



# Giant-Scale

*A 30-percent, precision classic*

**D**erived from the highly successful D.H. 60 Moth series of civilian aircraft that included the famous Gypsy Moth, the de Havilland D.H. 82A Tiger Moth is the quintessential British biplane trainer. The Tiger Moth has long been popular with modelers, and a cornucopia of "Tiggie" models is available today in the form of backyard flyers, ARFs, kits and plans. Few full-scale aircraft offer the available range of paint schemes (including military) from a dozen countries. Couple this with classic lines and docile flight characteristics, and the allure of this vintage biplane is easy to understand.

I flew a 1.20 glow-powered  $\frac{1}{4}$ -scale Tiger Moth for many years and enjoyed the experience immensely. These days, my preferred power source is gas, and I wanted a model suitable for the Zenoah G-45. A 30-percent-scale version seemed perfect. I tried to keep its construction methods and field assembly as practical as I could without compromising scale fidelity; the only intended deviation from scale is a slight widening of the cowl nose to accommodate the G-45 fitted

with a Blisson Pitts-style muffler, a 90-degree carburetor bend and a 2-inch prop-drive extension. The plans show an absolutely scale cowl nose section for those who might use a narrower engine/muffler combo.

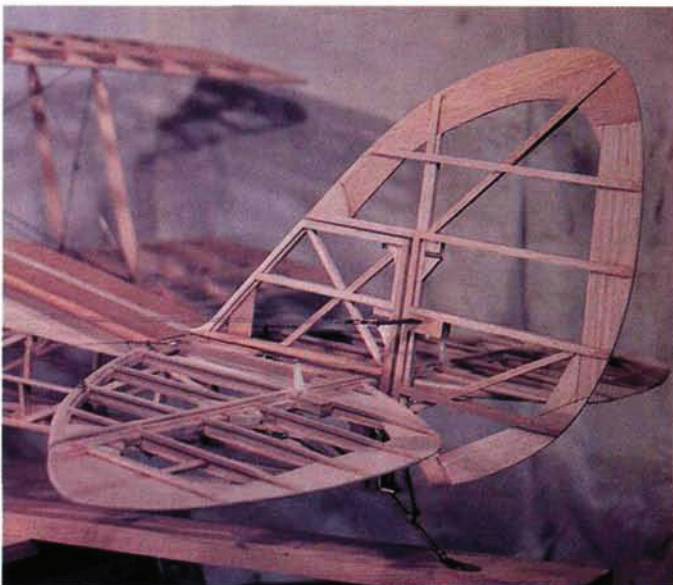
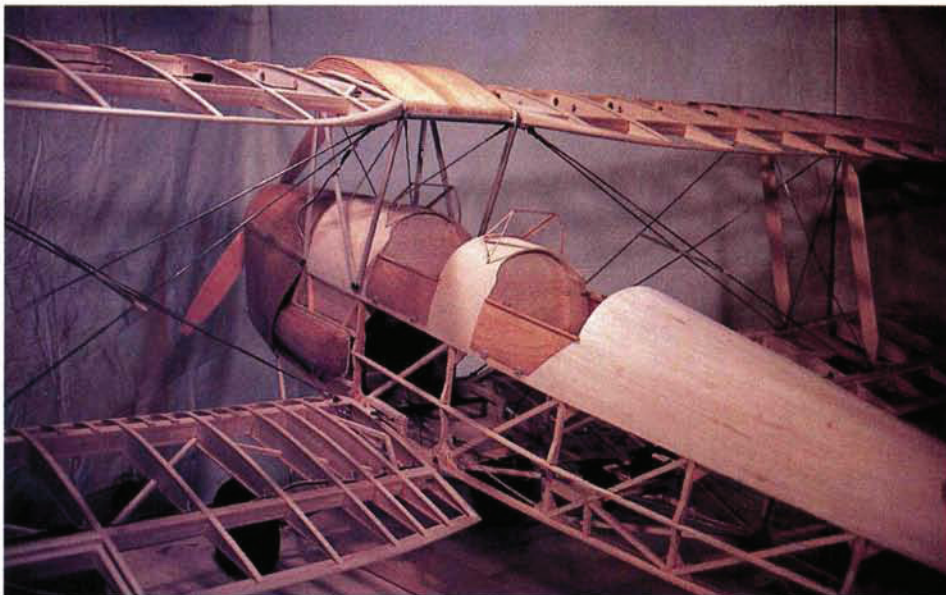
Many configurations of Tiger Moths are evident today, including all possible additions and omissions of retractable top-wing leading-edge slats, anti-spin strakes, navigation lights and a tailwheel as a tailskid substitute. My subject aircraft included all these extras, so they are also on the plans. There are, however, many attractive, easily documented examples of Tiger Moths that have none of these extras.

Detailed step-by-step construction notes are available on the *Model Airplane News* website "Click Trip," so I'll give only a general overview here. Construction materials consist of balsa, aircraft plywood, basswood, spruce, tubes of brass and aluminum and a multitude of small nuts, bolts and screws (all available from Micro Fasteners).



# Tiger Moth

by Gary Allen



**Top:** the Tiger Moth model construction closely follows the method used to build the full-size aircraft. It includes traditional use of balsa, plywood and lite-ply. **Center:** the engine cowl and the cabane struts and top wing center-section structure. **Bottom:** nothing complicated here. The tail surfaces are light and strong. Notice the filler blocks used around the Robert HingePoint hinges.

## specifications

**NAME:** 30%-scale Tiger Moth

**DESIGNER:** Gary Allen

**TYPE:** giant-scale biplane

**WINGSPAN:** 105.6 in.

**WING AREA:** 2,822 sq. in.

**FUSELAGE LENGTH:** 86.1 in.

**DRY WEIGHT:** 24 lb.

**WING LOADING:** 19.6 oz./sq. ft.

**ENGINE USED:** Zenoah G-45 with a Bisson Pitts-style muffler

**PROPELLER USED:** Moki 22x10

**RADIO REQ'D:** 4-channel (rudder, elevator, aileron, throttle)

### CONSTRUCTION

- **Fuselage.** The fuselage consists of four major subassemblies: the engine box, the upper-wing-tank center section, the landing gear and the main fuselage structure. The fuselage uses basic box construction and follows full-scale practice; spruce and balsa are substituted for the welded tubes of the original. The tank center section with its corrugated metal covering is one of the Tiger Moth's defining characteristics. It also represents probably the most tedious portion of construction. It is constructed around an 1/8-inch-ply framework, which is sheeted and glassed with 2-ounce fiberglass cloth and epoxy resin. The corrugations are duplicated with half-rounded balsa strips, which I soaked in ammonia and very carefully glued to the tank structure. After I had sanded them smooth, I brushed three to four coats of thinned epoxy over the "corrugations." The results are very realistic.

I fabricated the cabane struts using 1/8x1/2-inch aluminum stock. The critical alignment of the center-section tank with the fuselage is achieved by working directly over the plans as you install the struts. Access to the rudder and throttle servos and the receiver and battery pack is through a hatch just behind the cowl. A bottom hatch just behind the cockpit provides access to the elevator servos.

The engine box is assembled out of 1/4-inch-ply parts using epoxy and screws. It contains the tank mount and is attached to the fuselage with aluminum-angle stock, 6-32 socket-head bolts and blind nuts. The entire engine and tank assembly can be removed as a unit for servicing and access to the radio compartment. While the landing-gear outline and cross-sections are scale, their functionality is not. Shock absorption is provided by a traditional

## Documented "Tiggie"



The subject "Tiggie" aircraft was manufactured in 1947 and originally served with Station Flight RAF Church Fenton. It was acquired by the noted aerobatic pilot Jeremy Johnston and brought to North America when he emigrated to Canada. He retained the RAF No. 19 Squadron blue and white checkerboard markings by special permission. The aircraft was then sold to a New York resident, who flew it to the 1996 "Wings of Eagles" airshow held in Batavia, NY, where I photographed it.

*Decked out in traditional black and yellow trainer colors, this full-size Tiger Moth has a finish that's colorful yet simple to duplicate.*

## Tiger Moth: the world's primary trainer

The first time I strapped on a Tiger Moth, I had to laugh. For one thing, there was this huge compass projecting up off the floor between my knees. It was fashioned of polished brass and swung in gimbals to keep it level in all attitudes. It would have been more at home in a yacht.

My feet rested on a true rudder bar—a healthy-looking bar with a pad on both ends for my feet. A leather strap ran over the top of each foot, loosely trapping it in place. And there were no brake pedals. You set a lever for the amount of brake wanted, so pushing the rudder bar all the way down produced brake on that side.

Like the rest of the airplane, the Gypsy Major 1C up front (142 hp, 373ci) is an ancient 1920s design, and when it's kicked into life, the four short, inline stacks give it a vaguely Massey-Ferguson sound.

The little wooden doors that flip up and close over your shoulders are barely noticeable, and the view around the nose is actually not bad because you're so far back in the airplane and the fuselage is so narrow. Still, gentle S-turns are absolute necessities if you don't want to taxi into something the size of a fuel truck because it's stone blind straight ahead.

Takeoffs can best be described as "leisurely and civilized." The engine pop-pop-pops its way up to something like 1,800rpm, the airplane gently begins to move and then literally floats off the ground at a ridiculously slow speed. Compared with other aircraft, it feels as if you're moving at a fast walk. It also has a definite kite-like feel to it because it is so light and has so much wing area that there is no doubt it is flying on the wings, not the engine.

The brass-framed, faceted windshield holds most of the slipstream at bay, but just enough wind finds its way into the cockpit to ruffle your hair a little and remind you that you're in an open cockpit.

In the air, the word "leisurely" again pops into mind. The huge ailerons and light wing loading definitely remove the airplane from the Pitts category because even big aileron deflections don't result in big movements. The airplane is graceful in the extreme, but it wasn't born to be a dancer. Plus,

you're popping along at something less than 85mph, so the occasional ultralight will fly past you.

Landing the airplane is the ultimate in simplicity. A Tiger Moth has the drag coefficient of a parachute, so when the power is brought back on final, the nose is so far down to maintain speed that the runway remains firmly in sight. It's only when the ground gets big and you begin to rotate into that steeper-than-average three-point attitude that the runway disappears.

In the process of flaring to land, two things happen: first, the natural



background noise of the slipstream tripping over wires and struts changes tone. It gets lower and then slowly fades as the airplane settles onto the runway. Also, the airplane slows nearly to a stop while still in the air, and the impression is that you hovered to touchdown. It is all so veddy civilized. And so veddy British.

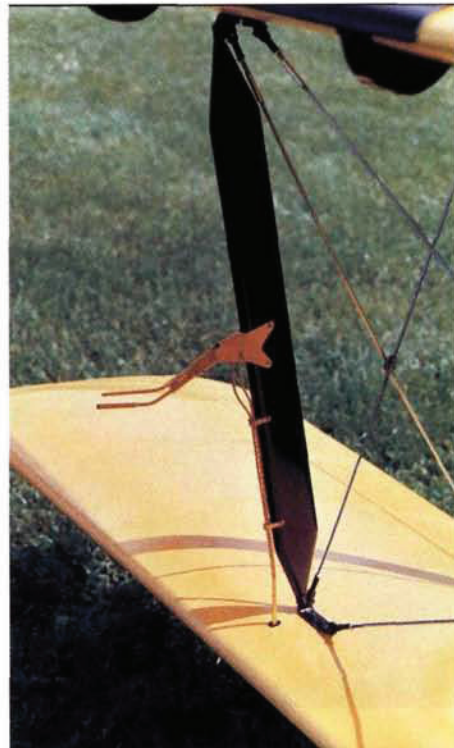
During WW II, we had the Stearman. The rest of the good guys, however, had the Tiger Moth. —Budd Davisson



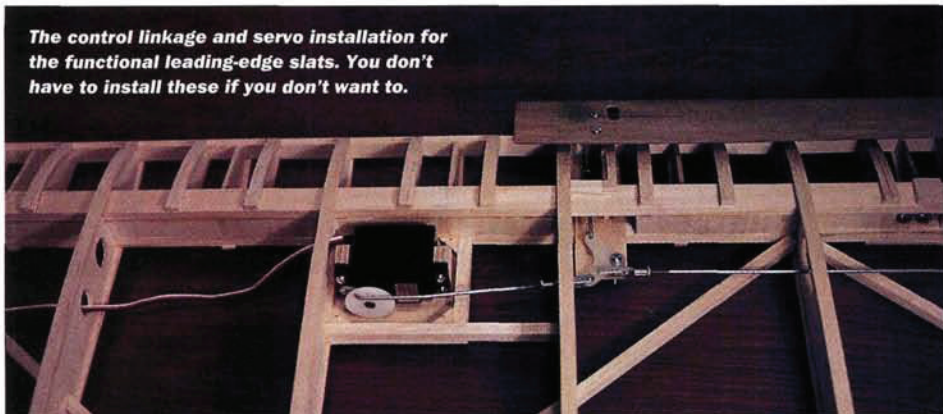
The wing structure is relatively simple and uses a scale flat-bottom airfoil. Notice the internal diagonal bracing.



The functional landing gear is scale but not difficult to build. It is made of bent and soldered music wire, and rubber bands are used for shock absorbing.



The finished interplane strut and scale Pitot-tube assembly show the model's simple but functional design. Field assembly is very quick for such a large biplane.



The control linkage and servo installation for the functional leading-edge slats. You don't have to install these if you don't want to.

rubber-band/spreader-bar method instead of complicated-to-build Oleo struts. The main portion of the landing-gear structure is constructed of 1/4-inch music wire and the rest of 1/8-inch music wire. Balsa and basswood fairings complete the unit.

Another defining characteristic of many Tiger Moths is the distinct D.H. logo-bearing wheel cover. A simple method of fabricating and mounting versions suitable for standard Du-Bro wheels is shown on the plans.

- **Engine cowl.** The cowl follows full-scale design, and its side panels are hinged to provide access to the engine for fueling

and to make carburetor adjustments. The side panels are secured for flight with scale-like fasteners. The cowl is built *in situ* (i.e., in place) around a ply framework. The top is balsa planking, the bottom is a thick balsa sheet, and the nose is a combination of balsa blocks and planking. The hinged sides are fabricated around 1/32-inch-ply cores. Everything is then glassed with 2-ounce cloth and epoxy resin.

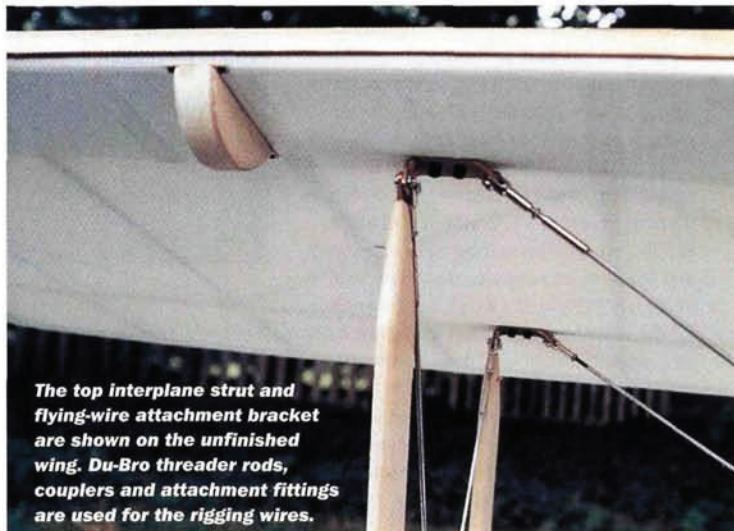
- **Tail surfaces.** The stabilizer/elevator and fin/rudder, which contains the tailwheel assembly, are easily removed from the fuselage. The stabilizer features a laminated-balsa leading edge. The trailing edge

and capstripped ribs are 1/8-inch balsa stock. The ply portions of the center section provide the attachment points to the fuselage and the slot for the rudder assembly. Note that functional struts are attached between the fuselage bottom and the stabilizer's leading edge. The elevators are fabricated around a sheet-balsa framework. I made the scale-like elevator control horns by carefully trimming standard hobby items to size.

The fin/rudder assembly is built in much the same manner. The rudder horn and the rudder bellcrank are made of two laminations of 1/32-inch ply covered with a top and bottom lamination of 0.014-inch



The engine cowl is made entirely out of balsa and plywood. The side panels are hinged for access to the engine.



The top interplane strut and flying-wire attachment bracket are shown on the unfinished wing. Du-Bro threader rods, couplers and attachment fittings are used for the rigging wires.

## CONSTRUCTION: GIANT-SCALE TIGER MOTH

carbon fiber. The tailwheel assembly is made with music wire, various sizes of brass tubes, sheet brass, wheel covers and hardware-store springs. The finished assembly looks quite convincing and is very functional.

The control cables are commercially available and work quite well. It is important to make sure that the cables are securely attached to the rudder and elevator control horns. Make them easily detachable if you plan to remove the tail assemblies for model transportation.

### WING PANELS

The top and bottom wings are constructed similarly. They feature  $\frac{1}{4} \times \frac{3}{8}$ -inch spruce or basswood front and rear spars,  $\frac{3}{32}$ -inch ribs and false ribs and capstrips. The bottom wings use large barn-door ailerons that are driven by high-torque servos. The top wing has leading-edge slats. The mechanism shown on the plans is similar to that used on full-size aircraft and isn't too difficult to fabricate. Forego this option unless you enjoy fiddling.

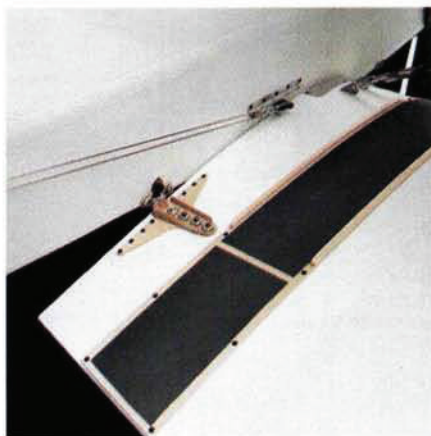
• **Rigging.** The process for rigging the finished model is quite simple and is described fully in the detailed construction instructions. The flying and landing wires as well as the interplane brace wires are all functional. I fabricated them out of 4-40 threaded rods, threaded couplers and Du-Bro threaded and solder attachment fittings. The interplane struts are basswood. Make the attachment fittings from  $\frac{1}{16}$ -inch brass stock and attach them to each wing panel at the front and rear spars with 4-40 bolts. The landing- and flying-wire anchors are part of the wing-root structures, so the entire rigged wing-panel assemblies (with interplane struts in place) can be handled as a unit during assembly and disassembly. Only five bolts per wing assembly hold everything together.

### COVERING AND FINISHING

I used Solartex fabric covering throughout. I simulated the rib stitching by using glue dabs and medical-paper adhesive tape for the rib tapes. I painted the model with paint-store-mixed polyurethane enamel, and then I added the various other surface details such as the venturi and Pitot tubes, windscreen, fuel lines (containing the leading-edge-slat servo wires), cabane bracing wires, flying hood-attachment points, anti-spin strakes, etc.

### FLYING

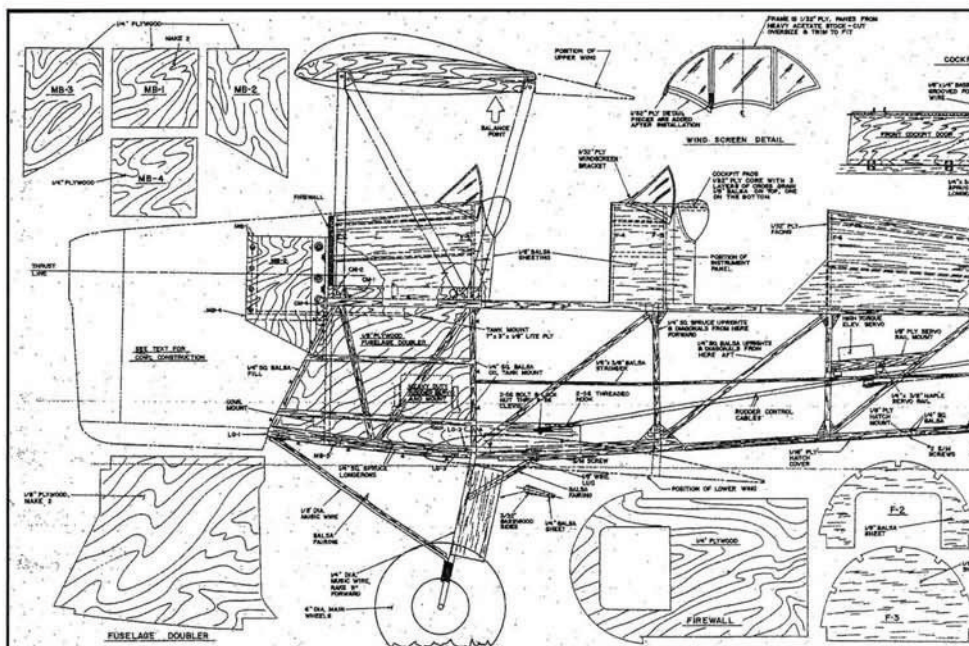
Takeoffs are very easy, even in slight crosswinds, and require very little rudder

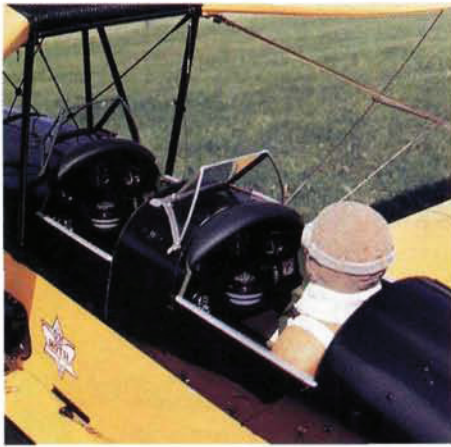


### 30%-SCALE TIGER MOTH FSP0704A

Designed by scale competitor Gary Allen, this is a great-flying classic biplane. Traditional balsa and plywood construction is used throughout, and the rigging wires are functional. The plans include many scale details to build any of several variants. WS: 105.6 in.; L: 86.1 in.; W: 24 lb.; Zenoah G-45 engine; 4 sheets; LD 3. **\$29.95**

**Top:** author Gary Allen fires up the trusty Zenoah G-45. Shown here with the model, Gary gives you a sense of just how big the 30-percent-scale model really is. **Above left:** this photo of the unfinished wing and fuselage shows the impressive scale treatment the author used throughout. Notice the dual rudder pull-pull cables and the functional wing-attachment bracket. **Above right:** this close-up of the all-wood engine cowl shows what's possible with a little effort. Once painted, the cowl looks exactly like the all-metal full-size version.





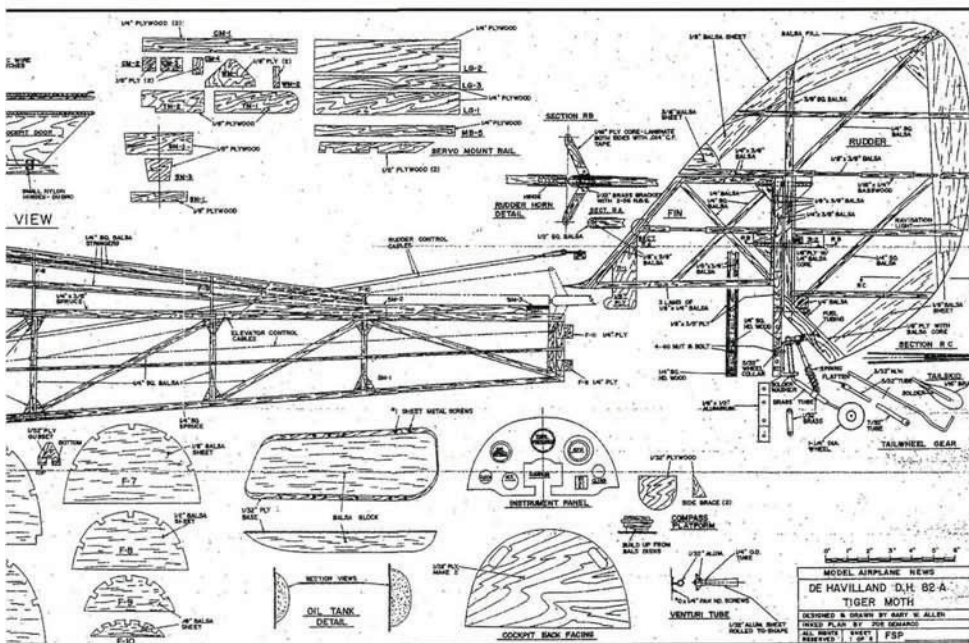
The more you look, the more there is to see! Gary's model is truly a work of art. The degree of scale fidelity is of masters' competition level.



The top wing center section on the full-size aircraft was also the main fuel tank. The author used long strips of balsa, plywood, small pieces of brass and aluminum tubes and some miniature screws to replicate the finest details.



The engine is easy to work on with the cowling's side panels swung out of the way.



To order the full-size plan, turn to page 124, or visit [restore.com](http://restore.com) online.

correction. Scale takeoffs are best achieved by slowly advancing the throttle and holding a bit of up-elevator as the model starts to roll. Even with only a 10mph headwind, the model will lift off within a few feet when you apply full power. Turns require a bit of coordinated rudder, especially during the climbout. As with the full-size Tiger Moth, which featured a significant positive decalage, you must advance the throttle to climb and retard the throttle to descend.

The model is capable of amazingly slow flight. Though not dramatic, deployment of the leading-edge slats enhances low-speed control. The Tiger Moth could never be mistaken for a Jungmeister, but it is nevertheless quite capable of many aerobatic maneuvers. Really nice loops, stall turns and wingovers are all easily within its capability, though its roll performance leaves something to be desired. Even with differential aileron and the judicious use of the rudder, an alarmingly slow barrel roll is the best that I can achieve.

Spin behavior, however, is a pleasant surprise. Even fitted with its anti-spin strakes, this model readily enters a spin from a stall with full right or left rudder, corresponding aileron and full up-elevator. Neutralizing the controls immediately ends the spin. The spin rate is slow enough to allow an easily controllable exit in any desired direction.

As with most biplanes, landings are best done by maintaining a bit of power until just before touchdown. Even on tarmac, this model has no tendency to ground loop. Due to its very light wing loading, this Tiger Moth is not at its best in strong, gusty winds. It is perfectly safe to fly under such challenging conditions, but precise maneuvering requires flying abilities far beyond my own.

All in all, this model provides a very docile (and, at the same time, spirited) flying experience. I really enjoy flying my Tiger Moth in the early morning calm, shooting touch-and-go's, side-slipping and executing low, slow flybys. If you decide to build your own version, I hope you enjoy the experience as much as I did. ✦

**Bisson Custom Mufflers** (705) 389-1156; [info@bissonmufflers.com](mailto:info@bissonmufflers.com).

**Du-Bro Products** (800) 848-9411; [dubro.com](http://dubro.com).

**Micro Fasteners** (800) 892-6917; [microfasteners.com](http://microfasteners.com).

**Robart** (630) 584-7616; [robart.com](http://robart.com).

**Solartex**; distributed by Balsa USA (906) 863-6421; [balsausa.com](http://balsausa.com).

**Zenoah**; distributed by Horizon Hobby (800) 338-4639; [horizonhobby.com](http://horizonhobby.com).