

The Voyager's unique shape has this model grabbing people's attention at the local flying field just like the full-scale did during its around-the-world performance. Sleek characteristics of the original's long-distance design tend to make this model quick for its size, so be ready.

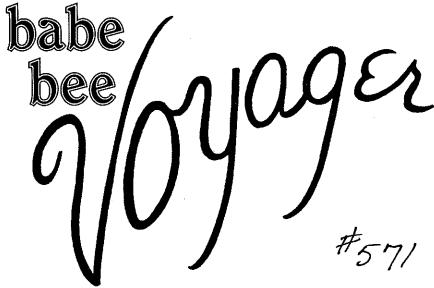
The media touted the Voyager's round-the-world-without-refueling flight as aviation's "last first." Now you can commemorate the event with your own Control Line version of what surely won't be designer Burt Rutan's last first. Luther Hux

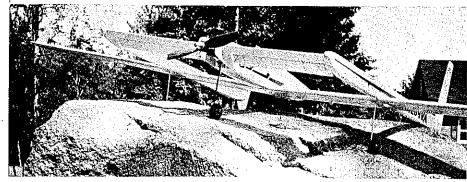
IT'S HARD TO IMAGINE a Baby Bee .049 pulling a 4-ft.-span Control Line model since most .049 CLs have a span under two feet, but it took a span that large to slow this model down to a realistic flying speed. Since the Voyager wing has a tapered chord that starts at only 2¼ in., the wing area turns out to be about what you'd expect for an engine of this size. Of course, the wings of the full-scale Voyager are even narrower, but if this model were exactly to scale they would have been much too fragile.

It took me four months to design and com-

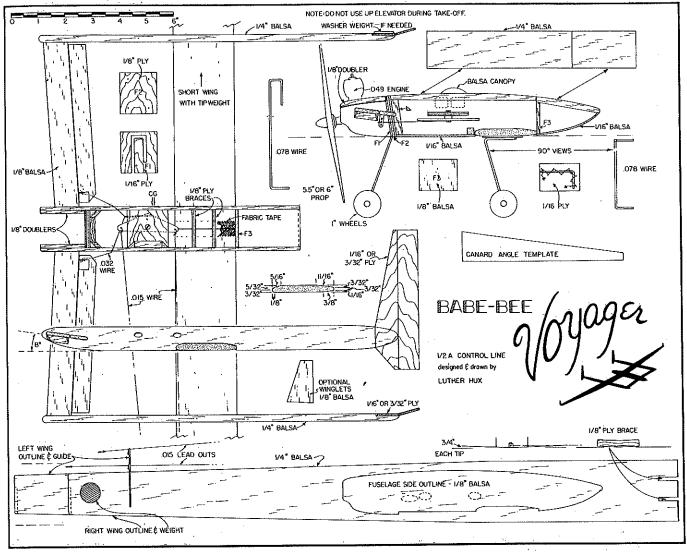


Here with his niece, Suzie, our author says he enjoys developing models of unusual airplanes. With the success of the full-scale Voyager it was too much for him to pass up.





Flying this model is great fun, but to enjoy this view yourself you'll have to loan the controls to a friend. Be sure to remind them, though, that no up-elevator is needed during takeoff.



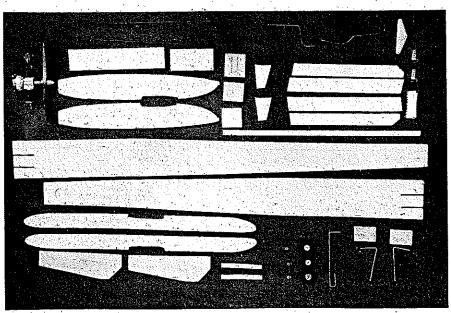
plete a 9-ft. RC model of the Voyager. It was a difficult project I wouldn't wish on any builder even though flying it is impressive (but a handful). It took only four nights to complete this CL model, so I felt that most people would enjoy building the express version.

Test flying the prototype proved to be interesting. Using the center-of-gravity (CG) location predicted by John Hunton's calculations, the model flew perfectly right off the drawing board. Then came the landings. They were more like crashes. Initially I thought it might be a problem with just my model, but John was having the same problems with his version of the Voyager. Right after the engine quit the models would dive straight into the ground. I've seen many a plastic model drop when the engine quits but never a nose dive in spite of full-up elevator.

The problem proved to be too much of a load on the foreplane. It could not support its end of the model unless it was flying at high speeds. Achieving a reasonable glide angle was accomplished by increasing the canard wing angle and area and moving the CG back to lessen the load the canard had to support. Downthrust was then added to the engine mount to compensate for the lighter loading on the canard during the powered

portion of flight. The calculation method presented by John is not contradicted by this model but had to be adjusted because of this model's small size. As it is now, you

can enjoy the landing without having to repair this thin and somewhat fragile model after every flight. There are two very impor-Continued on page 180



This model's complex design requires many more pieces than the average ½A Control Line ship. The original design was a profile model, but moving the engine back between the canard for balance led to a built-up fuselage. The boom's thickness could be doubled to achieve a better appearance, but from the pilot's viewpoint, the extra roundness would not be visible.

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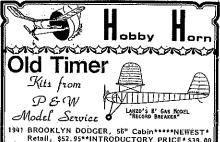
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tension was good, even when at low throttle. I flew the model on 60-ft. lines, but I'm sure that 70-footers would do as well. The landing was about as I expected—slow and predictable. I enjoyed holding the plane level while slowly easing off the throttle. The model would gradually lose altitude, and just glide onto the ground in a smooth and steady three-wheel landing—no bounces. I could then taxi for a lap or two, and take off again. Touch-and-goes and precision landings are also a lot of fun.

Although this article describes how to convert a T-4C to CL flight, the procedures described could be applied to many RC kits. The key is to look for a model that uses nylon bolts to attach the wing-if the kit uses rubberbands, they will have to be replaced with a nylon bolt arrangement. Low-wing or high-wing models should work equally well. Most RC trainer types have fairly long tail moments to promote stability, which really detracts from a CL model's maneuverability. The CL T-4C is a "landing and takeoff' trainer, not a stunt trainer. This type of model is good for introducing beginners to CL flight. If the pilot starts to get dizzy, all he has to do is pull the trigger to slow the airplane down. The model will land itself if it is kept level with the engine

I consider this to have been a a very successful project. I got what I wanted—an easy-to-fly, stable, three-line trainer. Additionally, the model is very fuel-efficient and doesn't annoy the neighbors with its

engine noise. The only improvement I can think of is to attach brakes so the model will stop sooner when taxiing.

#### Babe Bee Voyager/Hux

Continued from page 77

tant messages the builder must know in order to enjoy this model. Speed readers, slow down here and pay attention.

The first warning: Do not apply up elevator during take-off. The canard is already at an 8° angle when at neutral; that in itself is almost enough to get you into trouble. Burt Rutan, the Voyager's designer, told me that this airplane does not rotate on takeoff but must fly off the runway. John and I proved it several times by doing "figure nines" on takeoff during test flights. Keep the control handle vertical until the model lifts off (usually in 10 to 15 ft. on pavement) by itself.

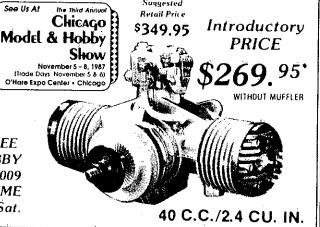
The second warning concerns the Y-shaped pushrod. When the angle of the elevators and an improper spacing on the pushrod are combined, you get a snapping action which can push the elevators up or down should the flying lines go slack. Therefore, the spacing between the Z-bends on the two pushrod ends must match the spacing of the control horns. Check to be sure the elevator can flop in any direction freely (and not toggle in one direction or the other). Otherwise, every time the lines go slack your model will dive or climb. Actually, when things are set up as they should

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be, this model does great as a Free Flighter, I've had the wind blow it inside the circle several times, and it remained level while I ran to tighten the lines.

Unfortunately, pavement (the best surface for takeoffs and landings) is also the surface most likely to damage the model. However, pavement is required due to the short landing gear spacing. I have not been able to get off on grass, but dirt baseball diamonds work well.

There are two schools of thought about the winglets. The first is that the plane was designed with them and the second is that the plane made it around the world without them. After you have broken them off for the tenth time, you may chose to go with the second point of view.

Construction. Use medium to mediumhard balsa for all parts. This structure is too thin for soft balsa to be used. Cut out all parts and sand the booms, wing, and stab to shape. Use guidelines on the wing blanks to aid in carving the semi-symetrical airfoil.

Bend the landing gear wires to shape. Drill the main gear plates and stitch the wires to plates with pieces of nylon control line. Do not groove the wing or place the wire between plate and wing for cosmetic reasons. The thin wing is too fragile to accept a groove.

Laminate the firewall and nose gear plate. When dry, drill the engine mount

Cut a slot in the right wing tip for the tip



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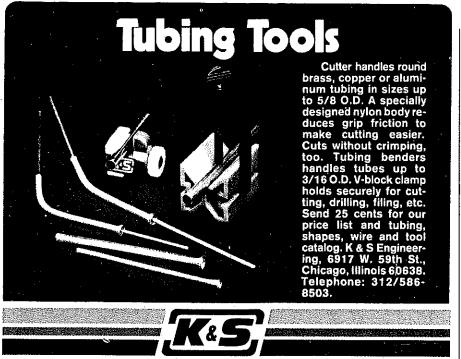






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weight. Join the wing halves with plywood braces and fabric reinforcing tape.

Glue the firewall, bellcrank plate, and rear bulkhead to the left fuselage side. Glue the fuselage top blocks into place between the two sides. Sand the bulkhead and blocks level. Align and attach the right fuselage side. To help with the appearance and roundness of the fuselage, add doublers to the top edge of the engine area. Add triangle stock to the firewall, bellcrank plate, and wing saddle. Sand the fuselage as round as possible without unduly weakening the corners. Do not sheet the bottom until the controls are installed.

Attach the wing to the fuselage. Glue the booms to the wings as follows: Align and glue each boom separately. Place one wing and the fuselage level on a flat surface covered with wax paper. Glue the boom flat to the same surface. Use the canard to establish the distance from (and parallel alignment with) the fuselage. Then place the other wing flat on the surface and glue on the remaining boom.

Glue the rudders to the booms. Tests made with flat one-piece offset rudders showed they were not as effective as the angled fin and rudder arrangement shown on the plan. Align the back edge of rudders at a right angle to the bottoms of the booms. The rudders on the prototype models were 1/16 plywood, but additional tail weight was required to balance the model (1/32 ply could be used for additional strength and require less add-on weight).

Glue the canard stabs in place and add triangle stock. Place the boom on a flat surface and use the angle template to mark the correct angle on the boom and fuselage sides. Slip the control horns in place and attach the elevator with fabric hinges. Note that the stab is too thin for traditional RC-type hinges. The prototype models broke repeatedly at the RC hinge points. Fabric hinges never present this problem. Glue the horns on after the pushrods are in place.

Attach lead-out wires to the bellcrank and thread the wires through the fuselage sides. I offset the ends of the lead-outs to prevent them from hanging up on each other. Insert the pushrod wire and bolt the bellcrank to its mounting plate. I routed a groove in the plate below the pushrod Z-bend to ensure clearance. An extra washer under the bellcrank would also do the job. Align, bind, and glue the two rod wires together. Make sure the distance between the Z-bends and the control horns is the same; otherwise, the elevator will tend to toggle up or down. The elevator must be free moving.

Remember that on a canard, up movement at the TE is down elevator. Down movement is up elevator. Confusing isn't it?

Sheet the bottom of the fuselage with  $\frac{1}{16}$  balsa and sand.

Glue the main landing gear to the bottom of wing with epoxy or thick cyanoacrylate. Again, do not groove or slot the wings. Seal the grain in the balsa and paint it. I used Flecto Varathane white and a Testor's light blue paint pen for the numbers and strips. Testor's dark blue is good for the windows

and canopy. Use a magazine photo for any additional detail. The call letters on each boom are N269VA.

Add the wheels and collars. Insert the nose gear into its slot and install engine with screws.

Push straight pins into both sides of the fuselage at the (CG) point about ½ in, up from the bottom. With the model painted and the fuel tank empty, add washers to the rudder or imbed nails in the rear of the booms to get the proper balance.

Make the test flights in calm air with the engine running slightly rich. This model is very sleek and can move right along, so a "screaming" engine is not required. I have been flying my Voyager on one roll of dacron line (approximately 35 ft.) and suggest that you not use lines any shorter because of its high-speed potential. Trim horizontally by adding additional weights to the right wing tip if the model leans to the inside of

Remember to let the model lift off the runway by itself. Do not give up elevator on takeoff. After trimming, run up the engine and enjoy wingovers and large-diameter loops-but keep the speed up. Don't at-

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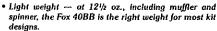
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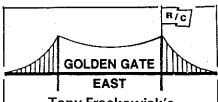


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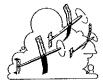
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tempt maneuvers if the model slows down. When the engine quits, lead the model by towing the lines. Add up elevator progressively until it lands. This design does not re-

spond to attempts to flair in this size or even the full-scale. According to Burt Rutan, "Fly it off and fly it on."Fly it and enjoy it.

#### Letters to the Editor

Continued from page 12

and it hurt to have to say that we had not seen it. My friend and I went our way. When I got home I mentioned the little girl and her lost kitten to my wife. We both understood how the child must have felt, as once we owned a tabby cat of our own (Charley); he was lost during a move.

The next day I decided to go flying again. As I unloaded the van and started walking toward the air strip, I heard a cry coming from the cattail foliage around the pond. I stopped and put my wing and field box down. Again, I heard crying and a splashing noise. I decided it was not a duck, as ducks quack. This noise was clearly a meow—and a wet one at that.

I walked closer. Sure enough, there was a very waterlogged little gray kitten. I fished him out. He was shivering and appeared to have great difficulty walking. It must have been in the water through the night.

I proceeded to dry the kitten off and thought I would let him go at a nearby park. As I set him down at the park, he seemed to catch sight of the apartment complex across the way. He made a B-line for the apartments, and I think if he hadn't been so weak, he might have scorched the grass!

It was a real good feeling to save the kitten. The question I still don't have an answer for is whether "cat-fish" and the little girl found each other. I sure hope so.

> Ed Gaeta San Diego, CA

#### A.J. Smith's AJ-2

Enclosed are some photos of A.J. Smith's full-size AJ-2 and my one-third-scale model made from your article in the September 1983 issue of *Model Aviation*.

Drawing and construction of the model are from your three-view drawing. The main difference is the wing. It was made from a modification that Mr. Smith will use on the plane after it retires from competi-

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