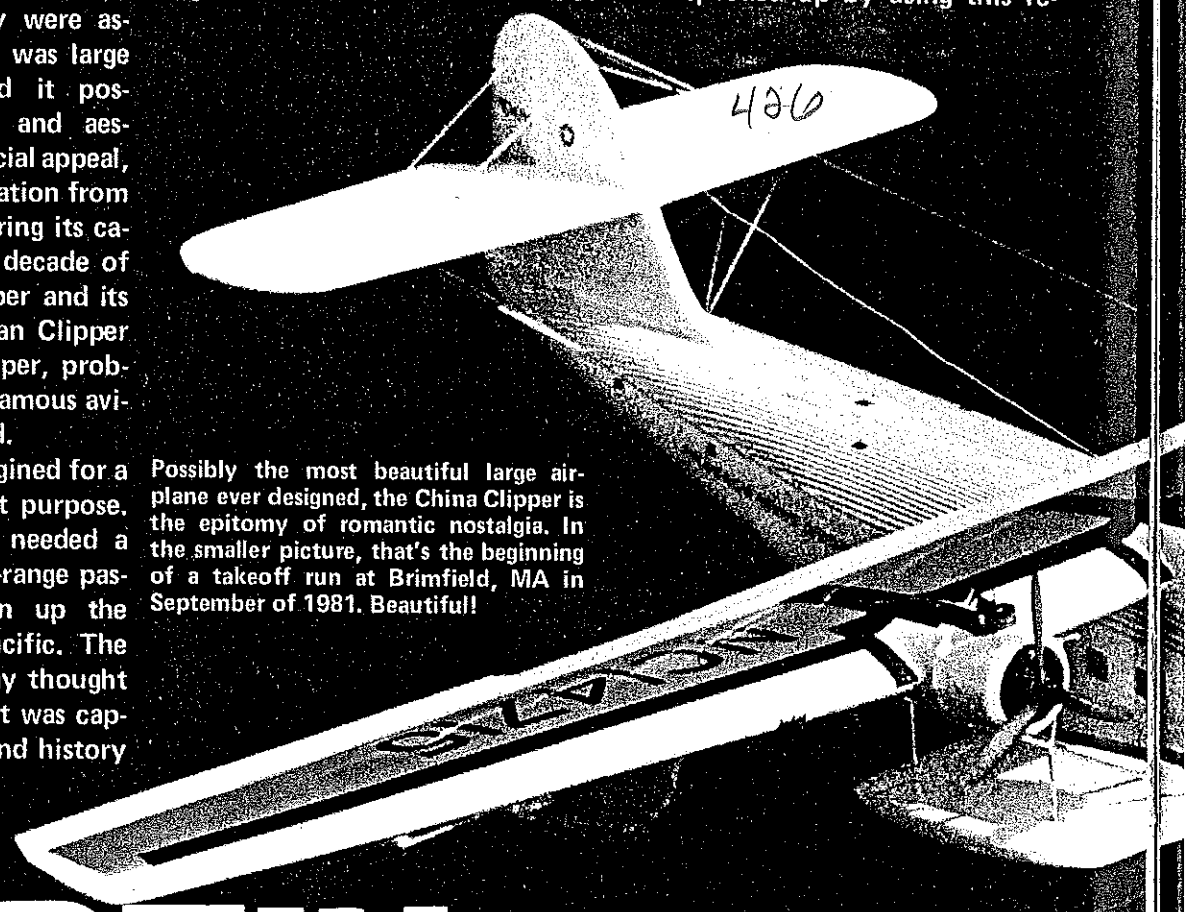
MARTIN CHINA CLIPPER

Is there any airplane that can stir feelings and imaginations more than this one? It played an important role in commercial aviation history in its time, and it was a major factor in making the world seem smaller. As a model, it isn't for the faint of heart, but you can see from the pictures that the results are very rewarding. This RC Sport Scale China Clipper flies with four .10 engines and four-channel controls. ■ Bud Chappell

IF SOME AIRCRAFT can affectionately be called romantic, the China Clipper would be one of those with the best qualifications to receive this honor. Designed and built only seven years after the epic flight of Charles A. Lindbergh, its advanced technology, capabilities, and beauty were astonishing. The airplane was large—130-ft. wingspan—and it possessed true symmetry and aesthetic grace. It had a special appeal, seeming to evoke admiration from all kinds of people. During its career, which spanned a decade of service, the China Clipper and its sister ships, the Hawaiian Clipper and the Philippine Clipper, probably became the most famous aviation names in the world.

The clippers were desgined for a tremendously important purpose. Pan American Airways needed a new, comfortable, long-range passenger airliner to open up the trade routes in the Pacific. The Glen L. Martin Company thought they had the design that was capable of doing the job, and history shows that they were right. The planes had a cruise speed of 150 mph, a range of 3,200 miles, and could carry up to 46 passengers. (They were second in size only to the German Dornier DO-X with its wingspan of 142 ft.) Sixteen sleeping berths could be created out of the various seating compartments, similar to the Pullman railroad cars. The clippers were considered the last word in traveling style. Trips that previously took days by ship were now measured by hours in the air. Of course, the mail was also speeded up by using this re-



Possibly the most beautiful large airplane ever designed, the China Clipper is the epitomy of romantic nostalgia. In the smaller picture, that's the beginning of a takeoff run at Brimfield, MA in September of 1981. Beautiful!

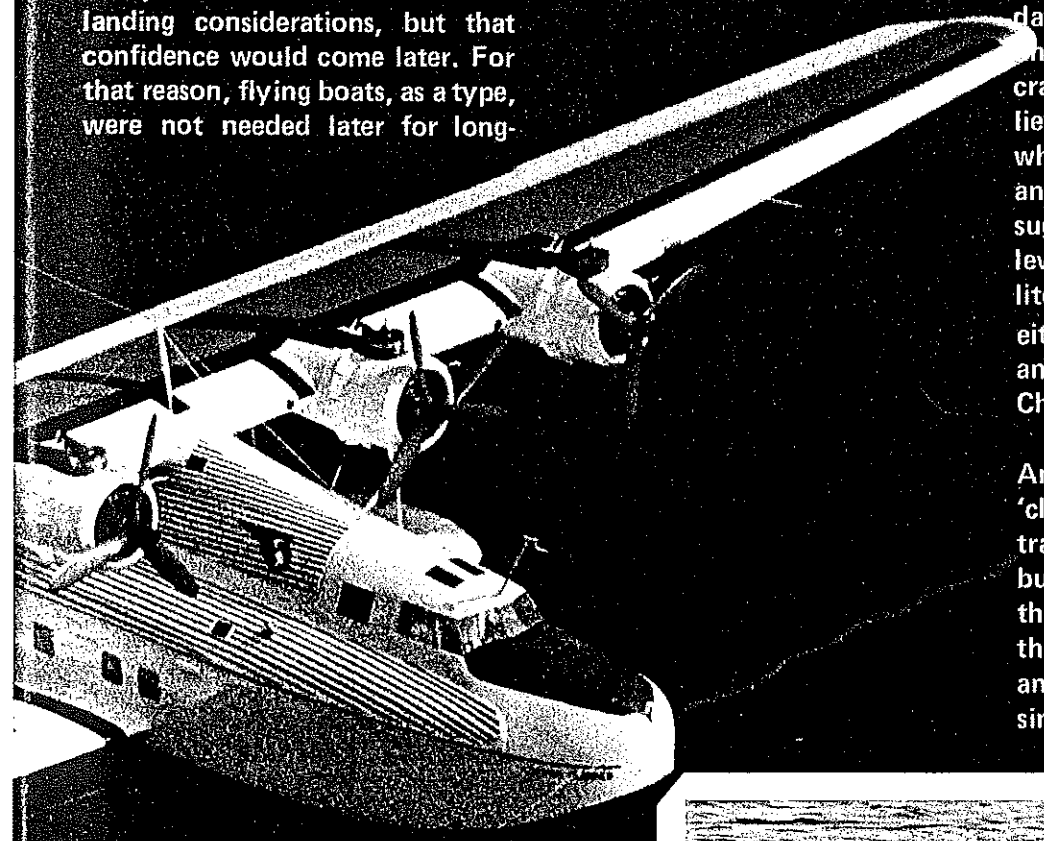
markable aircraft. All this caused people to realize that, indeed, the world had become a little smaller once again.

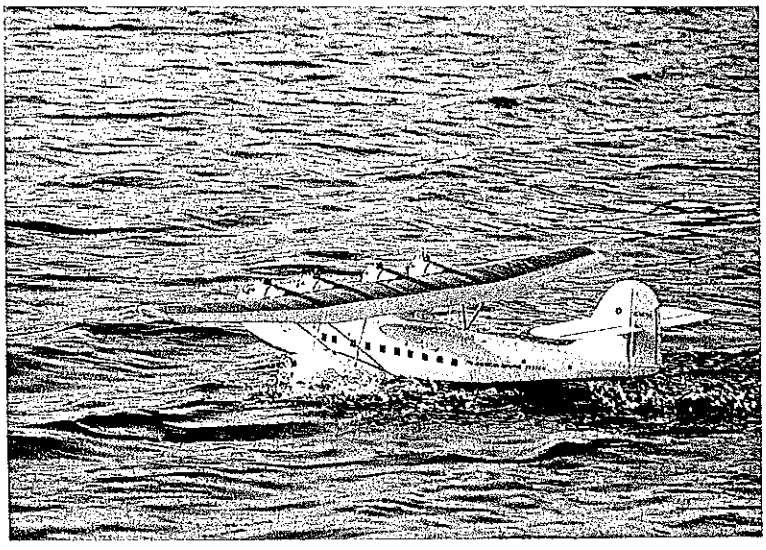
The Martin engineers felt that the airliner should certainly be a flying boat, affording the extra safety of being able to land on the water if too many of the engines became inoperative. Landing fields and airports were few and far between in the Pacific Ocean, and the extra safeguard of the boat concept was very reassuring. The engines used during that period were developing a reputation for dependability which would eventually eliminate the need for water landing considerations, but that confidence would come later. For that reason, flying boats, as a type, were not needed later for long-distance over-water routes. After World War II, designers abandoned the idea altogether.

All of the Martin Clippers served long and well, but the China Clipper, which was launched first, was also the one that outlasted the others. The Hawaiian Clipper was mysteriously lost in the Pacific on a flight from Guam to Manila on July 28, 1938. No trace of it was ever found. The Philippine Clipper crashed into a small mountain in Ukiah, CA on January 21, 1943. The captain, Robert M. Elzey, had mistakenly judged the tailwind and storm that his plane had been flying in. Still believing that he was west of the California coastline, he dropped down through the overcast to get a look at the weather under the cloud deck, a customary practice at the time. He had incorrectly figured his position as being out over open water; instead, he was several miles inland because he was ahead of schedule. The world was shocked by the news of the crash.

The China Clipper met her destiny in Port-of-Spain, Trinidad on January 8, 1945. The accounts of the tragedy are conflicting to this day, and the truth may never be known. The pilots died in the crash. At first the plane was believed to have struck a small boat while landing in the dark, but another possibility emerged that suggested that the pilot had not leveled off quickly enough, quite literally flying into the water. In either case, the aircraft broke up and sank, ending the era of the China Clipper.

The Boeing 314 Clippers (Pan American still calls its airplanes 'clippers') carried on the style and tradition of the big flying boats, but they proved to be the last of the trend. The DC-4s, DC-6s, and the Connies took over the routes, and landplanes have been used since that time.





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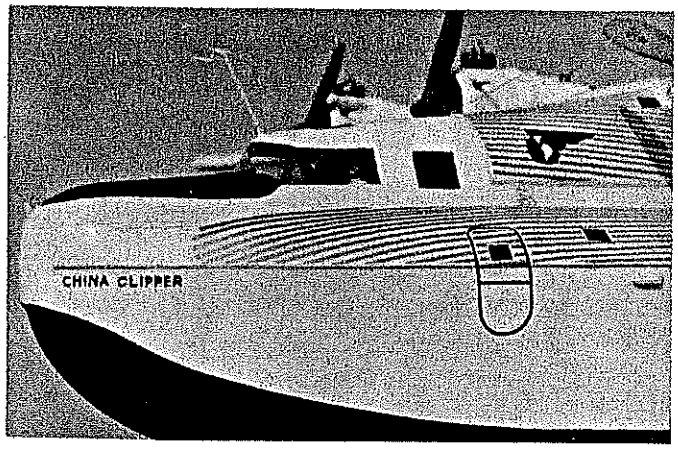
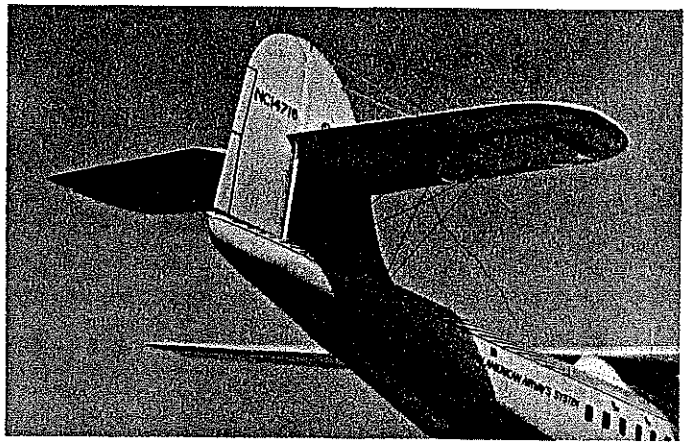
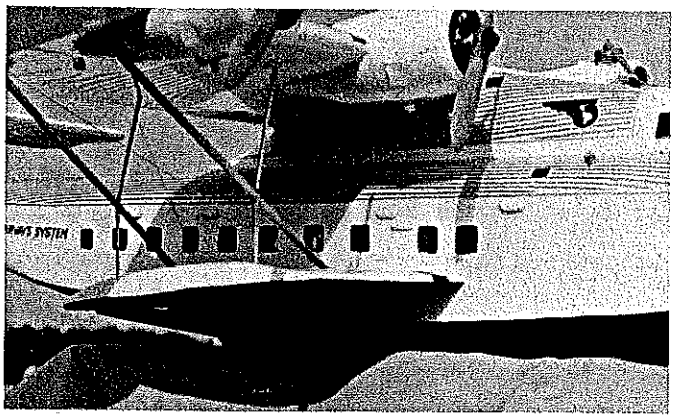
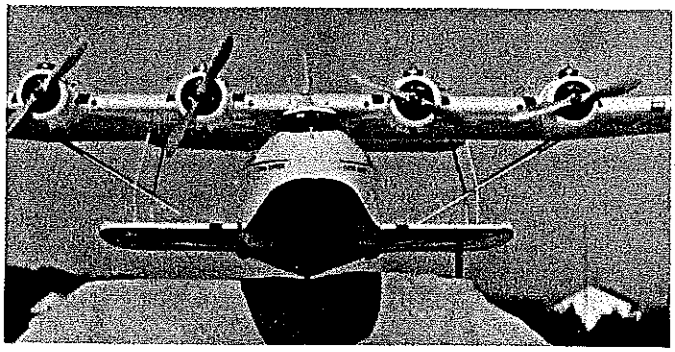




Left: Close-up of the nose shows the captain and copilot in PAA summer uniforms. Note unusual pitot tube design. Radio pull-on switch is just below the Pan Am logo. Right: All control horns are internal. Tail surfaces have generous area. Silver metallic thread used for rigging.



Left: Round 1/8-in. brass tubing soldered into the middle of streamlined brass tubing diagonal struts provides sockets for 1/8-in. dowel vertical struts. All doped silver. Right: Windows are cut from 1/16-in. Plexiglas; corners are sanded round. Bumps above the row of windows simulate air vents. Lettering is cut from black Super MonoKote as per the method described in the text. You may never paint your lettering again.



Left: Author now uses 7-4 props on the starboard side and 7-6 on the port. Authentic-looking three-blade 6-4 props tried at first didn't give enough takeoff thrust. Right: Wing detailing includes landing light, registration number, and static vent tube (a hardwood toothpick). Ailerons are mounted with MonoKote hinges on top. Internal control horns give a super-clean, scalelike appearance. All photos by the author.

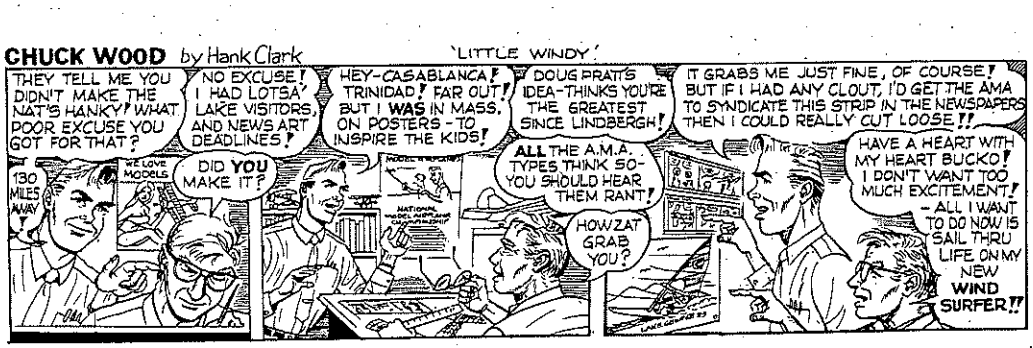
The China Clipper, NC14716, nicknamed Sweet Sixteen by her pilots, is the subject presented here for your modeling pleasure. It is not an easy model to build or fly, and is not the type of model a person would build to hack around the sky on a Saturday afternoon. But if you love to build the classics as I do, and you want to have a plane that will impress the crowd, this model is an excellent choice.

I think that this may be the first RC Sport Scale presentation of the China Clipper. For a long time there has been a lot of interest in building and flying many other four-engined models such as the B-17, B-24, Lancasters, and so on, but I am not aware of any previous attempt to model this plane. Why this should be is a mystery to me. The Smithsonian Institution in Washington, DC has a 24-in. solid display model of this plane, but I was disappointed at the rather poor representation of this magnificent machine. This is to say, jokingly, that if you complete this model as drawn and shown, you will own a copy that surpasses Smithsonian quality.

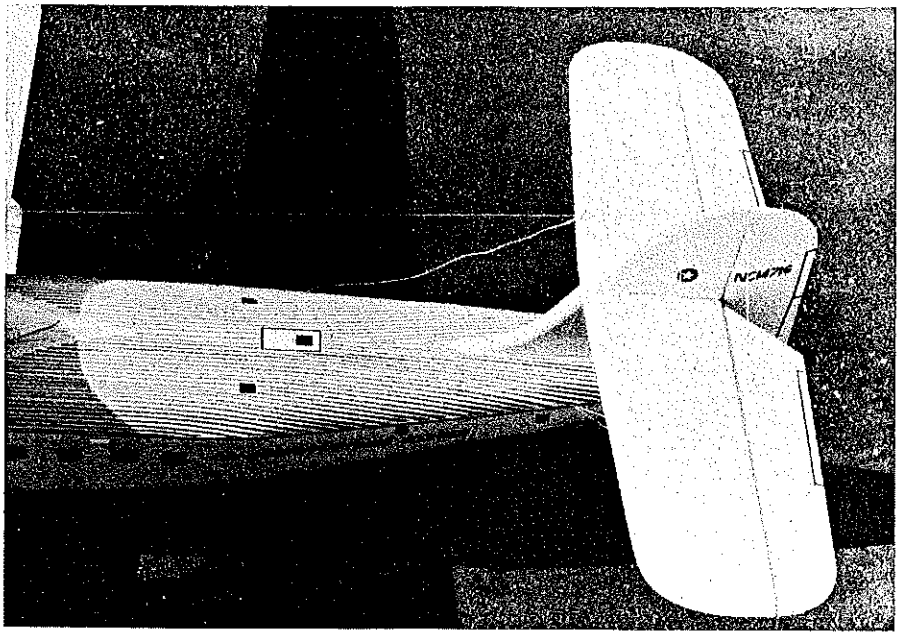
I would recommend that the builder be experienced with both building and flying multi-engined RC aircraft before tackling this project. It is definitely not a plane for the novice. The construction methods are straightforward and conventional, but accuracy and very careful attention to detail are musts. The plans and specifications must be followed without improvisation if you are to be successful. The total weight and balance point have to be right on. If you do make changes and modifications, your chances of coming out with a good-flying machine are seriously lessened.

The model's flying characteristics demand a lot of experience on the part of the pilot. Just as in flying full-scale aircraft, a person must work up from simple single-engine planes to the more complex multi-engine "heavies." They fly differently. Multi-engine model fliers will usually agree that planes of this type are challenging, to say the least.

This model, with its 74-in. wingspan, four OS .10 engines, and 8 lb. total weight, is classified as just the opposite of heavy. I realize this fact seems to contradict what I said in the preceding paragraph, but at this weight, the wing loading works out to ap-


CHUCK WOOD by Hank Clark
'LITTLE WINDY'
THEY TELL ME YOU DIDN'T MAKE THE NAT'S HANKY! WHAT POOR EXCUSE YOU GOT FOR THAT?
NO EXCUSE! I HAD LOTSA LAKE VISITORS, AND NEWS ART DEADLINES!
HEY-CASABLANCA! TRINIDAD! FAR OUT! BUT I WAS IN MASS. ON POSTERS - TO INSPIRE THE KIDS!
DOUG PRATT'S IDEA-THINKS YOU'RE THE GREATEST SINCE LINDBERGH!
IT GRABS ME JUST FINE, OF COURSE! BUT IF I HAD ANY CLOUT, I'D GET THE AMA TO SYNDICATE THIS STRIP IN THE NEWSPAPERS THEN I COULD REALLY CUT LOOSE!!
130 MILES AWAY
WE LOVE MODELS
DID YOU MAKE IT?
ALL THE A.M.A. TYPES THINK SO- YOU SHOULD HEAR THEM RANT!
HOW'ZAT GRAB YOU?
HAVE A HEART WITH MY HEART BUCKO! I DON'T WANT TOO MUCH EXCITEMENT! - ALL I WANT TO DO NOW IS SAIL THRU LIFE ON MY NEW WIND SURFER!!

1/4" BALSA FIN FRAMING
SNAP LINK
1/4"X 3/8" RUDDER L.E.
1/8" SHEET RUDDER
MUSIC WIRE ELEVATOR JOINER
1/4"X 1/2" BALSA SPAR
1/4" SHEET DOUBLERS FOR THICKNESS AT ROOT
1/4" BALSA TOP KEEL
1/2" BALSA ELEVATOR TAPERED
1/64" SKIN ON FIN ONLY
SERVO RODS TO RUDDER-ELEV.
1/4" BALSA BODY FORMERS
1/4" BALSA BOTTOM KEEL FORM NOSE TO TAIL
1/8" PLYWOOD REAR SPAR JOINERS FRONT AND BACK
1/4"X 1/2" REAR AILERON SPAR
1/16" T.E. SHEETING TOP AND BOTTOM
AILERON BELLCRANK MOUNTS ON 1/16 PLY PLATFORM
O S MAX .10 ENGINES ON 1/4 PLY MOUNTS
AILERON SERVO ROD
ENGINE BELLCRANK (4) ON 1/8 PLYWOOD
1/8" PLYWOOD C/S PLATFORM
1/16" SHEET BOTTOM CENTER RIBS
NYLON HOLD DOWN SCREW
1/64" BODY SKIN
BALSA BLOCK FAIRING
1/64" COWL SHEET
SODA CAN COWLS
1/4" DOWEL HOLD DOWNS
BALSA BLOCKS
'D' 1/4" PLYWOOD
BALSA BLOCKS
(HULL STEP)
1/8 PLY SPAR WEB FRONT-BACK (CAN BE LONGER)
BALSA TIP
1/16" SHEET L. EDGE SHEET TOP/BOTTOM
1/16" BALSA RIBS
1/2" FORMED L. EDGE NOTCH FOR RIBS
3/8" SPARS TOP AND BOTTOM
SPLASH RAIL
FLOOR
1/4" X 1" SPARS THRU SPONSONS
SOLID BLOCK FOR TIP AS 'FLOAT'
1/4" SHEET NOSE FORMS
L-1 2 3 1/4 BALSA
1/4" KEEL FORM
1/64" BOTTOM SKIN
RUDDER ELEVATOR SERVO POSITIONS
1/4" RIBS IN SPONSONS
1/4" BALSA CABIN SIDES
1/4" BALSA SPONSON CORE
1/64" SKIN TOP BOTTOM SPONSONS



Dummy scale antenna of elastic metallic thread provides support for not-so-neat receiver antenna. Silver MonoKote strips simulate the corrugated sections of the full-size airplane.

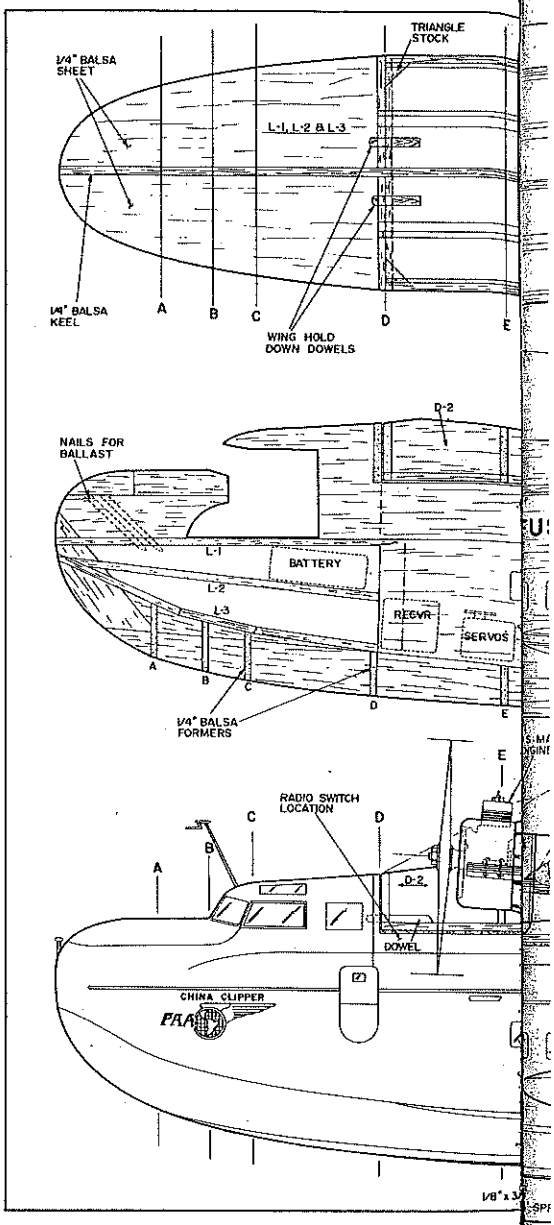
proximately 23 oz. That's one of the lighter numbers for a Scale model, and that greatly enhances the flying ability.

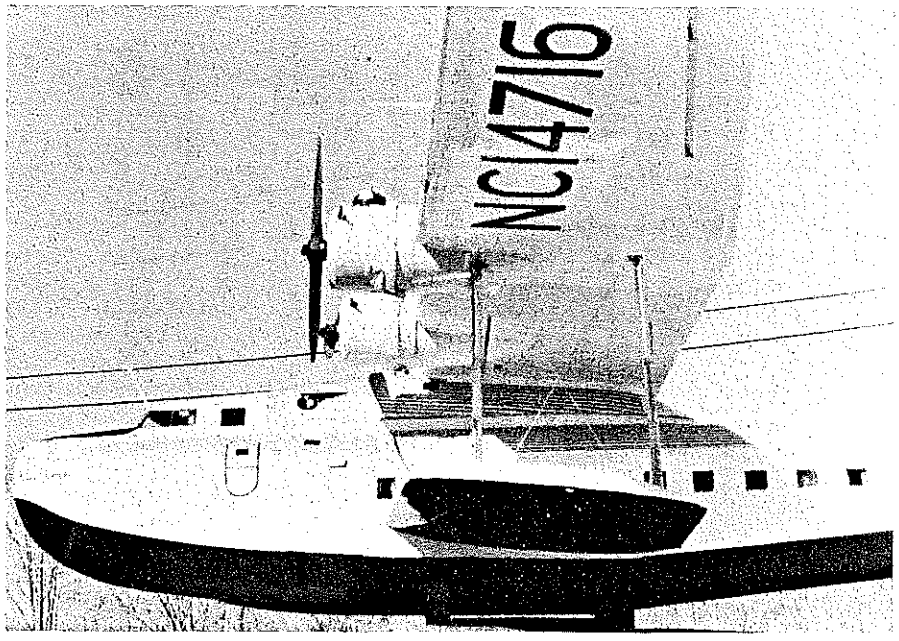
If you have read thus far and you are still determined to try it, let's get started!

The wing with its four engines was the place that I decided to begin. As I studied the old pictures that I had collected and looked through all of the reference books that I could get my hands on, I realized that the shape of the wing seemed somewhat familiar. After a while it came to me. The general shape and airfoil are close to the wing on the Carl Goldberg Skylane 62. I obtained one of the wing kits that are available through most hobby suppliers, and I found that much of the work was partially done, a most welcome aid.

The wing should be constructed as the wing kit instructions show, up to the point where the leading edge covering is to be put on. This is where the difference begins. With a very fine-toothed saw, such as the Zona Saw (another hobby shop item), cut the assembled wing exactly in half. This is done to enable the builder to make the center constant-chord section flat (no dihedral).

With the two sections pinned to a flat board, plywood joiners are installed by cutting away sections of the ribs. The joiners are epoxied to the spars and leading and trailing edges. Apply epoxy liberally to this center joint, as it must be very strong. At the place where the taper starts, Rib #7, saw carefully nearly through the structure on the outboard side of the rib. Leave about 1/16 in. uncut across the bottom of the wing. By trimming a little as you go, the tapered outer sections can be raised to the proper amount of dihedral, and more joiners are then placed in the #7 rib joint.

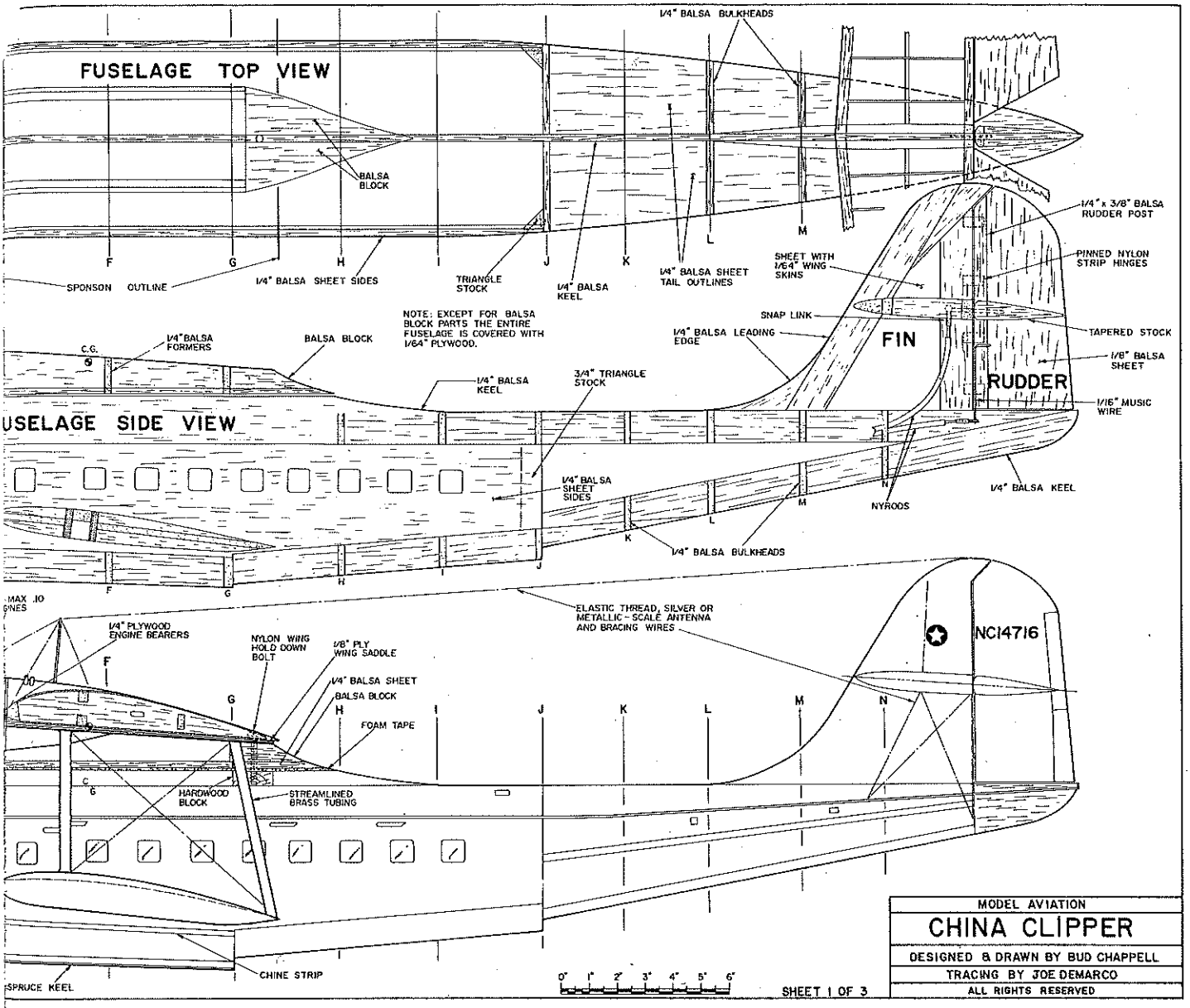




Sponsons were fuel tanks on the real China Clipper, a clever way to provide extra wing area while eliminating the need for wing-tip floats. Old man's face in second window from right.

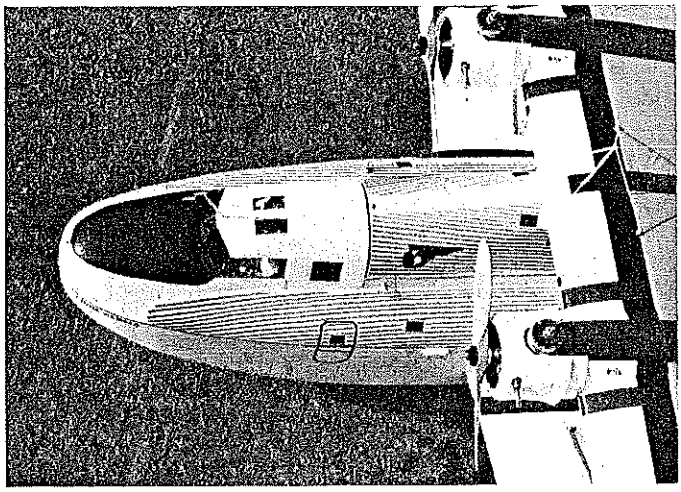
Now, move the ailerons out from their original positions, and make the ribs and spar parts to extend the length of the outer panels. The tips are shaped from block stock, and the trailing edge requires lengthening to meet the aileron. The ailerons are now covered with Super MonoKote (white) and fastened to the wing using MonoKote strips for the hinges. A strong, smooth, airtight seal at the aileron joint is made in this way.

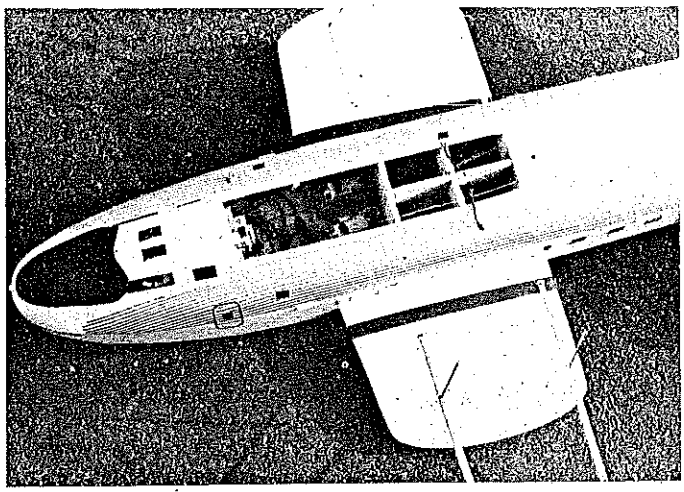
I like to hide the control horns as much as possible, contributing to the scale effect. The larger-sized Robart hinge points work well. With a small jewelers-size screwdriver, separate the hinge point into two pieces; one piece has a drilled hole, the other half is not used. The hole is just the right size to accept a piece of wire like that which comes on Goldberg control horn nylon snap links. Bend the wire at a sharp 90° angle, and after making a hole in the aileron, glue the Robart hinge half-point into the hole. The other end of the wire is hooked into a 60° bellcrank in the wing. This type of bell-



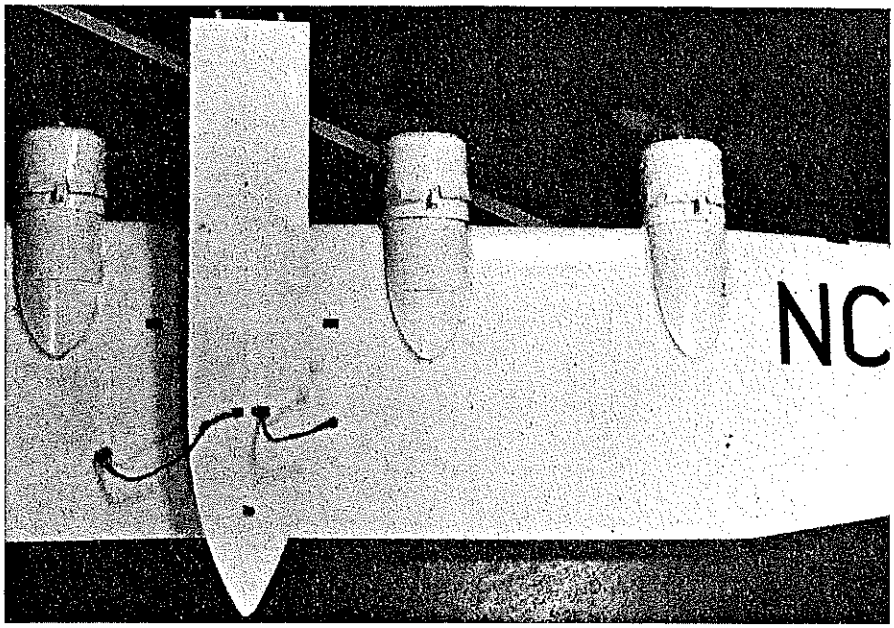
crank, when installed according to the plans, gives approximately 20° of up-aileron but only 2° to 5° of down. By eliminating most of the down movement, the drag of the downward aileron is substantially reduced, providing much better turning characteristics.

Cutting the plywood engine plates and epoxying them to the underside of the center wing section is next. The plywood engine bearers, drilled to match the engine mounting holes, are glued to the plates. Give the

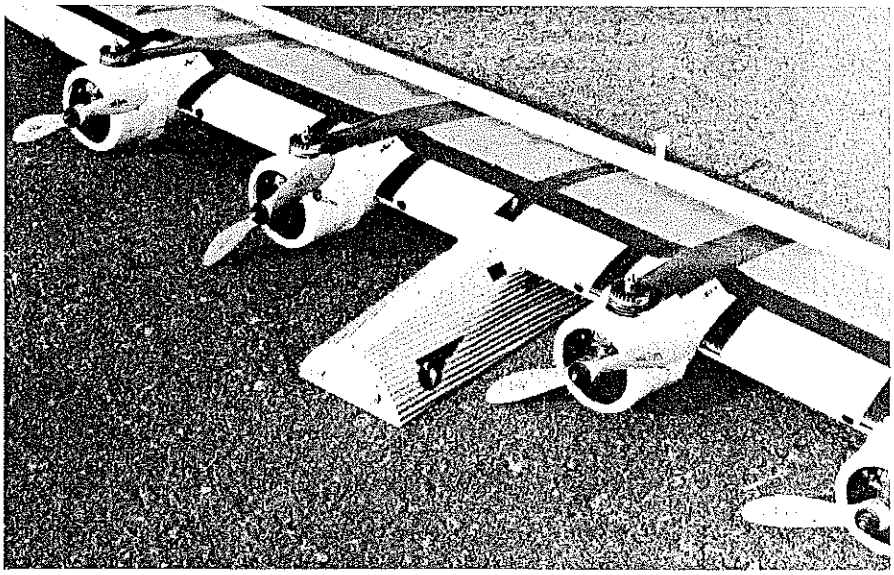




Left: Copilot is visible through the right skylight. Model has full cockpit instrumentation, seats, seat belts, control yokes, etc. Captain has his left hand on the control wheel, right hand on the elevator trim handle. Right: With wing removed, the receiver switch comes into view, as do the rudder and elevator servos and wiring for the engine and aileron servos that are in the wing. The charging jack, on the upper hull right side, is plugged with a nylon screw and O-ring gasket for waterproofing. It's important to use glues impervious to water in building model seaplanes.



Bottom view of the wing and pylon reveals the tiny MonoKote rectangles at the balance point and harnesses to the engine and aileron servos. Pylon sits on a wing cushion gasket on the cabin.



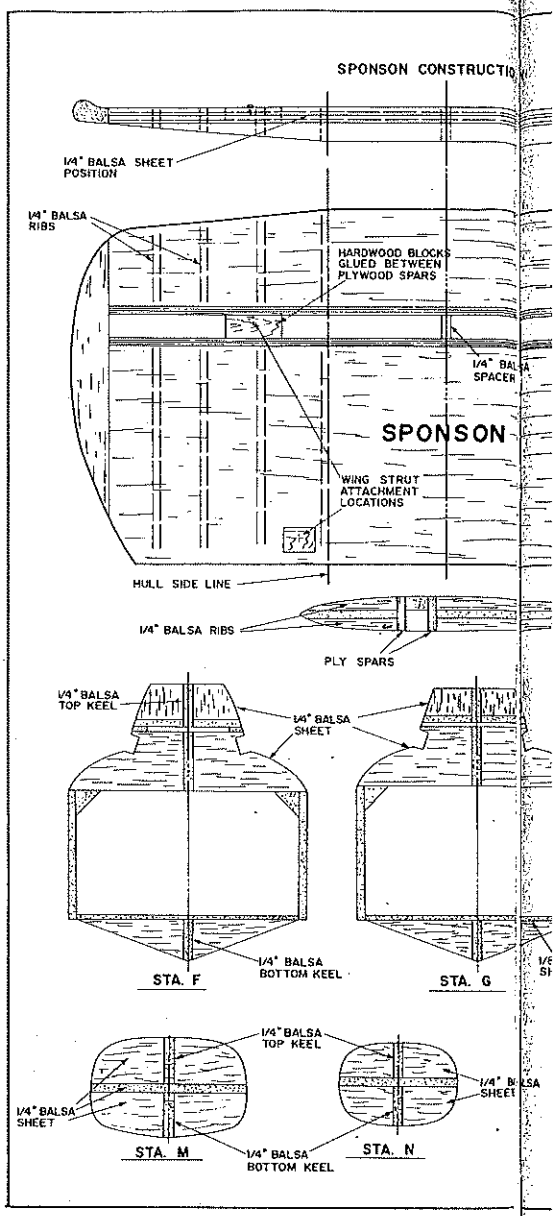
Front of the pylon is a typical plywood bulkhead with hardwood dowels that key into a hull bulkhead. A long nylon screw fastens the rear of the unit to a hardwood block at the cabin rear.

engine mount areas a couple coats of black paint to seal the wood against oil which, otherwise, would later on result in softening of the plywood. When dry, install the engines and hook up the gang throttle linkage. The Du-Bro swivel nylon ball-joint connectors are ideal to fasten to the throttle arms on the carburetors. When used with threaded rod, the connectors give the proper amount of adjustment needed to have all the throttles open and close exactly at the same time—working from one servo.

With the wires and bellcranks in place, the throttle servo is mounted on the balsa bottom wing covering, just to the right of the wing center joint, with double-sided tape. Hook up your battery and radio temporarily to operate the servo and to make certain that all the throttles work smoothly and in unison. Don't cover up these mechanisms until you are satisfied that everything is working perfectly.

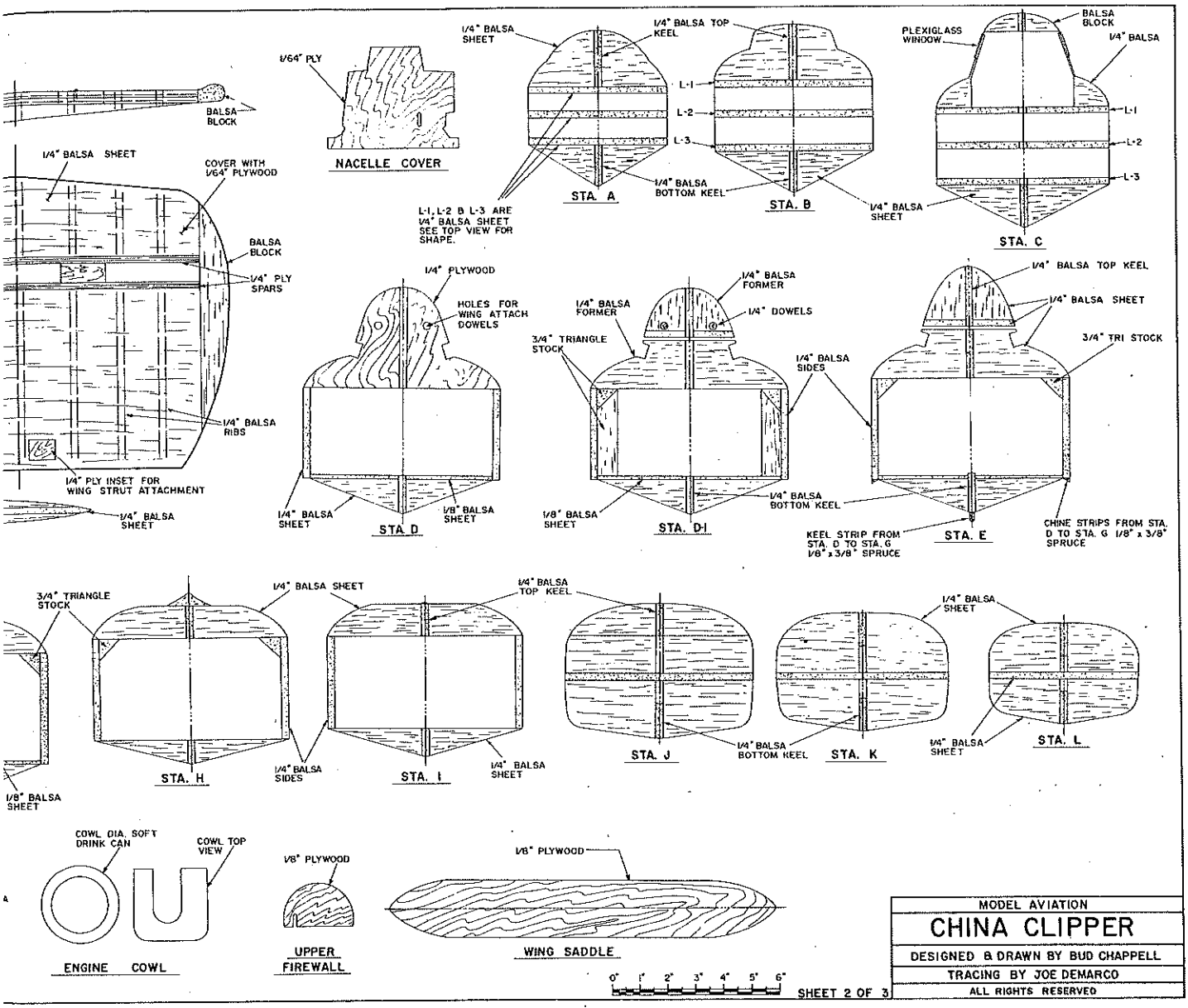
I departed from the usual practice of using clunk tanks in this model for the simple reason that it is not supposed to be aerobatic in any way. The prototype was designed to fly gently and mostly straight-and-level, with the most acute angles of its flight being at takeoff and landing. Perfect Brand #12 tanks (intended for Control Line models) fit quite well behind each engine if part of the back side of the leading edge is trimmed away. One change is required to the tanks. This is to slide a piece of 1/16-in. brass tubing into the rear ⅛-in. vent tube on the tank top to provide one fill tube and one vent tube. (The tanks are filled through the 1/16-in. modified tube; hang a 10-in. length of surgical tubing from the other tube to prevent the fuel from leaking all over the top of the plane when the tank is full.)

Semi-circular bulkheads are shaped and slotted to fit behind the engines and over the throttle rods. The fuel tank covering material is 1/64 plywood wing skin as marketed by Sig Mfg. Co.



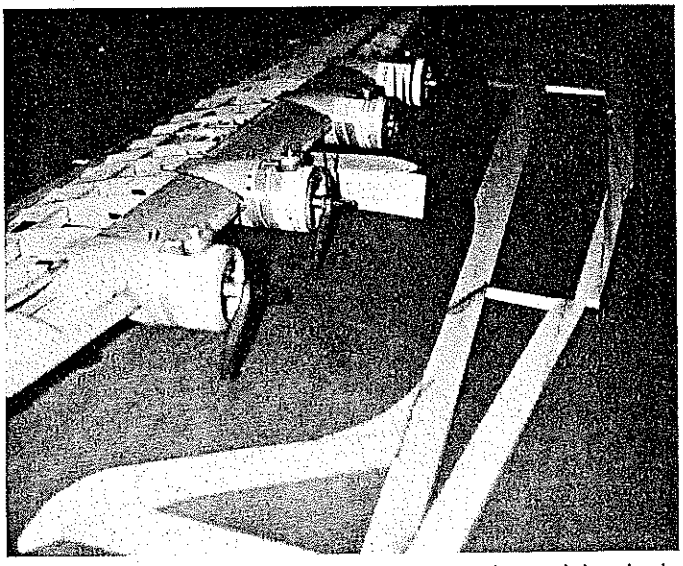
Install the aileron Nyrods and servo. Again, "breadboard" the radio and battery to make certain the ailerons work just right. With this done, the leading edge covering, more 1/64 ply, is glued on. The plywood wing saddle piece is glued directly under the center joint of the wing. Glue the hardwood blocks into the wing to accept the screws for fastening on the wing struts. The structure immediately under the center of the wing is built later, as the hull progresses.

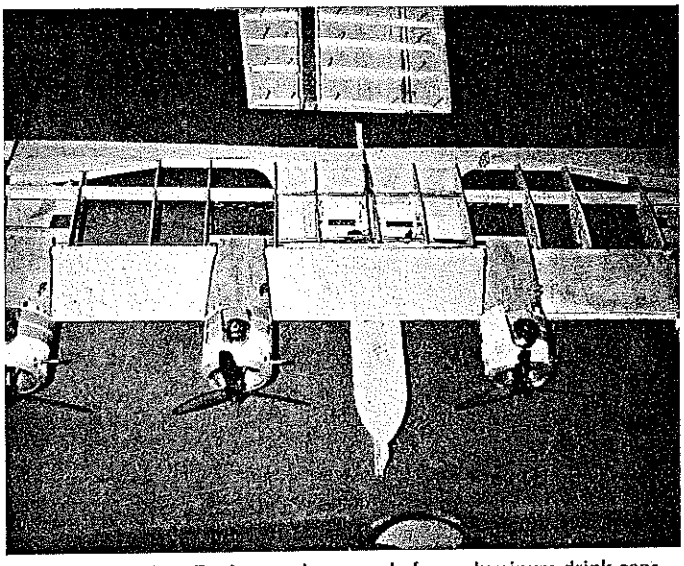
You can now move on to making engine cowls. These are no big deal, just three Fresca cans and one of another kind. (I spoiled the fourth Fresca can while trying to cut it!) Actually, a great deal of care must be taken to convert these little gems to suitable cowls. First, wear gloves. Second, the aluminum is so thin in these cans that it prefers to tear when you try to cut it. I found the best method is to cut out the bottom with a sharp locking-blade jacknife while the can is in its original condition. Then poke a hole through the side of the can up near the top, and with old (but sharp) scissors, begin to cut around the can in a shallow spiral pattern, continuing until you get close to the correct



length. Most likely you will spoil a couple before you get the hang of it, but it will come.

The corresponding semi-circle bulkhead will have to be glued onto the bottom of the engine plates to complete the bulkhead for the cowls. From some of the scrap aluminum, flaps can be cut and epoxied in the simulated open position. When completed,





Left: The ¼-in. balsa hull keel has been put together, and the wing is well toward completion. Engine cowls are made from aluminum drink cans. Cowl flaps are made from the can material, also, and are epoxied in place later. Right: World Engines servos are mounted beside the middle wing ribs with double-sided-adhesive tape. All throttles connect to one servo via pushrods and bellcranks. No dihedral in wing center section.

the cowls are painted with white Sig Plasti-Namel. Fasten the cowls onto the engine-bearer plywood parts with #0 × ⅜ wood screws after you have cut the tops to fit around the cylinders and made the holes in the sides for the needle valve extensions.

By the way, I am using 6-4 three-bladed plastic props on the OS .10s. By boiling these props in silver Rit dye, you get the double benefit of coloring the propellers and relieving the stresses that might be present from the manufacturing process.

Just in case you might not think of it until too late, be sure you are putting the model together with a combination of waterproof glues. I still think that Ambroid is one of the best all-purpose fasteners ever formulated, and I use a lot of it in conjunction with 5-min. epoxy. A great deal of care must be taken in making certain that these products are *never* within the reach of small children.

Stabilizer. Another advantage of using the Goldberg Skylane wing kit is that the materials for the stabilizer were included. The shape and area are not too far from the scale sections, so I decided to use them. I also felt that even though the stab/elevator outlines weren't true scale, the increased size would be helpful in controlling the model, and it would go unnoticed by most people. By modifying the tip shape and the elevators, the unit works out fine.

The hull is built with a keel and bulkheads, and is covered (planked) with more of the 1/64 ply wing skin. The fin assembly is built as an integral part of the hull, as the plans show. Once the keel (outline) is glued together, a box is made—which will be the passenger compartment. At this point you must decide whether you want to only simulate windows along the sides of the hull or if you want to take the extra time and effort to actually make windows. I chose the latter. After cutting out the window openings in the ¼ balsa sides, I sawed the windows from 1/16-in. Plexiglas. The corners of the windows were rounded with rough sandpaper, then epoxied in place. The edges of the window openings were finished and painted, then orange MonoKote strips were added to resemble curtains.

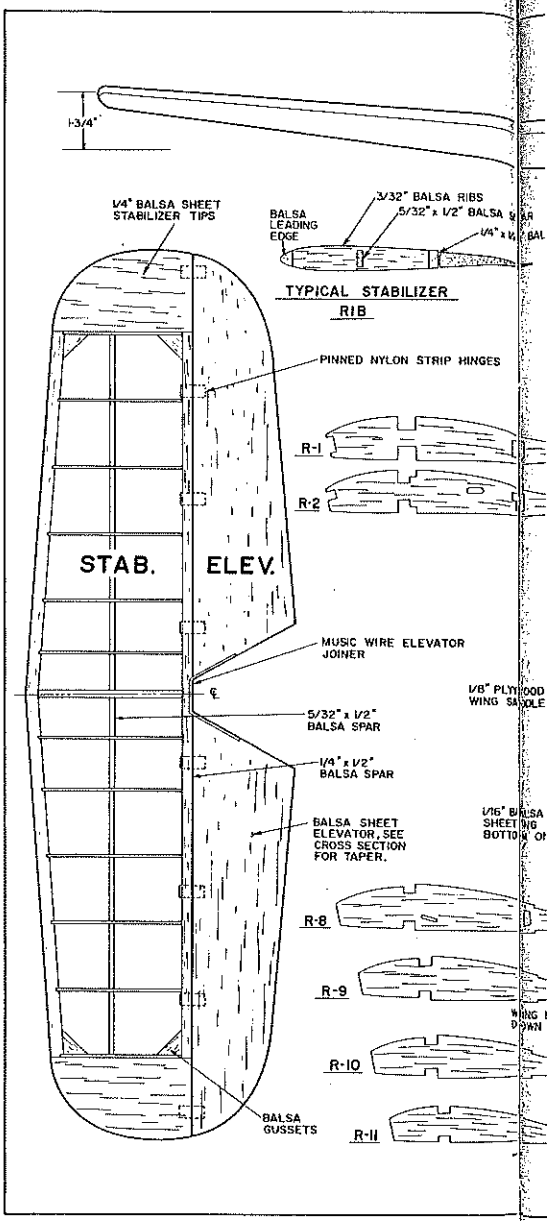
Construct the sponson unit. Glue it into position through the cabin sides. Finish the floor by adding sheet balsa in front of and behind the sponson.

I thought it would add a nice touch to use simulated passengers, so I carved them from balsa. Once decorated, I glued them into place near various windows. I tried to carve different types of people that I imagined might be travelers of that period. There is an old man with a worried look, a middle-aged lady, a priest, a little girl, an oriental gentleman, and so on. I put in seven people in all (not including the two in the crew) and one very famous dog, just for fun.

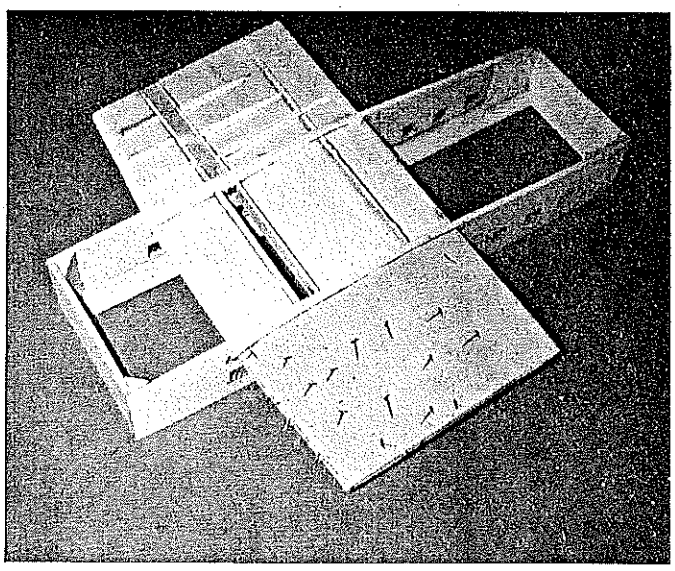
When you glue the box assembly into the keel, you will no doubt think, as I did, that this box in *no way* could be faired into the nose and tail shapes. Thinking that I had made some kind of huge error, I checked and rechecked my calculations to see if it would really come out correctly. Happily, I can assure you that it will. Putting in the triangular formers under the floor comes next, followed by Formers L-1, 2, and 3. Continue with the rest of the formers out to the tail, and you will see that it begins to take on the proper shape.

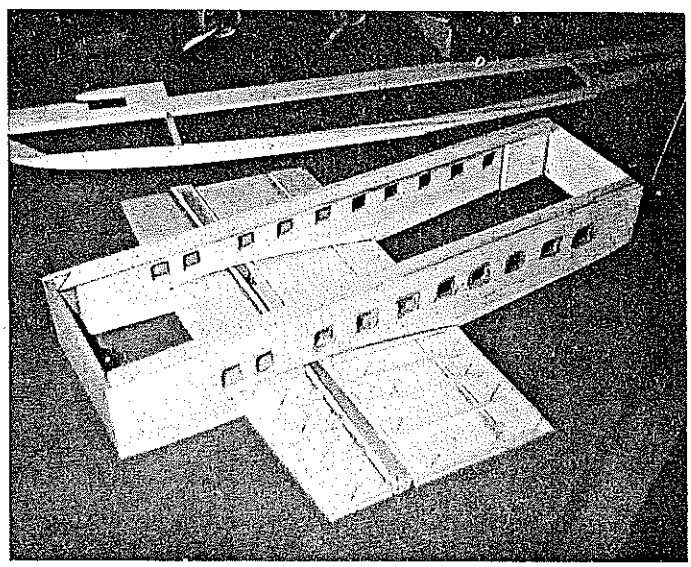
Paint the cockpit floor and the wall behind the pilots with black dope, and glue in the instrument panel. For the pilot and copilot, I found two Star Trek figures, approximately 4¾ in. high, in a toy store, that had movable limbs. Balsa seats, painted tan, were made to support them. Two narrow strips of aluminum can stock were the seat belts. The figures were then painted white with black trim, resembling the Pan Am uniforms of the China Clipper period.

Put the stabilizer in place, and glue it securely. Also glue the nose blocks in place. While these are curing, the cockpit roof with the skylights should be cut out and installed.

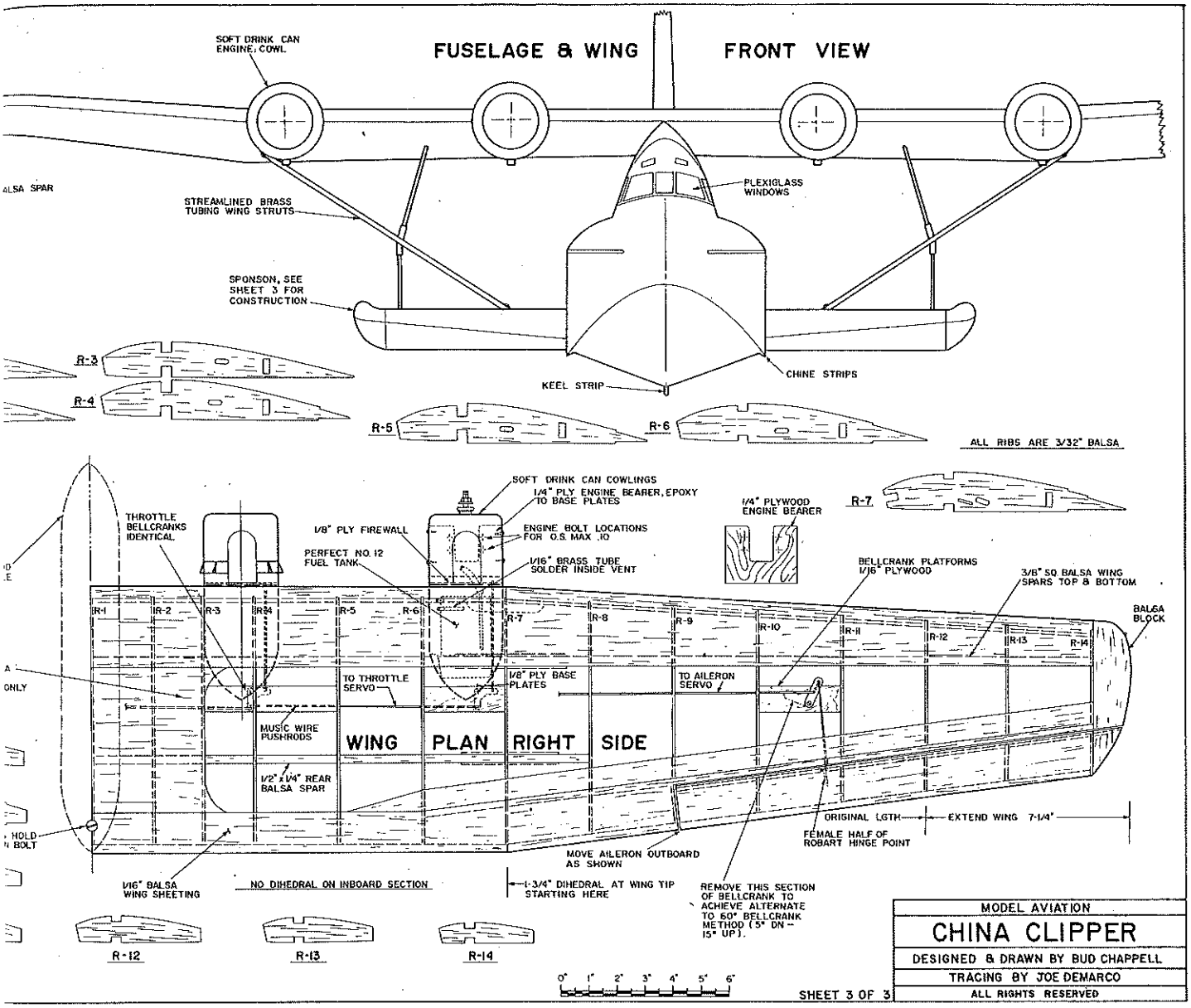


The glass in the cockpit area is more 1/16-in. Plexiglas. Saw it out, sand it to fit, and

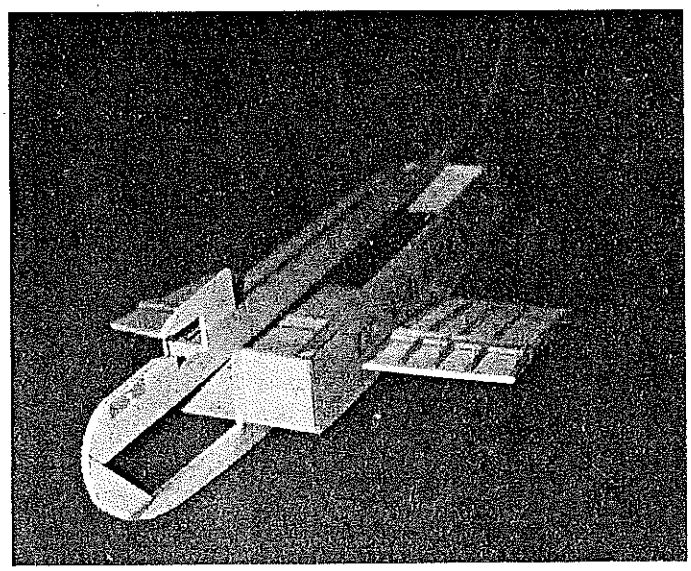


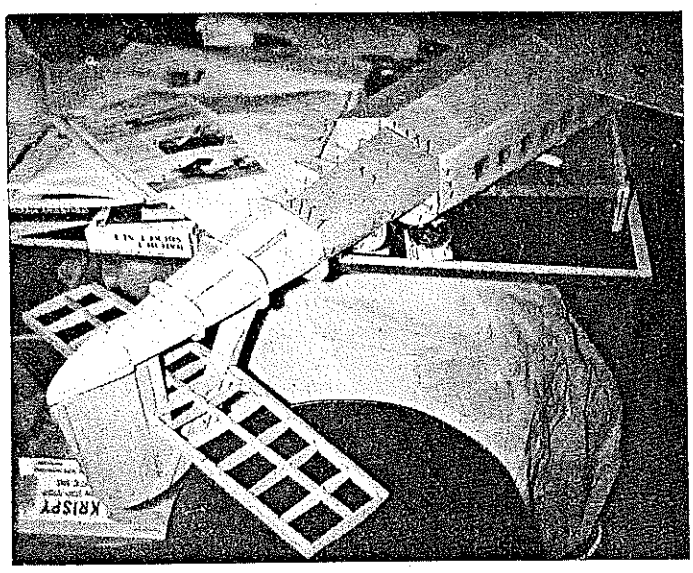


Left: Bottom view of cabin box and sponson under construction, showing 3/64 ply wing skin (from Sig) being glued and T-pinned to the sponson structure. Right: The same units from the top, half-ribs in place. Plywood and hardwood box spar gives the sponson much strength. Triangular balsa pieces, lengthwise, provide much support for the top and corners of the cabin box. Construction shots from Polaroid color prints.

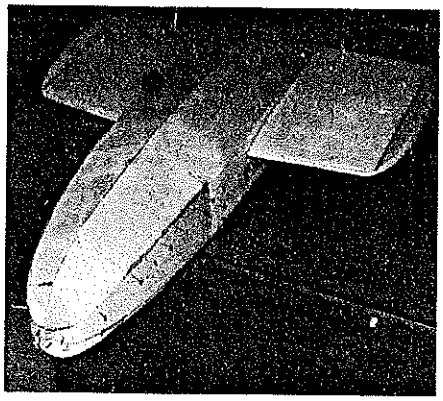


epoxy it in place. Care is required when handling these pieces to avoid smearing the excess glue onto the surface of the Plexiglas. Start with the center section of the windshield, which helps to support the cockpit roof, and add the right and left sections. The result of your efforts will be very realistic looking windows that are also both very strong and waterproof.

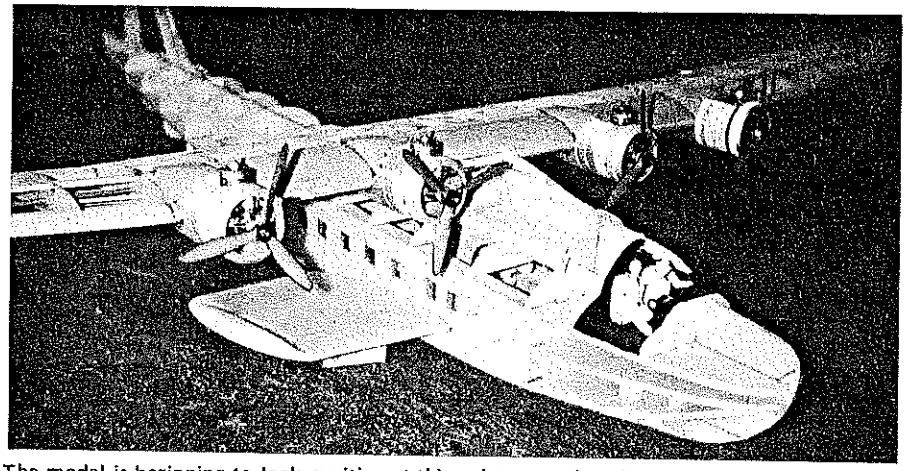




Left: First impression is that the cabin appears much too wide when it's glued into the keel. Right: Ply wing skin material being applied to the hull. T-pins permit easy twist and pull removal when the glue has dried. The hull is very strong when it has been completed.



Small pieces of wing skin are used for covering the nose of the hull. Author prefers Ambroid for gluing the ply wing skin.



The model is beginning to look exciting at this point, even though a good amount of work still needs to be done. The front of the hull (and most of the hull formers) are from ¼-in. balsa sheet. The cockpit is nearly complete in this pic. Receiver battery goes under the cockpit.

Be sure to install the Nyrods through the rear of the hull from the passenger/servo compartment to the back of the formers to be able to hook up the rudder and elevator after the hull is covered.

Some modelers seem to have difficulty in understanding how to apply the plywood wing skin material, so I will offer a few tips. First, you must not be tempted to try to use large pieces of covering. Most areas of the hull have a double compound curve characteristic, which causes buckling and rippling, and large pieces won't lay flat. Cut a section that is somewhat larger than the portion of the hull that you are going to cover, and lay it against the bulkheads. With a pencil, mark where the bulkhead edges seem to be, and begin to trim the piece to size by taking off a little at a time. When you have a good fit and are ready to glue and pin it into place, make sure you have allowed for the next piece to share the same bulkhead gluing surface. In other words, the joints between the pieces of wing skin must come at the center of a bulkhead. Incidentally, the sides of the passenger 'box' don't need to be covered with the wing skin.

As the hull work progresses, tail cone blocks are glued in, and the elevator and rudder with their control horns should be made. The elevator horn is simply a Control Line type of split-elevator arrangement with the horn moved to the straight-ahead position. This horn joint should be brazed onto the elevator wire to prevent failure due to stress. (Silver solder might be strong enough, though I prefer brazing.)

Bend the wire tiller for the rudder, and epoxy it into place. You will have to check the clearance of the rudder nylon clevis carefully in relation to the outside tail covering to be sure, before the area is closed, that there will be no binding.

The major drawback of hidden control horns is that they are built in completely, preventing future adjustments or corrections. Consequently, you have to be precise in the initial hookup and provide for control surface freedom and proper travel. It is a one-shot deal. On the good side, the lack of protruding horns and rods is very pleasant to the eye, enhancing the appearance on the same order as going from rubberbands to nylon screws for wing hold-downs.

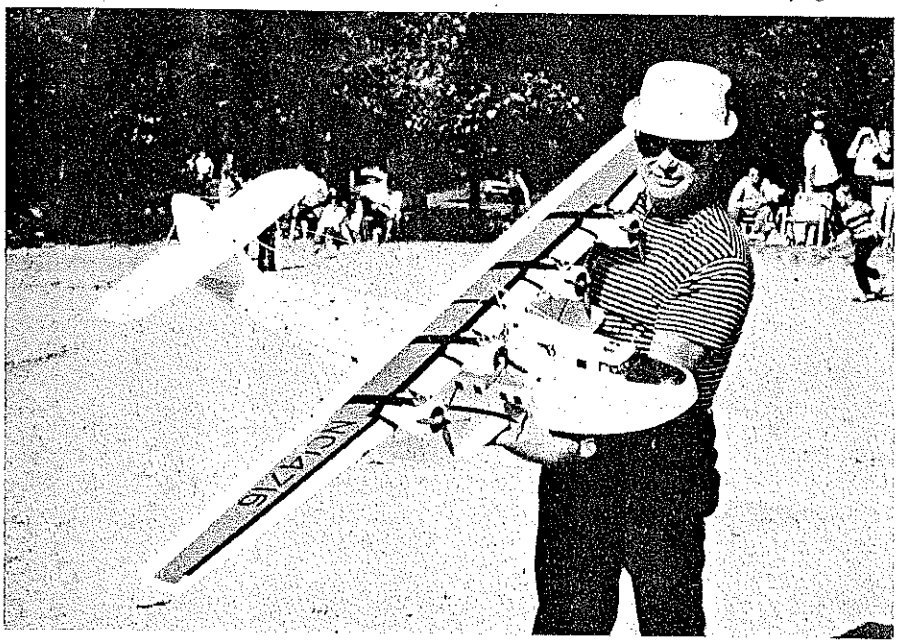
The wing pylon unit should be finished and fitted to the top of the hull. The dowels in the front of the pylon unit are very important to the fit of the pylon/gasket/hull arrangement, and the wing screw at the back must be exactly aligned in the hardwood block at the rear of the passenger compartment. Use a strong cement for these parts, as they carry high stress loads.

Before covering the plane with white Super MonoKote, install, hook up, and test the servos for the rudder and elevator, making the necessary adjustments for the control surfaces by varying the servo placement and/or adjusting the pushrods. Of course, the bottom of the hull is done in black, and the center of the wing area is done in orange, like the curtains. (The orange panel was meant to be helpful to searchers by being highly visible in the event the plane was down at sea. Fortunately, it makes the plane a colorful model.)

All of the lettering is cut from black MonoKote and ironed on. It was quite a chore, but worth it. Use a #11 X-Acto knife and a lead pencil with a soft eraser to hold down the small letters as they are being cut (your fingers will be eternally grateful). As in the case of the letters on the bow, cut a ¼-in. strip that is a couple of inches long, and chop off several 3/16-in. rectangles. Cut the letters from these rectangles. They will be quite uniform. After some practice, you may never go back to painting numbers or using decals again. Additional hints: do the cutting on a piece of pine board, not hardwood; strip the protective backing from the Super MonoKote after you cut the strips mentioned above.

The anti-glare effect on the top of the nose is achieved by sanding the black MonoKote with #600-grit sandpaper just enough to kill the shine. The wing walks and those on the sponsons can be done in the same way. In order to simulate the corrugated sections on some parts of the hull, I used strips of silver Super MonoKote that were cut into ⅛ × 12-in. strands. (I found that trying to cut longer strips was much more difficult.) These strips were then ironed on. Tack down

Continued on page 136



The China Clipper's designer-builder (and our author), Bud Chappell, poses for the camera. Bud started building models at age six. Fifty years later, he calls this his ultimate achievement.

For Fun/Winter

Continued from page 133

the Bell XFL-1, like the Airacobra but a tail-dragger for carrier use. Nice. And a long-winged Messerschmitt Bf 109T-2—a carrier-based fighter. Some few wild things of mixed vintages. Not an overwhelming book, but worth a look-see if you want good documentation for a plane that isn't duplicated by a zillion other guys.

And a coupla guys whose stuff I see in the big *FAC Newsletter.* Maybe you like little rubber-powered things? Dave Diels sent a slew of cute plans and urges me to build a couple. Diels (P.O. Box 101, Woodville, OH 43489) started with five plans three years ago, had over 30 as of last January 1 (oh, my!). He then was expecting to expand into printwood and molded canopies for the more popular subjects. And there's David Aronstein, 50 Pasture Lane, Poughkeepsie, NY 12603. We see 28 illustrated subjects on his plan listing, a mad variety of ultralights, racers, originals, various scales. Real cute flukies, like an 8-in. Beercat and a 12-in. Mini-Twin—an old-style twin-pusher. Or how about a Roland trimotor for Peanut. Drawings will seem rudimentary to RC kit builders, but builders of FF Rubber Scale get inspired by basic lines.

S.O.S. The thermometer says 103 degrees!

Bill Winter, 4426 Altura Ct., Fairfax, VA 22030.

China Clipper/Chappell

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one end of the strip with the iron; as it heats up, stretch it a little as you go. The effect of corrugated panels is quite good when done this way. I also used the silver strips to cover the joint on the wing where the orange and white come together. It makes the decorating a little neater.

The wing struts are not just for looks. They are quite functional, as they lend a lot of strength to the wing/hull joint. Start with four pieces of streamlined brass tubing from your hobby shop's metal display. Squeeze the ends in your bench vise to flatten them neatly for the drilling operation that is next. From the front view on the plans, determine the approximate location of the vertical smaller struts where they intersect the diagonals, and wrap a piece of masking tape around the diagonals at this point. Mark on the tape the exact point of intersection, and drill through the tape and struts with a 5/32-in. bit. Use a 1/16-in. drill to make a starter hole. After drilling the larger hole in each strut, remove the tape, and sand off the rough edges.

Cut to length the ⅛-in. pieces of brass round tubing, and bend them according to the plan. Solder together at the intersection, making nice, smooth, filled joints.

Cut to a general fit the sections of small hardwood dowel that go between the sponson and the under surface of the wing. You will find that the round brass tubing sockets for the dowels are deep enough to permit the dowels to be slid up or down to allow for a good fit against the wing and sponson. When the struts are finished, remove and paint them with two coats of silver dope.

Other finishing details include the various wires that are visible. Make small hooks from common pins with their heads removed, and press them into the locations shown. At your wife's favorite fabric store, purchase some elastic silver metallic thread. After tieing a knot in the end of the thread and trimming off the excess, loop the thread from hook to hook; with a little practice, you will find that you can rig a whole section with a single piece—such as one piece under each side of the stabilizer. The air vents over some of the passenger windows are small blocks of MonoKote-covered balsa epoxied in place.

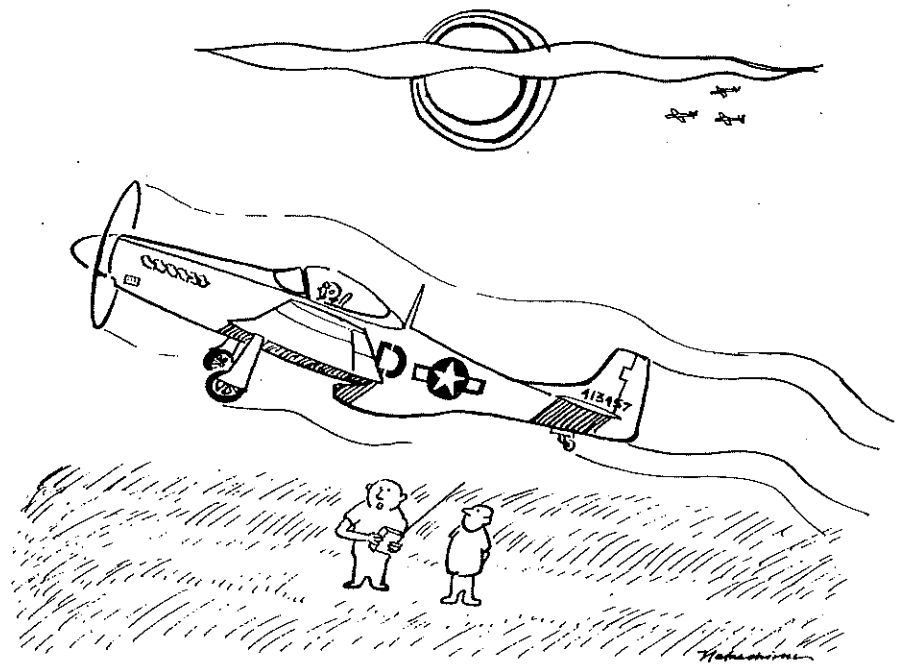
The pitot tube on the top of the cockpit is different in appearance than most. It is built with ⅛-in. tubing and dowel with a Z-bent wire glued to the top. The Pan Am logo can be placed in two different places. According to the photos that I have collected, in 1935

the logo appeared on the nose in the vicinity of the plane's name. In pictures that were made in 1936, for some unexplained reason, the logo is shown on the pylon behind the engineer's window. This and the various small windows here and there on the hull are duplicated in black MonoKote.

Pre-flight. A little difficulty was experienced in getting the ideal balance point (CG) when the model was completed. It turned out to be tail-heavy. I couldn't move the radio equipment forward any more, so the only thing left was to add nose weight. In my way of thinking, this was a last resort. I try earnestly to achieve the proper balance in any other way but adding weight, but in this instance I had no choice.

The first step was to put small pieces of black MonoKote under the wing alongside the pylon at exactly the desired balance point. This enabled me to locate by feel the precise point to place my two index fingers in order to lift the model. The next thing was to cut the top of the nose block off at the glare-panel line, about 1½ in. back. Remove this front section carefully so that it can be used again. Then, start drilling ¼-in.

Continued on page 140



China Clipper/Chappell

Continued from page 137

holes into the nose block (at an angle toward the back) which will accept 16-penny nails (heads removed). Keep adding nails until you get the perfect balance, which I feel is just a little nose-down from exactly level. For me, it took a total of 2½ oz. to do the job, which is not bad at all (but it really bugs me to have to haul around non-contributing weight).

When the decorating is finished and the flight pack batteries have been charged, start and adjust each engine individually for proper power and needle settings with the model's nose tilted upward 30°. Get the idle setting reliable, too, to prevent a too-fast approach for landing.

A Sullivan starter, with notches cut into the rubber insert to match the three-bladed props, makes starting very easy. With a friend handling the battery to glow plug duties, start the outboard port engine first. Continue on down the line. A one-third throttle setting seems about right. Once all the engines are running, test them for response and power likeness. Be forewarned—those four .10s make one powerful racket!

Check all of the control functions with the engines running to be sure that all are working reliably. *Be certain—don't risk the model.* I found that my aileron servo had a nasty chatter when tested in this way, and I had to cut the new wing open to replace it. I hated to do it, but I think it is very obvious what might have happened otherwise.

Flying. The first taxi tests were conducted at the 1981 Brimfield (Massachusetts) Fall Hydro Contest. Due to very high winds, the event was put off until late in the day in the hopes that the winds would calm down. They did slack off somewhat, though not as much as we would have liked. Quite a few people had waited all day long hoping to see the first flight of the China Clipper, so the decision was made to give it a go.

The engines fired up nicely, and the radio tested okay, so my faithful wife, friend, and helper, Lois, pointed the nose into the wind while I ran the .10s up to full power. On signal, Lois released the plane, and it moved out quickly. The wind was making the water much too rough—it was like trying to take off a full-scale plane in heavy seas. The waves caused the model to pitch violently, and it was hard to gain speed. It also became apparent that I had far less rudder control than I had hoped, and keeping the nose into the wind was difficult. Eventually, the plane got up on the step, and it was beginning to take longer bounces between wave tops. When it was just about completely airborne, it began to get too far off course to the left, heading for the tree-lined shore. Everyone was cheering it on, and the C.D., Don Foster, was yelling: "You got it—you got it!" But I wasn't pleased with the prospect of starting an immediate right turn with a new and untested plane that, by this time, was already too far away.

I decided that another attempt would be a lot better, and I cut the power. The model settled back into the water, but when I tried turning around to taxi back, I found the wind most uncooperative. The sponsons were marginal when the plane turned crosswind, and the wing tip was tilted into the lee side water.

This allowed the outboard engine to contact the rough waves, and it conked out. An attempt at turning the other way yielded the same result. I finally managed to sail the China Clipper back to the beach on its own power and avoid the humiliation of being towed. Several more times we tried to get it going in the right direction, but more directional control was needed.

A little daylight under the hull could hardly be called a flight!

Back at the workshop, the first modification was a ⅜ × ¼-in. spruce keel; and matching chine strips epoxied in place. Luckily, when doped black, they are hardly noticeable and do not detract from the scale appearance.

No further attempts were made during 1981 to fly the plane. By the time the Brimfield Spring Meet came around, I was desperate to find out whether I had created a flying machine or a hangar queen. May 22, 1982 was the time to find out.

Armed with picnic baskets filled with goodies, the old Chevy wagon filled with airplanes, flight boxes, grandchildren, and other loyal and sympathetic family members, we descenced upon Brimfield. The weather conditions, for once, were as good or better than forecast. Hoping to get test flights begun before the conditions changed, we hurried to get into the water. The radio was checked. The engines were run individually and then all together, and then they were shut down in order to top off the tanks.

With the engines all screaming, the China Clipper was released. It was soon obvious that building up enough speed to get onto the step was going to be the problem. As the takeoff run distance was used up, the throttles were slowed, and the plane was taxied back. Another attempt was tried with the same result. I taxied back again. On the next try the throttles were opened to the maximum, and it got up on the step. A little back pressure on the elevator was tried too soon.

The plane lifted with the port wing too high; the right tip dug into the water, and it cartwheeled around to the right in a great deal of spray, killing three of the engines. As the plane made tight circles on the water with the one engine idling, a modeler landed and crashed into the starboard wing. (I immediately became quite irritable.)

The chase boat retrieved the plane. I retrieved my composure and began to assess the problems. First, the keel and chine strips had cured the steering problem. Second, we had six inches of wing tip to rebuild. Third, it appeared that the suction of the hull and the sponsons was going to be difficult to overcome. While gluing the remaining pieces together, we discussed the advantages of using wax on the 'wetted areas,' different elevator techniques, and so on.

Some sections of the wing tip were missing or too badly crushed to re-use, so the trusty old flight box was called upon to yield the necessary scraps to re-form the tip and aileron. No MonoKote was available, so an old substitute was employed—Scotch Brand Magic Transparent Mending Tape. It makes a great waterproof skin that is quite fuel-resistant, too. With everything epoxied back together, the model was declared airworthy.

I was still worried about the lack of speed on the water. It occurred to me that the three-bladed prop could be a problem. Sometimes a two-bladed prop will let an engine turn better and produce more power. I decided that it would be worth a try. I installed four of the Top Flite wood 7-6 props, ran the engines, reset the carburetors, and headed for the water's edge once more. With the engines at full power and the area *really* cleared, Lois released the tail.

In approximately 50 ft. the model was in the air. I was so surprised that I was lagging several seconds behind the needed control response. Sensing my predicament, a calm, reassuring voice at my left elbow began coaching me: "Bring up that left wing—a little more nose down—now keep the right turn no more than a 30° bank—don't let her tighten up in the turn on you; she wants to do that," etc. All of a sudden, I realized that the China Clipper *was flying*. People were cheering and jumping and hugging. That plane flew beautifully!

I had time and the altitude to trim the sticks on the transmitter and take the pressure off my cramping fingers. How it flew! Very docile, very smooth, very majestic. The voice came again: "Fly it right on down to the water—now ease off some power—hold her off, now cut more power—let her settle—you got it!"

The landing was super smooth. As I taxied in, there was a feeling of pure elation! To be sure that flight wasn't a fluke, the China Clipper was immediately refueled, and I flew it again with even better results. The second takeoff was 'picture book,' the whole flight superb. It really flies!

The mysterious voice that helped me so much turned out to belong to a Mr. Len Bell, who (now get this for pure, unarranged coincidence) turns out to be one of the Pan Am pilots (14,000 hr.) who actually flew the China Clipper and her sister ships! His regular run was from Miami to Leopoldville, Africa when the Pacific got too hot for passenger flights. If that isn't one for the books, I don't know what is!

Needless to say, we then spent a lot of time discussing the similarities and differences of the model as compared to the real thing. Mr. Bell's caution about the model "tucking under on you" was a reference to the left turn only. In right turns, the plane grooved all the way around with no tendency for the turn to tighten. To go left, as the turn became established, a conscious effort had to be made to apply a little opposite control to prevent the angle of bank from increasing. We agreed that the difference in the turns was probably due to the collective torque of the four engines all rotating in the same direction; the rudder trim on the transmitter bore out that theory. After the first flight, the rudder setting was roughly 5° right trim (which was required to keep the plane flying straight ahead).

Mr. Bell suggested that reducing the prop pitch on the #4 engine (outboard, starboard side) would most likely help the situation, and possibly #3 should be changed as well. He told us that, on the real clippers, the pitches on the props were most likely to be all at different settings due to changes in the weight of the wing fuel tanks as a flight progressed, the load on board, and the trim requirements of the airplane. On the model, down-elevator has also been necessary to trim the plane to fly hands-off.

Summing it all up, I eventually realized that my model China Clipper was easier to fly than my trusty old PBY5. At 8½ lb. fueled weight, it is 3 lb. heavier than the Catalina (the PBY5 has no ailerons).

The China Clipper has been a lot of work, a formidable challenge, and, finally, a great satisfaction. If you think about that for a moment, this is exactly as modeling should be.

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China Clipper/Chappell

Continued from page 141

Happy flying to you all.

China Clipper Material List

1—Carl Goldberg Skylane 62 wing kit.
4—Aluminum soft drink cans (cowls).
4—OS .10 engines.
2—7-4 Props (starboard side).
2—7-6 Props (port side).
4—90° Bellcranks (throttles).
3—⅛-in. Balsa sheet, 3 × 36 in.
8—¼-in. Balsa sheet, 3 × 36 in.
1—Sheet Plexiglas, 1/16 × 6 × 8 in.
4—#12 Perfect brand Control Line fuel tanks.
2—1/16-in. Brass tubing × 12 in.
1—¼-in. Brass tubing × 12 in.
4—¼-in. Streamline brass tubing.
2—⅛-in. Hardwood dowel × 12 in.
4—Nyrod × 36 in.
4—Du-Bro ball socket fittings.
4—Sets 4-40 engine mounting bolts w/nuts.
1—16-in. Length medium silicone fuel tubing.
1—¼-in. Hardwood dowel × 12 in.
1—¼-in. Plywood sheet, 12 × 24 in.
1—3/16-in. Plywood sheet, 6 × 12 in.
4—Plywood wing skin, 1/64 × 12 × 48 in. (Sig Mfg. Co.).
1—Spruce pc., ½ × ⅜ × 36 in.
1—Balsa block, 6 × 4 × 3 in. (nose block).
2—Balsa block, 1 × 1½ × 10 in. (sponson tips).
1—Balsa block, ¾ × 3 × 4 in. (cockpit roof).
1—Pkg. wing cushion tape.
1—Pkg. servo mounting tape.
2—9/16 × 11/16 × 7 in. Hardwood (sponson main spar pieces).
2—60° Bellcranks (aileron).
2—Robart hinge points, medium size.
1—Split elevator horn, Control Line type, modified.
1—Nylon wing screw, 2 in.
2—Music wire, 1/16 × 36 in.
2—Rolls, Super MonoKote, white.
⅓—Roll, Super MonoKote, silver.
½—Roll, Super MonoKote, orange.
½—Roll, SuperMonoKote, black.
1—Spool, elastic thread, silver, metallic.
Misc.—Adhesives, crew figures, cockpit detail materials, 4-Ch. radio, etc.

Radio Technique/Myers

Continued from page 43

of 9.99 ms (ms = milliseconds = 1/1,000 of a second).

The Ace RF Interface turns the Datamaster display ON/OFF to show the widths of your transmitter's control pulses, which are taken directly off your transmitter's antenna (no intervening receiver required). Normally, the control pulses will be measured at some value between 0.69 and 2.00 milliseconds. When the trims and controls are centered, the pulse value will normally be 1.45ms for Kraft, 1.31ms for certain older Futaba sets, and 1.50ms for practically everyone else.

The rotary switch on the RF Interface will select any particular pulse you want to study, out of the two to eight normally generated by digital AM transmitters. Let's say that you have a four-channel set. You identify the pulse widths by wiggling the sticks and observing the effect on the time at each switch position. Lets say you find the following:

1. Throttle	1.54ms
2. Elevator	1.48
3. Aileron	1.54
4. Rudder	1.47
5. ???	3.00
6. Throttle (again)	1.54
7. Elevator (again)	1.48
8. Aileron (again)	1.54

You wiggle the sticks and see that item 5 is affected by every control. What's going on?

At this point, you need some additional information, similar to knowing that the sun had shone more than 2 hours in the previous example. You need to know that control pulses are sent out in strings that repeat, and that the length of a typical string is about 20ms. You also need to know that the typical pause between control pulses is 0.25ms.

So, let's work out the numbers for our transmitter:

Neutral pulse, 4 @ 1.5ms	= 6.0ms
Spaces, 4 @ 0.25 ms	= 1.0ms
Total	7.0ms

Subtract the time "used," 7.0ms, from the "string time" of 20.0ms and you get 13.0ms. Since the Datamaster can only read to a maximum of 9.99ms, it shows you what's "left over:" 3.0ms, so now you understand where the 3.0 reading comes from. Since the frame time (time for one complete string of pulses) is usually fixed at about 20ms, the Reset pulse (which is all that's left over) *must* change every time one or more of the control pulses change—and it does.

The RF Interface keys in on the Reset pulse to set up the distribution to the numbered switch positions, so it's logical that the fifth position will be Reset, and six, seven, and eight are repeats. Transmitters with other numbers of channels will get cor-