



WOODY'S PUSHER

A SEMI-SCALE MODEL OF THE POPULAR HOME-BUILT AIRCRAFT, THE WOODY IS DESIGNED FOR .049 TO .10 ENGINES AND THREE CHANNELS. OPTIONAL TRACTOR ENGINE CONFIGURATION IS SHOWN. AN EXCELLENT SPORT SHIP.

BY PAUL AND BILL DENSON

INTRODUCTION

After visiting several EAA fly-ins in Rockford, Illinois, with his father, a young teen-ager suggested to Dad, an aircraft design engineer, that he design and build a home-built airplane such as the Pietenpol. This was the impetus necessary to get Harris L. Woods busy. His efforts culminated in one of the better known home-builts, the Woody Pusher, sometimes known as Woody's Pusher. The plane was finished some seven months later in time to have its first showing at a fly-in in Dayton, Ohio in May of 1965. It was here that many interested people talked him into selling plans.

Young Robert Woods logged many hours in the plane and the Woody was instrumental in earning him his pilot's license a few weeks before he graduated from high school.

The Woody Pusher was flown to the EAA fly-ins at Rockford in 1965-66-67 and 1968; the last two times by Robert. These were his first long cross country solo flights. At the 1965 fly-in it received a great deal of attention and the trophy for being the most unique design.

The original Woody is now located at Holly Springs, North Carolina and has been flown many hours since it was moved there in 1971. There are many other Woody Pushers being flown all over the United States and Canada, all built from plans designed by Harris L. Woods.

I was sorry to find out, while making plans for this article, that Mr. Woods was killed in an aircraft accident on September 5, 1975. Prior to his untimely death Harris Woods designed seven-teen aircraft, among which were seven Gyros, one Flex Wing, two Hovercraft and seven Fixed Wing airplanes. For readers of the EAA Journal *Sport Aviation* names like Woody Pusher, Quail, Rail, and Scamp, are all familiar. Woody's wife, and Bob's mother, Mrs. Eva Woods, wanted to thank us for our continued interest in aviation and hoped it would be there for a long time because, "Woody lived aviation and contributed so much to it and enjoyed every minute." A fitting tribute to Mr. Harris L. Woods, aircraft designer.

THE MODEL

This is a brother act, one brother, Bill, in Indiana the other a resident of sunny

Southern California. Bill, the designer, indicated this Woody was not built to exact scale, it was not even built to Stand-Off Scale, kinda like stand-way-off similarity. It was built for fun and fun it has been. The one you see here is my Woody I, I had the privilege of building my plane from his plans and my payment was to write the article, draw the plans for publication, then take the pic-

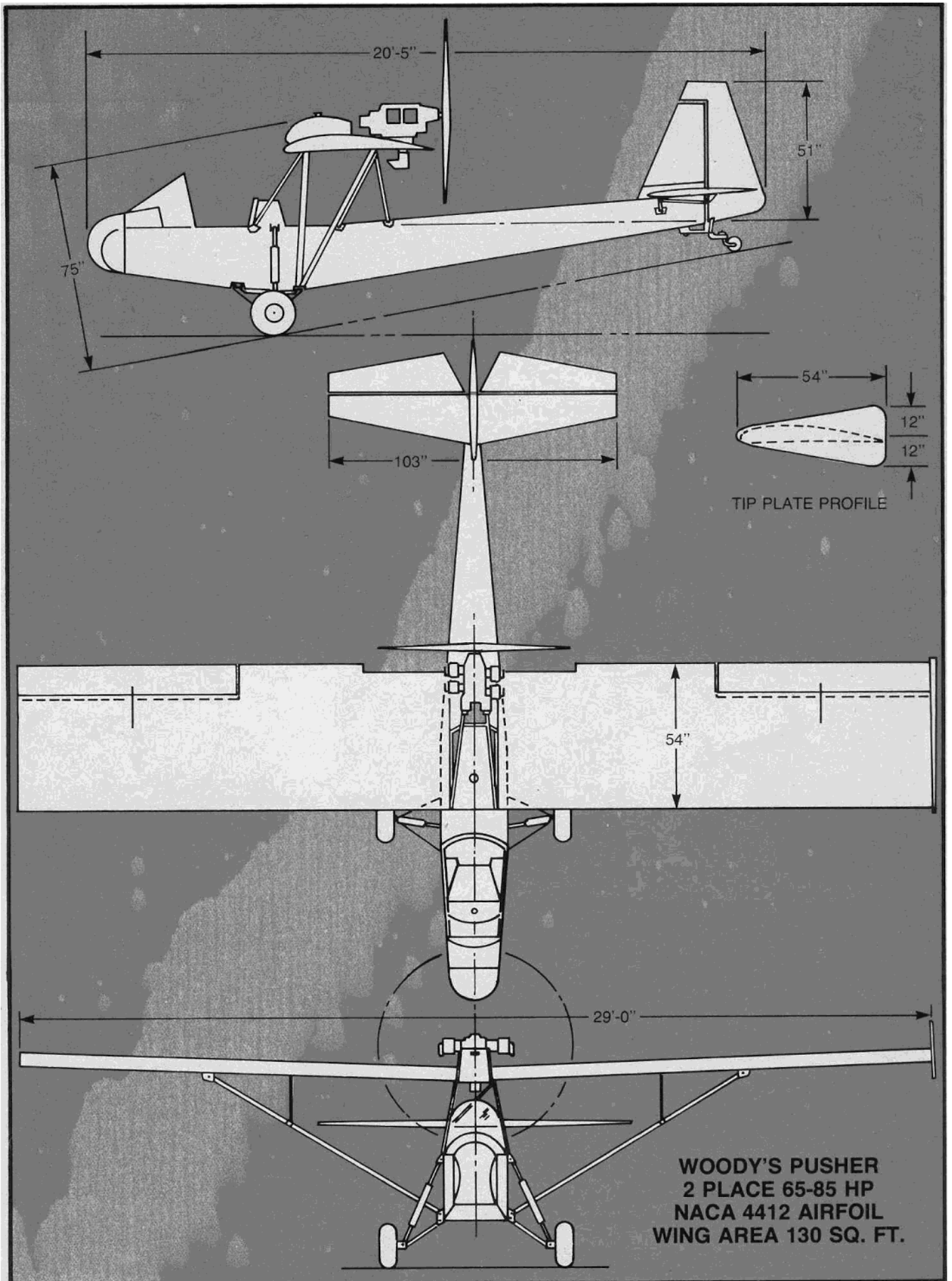
tures. Woody I was the victim of a dead cell in the flight pack, straight in from 20 to 30 ft. Straight in, to the adobe surface of our flying field, is like concrete anywhere else. Disintegrated is the best word I can think of. Rebuilt it will be, since I cannot remember a plane I have enjoyed as much or which has provided as much fun. My Woody II is in the construction stage and should be finished long before this gets into print. Even if you do not intend building a Woody Pusher, read on or wade through the following, there are all kinds of interesting tidbits for you RC buffs, no matter whether you fly .049's or .60's.

CONSTRUCTION

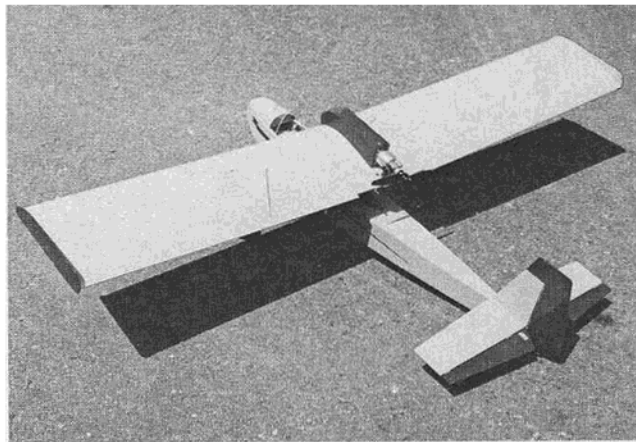
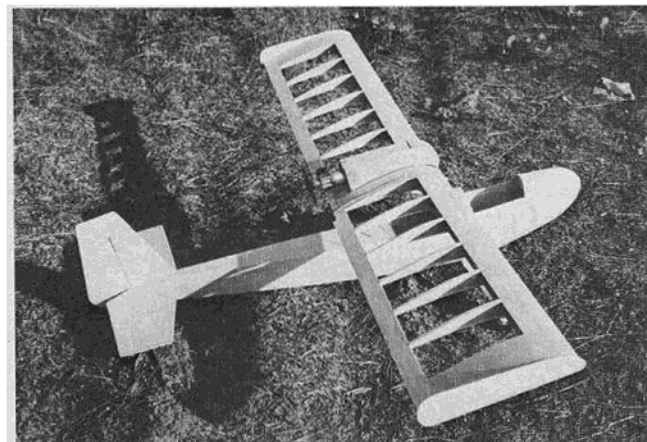
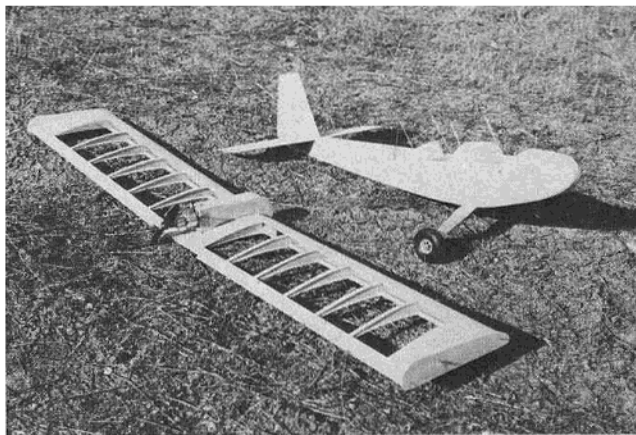
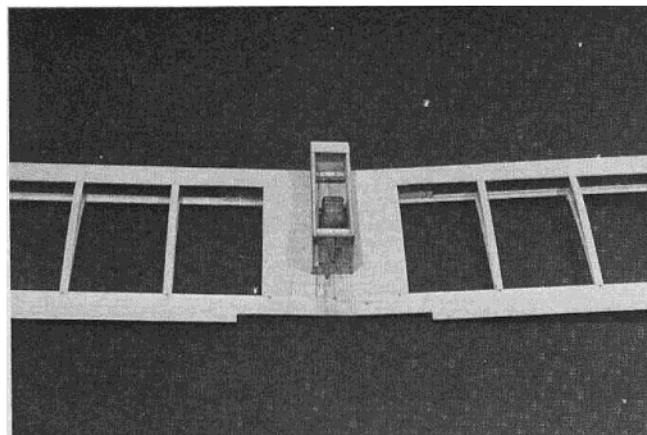
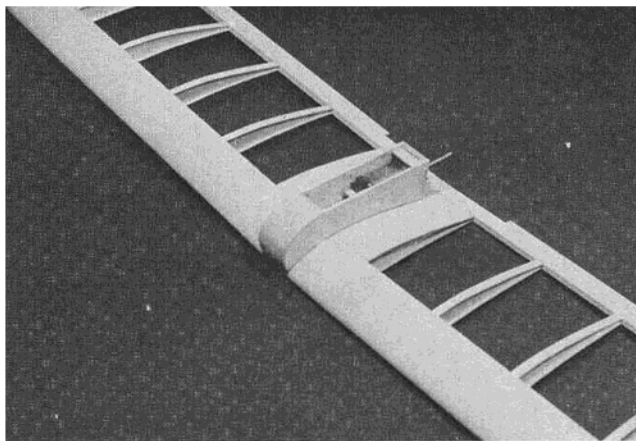
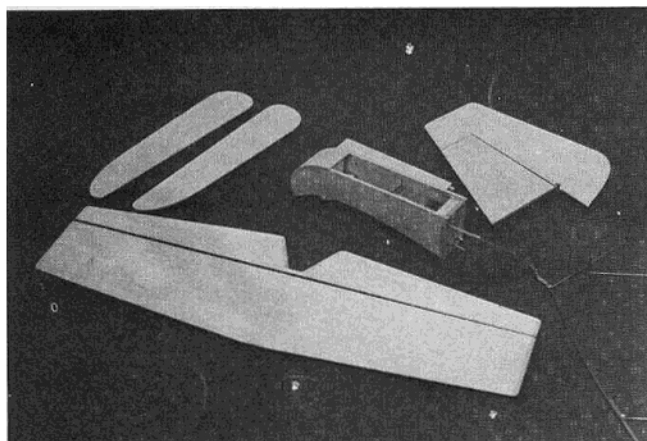
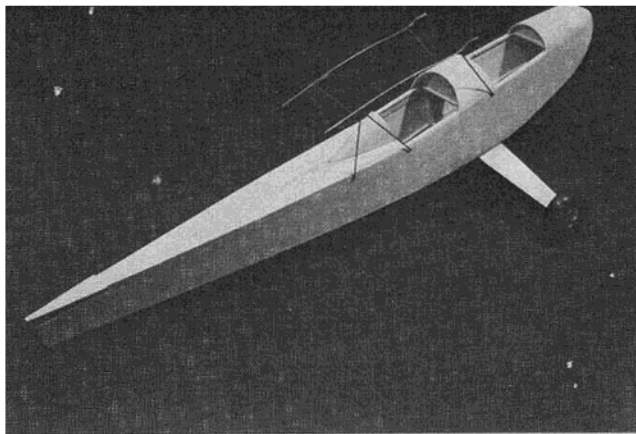
Fuselage: Extend all bulkhead lines on the plans 1" beyond the top and bottom. Cut two sides from 3/32" medium balsa, tape them together, and sand until they are the same. Place the two sides on the plans and, using the marks you made, mark the top and bottom edges with the location of all bulkheads and doublers. Separate the two sides and lay them out on your workbench, top edge to top edge. You must make a right and left side. Glue on the doublers.

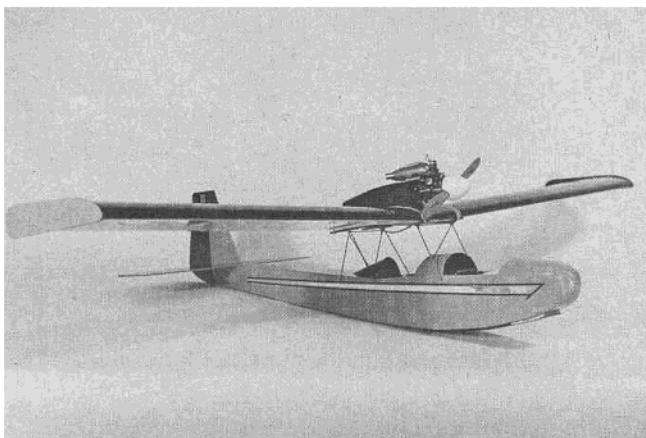
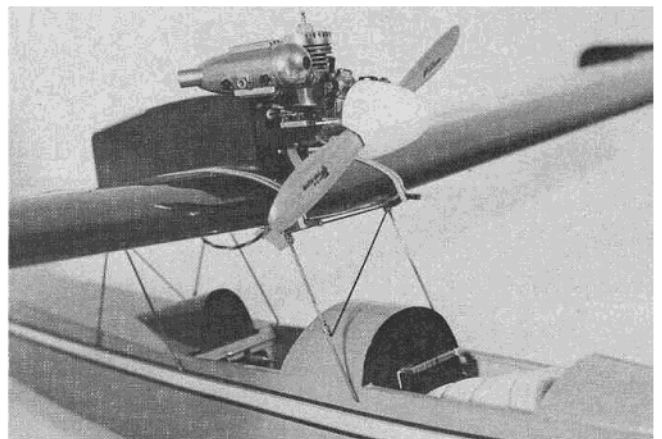
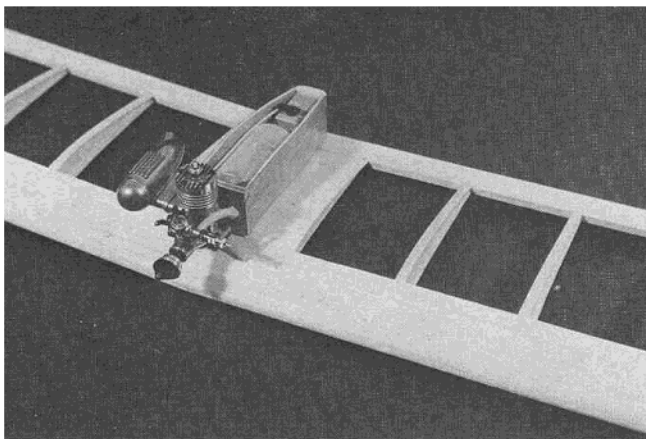
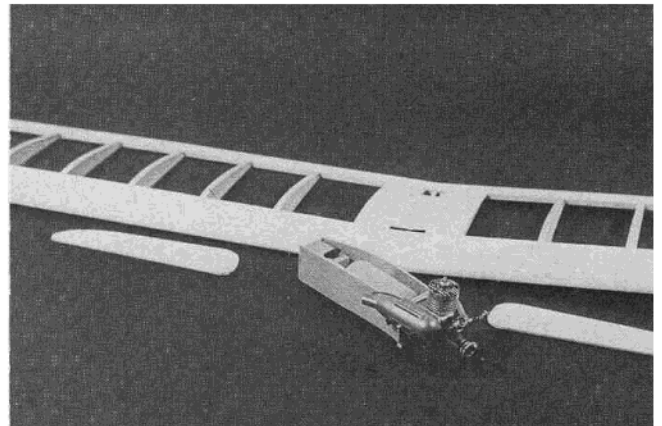
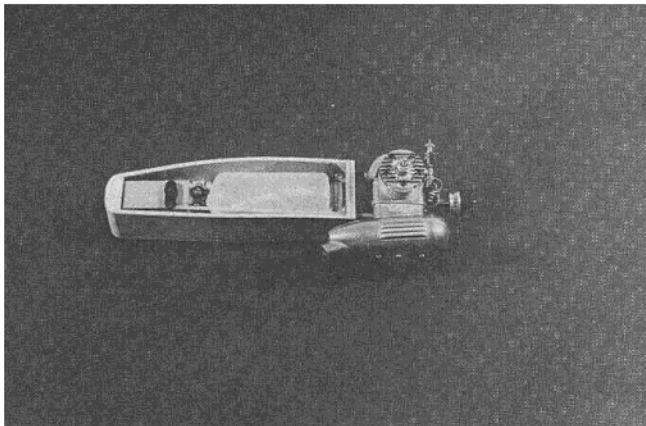
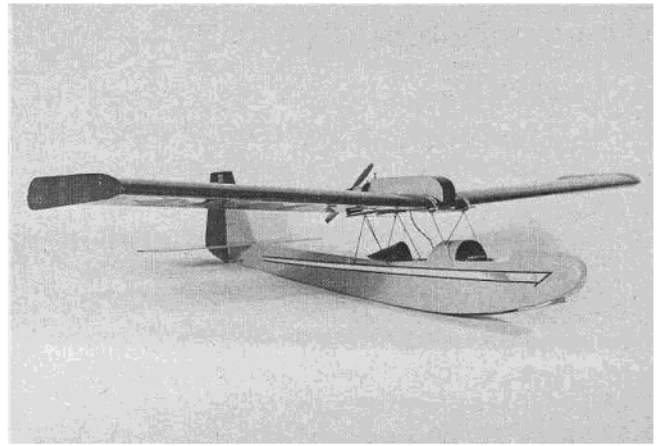
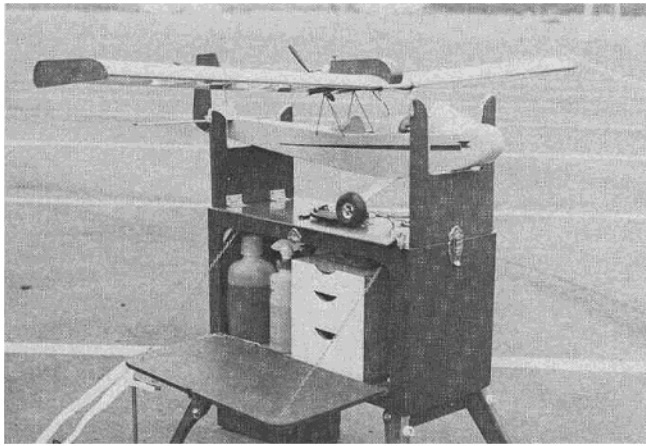
When dry, add to one side, in the proper location, bulkheads 2, 3, and 4. Using a small right triangle, make sure they are square to the side and allow to dry thoroughly. Put glue on the top edges of the formers and put the other side in place. Use masking tape to hold it together. Bring the two tail ends together and clamp with a clothespin. Sight down the fuselage and make sure it is symmetrical. Check the formers and make sure they are square with both sides. Add former No. 1 and the 1/16" ply doubler for the landing gear. Cover the bottom from former No. 1 back to former No. 3 with very hard 1/16" sheet balsa, cross-grain. Cut the cowls between formers 1 & 2 and 3 & 4 to shape from 1/16" medium balsa. Fit and trim, then glue in place. Temporarily install the servos and pushrods. When connected to your satisfaction, remove and add the top and bottom sheeting. **Note:** The top sheeting runs all the way from former #4 to the tip of the tail. This piece fits over the stab and around the fin. Keep it one piece all the way - - - it adds strength and acts as a doubler to hold the stab down and the fin square and upright.

TYPE AIRCRAFT	Semi-Scale Sport
WINGSPAN	46 Inches
WING CHORD	7 3/8 Inches
TOTAL WING AREA	339 Square Inches
WING LOCATION	Parasol
AIRFOIL	Undercamber
WING PLANFORM	Constant Chord
DIHEDRAL, EACH TIP	1 1/4 Inches
O.A. FUSELAGE LENGTH	31 1/2 Inches
RADIO COMPARTMENT AREA	(L) 10" X (W) 2 3/4" X (H) 2 3/4"
STABILIZER SPAN	15 Inches
STABILIZER CHORD (incl. elev.)	4" (Avg.)
STABILIZER AREA	58 Square Inches
STAB AIRFOIL SECTION	Flat
STABILIZER LOCATION	Top of Fuselage
VERTICAL FIN HEIGHT	5 1/4 Inches
VERTICAL FIN WIDTH (incl. rudder)	4 1/4" (Avg.)
REC. ENGINE SIZE	.049 Cu. In.
FUEL TANK SIZE	Cox Engine Tank & 1 Oz. Auxiliary
LANDING GEAR	Conventional
REC. NO. OF CHANNELS	3
CONTROL FUNCTIONS	Rudder, Elevator & Throttle
BASIC MATERIALS USED IN CONSTRUCTION	
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa and Spruce
Wt. Ready-To-Fly	30-32 Oz.
Wing Loading	12.7-13.6 Oz./Sq. Ft.



RIGHT: The Woody's Pusher fuselage with cabane struts and landing gear in place. 2ND ROW, LEFT: Empennage components, wing tips, and engine nacelle. RIGHT: The nacelle installed on the wing center section. 3RD ROW, LEFT: Another view of the nacelle. See text for details on tank. RIGHT: The completed basic framework. 4TH ROW, LEFT: Another view of Woody's Pusher prior to covering. RIGHT: The completed .049 three channel version, ready-to-fly.





1ST ROW, LEFT: The author's Woody's Pusher ready for a day's flying. **RIGHT:** Another version with a glider skid for rough field flying. **2ND ROW, LEFT:** Building the nacelle for the O.S. Max .10 powered tractor version. **RIGHT:** The nacelle, ready to install. **3RD ROW, LEFT:** The tractor nacelle mounted on the wing center section. **RIGHT:** A close-up view of the "Woody Puller". **LEFT:** The tractor version, with .10 power is more than adequate for use as a seaplane.

The bottom sheeting is applied cross-grain. Cut the turtle-back from 1/16" soft sheet and add to the fuselage. Add the three 1/16" ply doublers for the cabane struts. Drill 3/32" holes through the fuselage and insert the aluminum tubing. Put a 6" piece of 1/16" piano wire through each piece of tubing. With the fuselage flat on the workbench, sight to see that each piece of tubing is horizontal. Epoxy or Hot Stuff the tubing in place. Sand carefully and make your cabane struts.

Cabane Struts: If you have facilities for silver soldering, it will have sufficient strength alone, otherwise a binding of small copper wire will have to be applied before soldering the joints. The struts are made exactly to the side view as they do not taper in or out. The struts do have a right angle bend at the bottom which allows them to enter the tubing about 3/4". Finally, prepare two diagonal cross braces, one for the front of the cabane assembly and one for the rear. Viewed from the front, these two diagonal braces will appear as an "X". Do not solder these two braces in until you are absolutely sure you will not need to remove the cabane struts. I waited until the plane was MonoKoted and all the radio gear was installed.

Wing: The wing is more or less straightforward, however, a jig makes the construction much easier (note the drawing). The jig is nothing but two strips of 1/16" x 1/4" scrap which helps form the undercamber.

Build the wing in two pieces. Bevel the inner ribs for the dihedral which is held in place by the 3/32" ply dihedral brace cemented between the top and bottom spars. After sheeting the top and bottom of the center section of the wing with 1/16" balsa, run a 1" strip of fiberglass completely around the center joint. This will give it more than sufficient strength. Cover the tip plates with your favorite plastic covering and apply after you have covered the wing.

If you are going to use a throttle, it will be necessary to put a servo in the wing and, if you want super long flights, it will also be necessary to put an auxiliary tank in the wing. If you don't use a throttle, it is almost impossible to get her down without doing it dead stick. Even with the engine at low throttle, she just glides the whole length of the runway. The servo in the wing is a Citizen-Ship CD150. It is exactly the size drawn on the plans and it is the largest servo that will fit in the space designated.

The tank is a 1 ounce Perfect which has been modified as shown on the plans. The tank works on a siphon principle. For it to work, it will be necessary to connect a piece of plastic tubing (K & S small clear) between the vent of the 049 tank and the intake of the 1 ounce tank. To fill the auxiliary tank, you must first fill the 049 tank, when it is full,

the fuel runs out the overflow and into the 1 ounce tank. When the engine is running, the filler tube of the 049 tank must be closed off or the siphon won't work. A small sheet metal screw in a 3/4" piece of the tubing is applied to the filler tube. As the fuel is drawn from the 049 tank, fuel is automatically siphoned from the auxiliary tank, air to replace the fuel comes in through the vent. When the 1 ounce tank is empty, the engine will continue to draw fuel from its own tank until it is empty, the fuel being replaced by air drawn in the vent of the auxiliary tank. Yep! It does work. Put in the auxiliary tank - - - it is an experience. After all, this is modeling and things that tax your ingenuity are fun. Drill your holes for the throttle rod and the motor mounts in the firewall before you install it, since it is much easier to do at this point, and you don't take chances of drilling holes in your fuel tank.

Tail: The stab and rudder are standard and made from 1/8" soft balsa. Don't forget the cross grain strips, since they give the soft balsa strength.

Landing Gear: It is imperative that the landing gear be made as light as possible. My Woody had two sets of wheels, the first were Du-Bro which are excellent wheels but are just too heavy for this plane. I replaced them with Trexler #6's which are free-flight wheels, two of which do not equal the weight of one of the Du-Bro wheels. I also made cutouts in the aluminum landing gear. The tail wheel is the first spring loaded one I had ever seen and it does make tail dragging much easier. The rear end swings around when you apply rudder for a turn and the prop blowing a breeze on that big rudder brings her around smartly. If you are careful about weight you can put a steerable tail wheel on and this makes the taxiing even easier.

Do not try and get the battery in the front cockpit. There is room between bulkheads 2 and 3 — put it there. The Woody has such a long nose moment that it is difficult to keep it from being nose heavy. With the battery in that location, it was not necessary to use any trim to get her to fly perfectly level.

Flying: You have heard, and I have written, about those planes that flew right off the drawing board — well, honestly, this one didn't. I almost lost her on the first flight. The first engine was assembled from a couple of old ones I had previously. I had forgotten that it was necessary to have a gasket under the glow head and I couldn't understand why the engine vibrated so much while running. Make absolutely sure your engine is functioning to its peak. In this plane the extra power furnished by a double ported engine cylinder is helpful. The .049 engine is just perfect, she is not an overpowered bomb or an underpowered weakling, and you can throttle back after she gets up there and is flying level.

She will putt around until the fuel runs out. It is important that you have as little elevator throw as possible. The first launch was by hand and it was too steep and I gave it a little down elevator to counteract the stall. "A little" was too much and she was almost into the adobe before I could give any up, then it was up and down until I could get her back safely to Mother Earth. Use long elevator horns and put the pushrod out in the last hole - - - at least for the first flight.

Is a mess like this worth building? *Absolutely.* When trimmed, she flies beautifully. After the launch, she runs way out kinda' just putting along, gaining altitude a little bit at a time, no climb-out like a homesick angel — she flies scale. I have built many planes of all types and I find the Woody a fun type of plane.

A hard landing caused by not flaring out soon enough divested my Woody of her landing gear proving those nylon bolts do shear off like they are supposed to. The extra bolts were at home. I had some double sticky tape in the flight box and a piece of Formica I used as a place to mix epoxy. I stuck the Formica on the bottom of the plane for protection. She finished the day of flying without wheels. Looked kinda' cute up there — much like an amphibian. Who will be the first to try her out on water? Bill and I discussed this during a recent telephone conversation and we decided that there was no .049 that would give it enough power to ROW. There was absolutely no difference in trim with or without wheels; they must be pretty close to the C.G. Have fun with your Woody. Let me know how your experiments with engine, tank, wheels, and amphibian come out and do have fun.

A kinda' P.S.: Bill informed me that his favorite sport with the Woody was to play limbo under his own antenna. He is an expert pilot. I don't do it and I don't recommend you do it either but this is an indication of the fun you experts can have with your Woody.

WOOLLY PULLER

The tractor version of the Woody Pusher was done simply as an experiment. The discussion has gone back and forth between Indiana and California a number of times as to the merits of making an amphibian out of the Woody. ROW is one step closer to reality with the Woolly Puller. It is felt that the OS .10 will have enough strength to get her up on a step and out of the water. Tests with the Woolly indicate that, under full power, she will climb almost straight up and she will still fly when the engine is throttled back almost to idle. As it is, the Woody has to land at almost dead stick, even throttling the .049 all the way back she will take the whole field to land, so it really doesn't take too much engine to

keep her flying.

The Woody and Woody weigh exactly the same, there is a slight difference if you add the muffler to the OS .10. But the power difference between the two engines is remarkable.

If you construct the Woody exactly as the plans show, you will have to cut 1/8" off the forward end of each cabane wire. The prop wouldn't hit, but it is more comforting if you have 1/4" clearance rather than 1/8".

It isn't very often that a builder encourages experimentation to his plane. According to most, he has gotten all there is out of the design and he is presenting the finished product to you, the reader. I would like to leave this open-ended and would feel honored if you would respond, through RCM, with pictures or sketches of your experiments and modifications to the Woody Pusher. After all, this is my third plane since my brother first sent me the drawings from 'Back Home in Indiana', and I intend to continue experimentation.

After all, isn't that what the word "modeling" means?

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