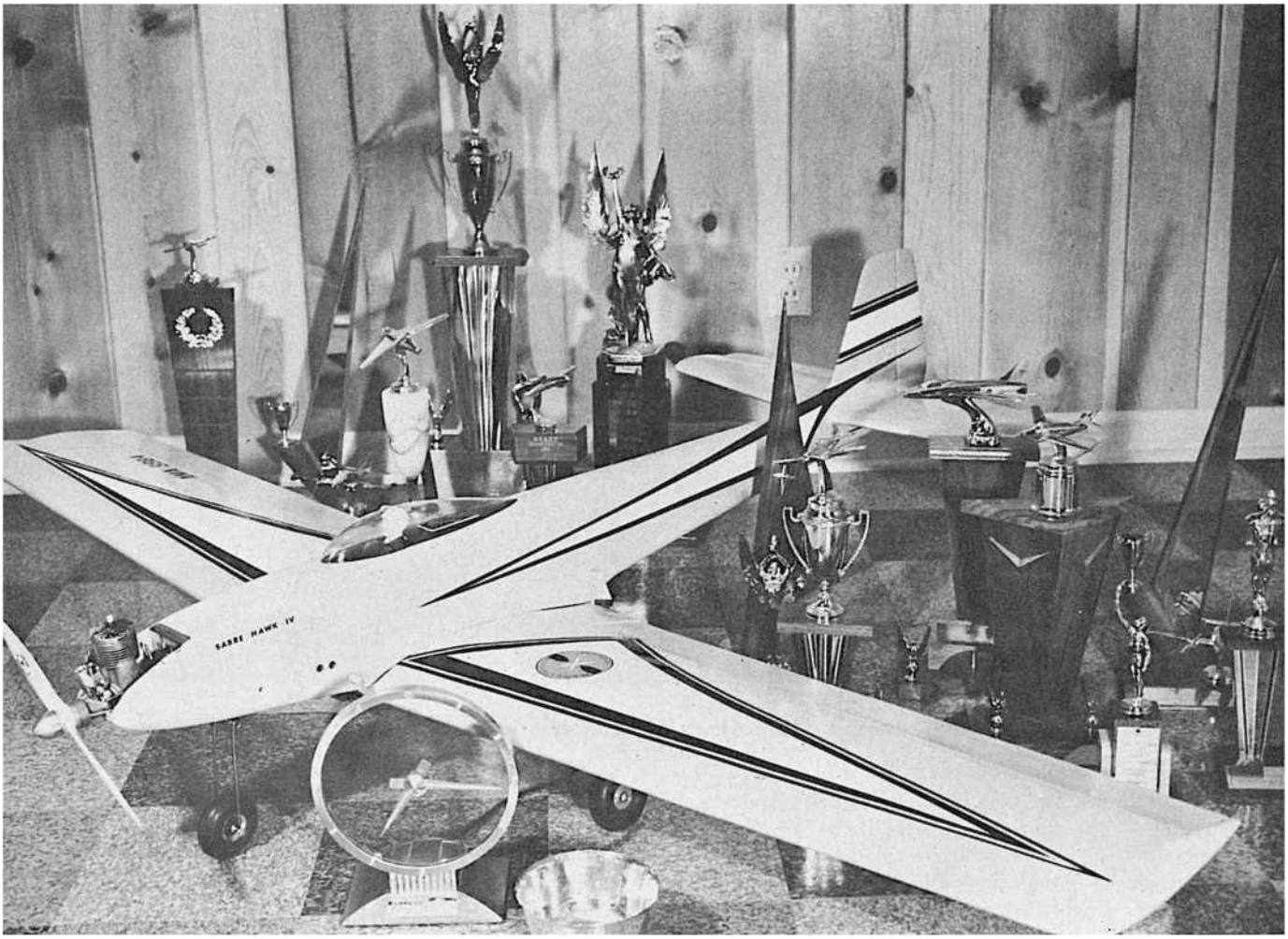
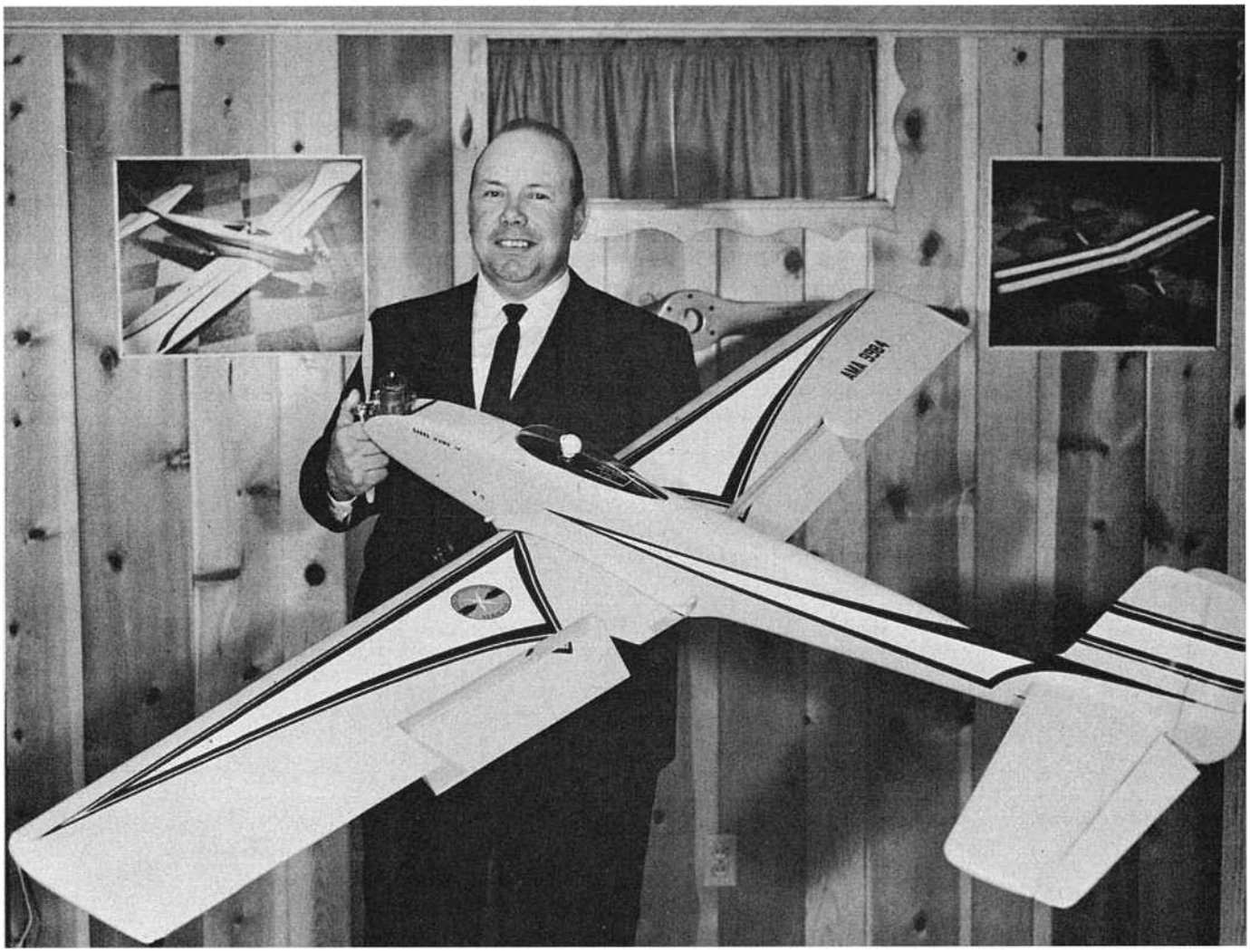
SABRE HAWK IV



by
Ed Izzo

NEW YORK STATE CHAMPIONSHIPS
1st—1962 2nd —1963
BUFFALO BISONS INVITATIONAL
1st—1962 2nd —1963
NEW ENGLAND CHAMPIONSHIPS
1st—1962
AERO GUIDANCE SOCIETY
1st—1962 1st—1963
LONG ISLAND DRONE'S INVITATIONAL
1st—1963



Full Size Plan Available

The Sabre Hawk was first designed for the flying season of 1960 — the four years spent in its development being well rewarded in that this airplane has won more major RC contests in the East during the past two years than any other single design. The Sabre Hawk's contest achievements illustrates its inherent consistent performance.

Prior to this design, I had flown an Astro Hog, which performed well, but was large and heavy. With the design of the Sabre Hawk I, I attempted to build a smaller and lighter airplane. It's configuration has remained intact except for changes in the airfoil and moment arms. Although I have flown this airplane exclusively for contest work, a number of Sabre Hawk's have been built by non contest fliers, and has proved to be a good transition airplane for its average flier.

We often hear descriptions of aircraft moment arms along with the many different interpretations placed upon them. The correct interpretation of the tail moment is the distance from the CG of the plane to the hinge line of the elevator, divided by the mean chord of the wing. My interpretation of the nose moment is the distance from the CG to the trailing edge of the prop. You will note that the Sabre Hawk utilizes a very long nose mo ment, which I feel has the following distinct advantages: (1) it gives a better grooving airplane in the inside and outside loops, and (2) allows you to stay level in banking turns without any hooking-in tendencies. Another· advantage is the fuel tank placement it allows, giving you a more pronounced rearward moving CG as the tank empties. It is obvious that the latter is an advantage in the present contest pattern event because the maneuvers requiring a rearward CG are all at the tail end of the pattern when the fuel is low, e.g., the spin, tailslide, verticle eight, traffic pattern, and landing.

Another myth I would like to attempt to dispel is the present consensus of opinion that entirely different designs should be used for proportional and reeds. The Sabre Hawk has been flown with both control systems with no discernable difference in flying characteristics with the exception of the flying ability of the pilot. The Hawk, as shown in the plans, was set up for 12-channel reed equipment. This includes use of either fine-throw, self-neutralizing aileron servo, or the use of flaps, the latter providing a pronounced advantage in landings and takeoffs. In the latter part of this article I will cover the use of these two features with respect to general flying and contest work.

Fuselage Construction

Start with two 3/32" x 4" x 48" evenly matched fuselage sides. Then glue doublers, ½ x 45 degree pieces, nose doublers, and engine mounts in place. Except for the side doublers, Ï use white glue exclusively in the nose section and for all plywood parts. The three formers are glued in place using a flat surface to insure the alignment of the fuselage. Dampening the outside surface of the fuselage sides will allow you to form them more rapidly. The top block is hollowed out in areas previously marked by test-fitting it to the fuselage. The bottom block of the nose, with the plywood landing gear support preglued in place is installed along with the bottom sheeting of the tail section. The fuselage is now roughed to shape with a razor plane. The latter is art excellent tool, allowing you to shape balsa parts very rapidly with little chance of undercutting. I use two of them, one being adjusted for coarse cuts, and the other for finer work. The rudder outline is cut out and the fillet pieces glued to both sides and rough-shaped. A little time spent in shaping the fillets of both the rudder and wing saddles will pay off with a final appearance of a smooth-flowing, wells shaped aircraft.

Next, glue the rudder and wing fillets in place. The fuselage is now ready to be completely sanded. Follow with two coats of clear dope and then apply your silk.

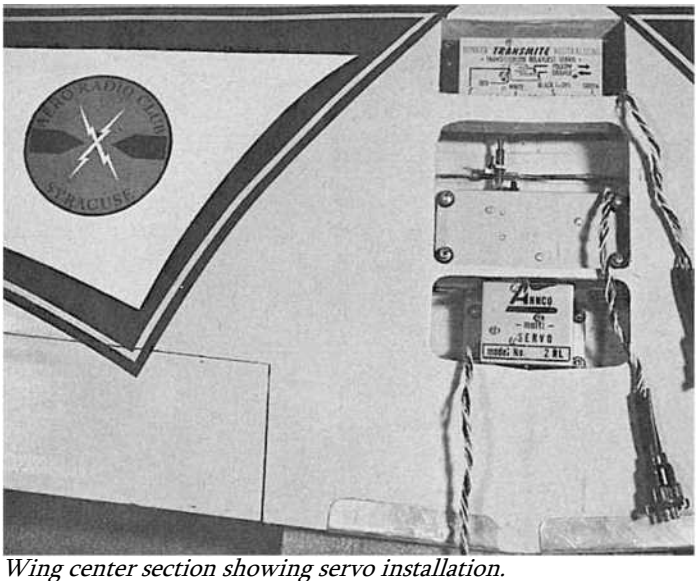
I'd like to give a hint at this point — one which has reduced silking time and insures a wrinkle-free silking job. Use a soft cloth folded into a pad approximately 4" x 6" square. Drape the dry silk over the fuselage and dope through the silk on the top surface of an area approximately 2" wide by 8" long. Using this pad, wipe off the doped area in long, flowing strokes. This leaves a minimum of dope, which will dry rapidly, and leaves the silk pressed tightly to the balsa structure without wrinkles. This method works especially well in concave and convex areas.

Plank the stabilizer with 1/16" medium soft balsa sheeting on the top surface first. When gluing the bottom sheeting on and pinning it in place, use a flat surface with shaped pieces to fit the leading and trailing edge of the top surfaces. This will give you a warp-free stab. The advantage of sheet planking is its ability to lock up the structure when the final piece is glued in place.

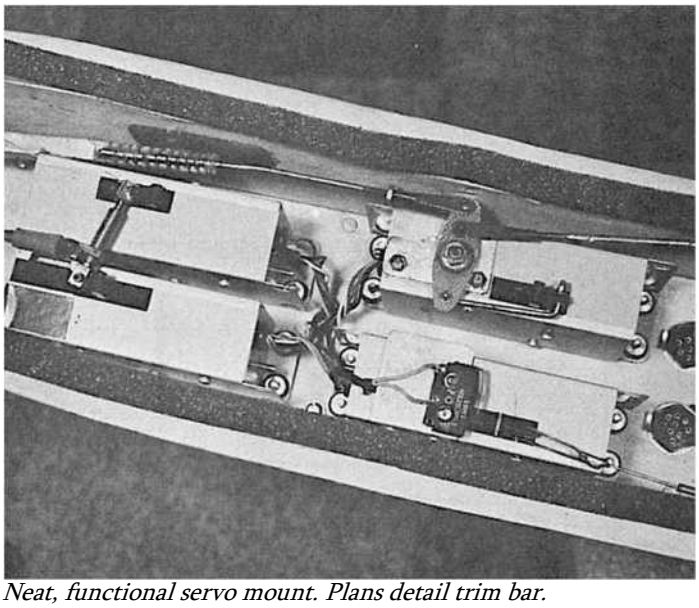
The elevator is then cut and shaped, and the stab and elevator are given a final sanding and two coats of clear butyrate prior to silking. You will note the long elevator horn which gives an important advantage in adjustment. I silver-braze the elevator horn to a *3/32"* piano wire, using silver brazing wire and flux purchased from Sears. I highly recommend the use of a small propane torch and silver brazing wire for connecting steel linkages and fittings in your R/C plane. I will withstand the vibrations and jolts more than soft soldered connections.

A template is made for the center section of the stabilizer. This is used to mark off the area to be removed from the fuselage in order to glue the stabilizer in place. I use leather fillet material between the fuselage and stabilizer, gluing it in place with white glue and wiping off the ex-

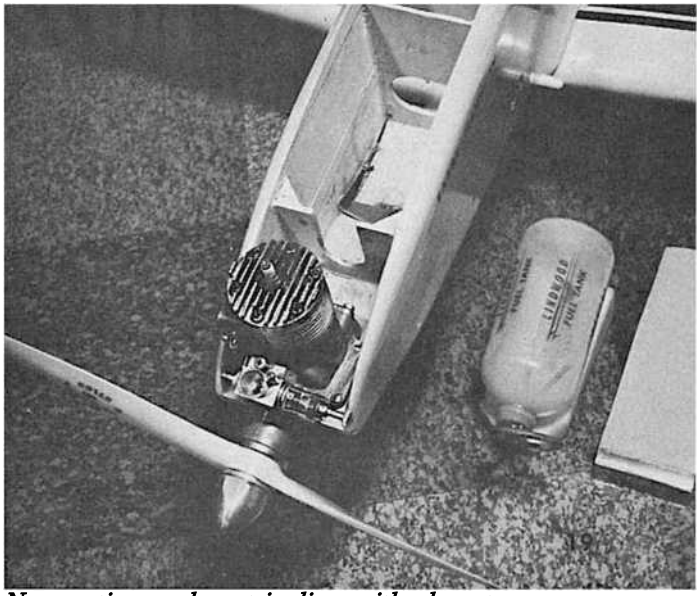
(Continued on page 18)



Wing center section showing servo installation.



Neat, functional servo mount. Plans detail trim bar.



Nose section — clean, trim lines with adequate space.

cess with a damp cloth.

Wing Construction

The steps used in constructing the wing are as follows: First, glue the ribs to the bottom and top spars. Soak the leading edge in hot water and form over a bent-up leading edge section made up of aluminum sheeting. The dried leading edge forms are glued in place, along with the top and bottom trailing edge pieces.

With all aileron and flap linkages installed, the top center sheeting is cemented in place. The wing is reversed and the bottom sheet is fitted and cemented. All alignments should be checked before locking in the last piece. The wing may be constructed with just a single servo for aileron control, and with or without flaps. The Sabre Hawk has been flown without flaps and fine-throw ailerons.

Completely sand the wing, using 240 and 320 grit paper, then apply two coats of clear dope before silking.

Equipment Installation

If I had to venture a guess. I would estimate that approximately 80% of equipment malfunctions are due to faulty installation. I would like to emphasize that a little extra time spent in planning and installing your equipment will pay off greatly in reliability and consistent performance. I sleeve all of the wires to insure against vibration and fatigue breakage of connections. In the area where the receiver antenna passes through the fuselage, a strain relieving connection should be made by wrapping this area with 14" wide masking tape and coated lightly with dope, allowing enough flexible length between the inside of the fuselage and the receiver. I have seen many examples of well-padded receivers with all of the strain on the antenna lead!

Try to keep to a minimum the number of times the engine is removed from its mount. Each time the engine is reinstalled, its crankcase is distorted in a slightly different direction than its previous mounting. This is evidenced by the black gunk from the exhaust after reinstalling the engine.

You will note on the plans that a linkage is connected to the rudder servo. The reason for this is to give increased rudder movement for the spin, plus decreased nose gear movement for smoother taxing. I use an R.G.A. kick-up elevator board that is energized when the motor servo is in low motor position. I have also been using a sponge wrapping around the fuel tank and noted that this application was described in an excellent article on engine idling by Clarence Lee. The height of the fuel tank is adjusted by shaping the polyurethane block used under the tank.

Flight Adjustment

I set up the aileron linkage so that the up-movement of the trailing edge of the aileron is 17/32", and the down movement is 13/32". The up and down of the elevator should be approximately 3/8" each direction, with the elevator trim adjustment up and down 1/8" each way. The fine aileron movement should be 1/4" up and 3/16" down, measured at the trailing edge. I usually stick a pin in the trailing edge and use this as an indicator against a scale. I always record the amount of movement to be used as a reference for subsequent adjustment.

To obtain the proper aileron adjustments, I trim out for level flight. I next make a right and left banking turn, noting whether the airplane hooks-in either way. If, for example, during the right bank the nose hooks-in, it is an indication that the left aileron should be raised 1/2 turn on the DuBro adjusting link. It should be noted that the aileron opposite from the turn that has the hooking-in tendency should be adjusted, the reason being that this aileron will be the one that is raised, therefore having less effect in high speed maneuvers. It has become quite evident that trimming the aileron in level flight is not sufficient, and that additional trimming may be necessary for banked turns and high-speed, looping maneuvers. I usually set my elevator trim so that full-up is the landing attitude in calm weather, with full-down giving a slight climbing trim in level, inverted flight. I use a slight amount of down-trim for takeoffs. This insures a smooth, "no-zoom" takeoff.

When flying with the fine throw aileron, I set it up to be used with the 41th and 12th channels of a 12 channel rig, using it in the pattern segment of the contest flight. You will be amazed at the very smooth, proportional type turns that can be executed by using this feature with reed equipment.

Flaps

I set the flaps so that they drop to a 25 degree angle. Some of the unique characteristics that I have encountered while using the flaps is the ability of the airplane to have a very low forward speed with full flaps, engine in i/4 throttle, and a slight amount of down trim. Whenever the flaps are lowered, a nose-up attitude is taken and down-trim is required. To find out what would happen with full power on, I lowered the flaps — the plane immediately started to loop, and continued looping until the flaps were raised. Consequently, **do not lower flaps for any engine setting above medium throttle!** When using the flaps in a contest, I wait until I'm in the downwind leg, place the engine in low throttle, and simultaneously hit the down-flap and the down-trim levers. This gives a smooth transition from powered flight to flaps down, slow flight.

The first time I used flaps in competition was at the Buffalo Bisons Meet at Buffalo, N.Y., and I had the good fortune of leading throughout the contest until being overtaken in the last round. I might add, the weather was calm in the morning and the field rather short. The flaps allowed me to make steep, slow-speed approaches and very short takeoff runs. You will be surprised, that with the flaps fully extended on takeoff, a run of only ten feet is required!

In closing, I would like to state that I have been flying the Sabre Hawk with styrofoam wings of the same configuration. I find this to be a faster building and sturdier wing with no undesirable flight characteristics. I wish you luck in building and flying the Sabre Hawk, for I have enjoyed many hours of good flying and have received numerous comments about its smooth, clean lines.