by Frank W. Beatty

LAIRD SUPER SOLUTION

The author completed his finished model with Brodak dope and handmade markings.

[A CL 1/2A-powerhouse version of the Bendix race favorite]

JIMMY DOOLITTLE RACED a tiny Laird Super Solution biplane across the US, making a record-setting flight to win the 1931 Bendix Trophy race. In the Thompson Trophy race several days later, Doolittle was forced to drop out with the Laird after leading the pack for six laps, because of a failing engine that was trailing a stream of heavy black smoke. Being the magnificent pilot that he was, he landed the aircraft safely in front of the grandstands.

The Super Solution has long been a favorite of mine, so I chose to build a model of it for the 2003 edition of the 1/2A Golden Age Speed contest. The competition is held annually by the Lafayette Esquadrille club in Saint Louis, Missouri.

In 1995, the late Carl Geary formulated rules for a 1/2A Golden Age Speed class, and it was included in the SAM (Society of Antique Modelers) N-X-211 Old Time CL contest schedule. From the beginning, Golden Age Speed was to be an entry-level, fun-type event. Only models of 1929-1939 Thompson Trophy racers were eligible to compete.

The rules were simple, and competitive aircraft could be built inexpensively and easily in just a few evenings. The event caught on with area fliers. Fifteen racers were entered that first year, and the average number of entries every year since then has been 12.

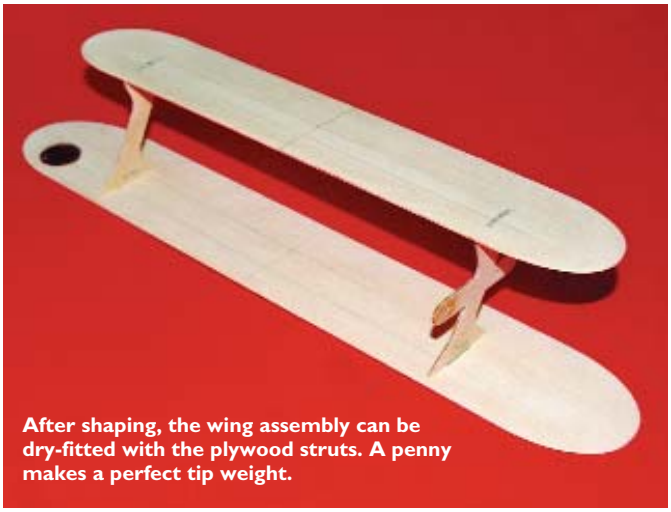
Carl wrote the rules so that hotshots with deep pockets and high-tech equipment could not take over and ruin the event, as has happened in so many other entry-level fun classes. The rules were amended once, to reduce the minimum wingspan of biplane racers to 12 inches; that was done so that they could be competitive against monoplane racers. Biplane lover that I am, my competing with a Laird Super Solution was inevitable.

A great variety of airplanes has been built and entered. But, as happens in all competition events, a certain configuration preference evolves that is considered more likely to ensure success. Airplanes with a midwing design—the Laird Turner Racer, the Folkerts family of racers, the Mr. Smoothie, and the Chester Goon—are considered prime choices for a good contest model.

Still, no individual or model is ever considered to have a lock on the event. Bad engine runs, a mishap on the takeoff run, or mechanical failure can knock a leader out of contention.

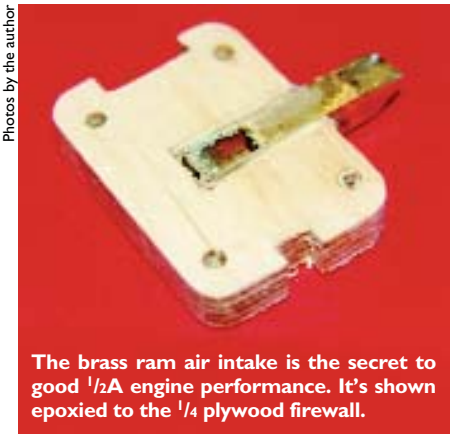
I am amazed by how well these tiny racers can handle winds and gusts. When there are upsets or even crashes, the models often survive with minor scratches and bruises.

The wings are made from 3/32 basswood blanks. Centerlines, various cutouts, and trim lines have been marked. The airfoil shape is sculpted by hand.



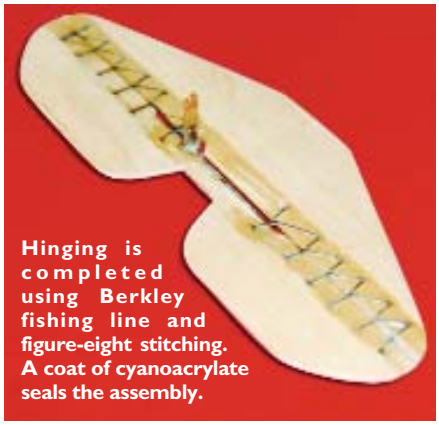
After shaping, the wing assembly can be dry-fitted with the plywood struts. A penny makes a perfect tip weight.

Photos by the author



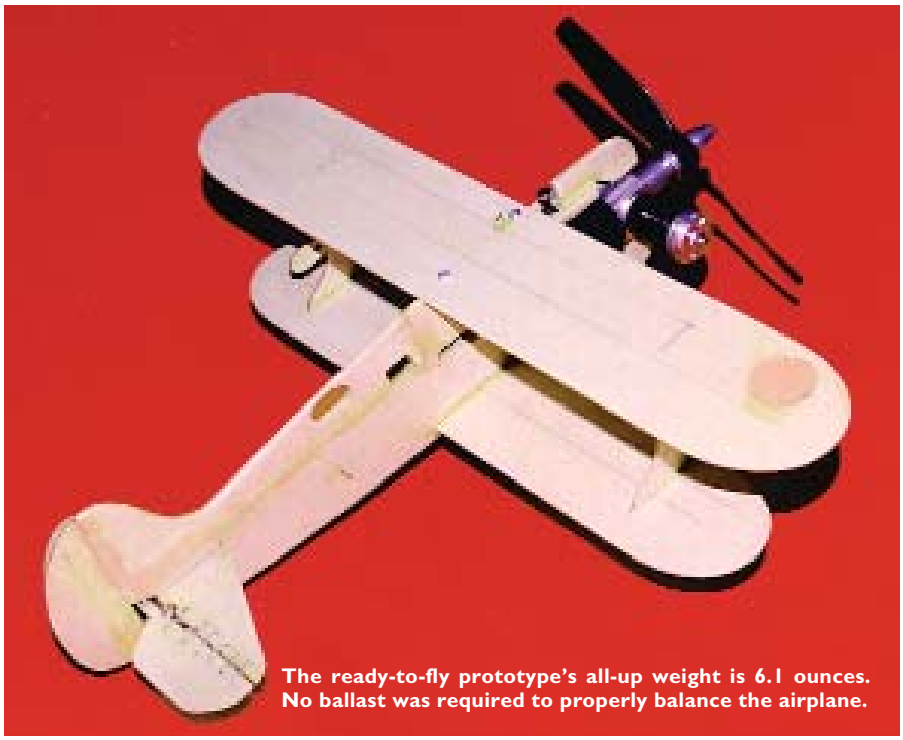
The brass ram air intake is the secret to good 1/2A engine performance. It's shown epoxied to the 1/4 plywood firewall.

As are the fuselage and wings, the horizontal tail components are made from basswood sheets. All surfaces should be smoothly contoured.



Hinging is completed using Berkley fishing line and figure-eight stitching. A coat of cyanoacrylate seals the assembly.

The model should be assembled before finishing, for testing the control system. The wire loop in the center of the top wing is used to check the CG.



The ready-to-fly prototype's all-up weight is 6.1 ounces. No ballast was required to properly balance the airplane.

1/2A Golden Age Speed Rules

1. Any Cox .049 reed-valve engine with standard (low compression) glow head and Cox tank only (except for Space Hopper) may be used with 15%-nitromethane fuel (supplied). A Cox propeller, unmodified except for balancing (5 x 3) may be used.

2. Racers must be a full-profile, built-up, solid, or combination structure of a 1929 through 1939 Thompson Trophy racer. (A photo and/or three-view should be available for proof.)

3. A racer's minimum wingspan is 18 inches. (Biplanes have a minimum top wingspan of 12 inches; the total span of both upper and lower wings is 18 inches minimum.) The minimum leadout length is 12 inches.

4. A Racer must look like the full-scale aircraft, to include color, markings, and wing struts, if used. No scale judging or scale points will be awarded.

5. Takeoff and landing gear is required, since all flights will be ROG (rise-off-ground).

6. Three attempts are allowed to make two official flights. The fastest time of the two will be used for scoring.

7. A speed run will be timed for six laps (1/4 mile), beginning one lap after a signal by the pilot.

8. Whipping, leading, or towing is prohibited.

9. 34-foot Kevlar control lines will be supplied by the contest committee.

10. Only one model per entrant is allowed.

11. Proxy fliers are permitted. MA

Each year, four to six new designs are entered. But we also see models that were in the competition in 1995 that are still flying and still putting up stiff competition.

Golden Age Speed aircraft are simple to design and build. Copy centers can enlarge a suitable three-view to the required 18-inch minimum wingspan, and you can take it from there. With this article's publication, *MA* and *Flying Models* magazines combined will have published a half dozen construction articles for these racers, if you would rather go that route.

The event's rules are included with this article in a sidebar. This is a great club-type, fun competition that is enjoyable for competitors *and* spectators. You may have heard the pitch, Give it a try; what have you got to lose?

CONSTRUCTION

Nearly all of the Super Solution's wood parts are made from basswood. The finished model, less engine and propeller, weighs just 3.5 ounces. You might be able to achieve a slight weight savings by substituting balsa for some members.

However, I recommend that the fuselage consist of basswood, and basswood horizontal tail members are a must. The elevator hinging system might not hold up if a softer wood such as balsa were used.

Fuselage: Cut the fuselage parts from 1/8 basswood. I represent the window and canopy openings with actual cutouts.

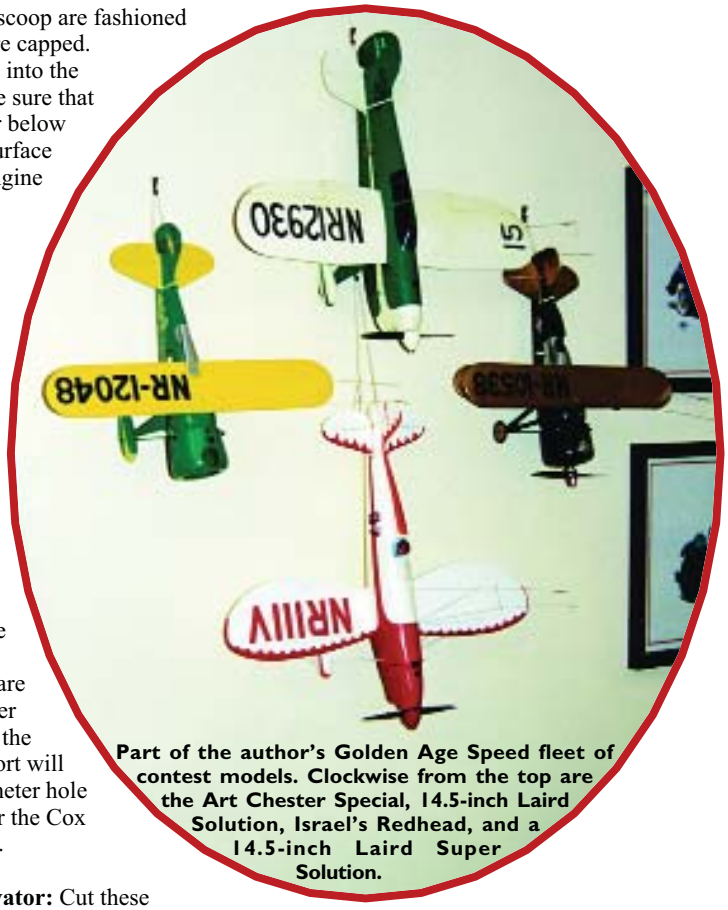
Use cyanoacrylate glue to adhere the 1/32 plywood doublers, to reinforce the area where the undercarriage will be mounted. Clamp the fuselage upside-down and vertical in a drill-press vise, and drill two 3/32-inch-diameter holes in the fuselage bottom, to receive the undercarriage struts at a later stage in construction.

Make the engine mount from 1/4 plywood, and set four 2-56 blind nuts as required. Make the air scoop from 1/4-inch-diameter square brass tubing. Notice how the openings in the scoop are fashioned and how the ends are capped.

Epoxy the scoop into the engine mount. Make sure that the scoop is flush or below the engine-mount surface to which the Cox engine will be bolted.

Use epoxy to adhere the engine mount to the fuselage. Make and install the 1/8 basswood bellcrank mount. Reinforce the engine-mount-to-fuselage joint with balsa block fairings, as shown on the drawing.

Make and install the 1/32-inch-diameter music-wire tail skid. The 1/8 basswood supports are used to join the upper cowling segment to the fuselage. This support will have a 1/4-inch-diameter hole drilled through it for the Cox needle-valve access.



Part of the author's Golden Age Speed fleet of contest models. Clockwise from the top are the Art Chester Special, 14.5-inch Laird Solution, Israel's Redhead, and a 14.5-inch Laird Super Solution.

Stabilizer and Elevator: Cut these components to outline from 1/16 sheet basswood. A series of 1/32-inch-diameter holes are drilled in them.

Make your elevator horn from 1/32-inch-diameter music wire and 0.010-inch sheet brass. *Silver solder* the horn to the wire. These homemade assemblies will be smaller and lighter than any commercially available units.

Trim the elevator LE as required to accommodate the horn and wire. Clamp the elevators vertically, hinge-side up, in a drill-press vise. Use a 1/32-inch-diameter drill in a press to carefully align and make holes in the elevator, to accept the horn wire ends. Remove the elevators from the vise, and use cyanoacrylate to adhere the horn assembly into them.

The hinges are figure-eight stitched using Berkley FireLine 6-pound-test-filament fishing line. Swab these stitchings with cyanoacrylate to harden, and set them in place. Align and cement the horizontal tail assembly into the slot at the rear of the fuselage.

Temporarily bolt a Perfect Parts Company bellcrank—item P233—to the mount. Make a 1/32-inch-diameter music-wire elevator pushrod, and install it temporarily so that the pushrod guide can be located and installed on the fuselage. Remove the bellcrank and pushrod, and set them aside until final assembly.

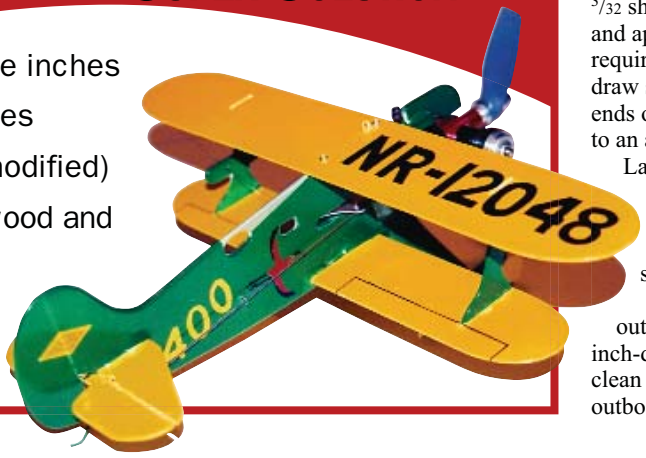
Wings: Cut two rectangular blanks, from 3/32 sheet basswood, to the correct widths and approximately 1/2 inch longer than required for each wing panel. Carefully draw symmetrical airfoil sections on the ends of each blank. Carve or sand the blanks to an airfoil shape.

Lay out the centerlines on each blank. Lay out and cut the slots for the interplane struts. I used an X-Acto knife and steel rule to make these slices.

The wingtips can be sawed to outline and sanded to shape. I used a 3/4-inch-diameter Forstner drill bit to create a clean hole for the Lincoln-head penny outboard wingtip weight. Epoxy the penny

LAIRD SUPER SOLUTION

Type: CL club racing
Skill level: Intermediate
Wingspan: 12 inches
Weight: 6.1 ounces
Wing area: 38 square inches
Length: 11.125 inches
Engine: Cox .049 (modified)
Construction: Basswood and plywood
Covering/finish: Brodak dope



in place, and then fill and smooth the depressed area with Brodak Aeropoxy Lite. Sand all surfaces smooth to satisfaction and set the wings aside.

Interplane Struts: These are cut from 1/16 plywood. Note that the port strut includes the control-line guide. Dry-fit the struts and the two wings together. Any trimming required to properly align the wings is much easier to achieve now than later, during final assembly.

Slide the lower wing into the slot in the fuselage, align it properly, and use cyanoacrylate to permanently affix it to the fuselage. I would also use cyanoacrylate to adhere the interplane struts into the lower wing at this time. It is easier to paint these small parts when they are attached to a larger assembly than when they are separate units.

Undercarriage: Make the five parts for the undercarriage, using the full-size patterns on the drawings. Bind the assembly with 24-gauge soft copper wire, and solder the mating pairs of struts together. Bend the bound ends of these struts to the approximate angle and test-fit them in the fuselage.

Eyeball, tweak, and bend these struts so that the axle will be properly aligned when the axle spreader bar is bound to these struts. This is so that the model will sit level and the axle will be at right angles to the fuselage.

When satisfied, epoxy the struts into the fuselage and solder the bound joints at the axle. I also slip small brass disks onto the axles and solder them to the wire struts. This will provide additional gluing surface when you install the wheel pants.

Wheel Pants: These are made from 3/8 balsa cores with 1/64 plywood sides. I find it easier to carve the core to shape, use cyanoacrylate to adhere the plywood sides to the core, drill the 1/16-inch-diameter hole for the axle, and then use a Dremel tool to grind out the balsa core to accommodate the wheel.

To install the pant and wheel on the axle, slip one side of the pant onto the axle. Cock it at an angle so that you can slip on two #2 washers, the wheel, and then two more #2 washers, and push the axle through the outside of the pant.

Solder a 1/16-inch-inside-diameter brass grommet to the axle against the pant, to retain the wheel. Epoxy anchors the wheel pant to the brass disk. Snip off any excess axle length. Triangular bits of 1/32 plywood fairings are fitted between the struts and covered with 0.5-ounce fiberglass.

Two kinds of 1-inch-diameter wheels are available. One type has gray plastic hubs, and the other has clear plastic hubs. The clear hubs seem brittle, and failures in them, caused by cracks, have led me to prefer and use the gray plastic wheels.

Finishing and Painting: It is easier to paint and apply trim to the model before the upper wing is permanently attached. I use Brodak dopes throughout the finishing process, and they are thinned to at least a 1:1 ratio.

I brushed three coats of clear onto all components, which I wet- or dry-sanded. I sprayed on two coats of white primer and wet- or dry-sanded it. Then I sprayed three coats of yellow onto the wings, tail, wheel pants, and rear fuselage. I masked the Laird as required and then sprayed on three coats of green.

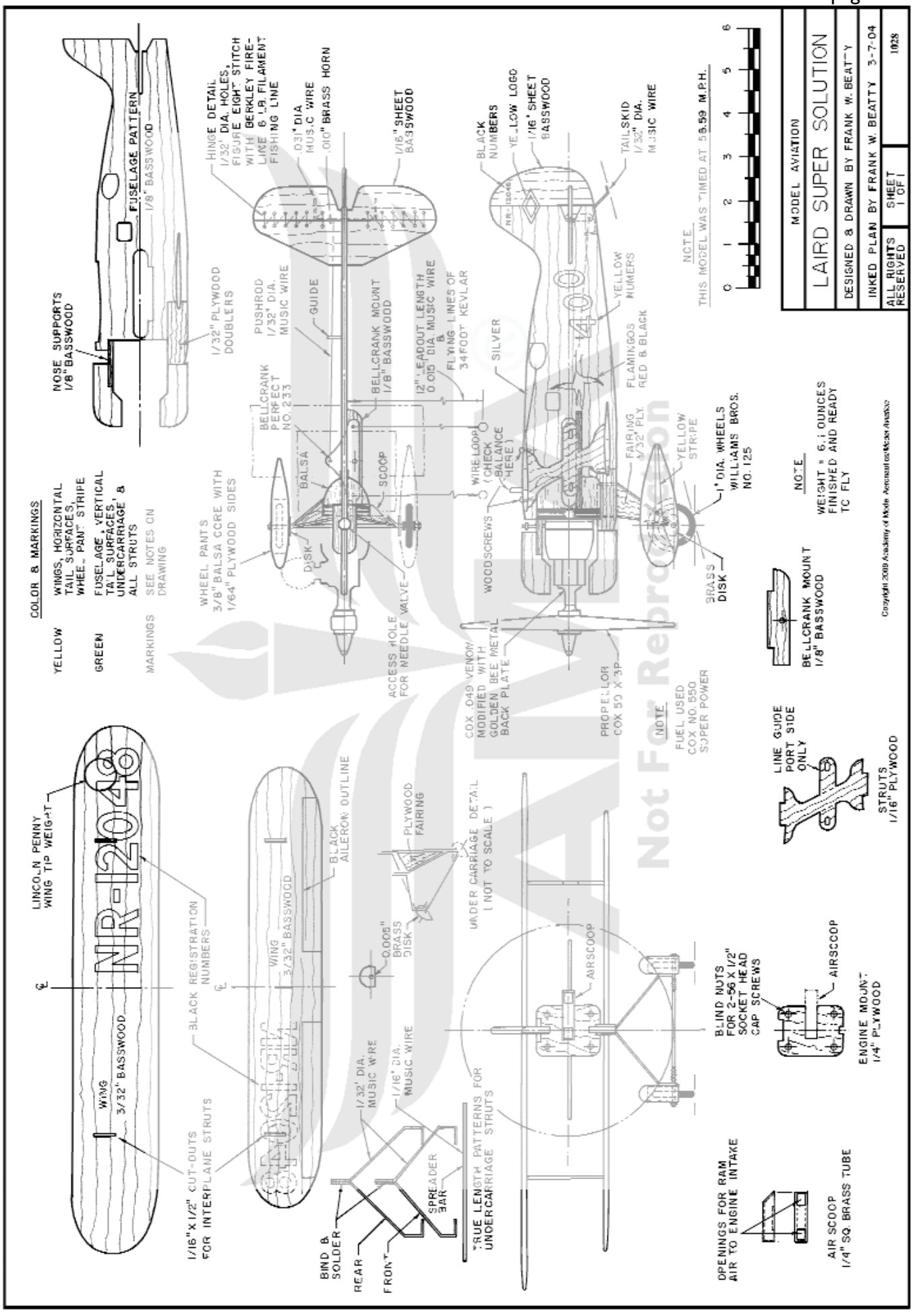
I drew the registration numbers on the wings and rudder using a black Top Flite Panel Line Pen. I masked off and sprayed the red flamingos and laid on the black feathers with the Top Flite pen.

The canopy was masked off and sprayed with aluminum paint. The aileron outlines were drawn on with the Top Flite pen.

After all trim was applied, I sprayed on four coats of clear. Rubbing compound and a wax job followed. The paint added approximately 1.1 ounces of weight to the model.

Final Assembly: Create the 0.015-inch-diameter music-wire leadouts and attach them to the bellcrank. Bolt the bellcrank to its mount. Permanently hook up the elevator pushrod.

Epoxy the top wing to the fuselage and interplane struts. From experience, I've learned to use two small wood screws to reinforce the fuselage-to-wing joint. Bolt the engine and propeller to the firewall.


COLOR & MARKINGS
YELLOW
WINGS, HORIZONTAL TAIL SURFACES, WHEEL PANT STRIPE
GREEN
FUSELAGE, VERTICAL TAIL SURFACES, UNDERCARRIAGE & ALL STRUTS
MARKINGS
SEE NOTES ON DRAWING
NOSE SUPPORTS 1/8" BASSWOOD
FUSELAGE PATTERN
1/8" BASSWOOD
1/32" PLYWOOD DOUBLERS
HINGE DETAIL 1/32" DIA. HOLES, FIGURE EIGHT STITCH WITH BERKLEY FIRE-LINE 6 LB. FILAMENT FISHING LINE
.031" DIA. MUSIC WIRE
.010" BRASS HORN
1/16" SHEET BASSWOOD
PUSHROD 1/32" DIA. MUSIC WIRE
GUIDE
BELLCRANK PERFECT NO. 233
BELLCRANK MOUNT 1/8" BASSWOOD
12" LEADOUT LENGTH 0.015" DIA. MUSIC WIRE & FLYING LINES OF 34 FOOT KEVLAR
WHEEL PANTS 3/8" BALSA CORE WITH 1/64" PLYWOOD SIDES
BALSA
SCOOP
DISK
ACCESS HOLE FOR NEEDLE VALVE
WIRE LOOP (CHECK BALANCE HERE)
WOODSCREWS
COX .049 VENOM MODIFIED WITH GOLDEN BEE METAL BACK PLATE
PROPELLOR COX 59 X 3P
FUEL USED COX NO. 550 SUPER POWER
BLACK NUMBERS
YELLOW NUMERS
SILVER
FLAMINGOS RED & BLACK
FAIRING 1/32" PLY.
YELLOW STRIPE
1" DIA. WHEELS WILLIAMS BROS. NO. 125
BRASS DISK
TAILSKID 1/32" DIA. MUSIC WIRE
NOTE
THIS MODEL WAS TIMED AT 58.59 M.P.H.
0 1 2 3 4 5 6
NOTE
WEIGHT = 6.1 OUNCES FINISHED AND READY TO FLY
BELLCRANK MOUNT 1/8" BASSWOOD
LINE GUIDE PORT SIDE ONLY
STRUTS 1/16" PLYWOOD
ENGINE MOUNT 1/4" PLYWOOD
AIRSCOOP
BLIND NUTS FOR 2-56 X 1/2" SOCKET HEAD CAP SCREWS
AIRSCOOP
UNDER CARRIAGE DETAIL (NOT TO SCALE)
TRUE LENGTH PATTERNS FOR UNDERCARRIAGE STRUTS
SPREADER BAR
BIND & SOLDER
REAR
FRONT
1/16" DIA. MUSIC WIRE
1/32" DIA. MUSIC WIRE
0.005" BRASS DISK
PLYWOOD FAIRING
BLACK AILERON OUTLINE
WING 3/32" BASSWOOD
BLACK REGISTRATION NUMBERS
LINCOLN PENNY WING TIP WEIGHT
WING 3/32" BASSWOOD
1/16" X 1/2" CUT-OUTS FOR INTERPLANE STRUTS
OPENINGS FOR RAM AIR TO ENGINE INTAKE
AIR SCOOP 1/4" SQ. BRASS TUBE
NR-12048
MODEL AVIATION
LAIRD SUPER SOLUTION
DESIGNED & DRAWN BY FRANK W. BEATTY
INKED PLAN BY FRANK W. BEATTY 3-7-04
ALL RIGHTS RESERVED
SHEET 1 OF 1
1028
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The model, complete and ready to fly, weighs 6.1 ounces. We are ready to go racing!

Engine Stuff: Sport pilots have the opportunity to fly their models using any combination of 1/2A engine, propeller, and fuel that works for them. Competitors in Golden Age Speed must comply with the rules, but a racer's performance can be enhanced by taking a few suggestions.

The engine of choice (if you can find one) is a Cox .049 Venom; however, a Cox .049 Black Widow will do. A metal backplate from one of the older, discontinued Cox engines is substituted for the Venom's plastic backplate. The backplate and fuel-tank openings need to be reamed out with a 0.094-inch-diameter drill.

You must use the standard (low compression) glow head, but you can remove the head gasket. This will raise the cylinder compression and improve engine performance. It is widely believed that the metal air scoop that rams air into the engine will improve performance, and several fliers have begun installing them on their aircraft.

Cox Super Fuel (No. 550) is the fuel of choice. The propeller is spelled out in the rules, so you must use a Cox 5 x 3. Balance it for best results.

Flying: Once these Golden Age racers are in the air, most will settle out into a nice, groovy flight pattern. Although some are prone to tumbling, if a sloppy landing is executed, most will glide smoothly to a two- or three-bounce landing with a nice rollout.

Even if the airplanes do tumble, they are tough. Except for a few scratches, they are likely to be none the worse for it.

Let's discuss the takeoff. These small aircraft are prone to nosing over on long takeoff runs. If they do so, they will usually charge along with the propeller thrashing the pavement, but the models will eventually take to the air and complete an official flight.

This doesn't do the propeller any favors, and performance does suffer. So takeoffs are a bit of an art.

You want sufficient up-elevator to get the racer into the air as quickly as possible, but you don't want to overdo it and see the dreaded wingover with subsequent dive into the turf. Not to worry; most takeoffs are uneventful, and we rarely see an airplane totaled in a crash.

Happy Ending: My little Laird was clocked at 58.59 mph, which was good for a third-place trophy in the 2003 1/2A Golden Age Speed event. Tim Pansic's Mr. Smoothie aced us all with a 63.03 mph first place, and Alan van Artsdalen's Pesco Special was on Tim's heels at 62.98 mph.

My Laird flew with the nose yawed out enough to adversely affect its top speed. Yaw out can be reduced by moving the leadout-wire guides forward. You must do this carefully, in small increments, lest you overdo it and have a model that flies into the circle. That's a no-no.

So, what's for next season? A Howard Pete? A Chester Goon? A Caudron? So many choices! MA

Frank W. Beatty
2608 Pontoon Rd.
Granite City IL 62040

Sources:

Frank W. Beatty
(618) 931-5436

Perfect Parts Company
(410) 327-3522
www.perfectpartscompany.com

Brodak
(724) 966-2726
www.brodak.com

Top Flite
(800) 637-7660
www.top-flite.com

Lafayette Esquadrille:
Robert Arata
561 Goldwood Dr.
Ballwin MO 63021
(636) 391-0272