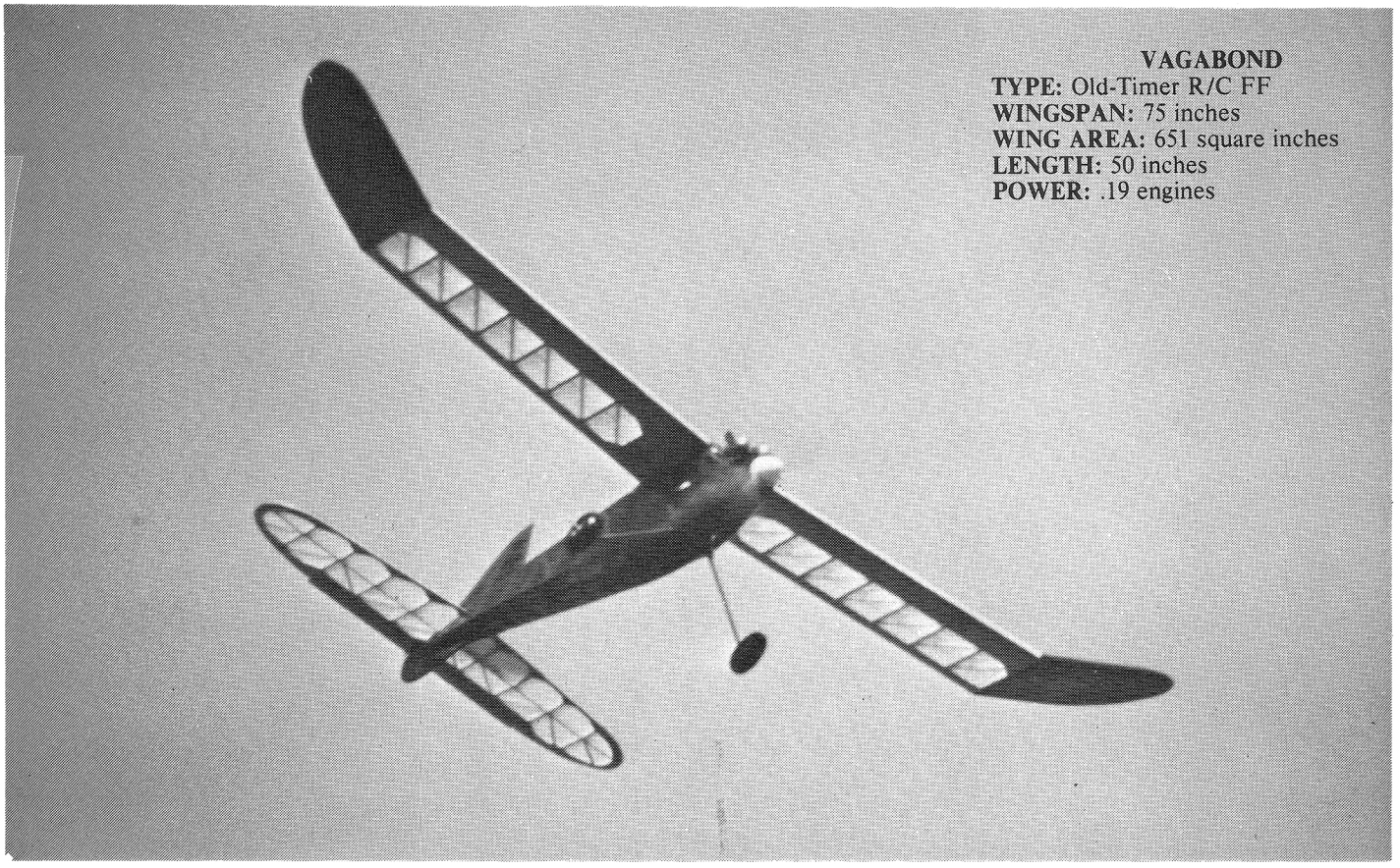


VAGABOND
TYPE: Old-Timer R/C FF
WINGSPAN: 75 inches
WING AREA: 651 square inches
LENGTH: 50 inches
POWER: .19 engines

VAGABOND

A "nearly" old-timer that could teach you a great deal about flight and flying! Interesting design from the Forties.

by Bill Winter

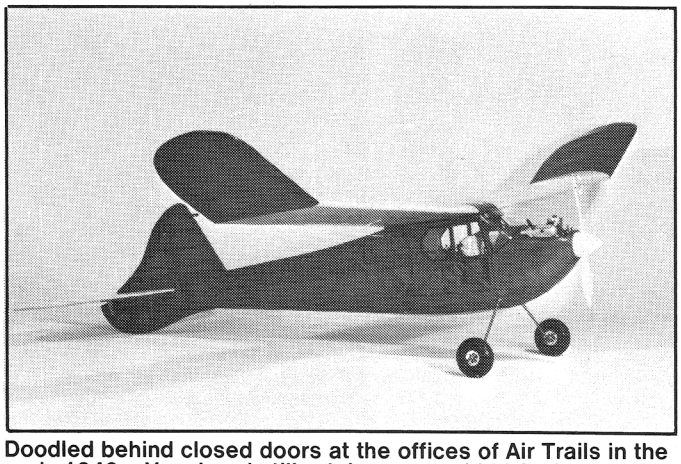
• To understand old-timer models you have to think of them as children. If you are an old-timer who has published perhaps 100 airplanes ranging from rubber scale and originals, Wakefields, stunt, free flight to numerous R/Cs, you know these things are children. Not only do they vary in looks and in fortune just like the kids in any large family, but the most unlikely ones somehow acquire their own aura of destiny. A virtually forgotten "one that got away" comes home a generation later, its fortune made.

The Vagabond was doodled behind a closed door at *Air Trails* while the outer office was in chaos meeting "our" deadline. Since it was a doodle it had to look spiffy. We sculptured a forward vertical tail with sweeping curves, an exotic ventral fin, a deep curved belly calling for formers and stringers under a box—we were thinking of Mr. Mulligan at the time—and, of course, an inverted fully-cowled engine. It was only a doodle, for heaven's sake! Doodling plays the percentages: you can get lucky, like winning the Irish Sweepstakes. This thing has a life of its own.

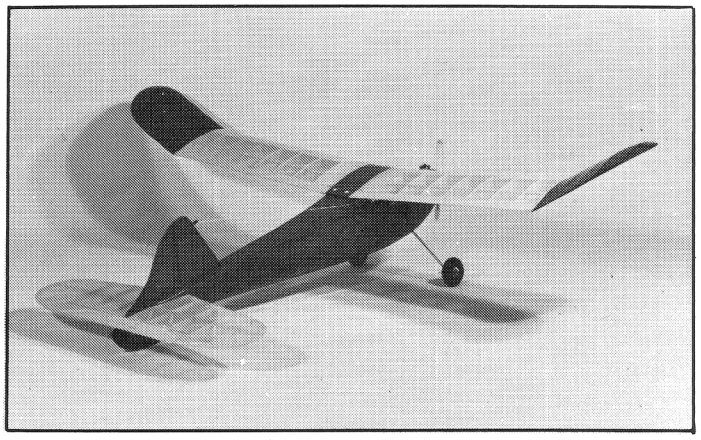
We are duty-bound to tell you that *Air Trails* had the biggest, and one of the best, staffs that ever came down the pike. Among these capable characters were other doodlers who were, unlike us, bloodthirsty competition types. Bill Tyler, an indoor master, is still very much on the scene—he typically does not bother to turn in results. And the late Ed Yulke, an engineer at Republic whom we enticed to do "something worthwhile" (that is, join the fun at *Air Trails*), and Walt Schroder. Without Walt many of these beautiful things would not have happened. We'd doodle and he'd insist, "You've got to build it." Oblivious to our moans and groans, he stood over us while we made the Vagabond, the WOG, and so many others. He'd then say, "Let's go fly." And he, not us, would have a ball flight testing. Walt became president of a now-gone company, Eagle, and it escapes us why he kitted the Vagabond.

While not authenticated by S.A.M. because we can't pin down that December 1, 1942 deadline, it quickly proved to be a highly competitive ship at 6 ft on an Ohlsson 60. (It was published in *Air Trails* with plans by Lorne Williams, and in an English special annual in 1948.) At Wichita in 1946, it seemed to have beaten the Sailplane in Class C on two flights, and the chap went home with the trophy. But Davis, a Californian, put up a late afternoon third flight which eked out a better total, and the Vagabond guy was told to return the trophy. In 1950, George Trammel missed by an eyelash winning the R/C event at the 1950 Dallas Nats. George's Vagabond had a slow pulse-rate elevator as well as rudder (it flew that way, too), when escapement/rudder was king (guys such as Walker, Sigfried and Rockwood had super stuff). He was running away with the meet, when some klutz tripped over a power lead—some systems looked like TV coverage equipment—and George, out a quarter mile, displayed the most exciting aerobatics imaginable...until the concrete rose up to smite him. (Foxworthy won, George was third.) Now, if we ever had a modeling disappointment, that Vagabond had to be it. How nice if it could have been a Nats Class C free-flight and an R/C winner.

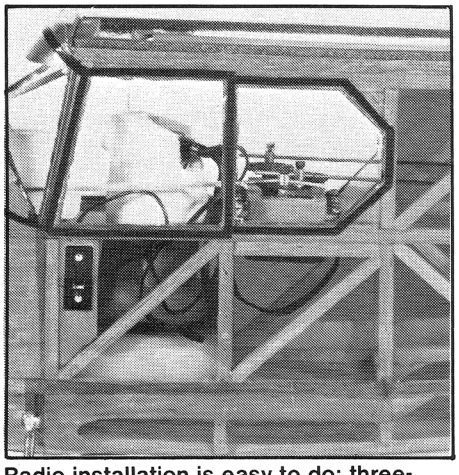
The "doodle" had no vices. One didn't even adjust it, except for the ABC stuff of balance and trim. No offsets, no twists. It did not wind in, that is, spiral dive, a bane of existence in those days. People said it



Doodled behind closed doors at the offices of Air Trails in the early 1940s, Vagabond still retains a neat 1980 look.



Vagabond was a high-performance free flight that served many as a radio vehicle in R/C's early days; great sportster today.



Radio installation is easy to do; three-channel rig enough for the Vagabond.

was "forgiving." To crash, you had to work at it. Lou Andrews sent us a picture with a note that it was the only airplane he ever flew that was not one of his own designs. Guys continuously jolt our memory by asking for plans—John Pond has authentic plans. Ours is now updated for R/C.

Having spent a couple of nice years soaring (and power soaring) a heavy, redesigned Sniffer which we thought to be the cat's whiskers, we put together a lightweight Vagabond just to see how the two compared. The Sniffer is sturdy—throw it into the ground on hand-launch and nothing happens—with an O.S. 35. Vagabond is almost two pounds lighter and has only a K&B .19. That K&B is a great baffle engine. Vagabond can climb on one-third to two-thirds throttle, and power lever full back for five to ten minutes; you can glide forever on dead engine, and then on final, discover this faint tick-tick-tick. With airspeed helping turn that prop, the K&B is darn near off scale on the low rpm end.

In good lift the crate will soar nose steeply down, diving, as it were, against the rising air. Balanced well forward by adding ballast, the crate reveals monstrous down trim after landing. The glide angle is as flat as a board, and with a high pitch prop you can have trouble making the bird sit down. It flies in ground effect on a high idle. Optimum performance is a 9x5 wood, but a 10x3½ will brake it better for approaches, at a modest reduction in rate of climb. Now for the deep stuff.

First: Throw away the book. Models do obey aerodynamic laws, but the pundits never wrote this stuff in a book. Forget the hard-and-fast rules on down thrust and offset. If you don't, you'll end up talking to yourself. Forget what they hammer into your head about torque. There are so many exceptions that one cannot even prove thereby that there is necessarily a rule. (Gyroscopic effect is nose-high to left, nose-down to right.) Only rubber modelers and free-flighters encountered these building blocks. It is unlikely you've seen these things in typical radio jobs upon which the flawed ten commandments of model flying have been rewritten.

If you reproduce any contest-type old-timer accurately (not sport), then your model, even with a radio, is correct only for R/C-assist S.A.M. type stuff. To loaf around without spiraling up like a homesick angel, it has many foibles. You just can't keep a high-climbing old-timer down on the farm. Since at least 9 out of 10 builders of such models are now engaged in the beauty of flight, not the stopwatch, they are faced with these problems.

To handle power, most old FFs had monstrous-area, lifting type tails, with a CG somewhere between 75% and 110% chord (Civy Boy). Trim these things flat and the combined lift of wing and stab makes them climb like elevators, regardless of the nose not being pointed up. Vagabond, like the much older K.G., had a streamlined stab section with the CG at one-third chord. They say a flat-bottomed wing on a real machine should balance at 25% of chord, so you can go forward in the interest of higher cruise—say, 30% for Vagabond. But it, too, had the short nose of its day, and all the angle of climb one could obtain. For optimum sport flying it needs ballast even when trimmed to perfection—there is nothing wrong with the machine.

Any wing has one natural cruise speed at which climb does not result. The author argues that all airplanes, big and little, have lifting tails. How's that? So you crank in down trim. Result: a cambered or lifting tail. At speeds lower than cruise to keep the tail up, up trim may be needed—look at the flying stabs on airliners. (Sal Taibi once tried an inverted camber stab.) That natural cruise speed is very, very slow on an old-timer. You'll fall asleep watching it fly. So we crank in down trim to enable it to cruise faster—still nothing sensational. Do expect to use heavy trim at times. And we can add down thrust to help keep the nose down. However, down thrust, or offset rudder, is effective only at low speeds and all but vanishes at high speeds. The trouble is that thrust adjustments give a one-on-one effect, whereas trim, or wing lift itself, operates on a formula in which airspeed is squared. This Vagabond has generous down thrust—oh, you could add a lifting stab too, but then the CG moves rearward. What happens to your Sig Kadet, or Falcon 56, or Phoenix when you do that? Do we really need to spell it out?

People argue that a ship with down thrust has something wrong. Baloney. Every time you add power in a real machine, you will climb, unless you trim for that airspeed (our lifting tail again!). Usually, there is no down thrust. But a Hellcat had, we believe, 6 degrees of down (you may correct us on that amount). The Ercoupe has down and right because designer Fred Weicke was a modeler. The Grumman Ag Cat with turbine has more down thrust than you'll ever see in a model. Our ¼ scale Piper Vagabond has 4 degrees negative in the stab—*scale*. They must have had a CG problem. Walt Mooney has down thrust in his real Vagabond and wishes it could be 5 degrees!

Down thrust is measured relative to the wing. The Ag Cat has its surfaces rotated to 6 degrees on the wing, 4 on the stab, with 4 degrees down thrust to reference line. Measured relative to the wing setting, that turbine Ag Cat has 10 degrees down thrust. We are fighting to hold the wing where we want it for cruise. This also dictates a minimum of angular difference between wing and tail—use too much difference and pour on the coal with a powerful engine, and you have a tiger by the tail. The slow glide, as much as we need it, is not the building block for adjustments in this case. Ultra-slow glide—those lifting tail models with aft CG again—means more sink, and you'll sink through

weak thermals. A flat glide with good over-the-ground travel is best for us.

Offset? That can't be considered independently of fuselage profile. You know that a pylon free-flight leans right with power. If you try to fly most of those pylons to the left, you court disaster. Old-timers recall that if a Hogan faded left, it was time to get under the ice cream truck. A high cabin does the same thing. Korda never could make his Powerhouse go left on power. A high cabin area, such as our Sniffer, does the same thing, lean right—the more power, the more it leans right. Thrust adjustment becomes reversed. Show us that in a book! Right thrust decreases the right lean, left thrust sends you to the cleaners. The prop slipstream against the left side of the high cabin is worse with left thrust. Prop slipstream is much more powerful than torque—except in such things as a Bearcat, a different kettle of fish.

Engineers claim prop slipstream becomes attenuated. Not with the props and rpm we use! Take Walt Good's Rudder Bug, the great R/C of its time. A very high thrust line, low cabin profile, and a low fin bisected by the thrust line. It flew dead straight.

It is a question of thrust line (and what does down thrust do to that?) relative to side profile. You'll note that Pattern people put everything on the same line, or close to it: thrust, wing and stab. It goes where it is pointed and nothing disturbs it. Our old-timers are children, remember—all different. In some ideal combination, they too will fly straight.

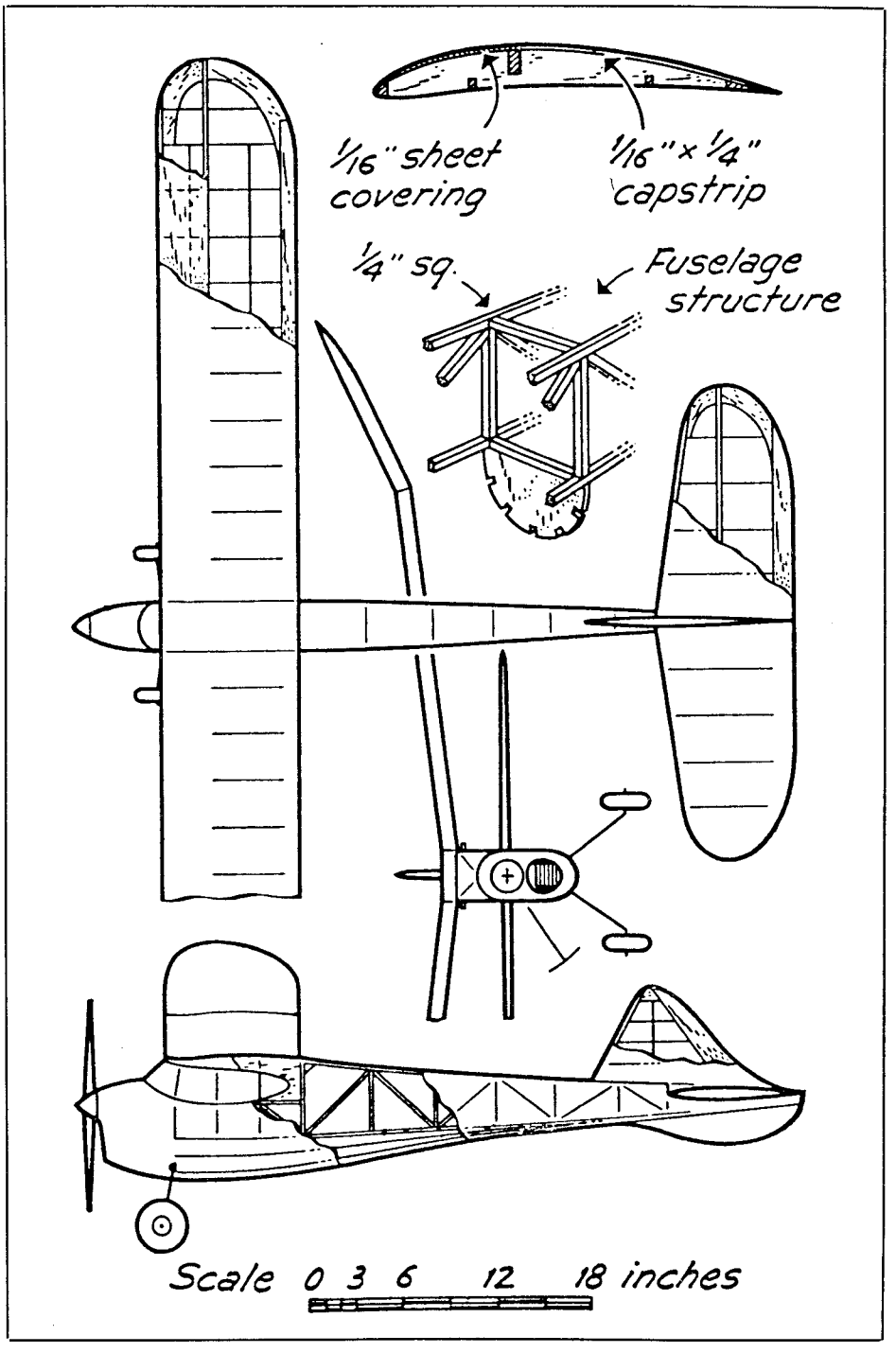
Vagabond has a low profile and a *relatively* high thrust line, but it also was designed for competition. It will roll slightly left with power, and with neutral thrust (no side offset) you'll be holding full right rudder trim during power, even at cruise. So we cranked in 2 degrees right to improve things for you. It has down thrust as an R/C, although thrust was dead ahead on the 1943 contest machine. The angular difference between wing and stab (on the plans) is two-thirds of what it is on my machine—your machine will be better than mine, although one can get anything he wishes with piloting.

How do you fly it? No hand-glides. With CG correct and no warps, test-fly it like any R/C machine. On the initial full bore climb-out, hold light rudder stick if there is a tendency to turn either way until climb steepens and the ship picks up altitude rapidly; slowly decrease power for modest climb, then feed in down trim (if nose comes up steeply, you always have forward stick...and what is novel about that?). When power and elevator trim are in the ball park, trim the rudder until stick pressure is not required.

Reduce power to suit lift—almost always there is some degree of general lift and some days you'll bump into hat suckers—climbing at 1/4 to 1/3 throttle (in a boomer it is idled, so do set your carb for kill by low throttle trim). When height is attained, set rudder trim for a wide circle, preferably right. You now find that any variation in power results in a variation in rudder trim. Add a click or two of power to maintain or restore altitude, and a click or two of right rudder becomes necessary to keep the circle diameter. Take off power and rudder trim is reduced. You fly the ship by clicks, not by sticks, unless something intervenes, such as having to go upwind in a straight line, or to seek another likely thermal area. The trick is on-station time, and in modest general lift the slow-running .19 will go for 15 to 20 minutes on 4 ounces of fuel—more if you are idling. Set up circles as with a sailplane. Now, if

(Plans on next pg.; text continued on pg. 106)

The "Master" himself; Bill Winter has a modeling background that has seen it all!



you alter elevator trim, as to slow up a circle, the circle will always tighten, and a click or two of rudder trim is required not to overbank and lose altitude.

Down thrust, especially with low pitch props, is very effective at slow speeds. Some ships will go out fast and flat, perhaps even dip when hand-launched, but once airspeed builds up and the wing lift becomes overpowering, the plane will then mysteriously assume a progressively steeper angle of climb. Leon Shulman's famous Banshee free-flight took off like an arrow (ROG rules in those days) and suddenly veered right into a steep spiraling climb. Hal deBolt's famous Live Wires had rotated flying surfaces (like that Ag Cat), which resulted in lots of effective down thrust—which appears to be zero to the reference line. A 6-ft Live Wire Senior on a .29-.35 and an 11x3½ or 11x4 would nose down when hand-launched and then pick up a climb. It was scary. You ran like mad and heaved mightily. But with a 12x5, you took a step or two and let the thing fly off your hand like a big fluttering ROG, rocking gently in a steep climb (nose not very high) until it reached pinpoint altitude. Remember, you will be forced to keep reducing throttle and adding down trim in a series of gentle increments.

One of the most difficult techniques in all radio control is achieving consistent approaches of a light model under a variety of wind conditions. The degree of required finesse for R/C-assist old-timers varies immensely according to the type and, above all, to the period in which the original was flown. Interwoven with this is the combination of flat-bottomed airfoils with CG positions. Early gassies, with their undercambered wings and generous lifting-type tails, had slow, floating glides; they do require sharp piloting to compensate for wind and frequently tend to fall short on approaches into the wind, especially after coming out of a far-out, seemingly high enough turn onto final. Planes coming after the S.A.M. cut-off date added new performance levels and can be different.

The Vagabond was an ultra-clean machine with a non-lifting tail, and its approach speeds and ground covered distances on final are more of a challenge to the superior R/C flying skills of the modern pilot, especially because the NACA undercambered airfoil used in early competition has been given a flat bottom for sport flying in the present project. The variables open to the pilot literally have been squared. For example, we shot consecutive approaches recently in a 17 mph wind, using half-down trim on final, progressive trim increments up to full-down, and flying the machine in with forward stick—and the latter with all the above trim settings as well. With full-down, we ended up performing typical S-turns to consume distance, then overshot into that wind by 250 feet.

Were the ship purposely overstable longitudinally, that is, with an extremely forward CG (say, 25% of chord), and with a matching severe angular difference between wing and tail, these variations would be greatly reduced. Its general performance under power would be inferior. But with the use of a small angular difference, and any CG in the 30-40% range, ideally around ⅓ chord, plus clean lines and light construction, excellent penetration is tantamount to playing a hand harp. There are so many ultra-difficult chords you can teach yourself.

A flat-bottomed airfoil in a non-lifting-tail airplane of this description—which includes many sport models today—requires understanding. Any adjustment, such as adding down thrust or flight trim, has effects not seen on convex undercambered sections. The problem in maintaining the wing at the desired angle of attack for best glide (we ignore thrust in this discussion) is not settled by one trim application that momentarily achieves the desired glide. If it's set up for a flat glide (as opposed to a hanging glide, permissible in near-calm), down trim causes the ship to fly faster and pick up lift. It can level off and then, with more speed, resume a slight climb, even the beginning of a mild nose-up.

If an aerodynamic change in angle of attack takes place during this nose-up, the center of pressure on a flat-bottomed wing moves drastically forward, accentuating the stall/climb and creating a partial stall if not stopped with forward stick. Good piloting at this point requires combined use of trim and flying the stick. Now, more down trim is cranked in. The plane seems to glide properly for a longer period, again picks up speed, and repeats the process with probably a higher speed "zoom." It is possible to go through as many as four down-trim changes before the flat-bottomed wing will hold the desired glide angle—if that much trim were applied in the beginning, a dive would result. If, with the ultimate down trim left in the machine, you were to hand-launch it under power, it would dive abruptly into the ground. After long, clean approaches, we find plenty of down trim on that big elevator—shocking, in fact.

Do remember that the Vagabond would far outclimb any Sailplane (Sailplanes are ultimate slow-gliders, due to Goldberg's extensive wing testing by hand-gliding from the balcony in a Chicago armory).

Since, in the windy approach, you can't add full down trim initially, the trick is to keep adding trim as the ship comes in on final, each application clued by any aircraft hesitation in the wind, a sudden slowing up, or going to nose-high attitudes (you prevent this with stick). Prolonged steep S-ing is out of the question because the plane is too clean and before touchdown will reach out into the next county in a mild gale. Steep turns build up speed if you properly avoid ballooning on turn exits into the wind. In calm or a gentle breeze, under 5 mph, add only enough down trim to avoid hanging, which increases sink rate and cuts distance over the ground. Clean glide has minimum sink, but vastly increases distance over the ground. In winds under 10 mph, you will require about 50% down trim at this stage (observations based on trim travel of Airtronics mini-servos in this ship—yours may vary). On windy days, you will end up with full down trim after a straight final of, say, 300 feet, provided you are not sky high to begin with. In strong winds, you also will have to fly the stick to stop the accelerating ship from tending to nose-up slightly upon striking gusts. If you don't your approach evaluation is upset.

An efficient "old-timer" of the post-war period is really two entirely different airplanes to handle, depending on whether throttle is open or idled, or if it is in power-climb or dead-stick. This will drive a pattern flier up the wall. To simplify, all speed increases tempt the Vagabond to go up—it desperately wants to fly. Consistent approaches in all weather conditions require reasonable proficiency in proportional piloting—it is a machine not just to be watched during approaches (do that when set up for circling soaring when it is hands-off for an eternity). Versatility in the use of down trim, plus keeping things smooth by flying the stick (you must be willing to "push"), will, with practice, give you mastery of varying approaches in all wind conditions. This is an ultra-clean machine—allow for that.

What about nose weight? We already used as much as we were willing to do to achieve the designated CG. You will need nose ballast anyway; a real free-flight has a long tail moment and you'd have to build a ghost ship aft of the CG to reduce, or avoid, ballast. With the flat-bottomed wing and angular setup given, progressively adding weight to the nose produces precisely the same results as progressively adding down trim. With each addition the ship glides faster, the wing lifts more, and a shallow climb eventually takes place. Eventually, you attain sufficient nose weight to stop this, but again, the result is like applying full down trim at the beginning of the dive.

For example, one of our published power planes was trimmed for a beautiful glide in calm weather. We added a pen-cell for nose ballast. The very faint stall tendency now became stronger. Adding a second and a third pen-cell made things progressively worse. Four pen-cells yielded the steady faster glide with its flat-bottomed wing. The sailplaners probably would say to add a ballast box at the CG and load down the plane, increasing its wing loading, until penetration is rock steady. For us that means more climb power, a laborious climb, and reduced soaring ability.

Why not learn to fly better? I never promised that a good-performing old-timer would be a piece of cake!

What about equipment? Let's start with muffler pressure. It is a waste of time on a plane such as this where there is no super demand for fuel during abrupt maneuvers. Nothing is abrupt. Even with the Kraft Slim Line tank I find the K&B idling almost silently after prolonged glides. I run it a tad rich and it may pick up slight power late in the flight, but it does not go lean. I discovered this when I forgot to seal the third line. While I have a number of popular R/C systems and am not making endorsements, the Airtronics XL happens to be in this ship. The new mini-servos are quite small but powerful, and sit nicely side by side in the narrow fuselage (plans are 1/4" wider than my ship, just in case). Servo-reversing is nice on anything since you don't have to plot installations. A flip of a switch changes rotation.

Exponential, as Aberlee and Myers state, is just great on a ship of this type. Being basically a free-flight, it has great rock-back stability. If you try to fly a straight line to a distant point, you find this remarkably accurate if exponential is present. And for our thermal playing, abrupt rudder reactions through overcontrol on a "rock-back" design are a bother—until you've found they are not necessary in the first place. You can have pleasure with three-or-more-channel systems. If you find that you have to use many control applications, you'll need to be thoughtful about batteries. Properly set up and flown, there is very little servo use, so battery drain is a fraction of what you are used to. No worry about long flights. A 450-mah pack is adequate—smaller is pointless.

Construction? If you'd tackle this ship, you know how to build it. Do note that one fuselage side is shorter for side thrust, and the nose is slanted at the firewall for down thrust. We highly recommend Super MonoKote. We used transparent red, yellow and blue. Since the ship is modified from the original, we have included a reliable 3-view from H.A. Thomas, who illustrated the *Model Aircraft Handbook* all those years ago. The nose is shorter; the nose profile now is altered because of the upright engine. The belly is not quite as deep as before, and we virtually eliminated the reverse curve bottom outline to simplify application of MonoKote. The belly is built up of soft blocks and laminations (forward of gear), whereas the original is fully stringered.

If tail-draggers scare you, relax. We find slow ships easier than trike gear ships to take off. Open the throttle smoothly with a steady acceleration; hold up-elevator briefly to prevent initial nose-over with power. Relax up as soon as the ship rolls well—this is within 10 feet, less into a wind. You can be darned sloppy with rudder corrections because the thing is into the air so quickly that you are into normal flying in seconds. However, this ship, due to its high wing, light weight and polyhedral tip panels, must be pointed into the wind for takeoff. It will get off cross-runway on any strip. ■