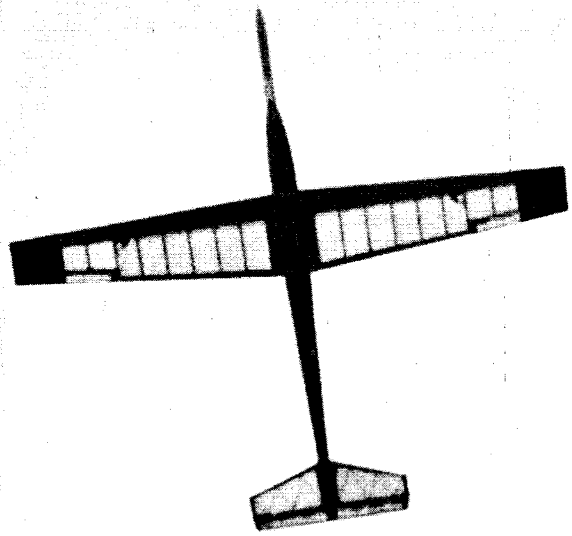


Skydancer

Fascinating combination of space, aero, and RC flying. Nine-pound-thrust rocket motor sends this boost glider 200 feet straight up for long fast glide.

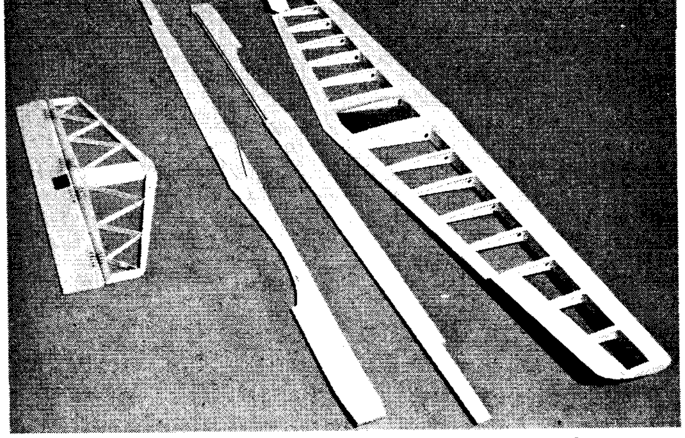
LARRY RENGER

HAVE YOU EVER SEEN a big dual-digital-proportional model blast two hundred feet straight up under nine pounds of rocket thrust? Skydancer is just such a breakthrough in the wide-open field of RC boost-gliders. This model also has good duration coupled with aerobatic capability following that spectacular launch! Its graceful performance has earned it the name Skydancer.

This boost-glider is an experimental project by the Research and Development staff at Estes Industries and was originally conceived by John Simmance, Director of Model Products Development and five times champion in scale at the British Nationals. The design, construction and development of the model were assigned to me because my indoor model and free-flight experience would aid in design of a light airframe. I also had designed and flown RC slope soarers and had originated both the front-engined boost glider and the "pop-pod."

Although NARAM 12, the Rocket Nats, was but four weeks away when this assignment was given, it did seem possible to have the glider ready for a demonstration at that annual meet. Construction took two and one-half weeks from initial sketch to first flight, and Bert Striegler, Technical Editor for Continental Oil Company, was asked to fly Skydancer for a NARAM demonstration.

At last year's Rocketry Nats, the Skydancer was first flown in public. Hold up-elevator during thrusting, then turn into glide.



Skydancer is built like any model plane, but it must be stronger to withstand acceleration and high speed in launch.

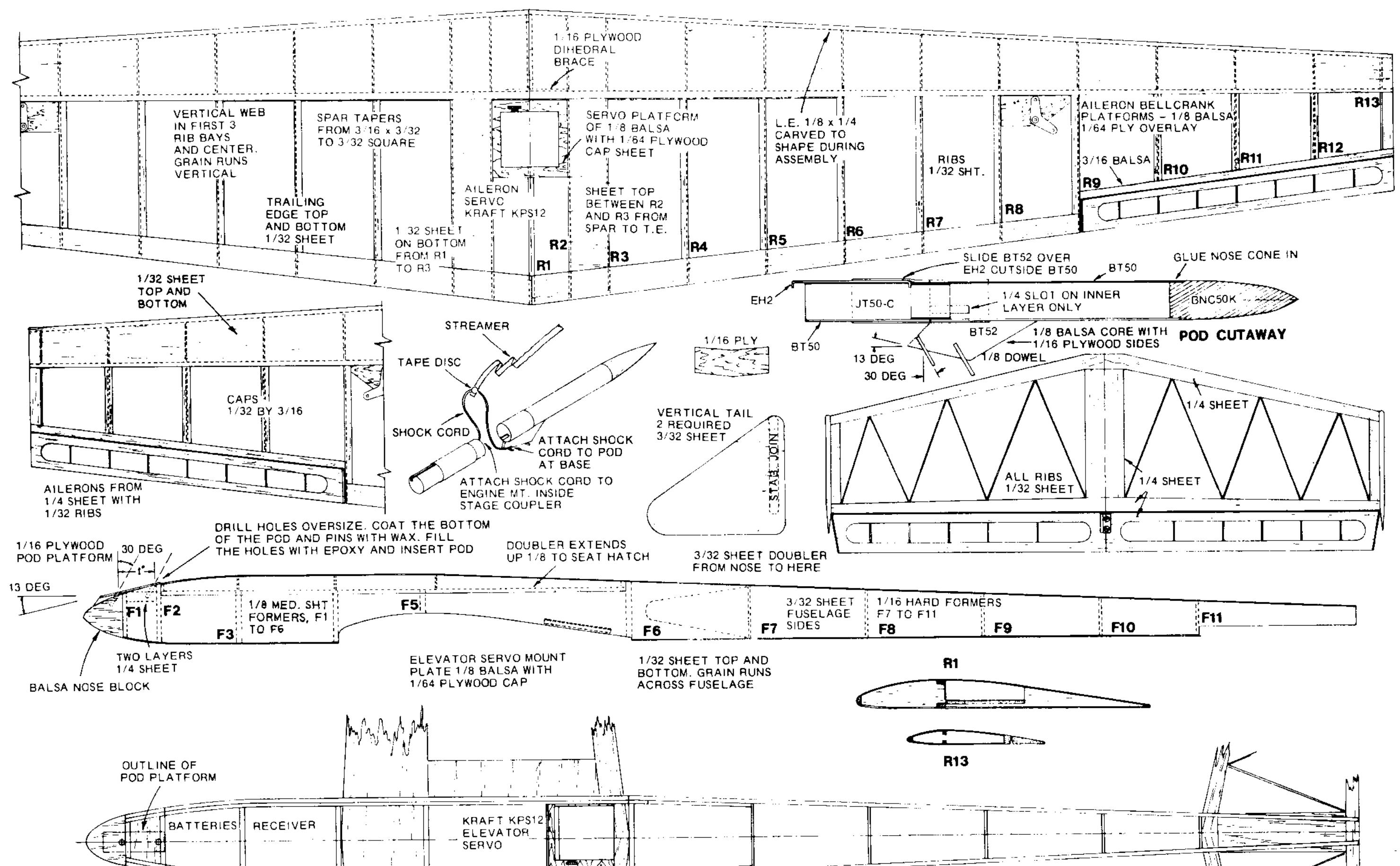
The model was test flown successfully several times at Estes' Penrose, Colo., test grounds. Then, just before Skydancer was to be shipped to the Houston contest site, its wing was destroyed when the ship collided with a power line. Enough had been learned by then to develop a new, larger wing. The old wing had a 36-in. span, which was now increased to 44 in. At the same time, ¾ oz. was cut out of the structure. After some late hours building, the improved model was sent off to NARAM 12 only one day behind schedule.

With the help of Bill Simon, Executive Director of Research and Development at Estes, Bert Striegler made several test flights and found no serious problems. Despite high winds on the day of the demonstration, Skydancer made a perfect flight before the assembly at NARAM—a satisfying milestone in an interesting project.

Normally, Skydancer is powered by a single D-13-3 Estes engine for a vertical flight of about 100 ft. The model is completely controllable, even during the boost phase. Transition to glide is easy and smooth. The best flight with the old 200-sq. in. wing at 12¼ oz. was 1:06. Using two-stage motors and the new wing, flight duration usually has been over two min., even with an occasional loop thrown in.

Two Kraft KPS-12 servos, one 225 mah battery pack and a Kraft three-channel receiver for an airborne weight of 6½ oz. provide aileron and elevator control. Although the equipment could have been modified to further reduce weight, flying with off-the-shelf gear was one of the project's goals. This model works quite well, but it is just a starting point. The structure can be lightened and the tradeoff of boost altitude versus glide must be investigated.

All recent flights have been with a D-13-0 booster taped behind the D-13-3. This is not legal for the NAR, nor is it good practice. A true, legal, two-stage *(Continued on page 87)*



Skydancer

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pod is next on the list for development. One flight was attempted with twin clustered D-13-3 engines for liftoff thrust of 18 lb. The model nosed over off the launch rail and accelerated across the field at an altitude of about one ft. before the speed built up enough for the elevator to overpower the nose downthrust moment. That experiment has not been repeated!

Construction: The wing, with the aileron servo, is built first. Cut out forms for ribs R-1 and R-13; the forms should be 1/32" undersize from the outline of the airfoil. Use 1/16" plywood and cut in the spar notches. Sandwich balsa strips, alternating 1/32" for ribs and ⅛" for spacers, between the forms and pin it all together. The two spacers between R-1 and R-2 and R-3 should be 1/16" sheet, since the spacing is 1", not 2" as for the others.

Carve the block of ribs and spacers to shape, spar notches and all, then repeat for the other wing; discard the spacers. Cut the tapered spars out of hard 3/32" sheet.

Wing assembly by the following procedure will result in a warp-free structure. Pin down the lower spar, glue all ribs in place, then glue in the top spar. Ribs R-1 should be set to the dihedral joint angle of 82½ degrees. Glue the leading edges to the ribs. The bottom of the LE should be pinned to the workboard and will act as a jig later. Trim ribs R-10 through R-13 for the ailerons and install the 3/16" trailing edge. Cut and glue the upper trailing edge sheet in place.

Next, glue the two panels together, bracing them up to a dihedral angle of 15 degrees. Cut rib R-1 to accept the dihedral brace and glue it in.

Sheet the bottom of the wing and put in the cap strips. Do not carve the LE yet. Pin one panel of the wing down, use the LE as a jig, and sheet the top. Glue in the spar webs on that side now; let it all set up hard before unpinning. Repeat for the other panel. The wing should now be warp-free and remain so. Carve the LE to shape and sand the wing smooth.

Cut away the area needed for the servo mount from R-1 and install the servo, pushrods, bellcranks, etc. The pushrods on the original are 8" lengths of Estes launch lug tubing (a very light. strong 5/32" mylar tube) with the 1/16" wire ends simply expoxied inside. Set up the ailerons for about 25 degrees up and 10 degrees down movement. Use a ½" horn on the elevator.

The remainder of the aircraft is standard construction except for the pod and pod mount. The pod is a rear ejection model which reduces the likelihood of a "Red Baron" where the streamer tangles with the model. Two such situations arose with the original Skydancer. In one instance, the pod hung up on the stabilizer but, with the control available, the model landed safely.

The pod is built before the model so that the mount lugs fit their sockets exactly. Dowels must be perfectly parallel to achieve a smooth sliding fit. The shock cord must attach to the bottom rear of the pod mount or the pod will tend to bind. Drill the holes in the nose of the model well oversize and then use the pod itself, well-coated with release agent, to cast the mount holes.

The model is launched from 18" of C-Rail; ignition by a standard 12V launch system. Two launch lugs are epoxied to the top of the fuselage hatch cover, the remainder of the top of the cover is protected by heavy silver foil.

Flying: Skydancer is a sensitive, neutral stability model. When rolled to a bank it will stay there until rolled out. Elevator must be used in conjunction with aileron for turns, but the sharp turns are handyon landing approach.

Mild aerobatics are easy with this glider, although the flat bottom airfoil limits the variety. It is great fun to loop by pushing in a bit of down to gain speed then grab up for the loop. Little altitude is lost because the ship can climb back almost to its starting point after the maneuver.

Rolls can be done, but plenty of speed is needed. As she comes over, push full down to prevent the nose from dropping. This takes practice to get it right.

Inverted flying is also possible for those with strong nerves.

There is some nose down tendency as the model comes up from the launch rail. Be ready to pull a small amount of up elevator at first, but as the model accelerates, begin to hold the nose down to maintain a 70 degrees to 80 degrees climb. The model is down to glide speed at ejection so it should be nosed over to glide about 4½ sec. after final-stage ignition.