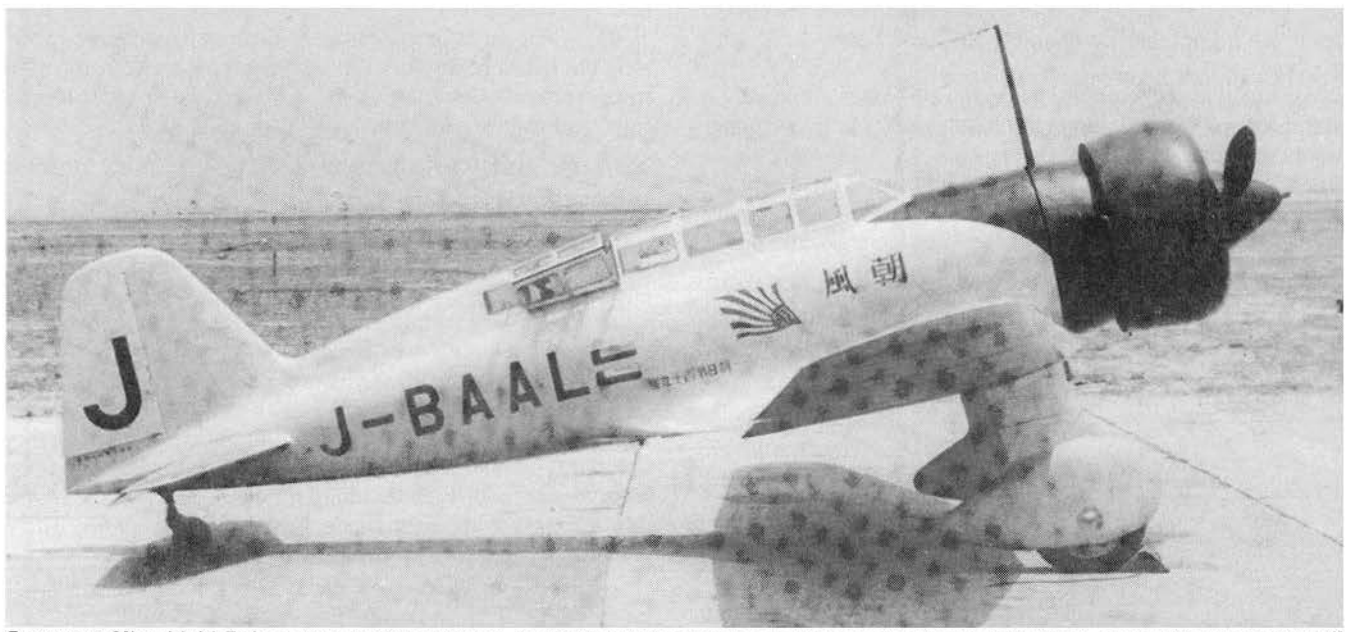
Ready for a new scale project? This one will grab all of the attention at the flying field.

By David P. Andersen

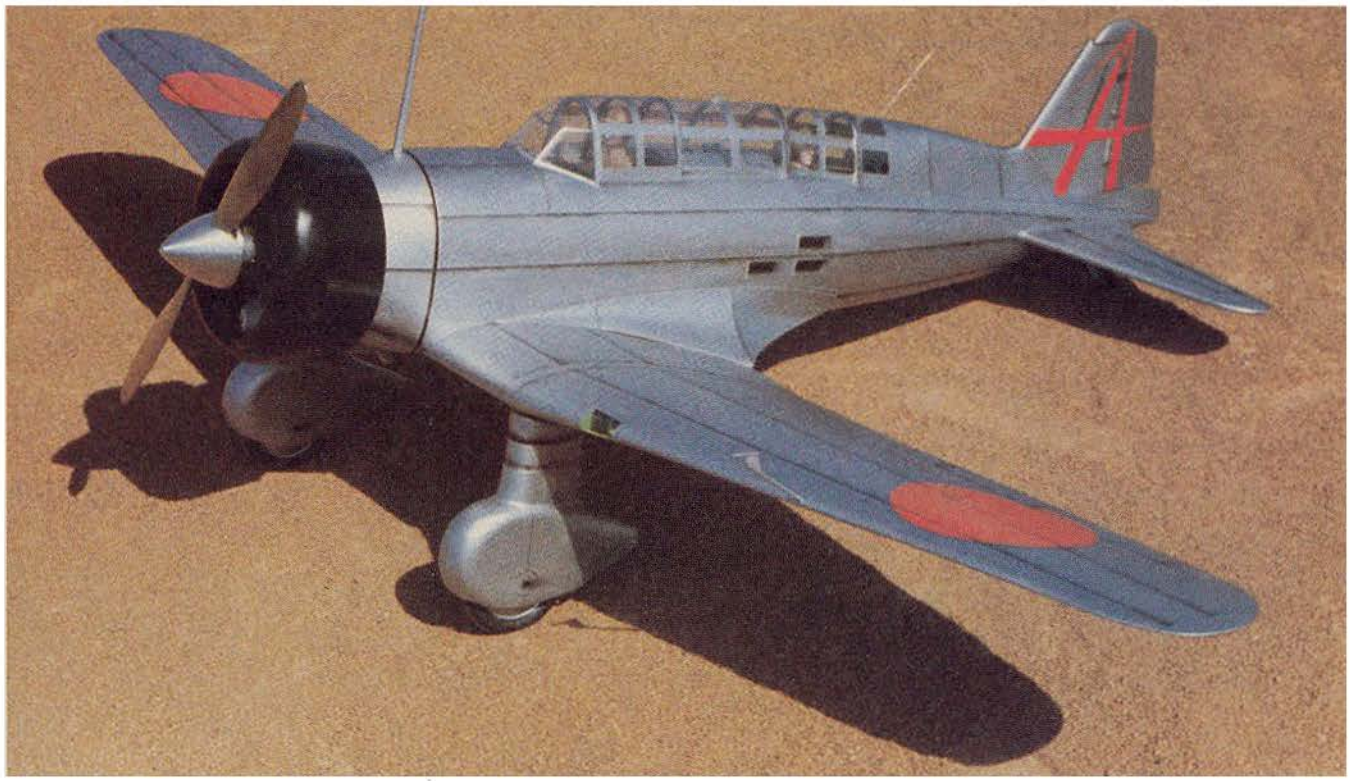
For a brief period in 1937, the Mitsubishi type 97 Ki-15-I, later named "Babs" by the Allies, was the fastest production airplane in the world. It was a high-speed reconnaissance aircraft capable of flying faster and higher than any fighters it would encounter at the time. About the same size as a P-47 Thunderbolt but only one-third as heavy, its range was four times that of a Spitfire and its ceiling was 6000' higher. Fully aerobatic, it could out maneuver most fighters of the era if they could catch it.

We Are Not Amused

The second prototype Ki-15 was purchased by the Asihi Shimbun, a large Tokyo newspaper, as a fast courier. It was a time of intense nationalism and the airplane was to be an instrument of national publicity. The plane was prophetically named Kamikaze (the name had a different meaning then). It flew a record breaking



Prototype Mitsubishi Babs was a fast courier for Asahi Shimbun newspaper. Natural aluminum with black cowl, lettering and kanji characters. National emblem and flag icon in red. Photo courtesy of National Air and Space Museum, Smithsonian Institution.



flight from Japan to London in time for the coronation of King George VI. Its top speed of 300 mph and trouble-free performance impressed the western world with the abilities of Japanese aviation. Although meant as a tribute, the flight must have been an embarrassment to the King because the fastest British aircraft in production at the time was an open-cockpit biplane.

Several other Ki-15s were built as fast mail planes and licensed as civilian communication aircraft. When the second Sino-Japanese war broke out in 1937, nearly 500 aircraft were delivered to the Imperial Army, equipped with radios and aerial cameras. Faced with an enemy flying much slower aircraft including the Curtiss Hawk, Gloster Gladiator, and Polikarpov biplanes, the Ki-15s easily penetrated deep into China from their bases in Manchuria and kept the Japanese army well informed of Chinese ground movement.

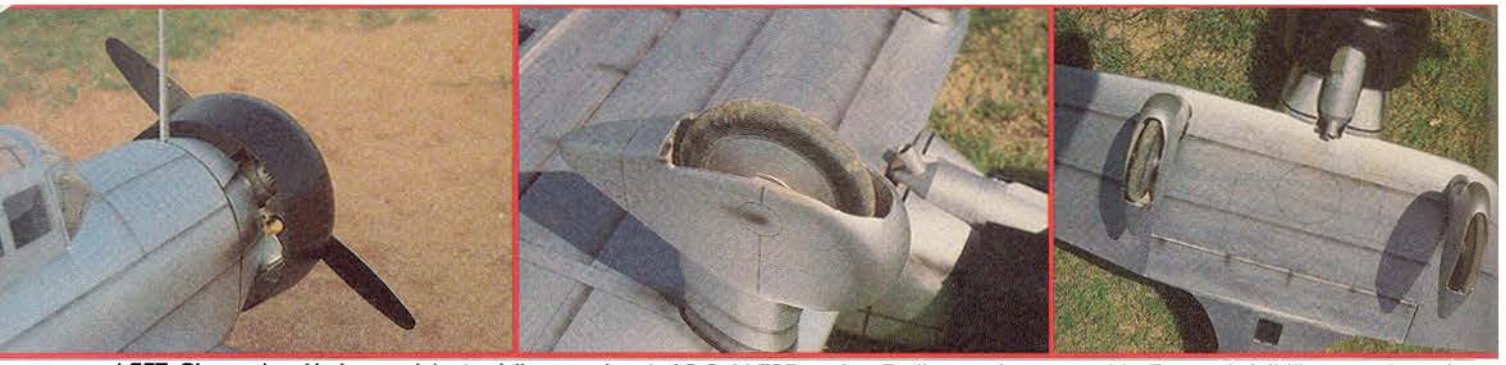
The Ki-15s long range reconnaissance ability attracted the attention of the Imperial Navy who ordered twenty aircraft to support naval operations from land bases. One of these Navy airplanes spotted the British battleships HMS Prince of Wales and HMS Repulse at sea on December 10, 1941. Land-based bombers sunk these two ships a few hours later.

Eventually the Ki-15s faced ever faster Allied fighters. Lacking armor protection for crew and fuel tank, they endured increasing losses. By 1942, the remaining Ki-15s were withdrawn from frontline service and converted to trainers or used as communication aircraft. During the closing months of the war the last were expended in kamikaze sorties.

MITSUBISHI Ki-15-I, BABS

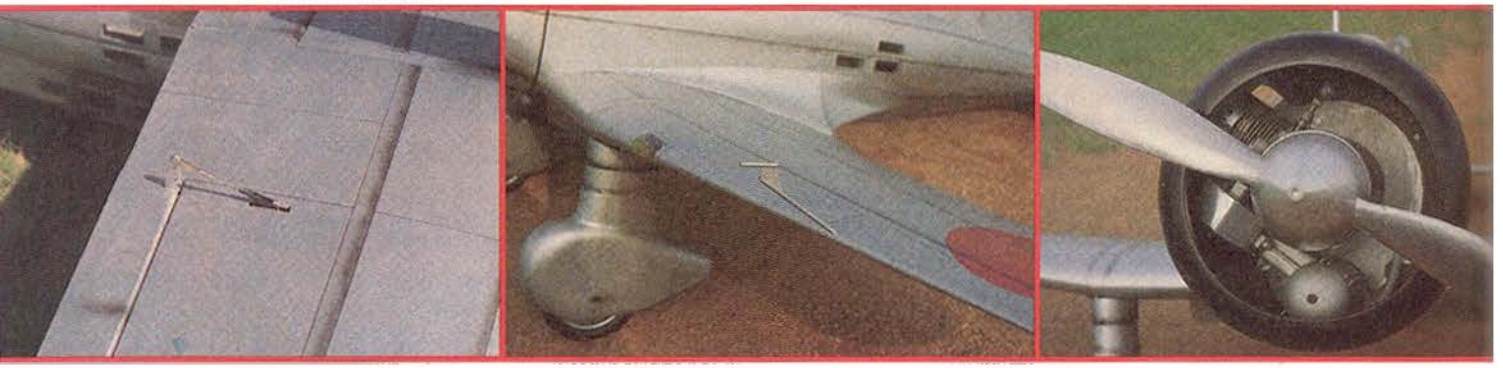
Designed By:
David P. Andersen
TYPE AIRCRAFT
Sport Scale (1/6 Size)
WINGSPAN
75 Inches
WING CHORD
Root 13½", Tip 6"
TOTAL WING AREA
803 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
2¾ Inches
OVERALL FUSELAGE LENGTH
51 Inches
RADIO COMPARTMENT SIZE
(L)13" x (W)5" x (H)4"
STABILIZER SPAN
24 Inches
STABILIZER CHORD (incl. elev.)
5½ Inches
STABILIZER AREA
125 Sq. Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
8½ Inches
VERTICAL FIN WIDTH (incl. rud.)
10½ Inches
REC. ENGINE SIZE
.91 2-stroke
FUEL TANK SIZE
16 Oz.
LANDING GEAR
Conventional w/Pants
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt., Flaps
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Ply
Empennage ..... Balsa
Wt. Ready To Fly .. 164 Ozs. (10 Lbs. 4 Oz.)
Wing Loading ..... 29 Oz./Sq. Ft.

In-flight photo shot at Grassfield Radio Control Club by John Hall.



LEFT: Plywood and balsa cowl ducts airflow overhead of O.S. 91 FSR engine. Radio mast is removeable. Forward visibility was a hazard for Japanese pilots --- no problem for RC model. MIDDLE: Plenty of wheel clearance for Williams Bros. wheel in all-wood pant is requirement for good grass-field operation. Note clearance in wing surface for flex of coil-spring landing gear. RIGHT: Wide-stance landing gear yields good ground handling. Radio switch, jack and wing bolts are inside flap opening. Muffler is partially exposed. Observer's window aft of wing. Wheels have 1 degree toe-in each.

LEFT: Stock O.S. 91/108 muffler is all but hidden beneath cowl. Sound level meets AMA's goal of 90 dB at 9 feet. Cowl is attached to firewall with three nylon bolts. MIDDLE: Canopy is nearly all flat acetate sheet. Top half of windscreen is shaped without vacuum forming --- details in text. Note observer's three small windows in fuselage side. RIGHT: Landing light is a cut-down Magicube flashbulb reflector enclosed in an acetate window.



LEFT: Aileron servo imbedded in wing provides fast response and precise control. Modern servos are so inexpensive and reliable, it's often best to build them into the structure. MIDDLE: Scale pitot tube is removable for flight per AMA safety rules. Built from break-away aluminum anyway. RIGHT: Stock O.S. 91/108 muffler attached to modified Tatone manifold keeps muffler system inside the cowl. All incoming air flows over cylinder head. Tru-Turn spinner serves both static display and flying duties.

Technical Data

Span	39 ft. 4 in.
Length	27 ft. 10 in.
Empty weight	3,084 lbs.
Maximum weight	5,071 lbs.
Power Loading	7 lb./hp
Max speed	298 mph at 13,125 ft.
Service ceiling	37,400 ft.
Range	1,491 miles

Looking For Mr. Chiang

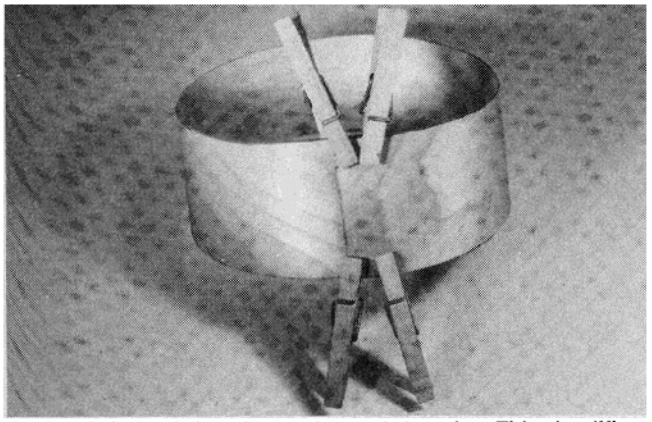
The model presented here was designed by enlarging the scale views and filling in the structure. The only deviations from scale are widened landing gear struts for stiffness and reduced dihedral for better aerobatics. Using the documentation sources shown will produce a model very competitive in Sport Scale Contests.

Babs wide-stance landing gear and big wheels produce good ground handling, despite wheel pants, even in dense grass. The full-depth canopy smooths airflow to the tail, ensuring excellent lateral stability at low airspeeds. Long chord ailerons provide effective roll control even at low speeds. Lots of side area support slow rolls without top rudder. The plane flies only slightly above scale speed with rather pattern-like handling and rock-solid control. Babs won its first scale contest with flight score of 95 points.

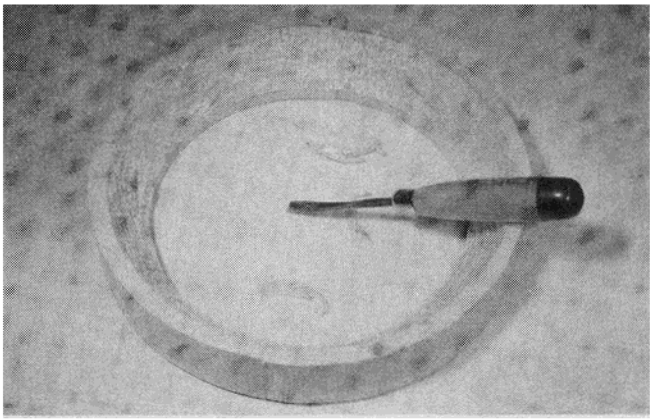
You have reason to believe that the neighbors have acquired the combined armies of Chiang Kai-Shek and Mao Tsetung in order to mount an offensive against your R/C club's flying field (perhaps you guys should have had a stricter muffler rule). Your commanding officers desperately need complete intelligence information in order to defend your flying site. Therefore it is your duty to change into your kimono, slowly sip a final cup of tea, pad your way down to the shop and, before entering, remove your sandals and begin construction of a Mitsubishi Babs.

CONSTRUCTION:

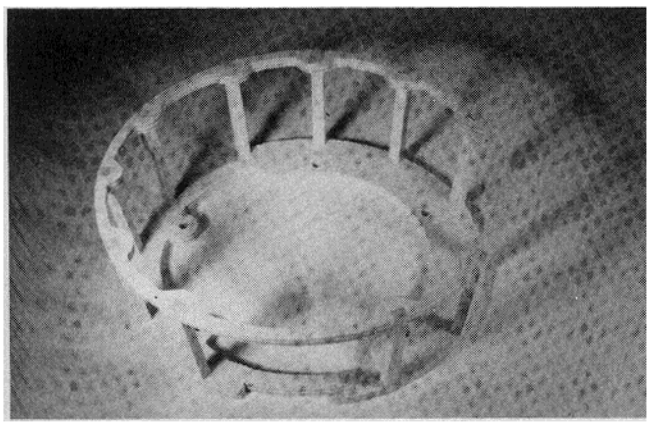
(Editor's Note: Due to the length of the construction sequence on the Mitsubishi Ki-15 "Babs", it is not being reproduced in this article. We have given you the introduction and the flying portion of the article; the complete construction article will be furnished when ordering the full size plans.)



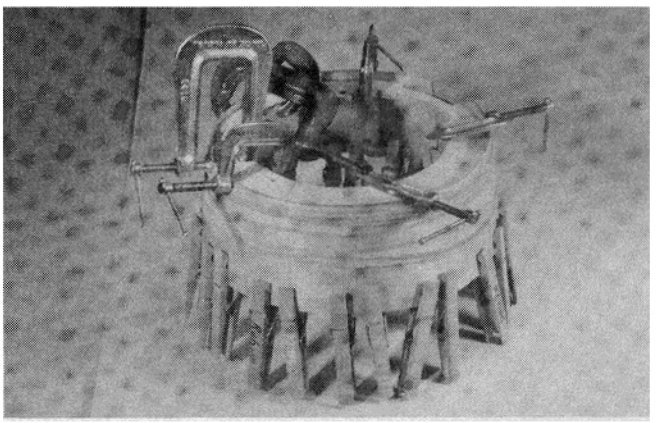
Pre-bend ply cowl sheet by wetting and clamping. This simplifies later attachment to cowl frame.



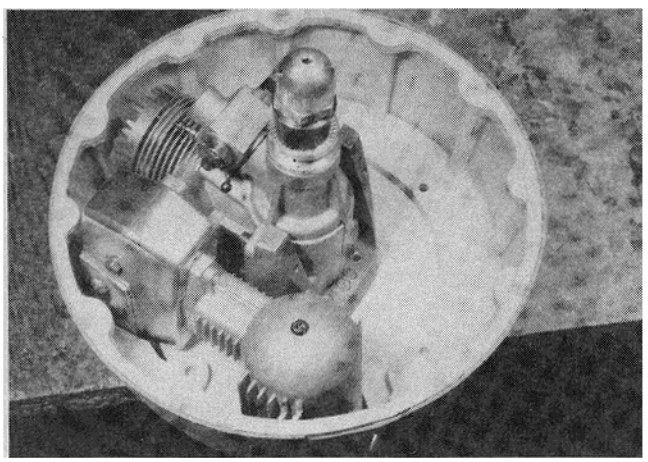
Inside of nosebowl is beveled prior to attaching to cowl frame. Medium to hard balsa for durability.



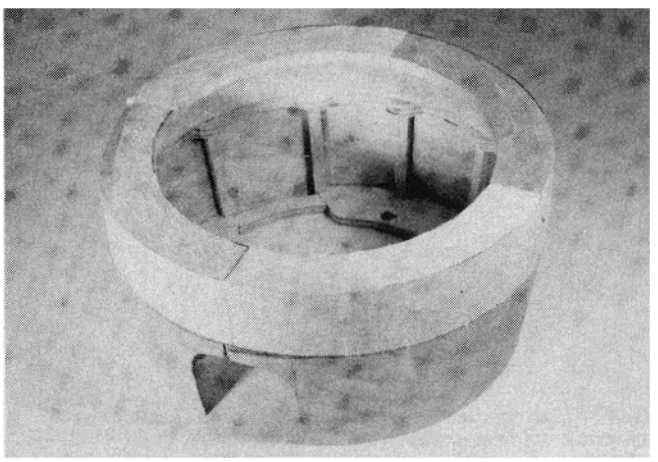
Two ply rings and balsa stringers form the cowl frame. Parts of rear ring will be removed after assembly.



Many rubber bands, C-clamps, and clothespins, hold cowl sheeting to cowl frame while epoxy sets.



Engine and muffler are trial fitted to cowl and firewall. Rear cowl ring is trimmed as needed.



Nosebowl glued to cowl. Ready to round with razor plane. Template on plans.

Hang Nokumura, Here We Go!

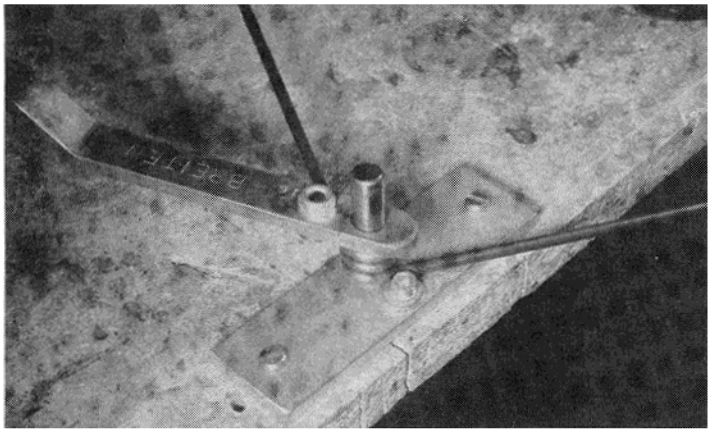
Never fly a new scale airplane with a new engine or a new radio. Check out, break-in and tune up these things on a sport airplane. Then, without touching the needle valve, transfer the engine and radio to Babs.

It is not possible to access the needle valve with the cowl in place and the engine running. Remove the cowl and start the engine. Verify that it runs slightly rich. Babs has plenty of power, so the plane will fly safely with even a very rich carb. Better to err on the side of too rich than too lean. Don't fly with the cowl off. Put the cowl on and restart the engine. It has been my experience that once the needle valve and idle have been properly set, no changes are needed for the rest of the flying season as long as no other changes are made.

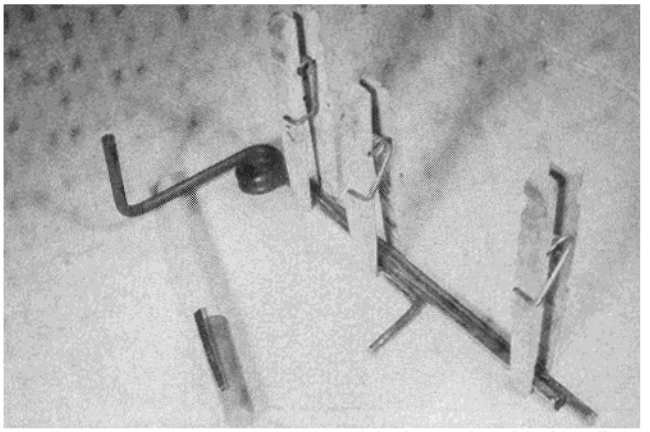
Many scale airplanes require the pilot to advance the throttle slowly during the take-off roll while steering carefully with the rudder. This makes for a realistic take-off and is a good practice for Babs too, but this is an airplane with which you can slam the loud-lever forward and roar into the air if that's the way you wish to fly. Don't use flap on take-off except partial flap, but only in calm air. Flap slows the airplane too much for safe control while climbing.

The rudder is very effective. So effective, in fact, it can spoil loops if not trimmed well. If the plane flies without rolling in level flight but tends to roll in a loop, adjust the rudder trim, then readjust the aileron trim in level flight.

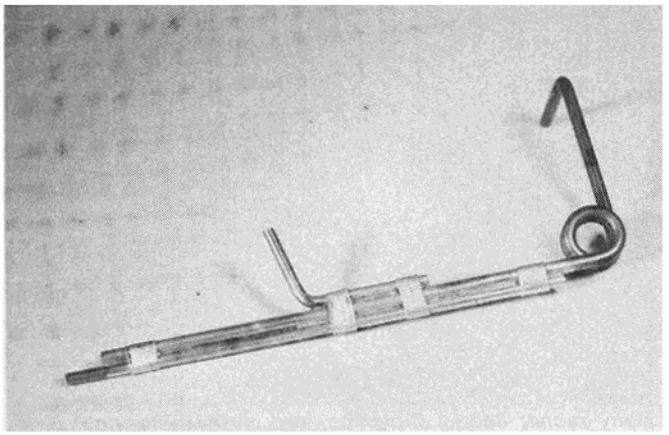
Rudder effectiveness is demonstrated even more in the stall turn. From level flight, pull the nose straight up into the wind. As it slows, reduce throttle to idle. Just before it stops, boot full rudder. Chances are Babs will rotate too quickly. Next time, use less rudder throw for a more graceful turn. The extra margin of rudder control is available in those cases in which



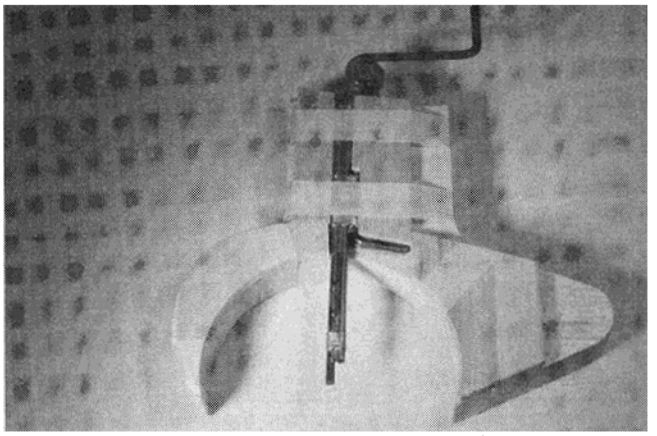
Landing gear struts are formed with Breiten Coil bender or equivalent.



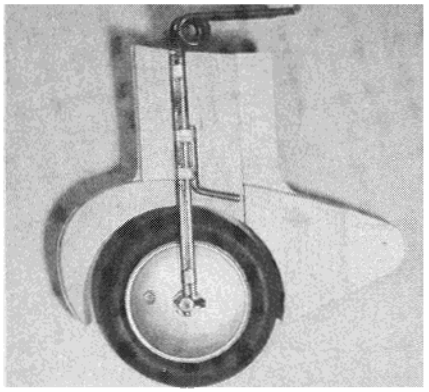
Landing gear strut components ready for tack-soldering. Four struts required.



Landing gear strut wrapped with copper wire and well soldered.



Wheel pant components being glued together. First of two struts shown.



Two struts epoxied to pant. Wheel is painted before assembly.

the approach to the turn is leaning in the wrong direction.

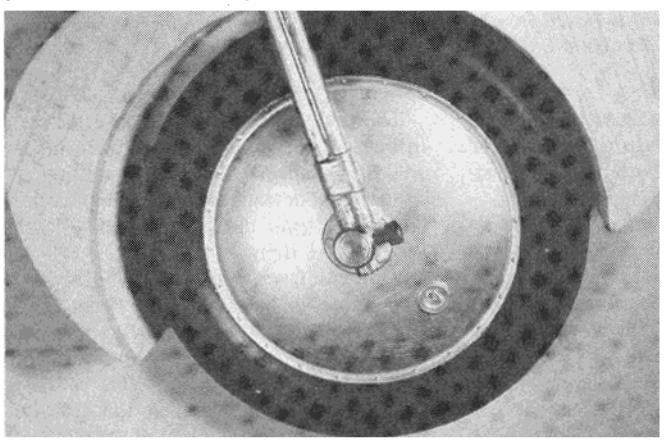
Spins always work.

Climb to altitude and reduce the throttle to idle. Hold level flight by slowly adding up elevator until it stalls, then pull full up elevator and hard left rudder. Babs will immediately drop into a spin. The rotation rate will be too fast if you continue to hold full rudder so back off to half rudder as soon as the spin starts. Neutralizing the controls stops the spin, transitioning into a dive. Let it drop to resume flying speed, add throttle and recover to level flight.

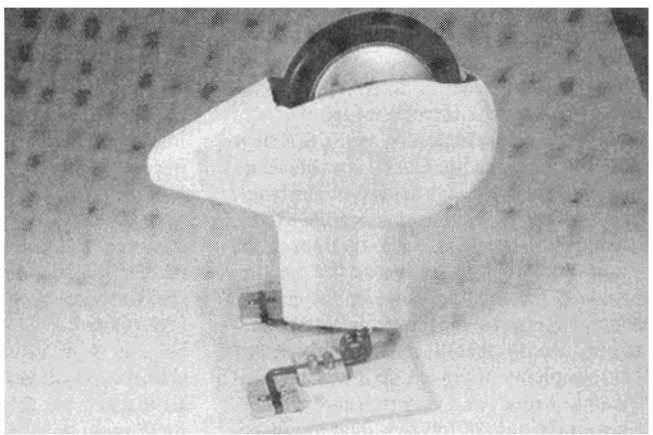
Scale Judges — Please Do Not Read The Next Paragraph

The dihedral is less than scale. This improves aerobatics by reducing unwanted roll in stall turns and making slow rolls more axial. It also reduces the tendency to roll away from the wind in a cross wind take-off. Purists and competitors at the national level will have to restore scale dihedral. Do this by elevating the wing tips 4'' during construction instead of the 2¾'' shown on the plans. The thickness of the wheel pants will have to be slimmed too. Serious competitors will know how to do this. Those are the only deviations from scale.

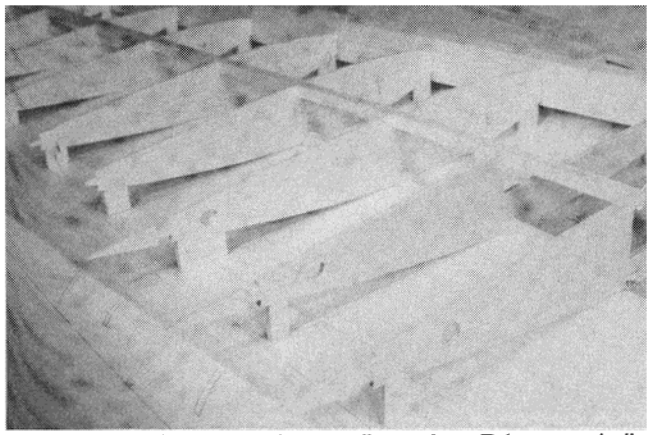
Drop full flaps only after slowing to well below cruise speed. There will be a



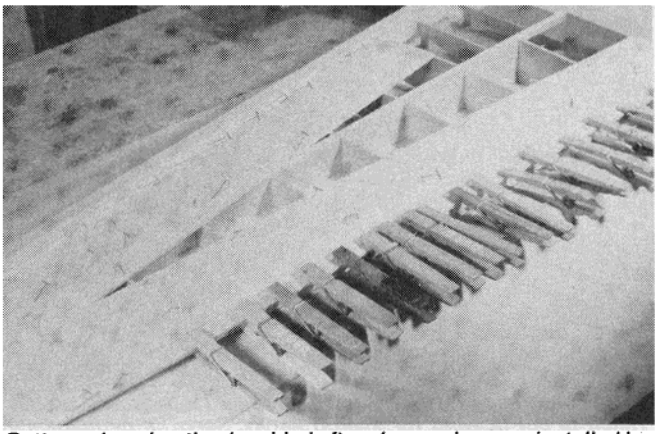
Goldberg axle rests against strut. Williams Bros. wheel.



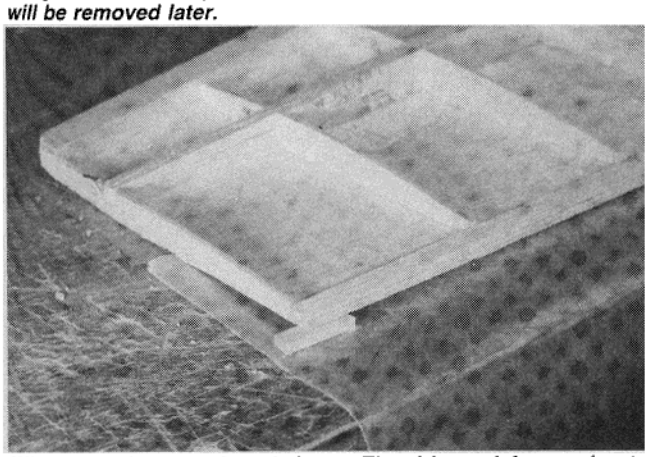
Shaped landing gear attached to ply bearer with Du-Bro landing gear straps.



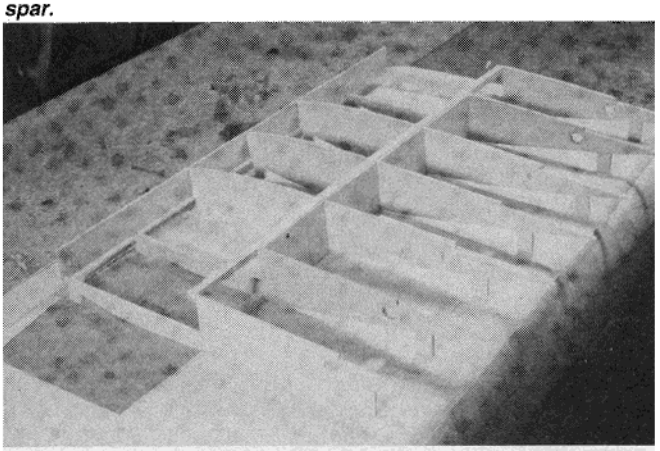
Wing is assembled upside-down on flat surface. Tabs on each rib will be removed later.



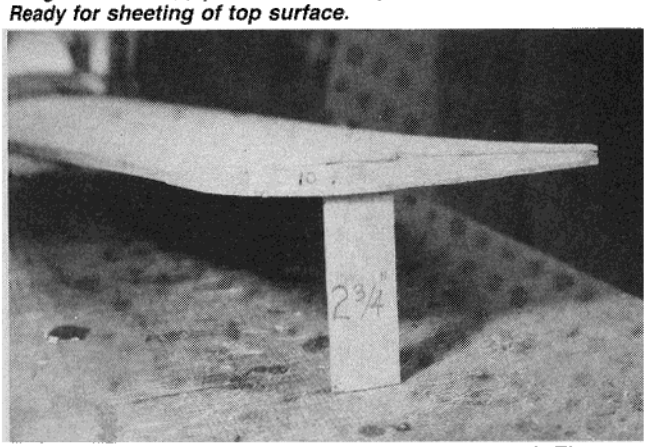
Bottom wing sheeting is added after shearwebs were installed in spar.



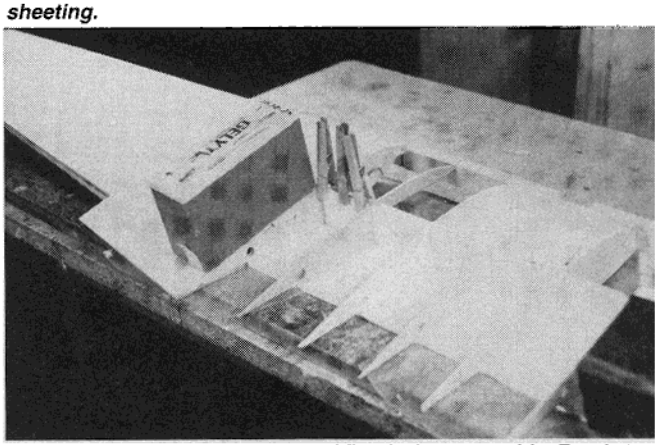
Wing turned over, pinned down. Tip shimmed for washout. Ready for sheeting of top surface.



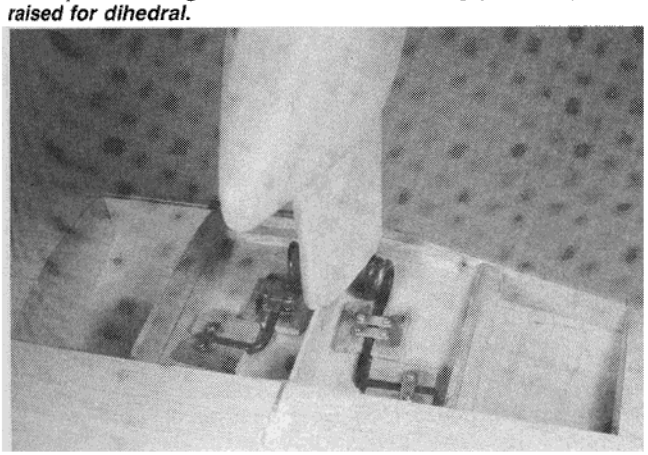
Center section is also built upside-down. Ready for bottom sheeting.



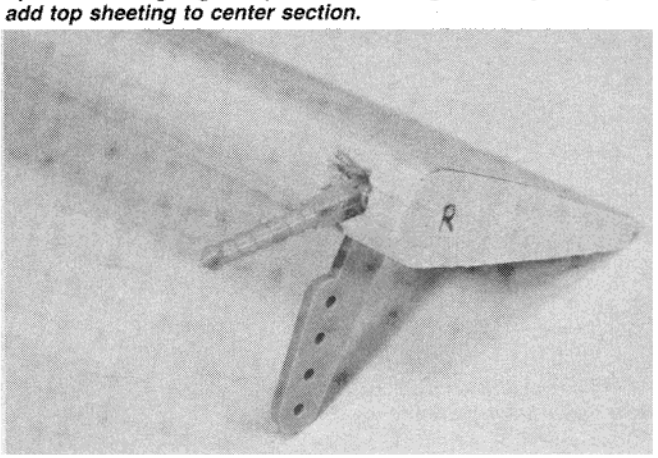
Outer panels being assembled to inner wing panel. Tips are raised for dihedral.



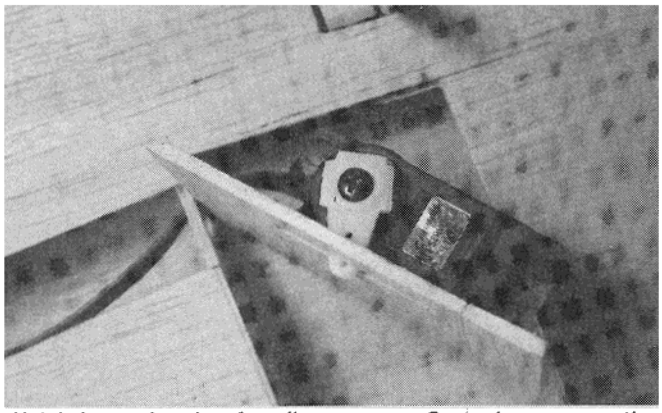
Spar and trailing edge are pinned flat during assembly. Ready to add top sheeting to center section.



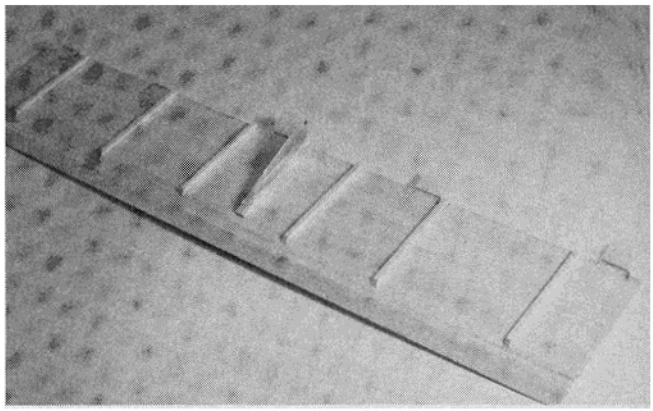
Landing gear with bearer is glued in place in wing. This section can now be sheeted.



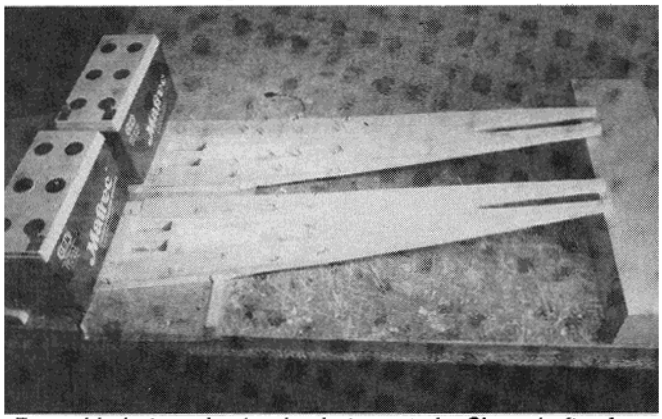
Robart Horny Hinge in aileron. Hinge line is recessed into aileron.



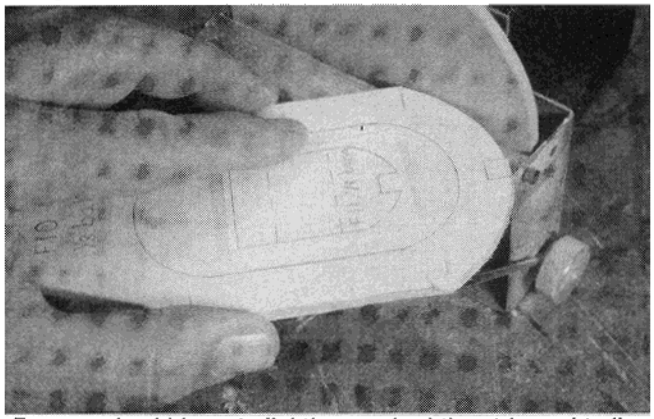
Hatch is cut in wing for aileron servo. Servo is permanently installed with silicon glue.



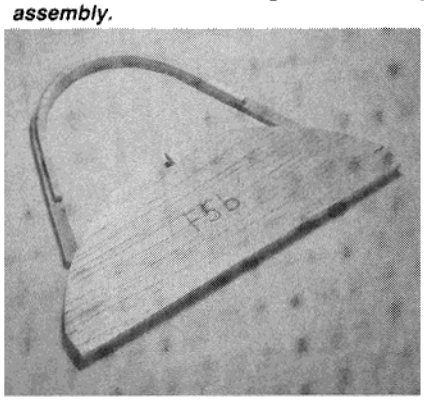
Aluminum horn is epoxied to flap. Six Klett hinges are screwed and glued in place.



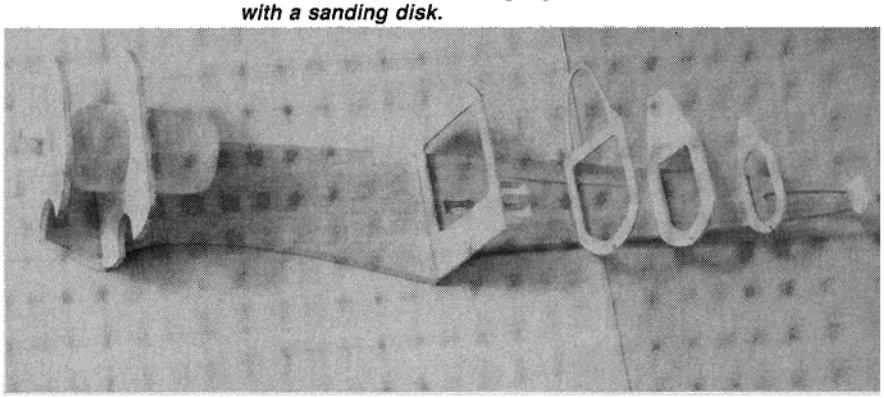
Fuse side is two sheets glued at an angle. Shaped after fuse assembly.



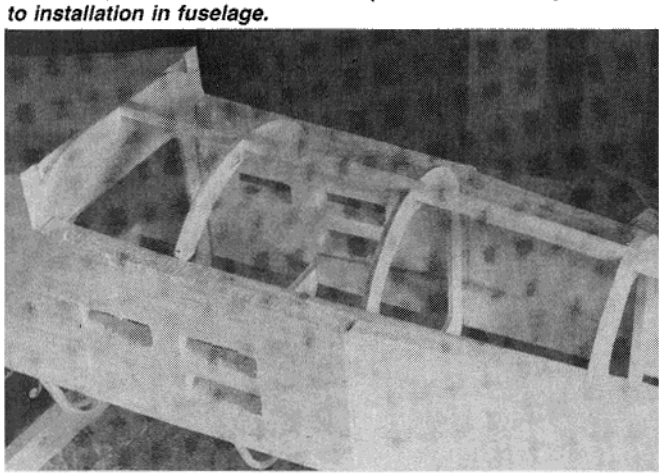
Formers should be cut slightly oversized then trimmed to line with a sanding disk.



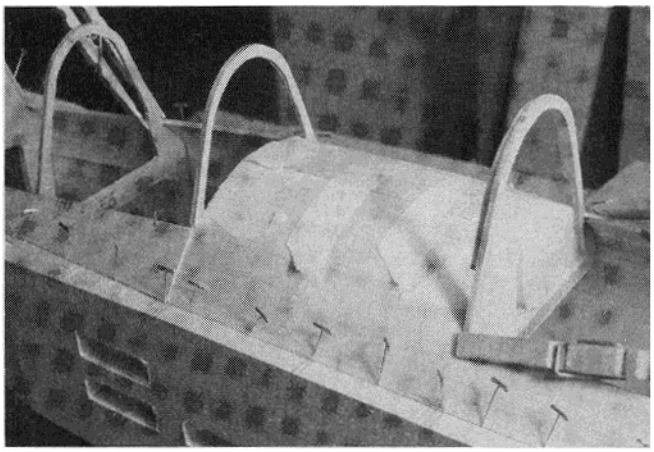
Formers 5, 5a, and 5b are assembled prior to installation in fuselage.



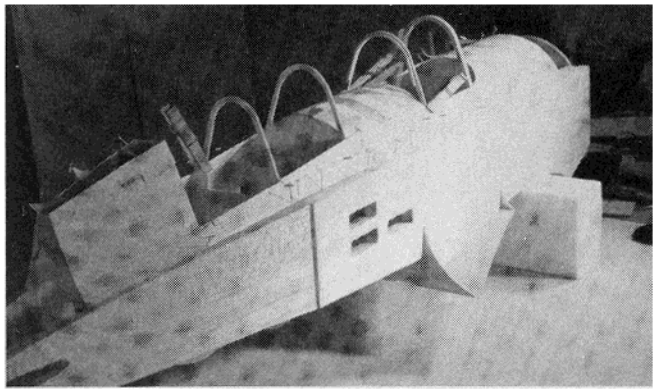
First step in fuselage assembly is to install the tank. Ready for other fuse side.



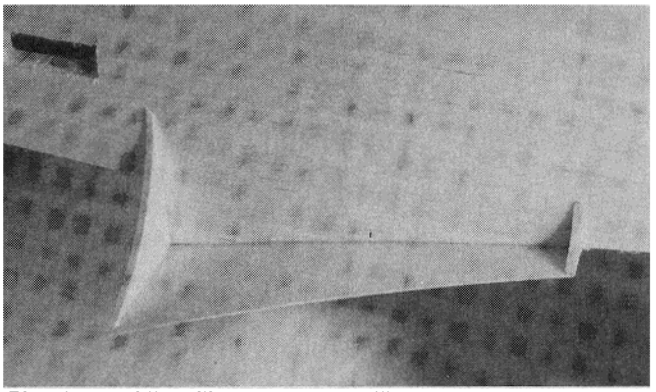
Rear lower fuselage ready for sheeting.



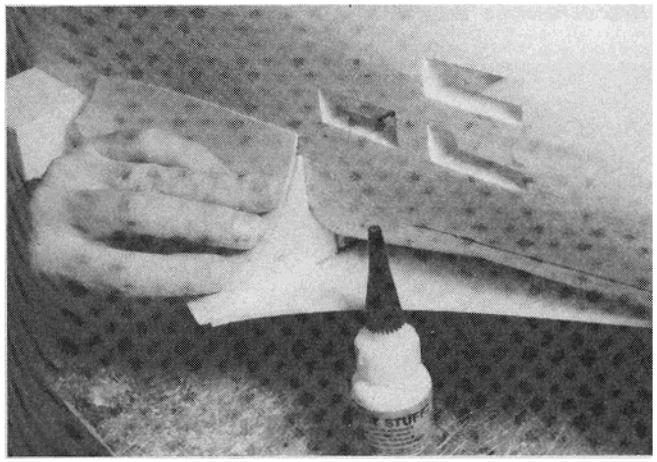
Sheeting applied to upper fuselage. Tape, pin, and clamp.



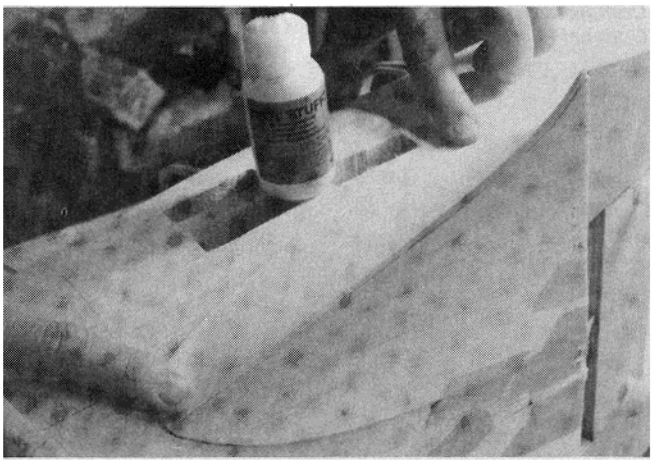
Fuselage top sheeting in place. Ply formers are also canopy frames.



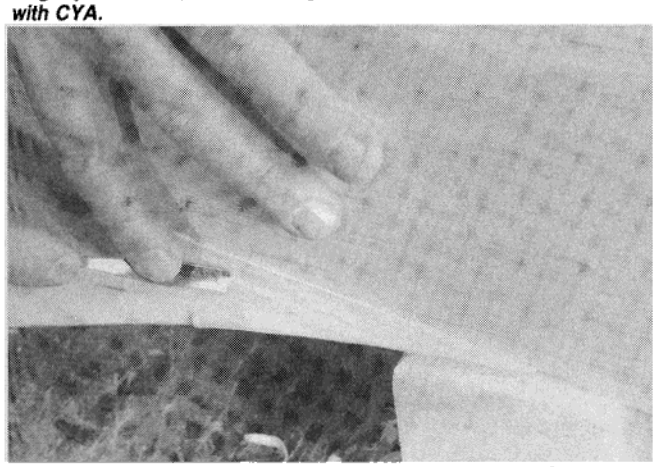
Ply wing saddle will support wing fillet. Installed with wing in place.



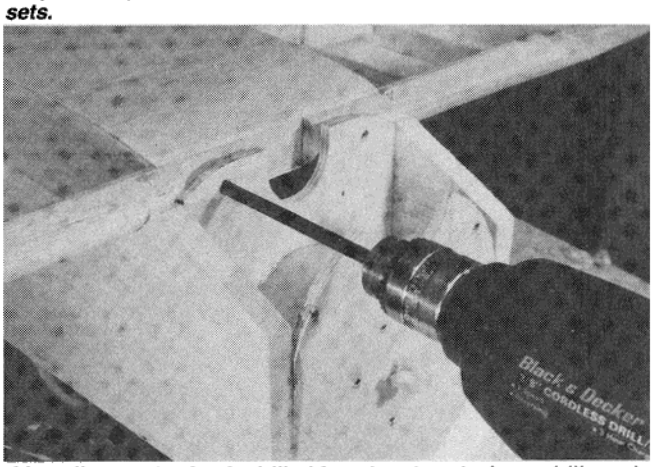
Finger pressure alone is enough to hold wing fillet while gluing with CYA.



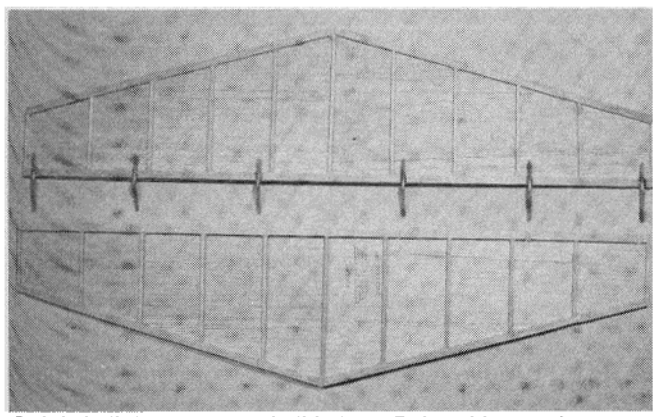
Only two fingers are required to hold upper wing fillet while CYA sets.



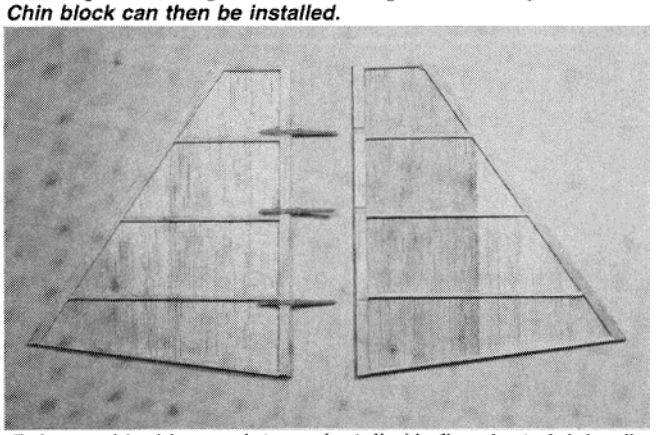
Forward fillet block is finished with small woodcarver's gouge.



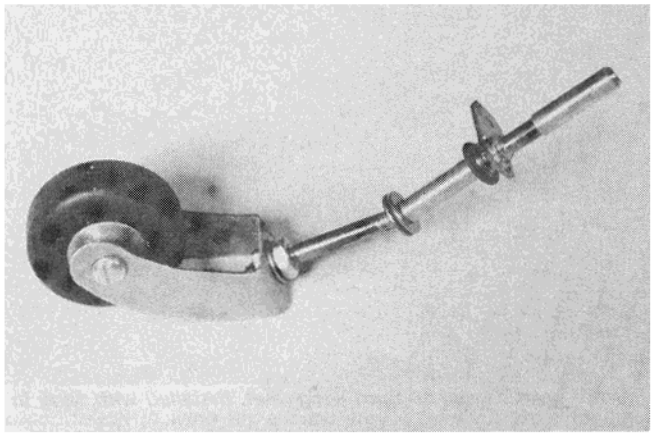
After alignment, wing is drilled for wing dowels. Long drill used. Chin block can then be installed.



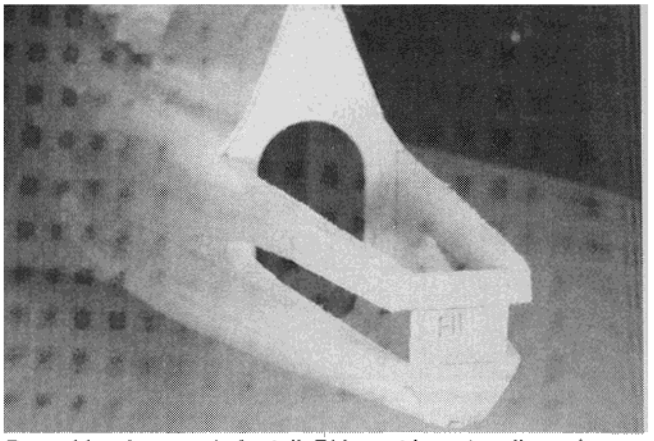
Stab is built in two clam-shell halves. Robart hinge points.



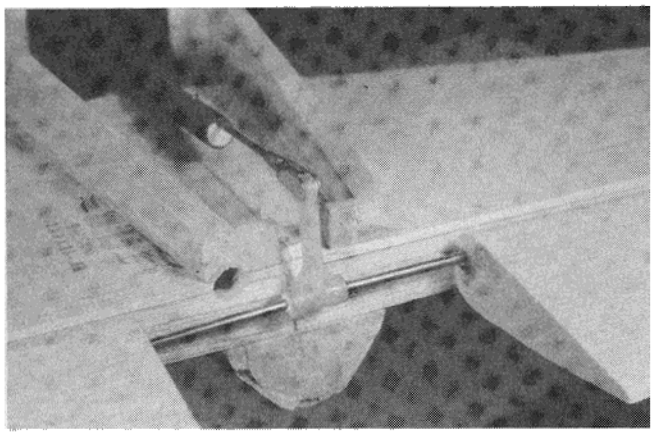
Robart rudder hinge points are installed in fin prior to joining fin halves.



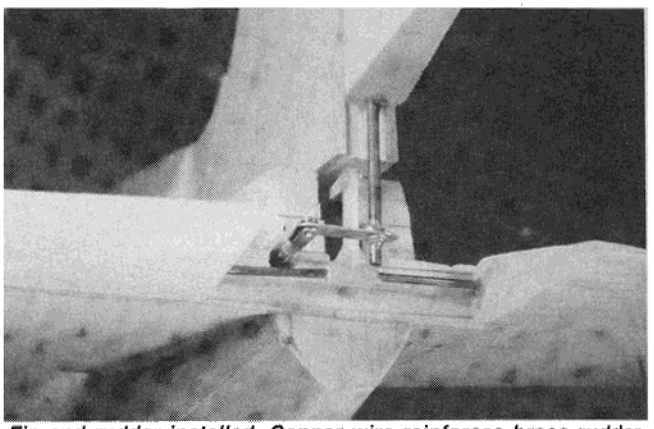
Completed tailwheel strut. Note aluminum-tube bearings. Optional tiller arm shown.



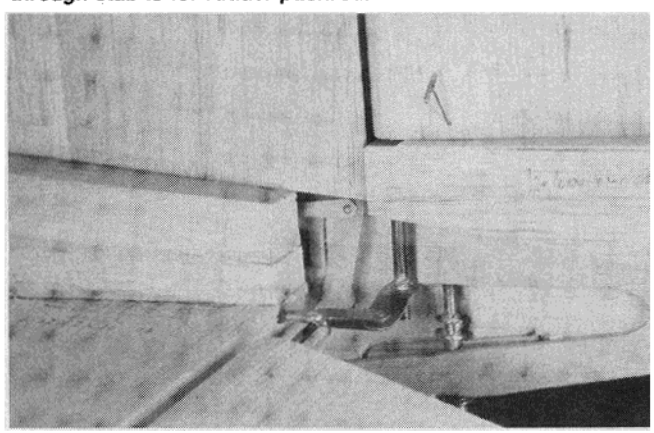
Rear of fuselage ready for tail. F11 must be cut on lines shown.



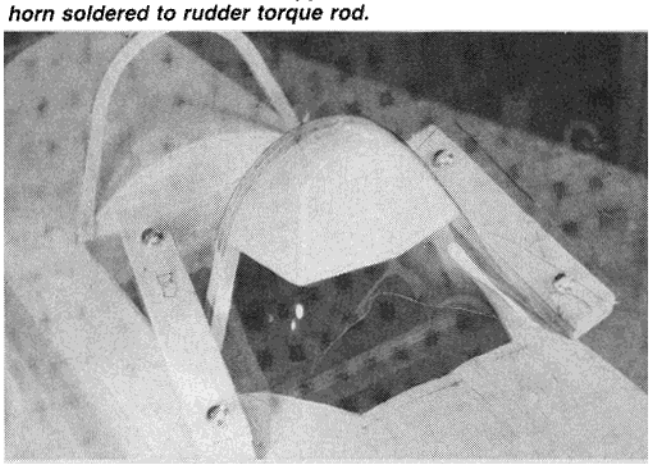
Stab and elevator aligned with wing and installed. Hole drilled through stab is for rudder pushrod.



Fin and rudder installed. Copper wire reinforces brass rudder horn soldered to rudder torque rod.

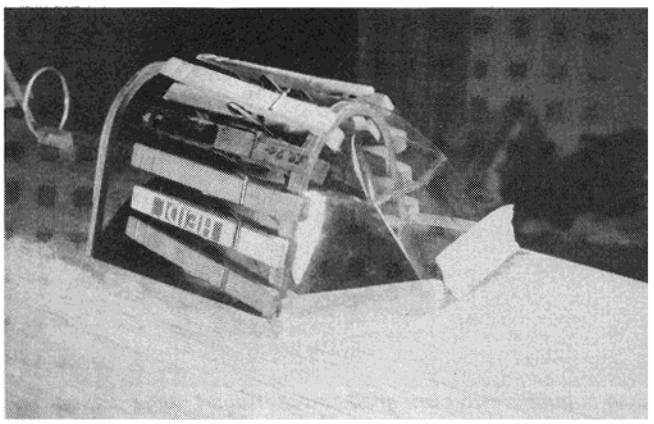


Tailcone with tailwheel strut installed. Castoring tailwheel shown is okay for grass.

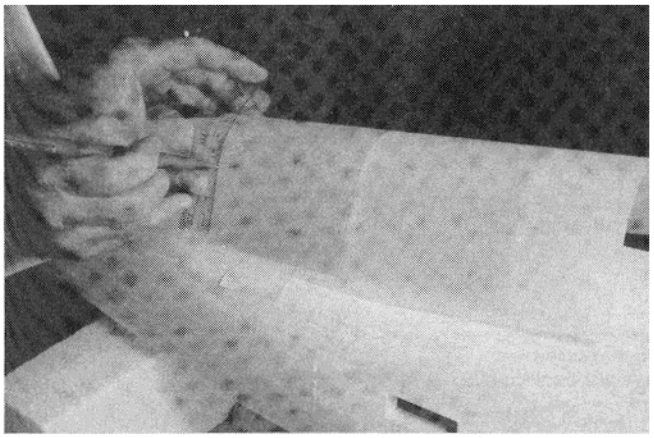


Hot acetate sheet is pulled down over upper-windscreen form, removed and trimmed.

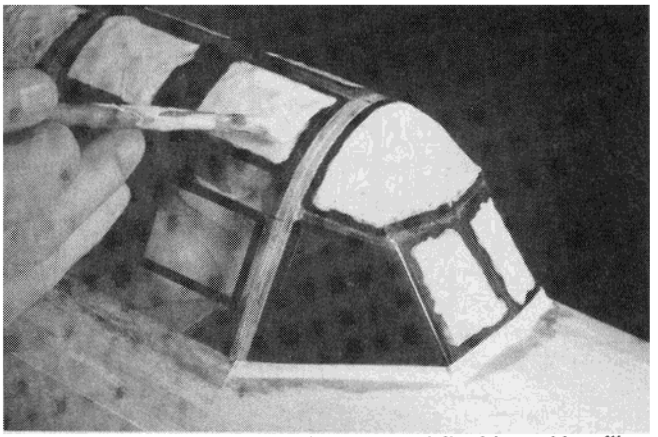
Windscreen is taped to upper windscreen, then removed from form and glued with RC-56.



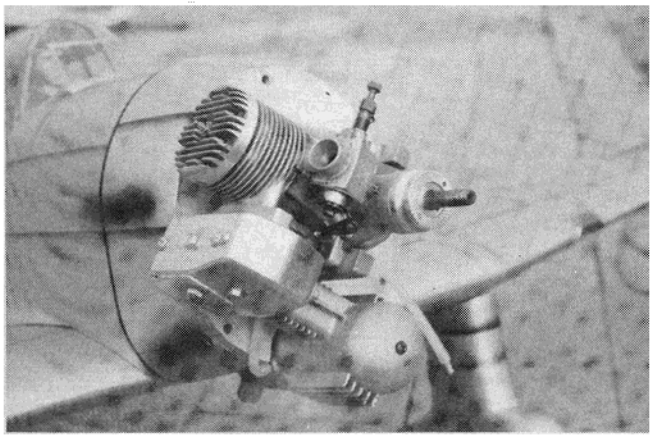
After form is removed, windscreen is returned and glued with RC-56. It dries clear.



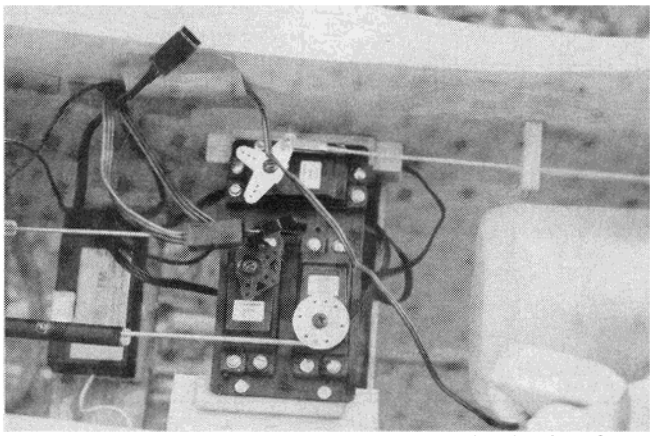
Tracing paper is used to form exact canopy patterns. All canopy sections are flat Sig acetate butyrate.



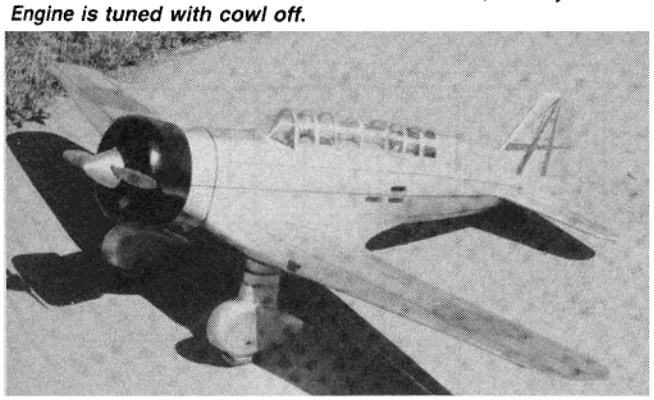
Windows are masked with trim tape and liquid masking film. Latest estimate is 39 windows.



Tatone manifold modified for O.S. muffler. Quiet, throaty sound. Engine is tuned with cowl off.



The inside is Japanese too. Radio receiver is glued to foam rubber under pilot support.



Waiting for frequency pin at Twin City Radio Controller's taxiway.

A 1/72 scale plastic model is available for scale reference. Produced by Hasegawa Seisakusho Co. Ltd. in Japan.

considerable nose-up trim change which requires considerable down-elevator or elevator trim correction. This is typical of flaps of this type --- models of the DC-3 have this characteristic too. This is why modern airplanes don't use single flaps. The effect is caused by the flap creating a downwash on the horizontal stabilizer. This might be a good application for electronically coupled elevator and flap.

Full-down flap enables Babs to descend steeply without gaining airspeed. Practice this at altitude before attempting a short-field landing.

The trim change associated with flap change can be used to advantage when landing with partial flap. A little up-trim is desirable during landing approaches anyway. Partial flap (20 degrees) slows the plane nicely without reducing stability. I recommend the use of partial flap for all landings except in the strongest wind.

I would like to hear of your experiences with Babs. Write to me in care of RCM. If you find scale documentation, especially color schemes other than those listed on the plans, please inform me so that I can pass on your discovery to other modelers. I will respond to every letter.

I wish to thank Bill Cowette for suggesting this subject. Thanks to Larry Wilson of the Smithsonian Institution for his research. And thank you to my flying friends in the Twin City Radio Controllers and the Scale Flyers of Minnesota for their help and inspiration.

Materials List

All material is 4-6 lb. balsa unless otherwise specified.

1 — 3'' x 2'' x 12''
1 — 3'' x 24'' x 1½ medium
1 — 1/8'' x 3'' x 36''
1 — 1/4'' x 3'' x 36''
3 — 1/2'' x 3'' x 36''
1 — 3/8'' x 4'' x 36''
1 — 5/8'' x 3'' x 36''
1 — 1'' x 3'' x 16'' medium
1 — 3/16'' x 4'' x 36''
20 — 3/32'' x 3'' x 36''

1 — 3/4'' x 3'' x 24''
8 — 1/16'' x 3'' x 36''
1 — 3/16'' x 4'' x 36''
3 — 1'' x 1/2'' x 36''
12 — 1/4'' sq.
1 — 3/32'' sq.
8 — 1/8'' x 1/4''
1 — 6'' x 12'' Siglite ply
1 — 3/32'' x 16'' x 24'' ply
1 — 1/4'' x 12'' x 36'' ply
1 — 1/8'' x 12'' x 36'' ply
1 — 1/16'' x 6'' x 36'' ply
1 — 1/32'' x 3'' x 8'' ply
5 — 1/4'' x 1'' nylon bolts

3 — 18'' x 12'' light cellulose acetate butyrate sheets
1 — 18'' x 12'' heavy cellulose acetate butyrate sheet
4 — 3/16'' x 36'' music wire
2 — 5/32'' x 36'' music wire
1 — 3/32'' x 36'' music wire
1 — Dave Brown carbon-fiber pushrod
1 — Sig elevator horn SH-554
4 — Goldberg #300 axles
2 — Williams Bros. Golden age wheels
15 — Robart Hinge Points
2 — Robart Horny Hinges
1 — Map of China Circa 1937

References

''Koku-Fan Illustrated No. 40, Japanese Imperial Army Aircraft'' by Masahiko Takeda, 1987. Bunrin-Do. Co. Ltd., (Book, in Japanese — 4 views, B&W photos, color profile).

''The Illustrated Directory of Fighting Aircraft of World War II'', by Gill Gunston, 1988. Prentice Hall Press. (Book — 3 views, B&W photo, color profile, history).

''Japan's Aircraft of the Pacific War,'' by R.J. Francillon, 1979. (Book — 3 views, B&W photos, history.)

''Mitsubishi Babs'' — plastic model kit Hasegawa B-3, (2 color views on box).

B&W photos B7-15115 & 47040-B — Smithsonian Institution, Washington, D.C. 20560.

Koku-Fan drawing S.K.F.7006, Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, California 92626.

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From RCModeler Sep. 1991