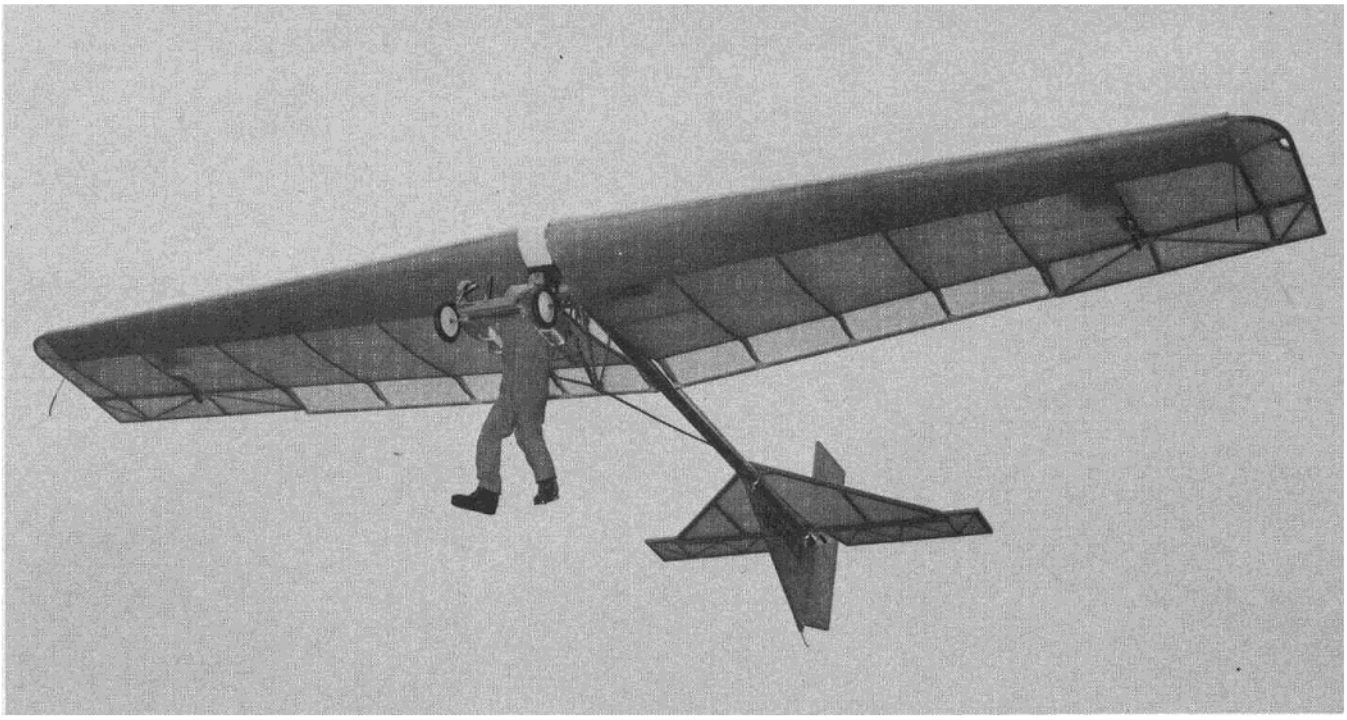


Vern Schroeder's 65" Span R/C Model of Volmer Jensen's

# SUNGSING

First Place Winner in R/C Modeler Magazine's 1974 Design Contest

Near the corner of National and Coronado Avenues, on the rim of Otay Mesa, south of San Diego, stands a monument — a tribute to a man — a pioneer — a pioneer of human flight. The inscription reads: "JOHN J. MONTGOMERY made man's first controlled winged flights from this hilltop in August 1882." He had flown some 603 feet and accomplished what others had dreamed of for centuries, opening for all mankind the great highway of the sky. Although much work was done with gliders by such men as Otto Lilienthal of Germany, Sir George Cayley and several lesser known, Montgomery has been credited with the first completely controlled hang glider flight.

In succeeding years such notables as Wilbur and Orville Wright, Glen Curtiss, Octave Chanute, James Doolittle, Eddie Allen and the Schweizer brothers, plus many more, all began their aviation careers with hang gliding, commonly called skysurfing, or self-soaring.

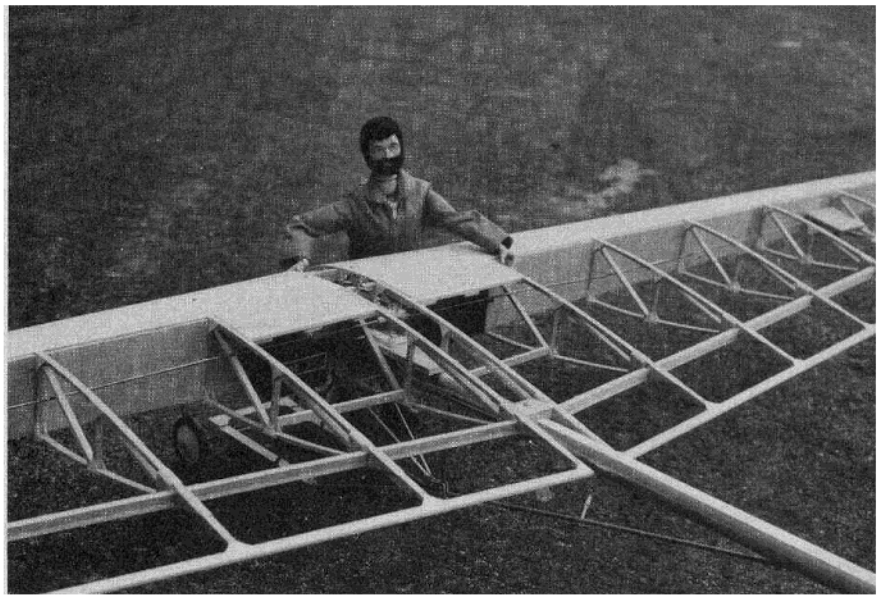
Another name which has contributed significantly to the sport of skysurfing is Francis M. Rogallo. Not as a pilot, but because his kite has been developed into the most common form of hang glider in use today.

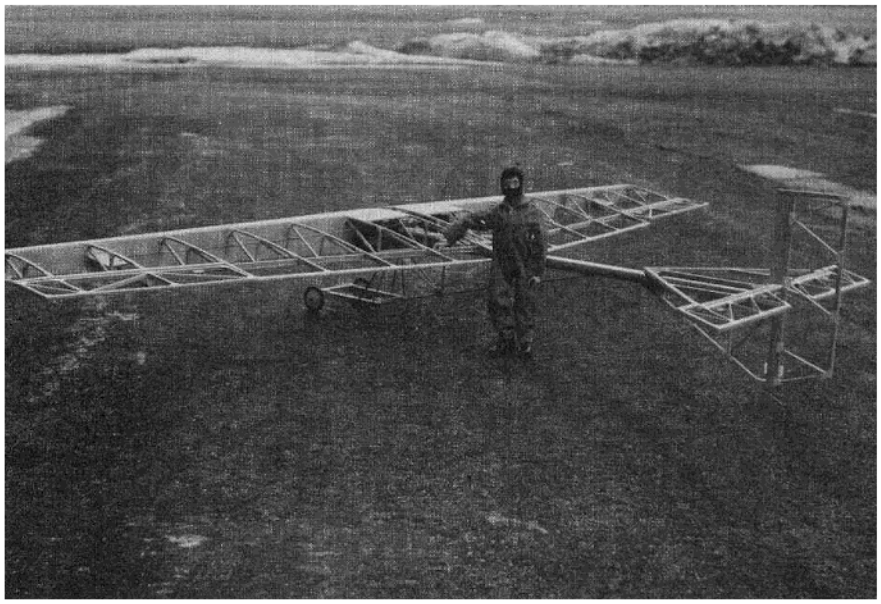
In the early nineteen hundreds, the Wright brothers spent several years experimenting with gliders until finally they added power to their latest creation, catapulting into the realm of powered flight, and pushing aside the development of skysurfing for nearly seventy years.

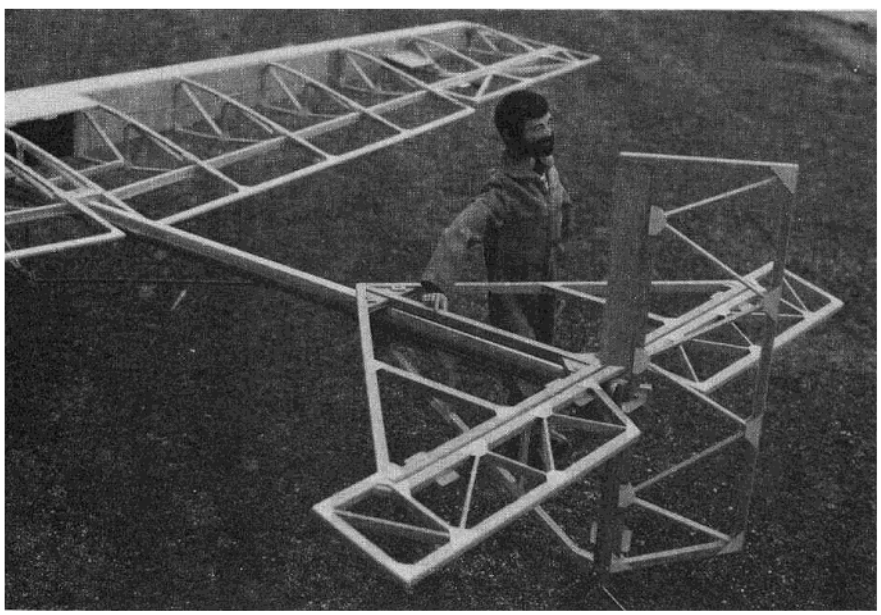
There was one exception, however. In 1941 a pilot named Volmer Jensen, frustrated by the Government ban of all flying within 150 miles of the California coast, built a different type of hang glider. Instead of relying on weight shifting and wing warping, he installed a full set of controls and it flew. This 100 lb. biplane glider, named "SO-LO", enabled Jensen to fly when all other aircraft were grounded. Over the next 30 years Volmer built more gliders, powered aircraft and amphibians. Today his hang gliders are among the best designed and most professionally produced available.

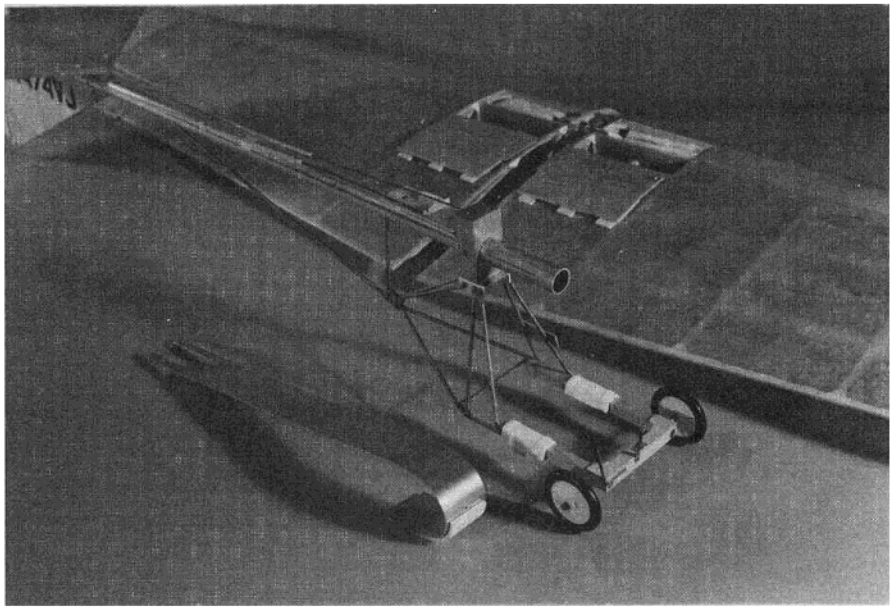
In 1971, to celebrate Otto Lilienthal's birthday, a successful meet was organized and the hang gliding movement has been growing ever since. It was after this meet and several consultations with Irv Culver, former Lockheed advanced aerodynamicist, that the VJ-23 Swingwing was born.

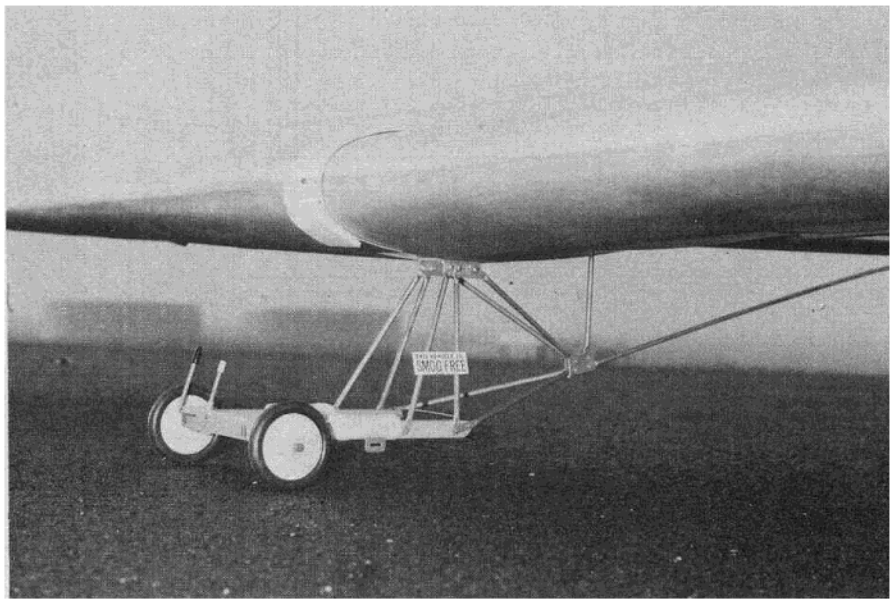
The VJ-23 is probably the most advanced hang glider design available today. It was designed and developed over a 12 month period and has hundreds of successful flights to its credit. It is the first full cantilever, fully controllable monoplane hang glider. Using a conventional control stick and control system similar to that of the Ercoupe, it can take off in a 15 mph wind, gain altitude immediately and climb above the take-off point. The Swingwing












has broken all records for altitude, duration and distance at the Sand dunes of El Segundo Beach. A sling type seat is provided for long flights.

The VJ-23 has a wingspan of 32 feet 7 inches, a length of 17 feet 5. inches, and weighs 100 pounds less pilot. Anyone with woodworking tools and experience can build the Swingwing in about three months spare time. It can be completely broken down so it will fit into any normal trailer. Assembly and breakdown time is approximately thirty minutes. The 16 inch thick root airfoil completely eliminates the need for external wires and braces.

The tail boom is made from a 15 foot length of 4'' x .035 aluminum tubing. The cantilever wing is constructed in two sections and joined by three bolts. The leading edge is covered with 1/32'' poplar plywood and the remainder of the wing is covered with lightweight doped aircraft fabric. For insured cockpit safety, in case of belly landings, the hanger structure was completely redesigned and rebuilt. The wheels are not used for landing, but are used to roll the machine back up the slope and into launching position.

A 9-to-1 glide ratio puts the Swingwing far above most of its competition on the slopes. At one recently held meet on a 7 to 1 slope, it was the only glider capable of leaving the angle of the slope.

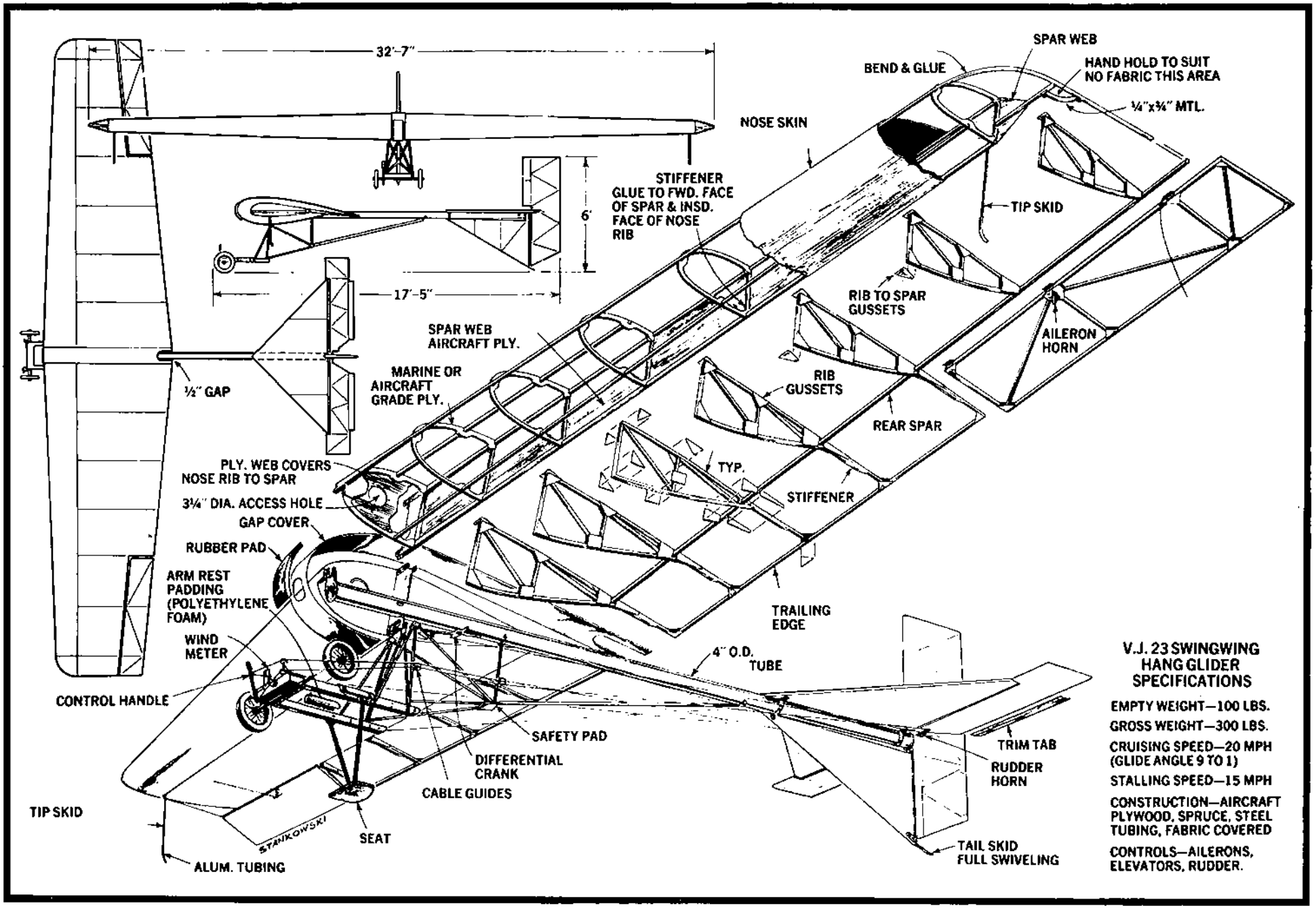
One of the most popular self-soaring sites in Southern California is located on the beach near the take-off lanes of Los Angeles International Airport, 400 yards south of Imperial Highway. There, Volmer Jensen and his Swingwing are a familiar sight as he makes one of his famous two-step take-offs from the top of the 33 foot sand dune and soars majestically out over the 23 degree sandy slope towards the blue Pacific; often to circle and rise as much as 20 feet above the slope and land near his original take-off point.

Volmer Jensen is today probably the world's oldest hang glider pilot. A living legend, superb craftsman, and enthusiastic experimentalist, at age 64 he still flies with ease, comfort, class and style.

Jensen is also a man of firsts: (1) First to build a 3-axis control biplane hang glider in the U.S.A.; (2) First in the U.S.A. to build a sailplane with a wing loading over 3 pounds per square foot; (3) First in the U.S.A. to build a side-by-side two-place high performance, fully cantilevered sailplane; (4) First to build a practical amphibious sport aircraft; (5) First to build a practical fully cantilevered monoplane self-soar or pilot-launching hang glider.

Volver has been called the missing link between the soaring youth today and those who foot-launched in the early days of this century. Once asked, ''Have you ever bothered other aircraft while hang gliding?'', he replied, ''Only RC models!''

Our model is built to a scale of 2'' = 1' which gives it a wingspan of slightly over 65'' and a length of 35''. It was designed from a 3-view drawing supplied by Volmer




## V.J. 23 SWINGWING HANG GLIDER SPECIFICATIONS

EMPTY WEIGHT—100 LBS.

GROSS WEIGHT—300 LBS.

CRUISING SPEED—20 MPH (GLIDE ANGLE 9 TO 1)

STALLING SPEED—15 MPH

CONSTRUCTION—AIRCRAFT PLYWOOD, SPRUCE, STEEL TUBING, FABRIC COVERED

CONTROLS—AILERONS, ELEVATORS, RUDDER.

Aircraft of Burbank, California. Construction follows quite closely that of the original aircraft except that all structural members were beefed up considerably to compensate for some of the abuse which we figured was bound to occur during the life of the model.

The wing and tail structures are built entirely of balsa except in a few places where we felt that spruce could be used to better advantage. All wing ribs are built-up as on the full scale aircraft. This proves to be quite a time consuming job and, when finished, the wing structure is quite a sight to behold.

The tail boom is made from 3/4" OD Reynolds aluminum tubing available at most hardware stores. All other materials are available at most well stocked hobby shops.

We definitely do not recommend this project for beginners and only an experienced builder should attempt to tackle it. As much of the detail as possible is shown on both photos and on the plans.

We will not go too much into detail, but will try to explain some of the more difficult phases of construction.

## TAIL SURFACES

Lay the plans out on your building board and cover with Saran Wrap or other similar type of clear plastic. All pieces are laid out, pinned and cemented in place over the plan in the usual manner. An aliphatic resin type of cement such as Titebond or Wilhold is highly recommended. We prefer to allow it to dry overnight or for at least eight hours. When dry, the structure can be lightly sanded and all gussets can be added. In the original, these were cut from file or recipe card stock. The simplest part of the model is now finished so let's move on to the . . .

## WING

This is the most tedious and time consuming part of the model. The ribs can either be built-up or cut from 1/8" balsa sheet as shown in the alternate method of construction. When making the built-up ribs it will be necessary to soak the curved pieces in water for a few minutes to allow them to be more easily bent and to retain their shape after drying. Be sure to wipe all excess water from the strips first so the cement will not be diluted and its strength reduced. Add the gussets while the cement is drying. When everything is completely dry, remove from plan and add gussets to other side of ribs.

It is extremely important that your building board be perfectly flat and free from all bows and warps. Three degrees of washout is built into the wing during assembly and dimensions are given for blocking up the leading and trailing edges to achieve this.

Begin by pinning the lower 3/16" square hard balsa spar down over the plan. This should be raised 1/16" off the building board to allow for the 1/16" sheet leading edge covering which is added later. Now fit and cement the ribs to the spar. The upper spar can be fitted in place to help hold the ribs vertical, but do not cement at this time.

When dry, carefully slip the 3/16" square spruce rear spar through the ribs and into place. Now add the 1/4" square balsa leading edge followed by the 3/16" square balsa front spar. Now block up the lower surfaces of the leading edge at the root and tip ribs to the dimensions shown on the plan. The rear tips of the root and tip ribs are, likewise, blocked up to the given dimensions. When everything is blocked up and aligned properly, all joints can be given a liberal coating of cement and allowed to dry thoroughly.

The 1/8" x 1/4" spruce trailing edge can now be cemented in place. A strip of masking tape from the lower surface of rib, wrapped around the trailing edge, and stuck to the upper surface of the rib will hold it in place nicely. The 1/16" balsa sheet webbing can now be glued to the rear of the center spars and the laminated balsa tips added.

The wing can now be removed from the building board and the lower front spar added. It is necessary to cut away the portion of the root ribs W1 between the center spars to make room for the 3/16" plywood dihedral brace. When joining the two wing halves note that there is no dihedral on the upper surface. It should be perfectly straight from tip to tip and should be checked by laying a straight edge across the top of the wing and held in this position till the joints are dry.

Finally, the 1/16" sheet covering is added to the leading edges. It will be necessary to wet the sheeting with either water or ammonia to allow it to be bent around the sharp curvature.

## FUSELAGE AND TAIL BOOM

Cut a 30" piece from a length of Reynolds 3/4" OD aluminum tubing. Square off both ends and file smooth to remove all burrs and sharp edges. File a 1/4" wide notch 1/8" deep in one end. This is to accept the rear vertical fin member and prevent it from bending from side to side when in place.

Cut block F1 from some type of hardwood, preferably maple. Bore a 3/4" diameter hole in it to accept the tail boom. For this we recommend a 3/4" power wood boring bit. It may be necessary to sand the hole slightly larger with sandpaper wrapped around a dowel to get the tubing to fit into it. The fit should be as close as possible but still allow the block to slide on and off the tube easily. Note that the hole is bored at a slight angle to allow the plywood wing gusset to fit tight against the block.

Carefully align this block with the slot in the rear of the fuselage and drill both tubing and block for #6-32 flat head machine screws. Use a tap size drill and then thread both the block and tube for a very tight fit with absolutely no slop. The block is countersunk slightly to allow the screw head to fit flush with the sides of the block.

Next, make the cockpit from 3/8" square maple motor mount stock. Reinforce the joints with wood screws as shown.

The cockpit supporting struts are made from 5/32" brass or stainless steel tubing with 1/8" music wire slipped inside before the ends are flattened and drilled. The actual lengths are shown on the plan. The dimensions given are from end to end, so drill the holes about 1/8" from each end. Before fitting any of the struts it is first necessary to mount the .063 aluminum bracket which attaches to the bottom of the hardwood block.

Work carefully, mounting one strut at a time with small wood or self tapping sheet metal screws, checking alignments each time. Do not pre-drill any holes other than those in the struts themselves. Position the struts, and when everything is aligned properly, mark the hole locations and drill.

Mount the 3/32" music wire axle with 3/32" landing gear clips and add other details such as arm pads, seat clips, joy stick, etc., as you desire. The fin and stab mounting straps can also be formed at this time from .063 aluminum. Mount the #2-56 machine screws temporarily at this time.

## COVERING AND FINISHING

Any type of covering material may be used as the builder desires. The full size ship was covered with lightweight aircraft fabric and doped sufficiently to render it non-porous; therefore some type of woven fabric material such as silk or nylon would be the most realistic. Although we have never used them, there are a couple of "iron on" materials which would also fall into this category. MonoKote is an excellent covering material but in this case we felt that its glossiness would detract from scale appearance.

We ended up covering the original model with heavy weight silkspan, mostly because we had a quantity on hand. Two layers with the grain running 90° to each other produces a very strong covering. The silkspan was first dyed a light tan color by spraying it with water in which a small amount of brown and gold Rit dye had been dissolved. It was then applied wet after blotting off excess moisture between two towels.

To finish, it was given four coats of clear dope. No color doping was necessary since we were trying to give the surfaces a translucent appearance. The cockpit frame should also be finished with clear dope. The cockpit struts should be painted an aluminum color and the tail boom left natural aluminum.

## RADIO INSTALLATION

Fortunately for the RC builder, the Swingwing wing has a thick enough section to enable all of the radio gear to be mounted entirely within its structure. The areas indicated on the plans are boxed in with 1/8" sheet balsa to hold the receiver and battery pack which should be well wrapped in foam rubber padding. The model can be flown with ailerons and elevator only or using coupled ailerons and rudder. The coupled ailerons and rudder are preferred, but the builder may feel that the added complexity of the linkages may not be worth the extra effort, since the performance may not be that greatly improved.

The servos are mounted to the rear side of the plywood wing gusset with servo mounting tape. Give the gusset a couple of coats of clear dope first to improve adhesion of the tape. The bellcranks are mounted on a 3/16" thick plywood platform fastened to the boom with #4-40 machine screws. Pushrods are 1/16" flexible cable in nylon sleeving to prevent metal to metal contact which could cause electrical noise and interference to the radio system.

The antenna may be concealed inside of the wing structure. 1/16" plywood hatches should be provided for access to the radio gear and servos.

**FLYING**

If all assembly has been done very carefully, your Swingwing should be in perfect alignment, i.e. the stab should be perpendicular to the fin and the wing likewise. If not, it may be remedied by loosening the mounting screws, shifting the surfaces slightly and re-tightening. If this doesn't do the trick, a few shims here and there may be necessary. Remember, mis-aligned surfaces can cause severe instability which may, or may not, be corrected by the trim levers on the transmitter. An ounce of prevention is always wise at this point.

The ailerons should be set for about 30 degrees up and about 10 degrees down as a starter. 20 degrees of movement in each direction should be plenty for the tail surfaces. Minor adjustments may have to be made during the first few test flights as necessary; since all models will differ.

The model should be balanced at the point shown on the plans. Be sure to have your pilot fastened in place before this is done. It might even be wise to forget the pilot and place some ballast in his place for the first few test flights.

It would also be wise at this point to make a few test glides to see how your model is going to behave in flight. We recommend doing this over tall grass if possible. Run for a few feet to get up some speed and then release with the nose slightly downward. Do not launch it with the nose level, or high, or it will more than likely stall and nose into the ground, possibly damaging the model. Make any necessary trim adjustments by adjusting the linkage on the rudder and elevator horns.

Once your test gliding is completed, you're ready to try it at your favorite slope soaring site. Admittedly, the Swingwing is more of a novelty airplane than most. I doubt if anyone will ever win any contests with it, but we are sure that wherever you take it, it will more than likely arouse a multitude of comments and questions, and perhaps even a few snickers. At any rate, it makes a good sport model, and for most of us anyway, that's the name of the game.

Our special thanks go to Volmer Aircraft for furnishing us with three views, and to the Self-Soar Association for furnishing us with a copy of Low & Slow No. 17 which is devoted entirely to Volmer Jensen and his Swingwing. Last, but not least, our thanks to G.I. Joe, who has served faithfully as pilot of the Swingwing throughout its development, and who probably has accumulated more hours in, and has flown more different types of model aircraft than any of his peers today. □

**From RCModeler Oct. 1974**