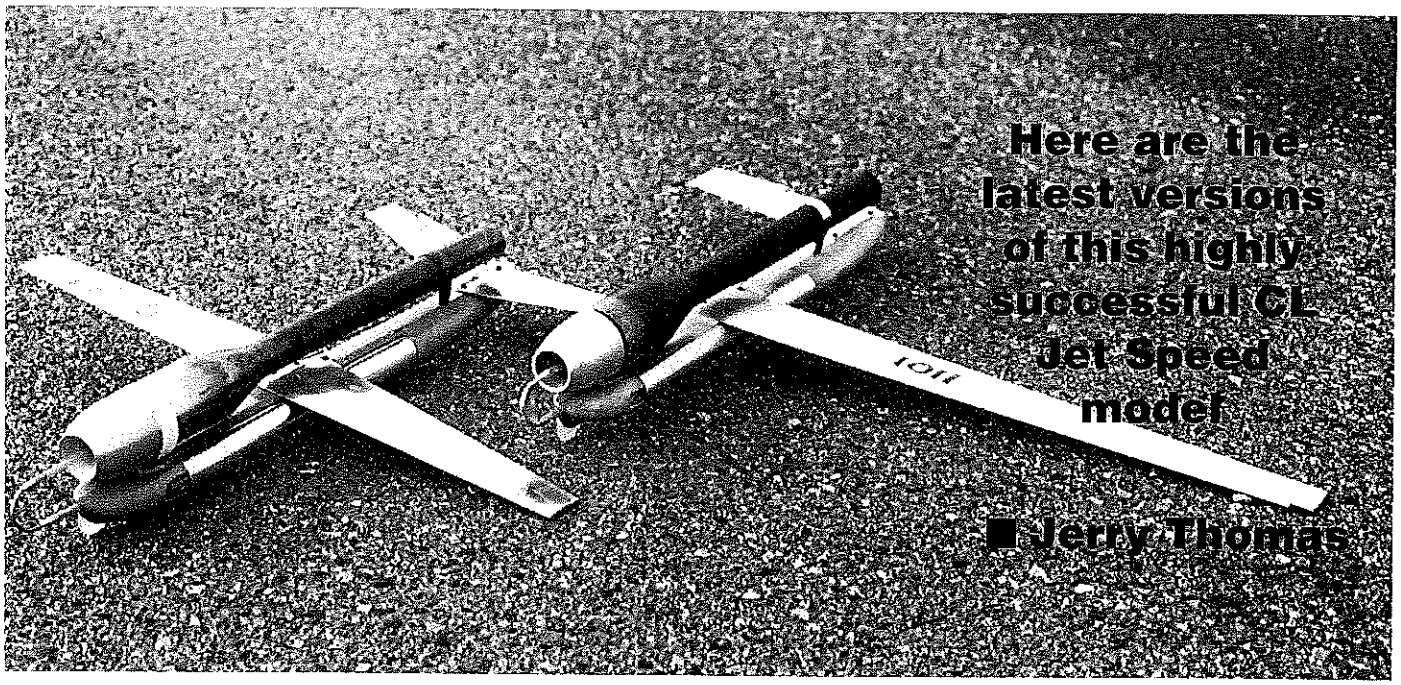
IRONSIDE



Here are the latest versions of this highly successful CL Jet Speed model

■ Jerry Thomas

THE ORIGINAL IRONSIDE was published in the July 1970 *American Aircraft Modeler*; it had a top speed of 183+ mph. Next was Ironside Too with a top speed of 196+ mph with nitromethane and propylene oxide fuel. A copy by Mike Couts, except for his engine mounts and tank ends, holds the present record with methanol and propylene oxide at 193.06 mph.

The Mk II and Mk III are simplified versions of Ironside Too and a later model, Hummer, with the same basic aerodynamics. It isn't as simple as gluing some pieces of wood together, but the alignment of the wing(s) and horizontal stabilizer is difficult with a wooden airplane. A metal airplane can be made to fly as it should because you simply trim the tail incidence with .005 shims until the airplane tracks or grooves smoothly between three and five feet altitude.

Mk II and III also have eliminated the special fasteners (Rivnuts®), and the turned aluminum ends for the tanks used on the Ironside Too and Hummer. The tank is simply bolted to the body angle, which is like a "crutch" that the tank, wing(s), horizontal, and engine are bolted to.

These plans actually show how to build four types of airplanes: two monoline and two with two-line control, so review the text and drawings very carefully—there could be problems if you try to go too fast in building.

My airplane weighs 32 ounces (dry weight); a model with a Bailey Fast Jet will come out a few ounces heavier.

CONSTRUCTION

Note that most material is aircraft aluminum. *Please* do not use aluminum from hardware stores; it is almost pure aluminum and is not strong enough.

The type of aluminum is printed on the sheet or extrusion. It is really necessary to know the type you're using, and especially that its T-type, or heat-treated. Never use O-type; it's annealed or soft. The grain is parallel with the print on the aluminum. Note the grain on the drawings. Whenever you bend aluminum, do it 90° to the grain.

The wings and horizontal stabilizer are 2024 T3, as 7075 T6 can not be bent tightly enough (for the wings, especially); either can be used for the other parts that are made from aluminum.

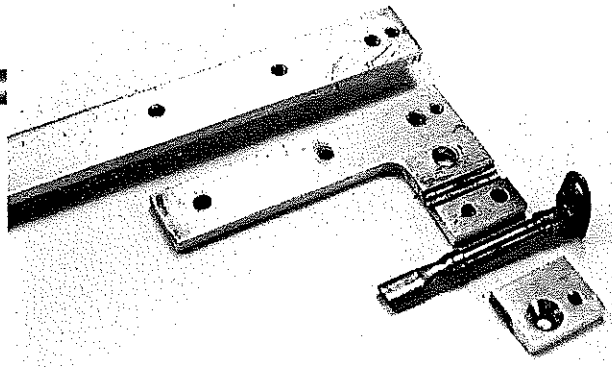
The rivets used are soft aluminum, but they are strong enough where used, including the elevator horn. You may be able to find them where you live; if not, some can be supplied by J.T. Products. They do have heat-treated rivets, but don't use them, because you would beat the parts to pieces—much too hard.

The rivets used in the wing TE, to prevent "peeling" of the skins, are put in after the epoxy has cured, by carefully compressing in a vise with flat jaws (even better, at the corner of the vise at a 45° angle so you just compress in a very local area), or using a small drive pin punch, carefully set the rivets using a tack hammer on the punch.

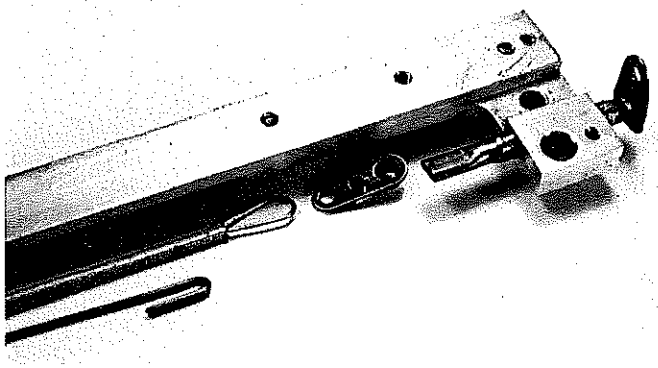
The glue we use (3M gray 2216 epoxy) has high peel strength, but this is a good preventive method. It's very frustrating to peel the TE at either end of the wing—especially at the field. This epoxy is flexible, and it will also cure at room temperature. Where "epoxy" is noted on the drawing, use this brand. You may have your favorite epoxy, but it should be flexible. Do not use five-minute or 30-minute epoxies for gluing the wings; those epoxies are too brittle. Where I say "lightweight epoxy," use something like Sig Epoxolite.

Wing: Bend the LE at 90° to the grain or material ID; use a brake if possible. To get a

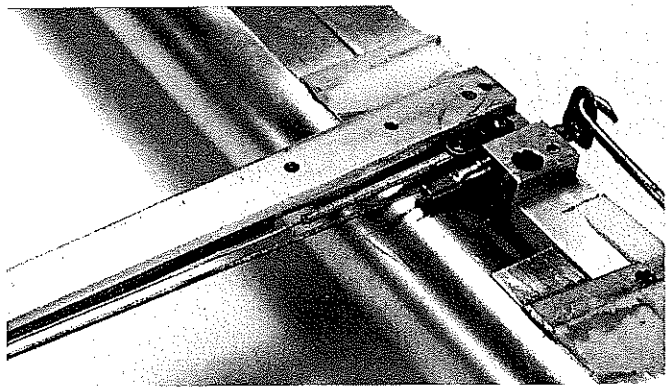
845



Spar, spacer, torsion tube clamp, and torsion tube prior to assembly.



Parts from photo above have been assembled. Shown with flying wire loop, torque transfer wire, and 1 lug nutplate.



Parts from preceding photo have been assembled on body angle. Part of tank and cover plate are also visible.

good LE radius you may have to compress the wing between two pieces of plywood with a piece of .050 or .060 aluminum inside the wing so you don't compress it completely flat.

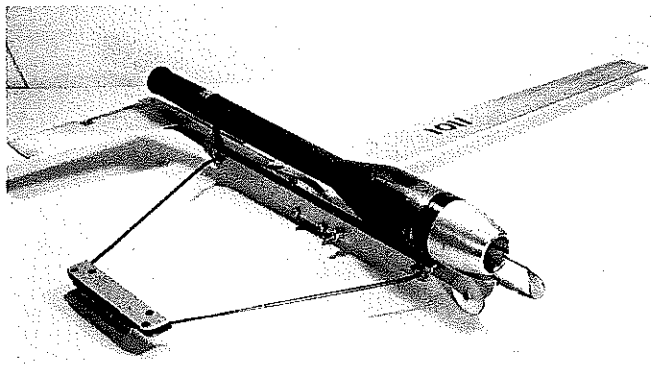
Carefully open the wing with two thin pieces of material to about 30°. When you hold the TE together you want the airfoil to be 5/16 thick inside the wing inboard and 1/8 inside at the tip so the wing will slide onto the spar easily. Open or close each end until you end up with a good fit. It's better to have it a bit larger, because its easier to carefully compress after gluing than to open up the thickness.

Rough up the inside of the wing at the TE with sandpaper (80- or 100-grit) and clean with MEK (Methyl Ethyl Ketone) or acetone. Glue a piece of 1/16 x 1/8 basswood glued to a flat board (to rest the TE on); put another 1/16 x 1/8 about 1/2 inch away to put a piece of 1/8 aluminum to clamp the TE. Put a piece of wood or aluminum angle to use as a stop to butt the LE against so the TE just laps onto the 1/16 x 1/8 wood by 1/16 inch.

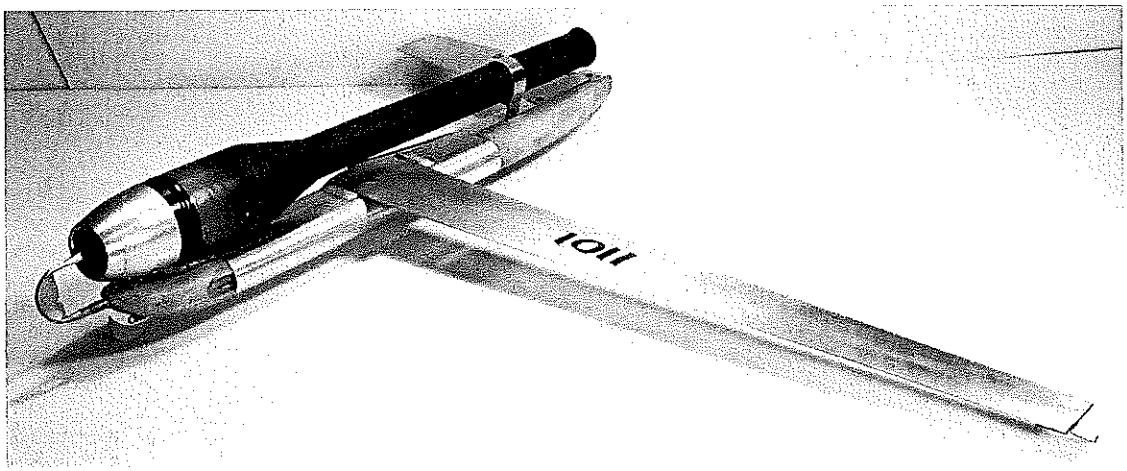
Put good plastic tape over the 1/16 x 1/8 that the TE rests on and on the lower side of the plate holding the TE down. Add a light coat of paste wax on both to prevent the wing from sticking to them.

The wing should be glued with the upper surface up. The lower surface should just touch the board. Bonding this way will give you a predetermined twist so that you have incidence at the center and 0° at the tip (because of the taper in the wing). This is essential on the Mk III and works well on the Mk II.

If the wing is too difficult for you to make, the metal wings are turned out by other modelers, such as Chris Sackett.



Completed Ironside Mk III model with "sidecar" dolly in place. Airplane rides on the wheels and the dolly tipskid.



Ironside Mk III fully assembled and ready to fly.

The flying wire attaches directly to the airplane. The wire goes around a 1 lug nutplate and is held in place by a 6-32 Allen screw. This is extremely strong because the screw and nutplate take the pull of the wire and the nutplate is also retained by the ⅛ aluminum spacer. The torsion transfer wire is held to the flying wire by copper wire (.015-.020) and is soft-soldered just as the end of the wire is made according to the AMA rule book.

The wingtip guide simplifies installing the flying wire, because you just slip it through the slot and then straighten it out. With the wing on, it can't go anywhere.

The control system has been used for 10 years now with good success. A control system on a Speed model is basically a trim tab, because the model should be stable and track well without a great deal of control.

The actual torsion wire isn't very long, and we use a long elevator horn, but in turn I feel the control in the air is very close to what we get on the ground. The long horn is like a long lever.

The tank is anodized 6061 T6 tubing with .028 wall, and the tank ends are turned from Delrin or its generic equivalent. The tank ends and the holes in the sidecar dolly bolts are all you will need to make on a lathe. The O-rings for the tank ends are ethylene propylene 1.125 inches in diameter and .070 thick. The number from Bearings, Inc. is 07 022. If there's none in your area, try a hydraulic supply company or J.T. Products. Ethylene propylene is not affected by methanol or propylene oxide.

Installing the ⅛ brass tubing in the tank end is very easy; the fuel fillers are straight and the fuel line has a very easy bend. A ⅛ pressure line has been used with good success, but some people might want to try 3⁄32. You would use a #43 hole through the front tank end, and wouldn't have to enlarge the hole in the Fast Jet cowl.

The ⅛ brass fuel line we use is shown in the side view of the Mk II. The medium silicone fuel line that many people use is shown above the side view. The silicone is twice as big in diameter as the brass and is not faired. We should try to eliminate as much turbulence as possible from in front of the intake, because it affects

Type: CL Jet Speed

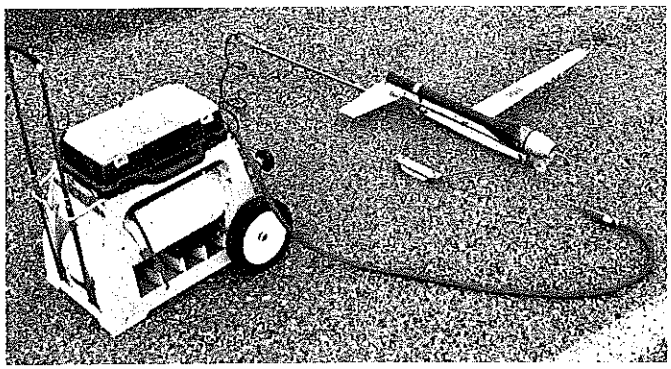
Wingspan: 24 inches

Engine size/type: Bailey Fast Jet or similar

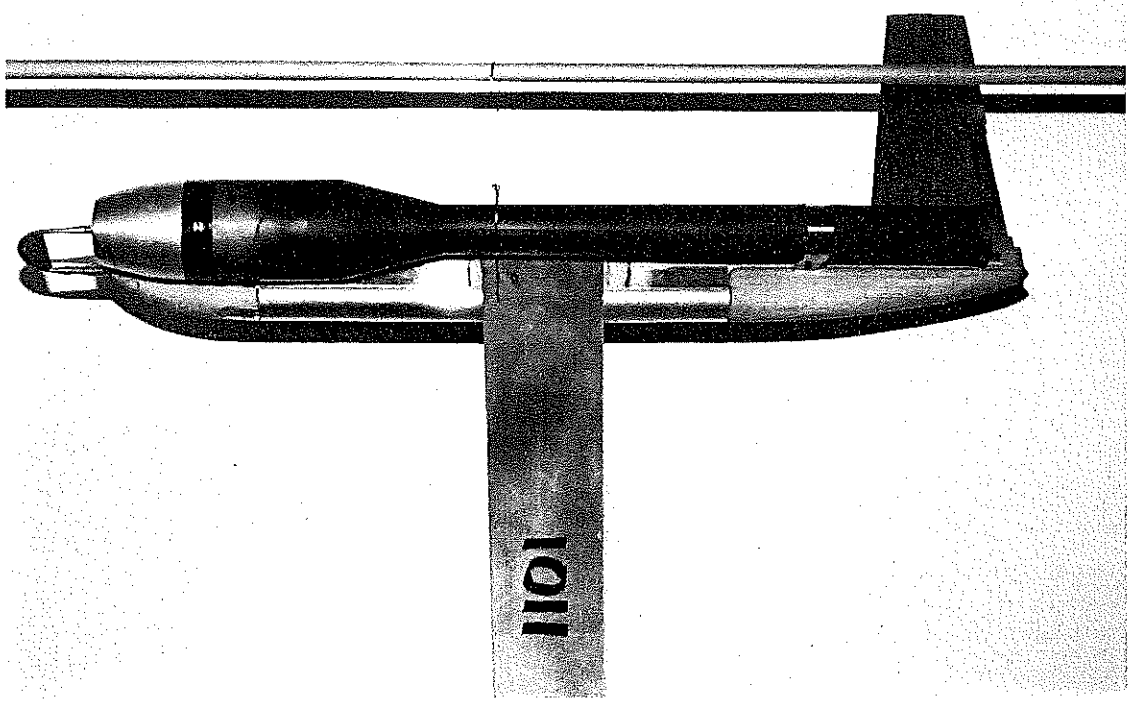
Flying weight: 32 ounces (more for Fast Jet)

Construction: Aluminum

Covering/finish: None



Field setup includes air tank (preferred over manual pump), starter, air hose, starting probe, and toolbox.



Checking Center of Gravity position with wire loop lined up with felt-tip pen line on wing and tube level.

the power out put of the engine. The cowl shape is not critical as long as it's a smooth contour.

The fuel fillers should have enough clearance in the balsa fairing to be able to slip the silicone off one tube, hook your fuel bulb up to one of the tubes, and fill with the airplane vertical, nose up. When fuel comes out of the other tube, it's full; then just replug the free end to the tube you took it off. This is quite flush but you may want to cover it with vinyl electric tape.

When you fly it's a good idea to put a piece of the tape around the threaded end of the tube and the lock ring. If it's "cut" after you fly it means there is a pressure leak from the combustion chamber, and a power loss. It's a good idea to lap the forward or threaded end of the tube on a flat plate or piece of glass, on wet-or-dry silicon carbide, the same with the back of the lock ring so they seat flat to each other.

When installing the ends of the tank, have a small tube of dielectric tuneup grease to put a light coat on the O-ring so it will slide easily. When making the tank tube, use a bearing scraper or deburring tool to deburr the sharp edge on the inside edge of the tube, which helps the O-ring go in. By taking the forward balsa fairing off and removing the two screws into the tank angles, you can remove the tank very easily to clean or check it out.

Balance: To get the engine in the correct position to bolt to the airplane, mount it loosely in the rear mount so it can be moved. Use a large rubber band to hold the forward end of the engine. Make a wire loop about 1½ inches in diameter with a U bend so it can be installed and removed easily. Cut the wire about eight inches long and make a small loop to hold in your fingers. Mark the Center of Gravity (CG) location on the wing with a fine felt-tip pen, and move the engine until the wire lines up with the mark on the wing with the engine level.

When mounting the engine, make sure it is parallel with the top of the body and also parallel with the body in the vertical plane. This is essential to a smooth-flying airplane.

Dolly: The Mk II can use the sidecar dolly with the weight shown, but the Mk III should have a piece of lead between the aluminum and steel held in by the two screws inside the wire. The weight of the three pieces should be about eight ounces. The dolly pins going into the body angle should not be longer than ¼ inch beyond the end of the bolts.

After you've completed the dolly and drilled the holes in the body angle, to match the "pins" on the dolly, put the dolly in the holes, and holding one pin in the hole, rotate the other end out to see if it comes out smoothly, then do the reverse to make sure it comes out with no bind. Then drill the same-size hole ⅜ inch forward of the aft hole. With a jeweler's saw, cut the material between the holes, leaving a slot 9/16 long. It will be close to the rear tank mount. Check this before you drill the holes to make sure it will clear. Clear the balsa and plywood in this local area.

Tie a brightly colored streamer to the outboard end of the dolly to make it easier to find after the flight.

With the wheels shown, the Mk II will take off without a dolly. The wheels are in line with the center of the engine and it will track in a straight line. The wheels we use are make by Glenn Lee.

With the skids you should use the dolly shown, as the skids are on the inside the center of the engine and it would pivot about the skid and come in. It would spin in a circle several times, but there's no danger to anyone. If you choose to use the skids they can be reversed when they start to wear too much at one end, and they should be switched from front to back to increase the life of the skids.

If you have never flown or started a jet, it's quite an experience. Jets don't react as quickly as prop airplanes, but you soon get used to this; and as stated earlier, they should really fly themselves with very little correction necessary.

If you've never flown monoline before, build a trainer that will fly six laps in 9.5-10 seconds, which is 180-190 mph on a 70-foot line. It has to be like driving a car, where

everything comes naturally. When you start trying to think about what you should be doing, you're going to be giving it the wrong control. Your brain doesn't work as fast as your reflexes.

If you are new to jet, you can hopefully find someone experienced to start it, and help you learn the correct method of starting it.

Metering Jets: The Bailey Fast Jet comes with .037, .038, .039, and .047 meters. They are made for flying the engine in a Sidewinder-type airplane that has the tank pickup two inches inboard from the center of the engine. The Mk II and Mk III have the fuel pickup 3/8 inch inboard from the center of the engine.

We've been running .041-.044 metering jets, depending on the weather. Earl Bailey has .040-.046 meters, which would give you a set from .037-.047. Temperature, humidity, and altitude affect the engine and the meter you will need.

Note that the pressure metering is enlarged to .046 with a Du-Bro 6/32 pressure tap.

The Bailey Fast Jet will just run on pressure as it comes, but the Stock Jet and Dyna Jet type engines will run on suction. The metering will run between .055 and .060. Run the engine as rich as you can, whether running pressure or suction. If too rich, go down in metering .001 at a time. Running too lean can burn or chip a valve, and this means taking the engine apart to check the valve; you may have to lap the valve face, on the head, because of a nick on the face.

The volume of this tank is 200cc, which is enough fuel for a good official flight, running as rich as you need. Use a 500cc fuel bottle and mix 400cc of methanol and 100cc of propylene oxide, which lets you fly twice in testing with some to top it off (you may have to restart a few times to get correct metering).

Methanol is a difficult ingredient to work with because it affects other materials normally used for tanks. Two-strokes don't have these problems because there's oil in the fuel, which isn't the case with jet fuels. Methanol is a liquid that draws water very easily. You should check the methanol with a hydrometer; 100% methanol is .795. We checked two different batches from one

manufacturer; one was 100% and the other was 92% methanol. Water will knock your speeds down (if it will even start).

If everything checks out okay and the engine won't start, blow the tank out. You might have a line plugged, but under certain weather conditions we've had condensation form in the tank, and when you put the fuel in you're adding water to it. Blow it out with a tire pump and fill immediately.

When starting a jet, some people use the plug and a ground to the engine. The Fast Jet comes with a plug; put alligator clips on the wires from the starter box and attach them to the plug, and ground the other to the airplane somewhere. (Take the sharp point off the teeth on the alligator clips so you can pull them off easily.)

We use a probe, rather than the plug. The airplane can be launched immediately, and if the probe pops out of the engine without starting, it's too rich. Go down in metering .001 at a time. If the engine sounds like a sick cow, stop immediately—the engine is lean and you'll just sizzle the silicone used in the probe; start going up .001 at a time.

When starting out, try a #44 metering jet. After you zero in on the metering jet you'll find the engine will usually start without priming.

We use an air tank, which is easier on people than a hand pump. The hand pump works well if you have a good pumper who is there all the time. It will take some practice to coordinate the pumping and placement of the probe on the flojecter. The guide on the Fast Jet probe is nice to get you centered on the flojector.

When the engine starts, you want to release the model as soon as you can, but don't get excited and rush the release (sometimes easier said than done), because you might let go too soon. You just want to make sure it's pointed straight ahead (or slightly toward the outside) and just let go. Make sure both clips are attached, or you could get a shock; it's not life threatening, but it will wake you up.

When you pick the airplane up after the flight, use the wing close to the body, because the tube is quite warm and the heat has radiated forward to the intake. Never stand behind the airplane when you pick it up—there may be some raw fuel in the tube that can spill on you.

I have used only Allen screws in my airplanes all these years, and have never had any problems. They're the strongest that you can buy in the sizes we use all the time. Some modelers don't like the hex wrenches because they seem to round the screw socket, but I think the main problem is not making sure the wrench itself is in good shape. It just takes some careful work on a grinder to get the ends sharp and square. Use the screwdriver-type hex wrenches.

All of the Allen screws are button-head except for one flat-head in the inboard end of the spacer and one on the torsion tube clamp on the Mk II and Mk III monoline airplanes.

Some people may feel the button heads sticking out and the wheels will create drag, but two friends who are retired aero-type engineers say you won't see it on a watch. ✈

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Sources:

Wings, *Speed Times*:
North American Speed Society
(Chris Sackett)
Box 82294
North Burnaby B.C. V5C 5P7, Canada
(604) 299-4500

Wheels:
Glenn Lee
819 Mandrake Dr.
Batavia IL 60510

Bailey Fast Jet, Stock Jet, Metering Jets:
Bailey Machine Service
633 West Parker
Houston TX 77091
(713) 694-7017

Monoline handles:
George W. Brown III
5235 S. Kyrene Rd. Suite #7
Tempe AZ 85283
(602) 491-0902 (days)

.031 x 70-foot monoline:
Ned Morris
9044 Rushmore Blvd. South
Indianapolis IN 46234
(317) 271-1231

Materials for Ironside Mk II and III:
J.T. Products
9215 33rd St. East
Edgewood WA 98371
(206) 845-1269

Nutplates:
Spencer Aircraft
(800) 424-1160

3M Gray 2216 epoxy:
3M
(800) 362-3550
(Call for dealer nearest you.)