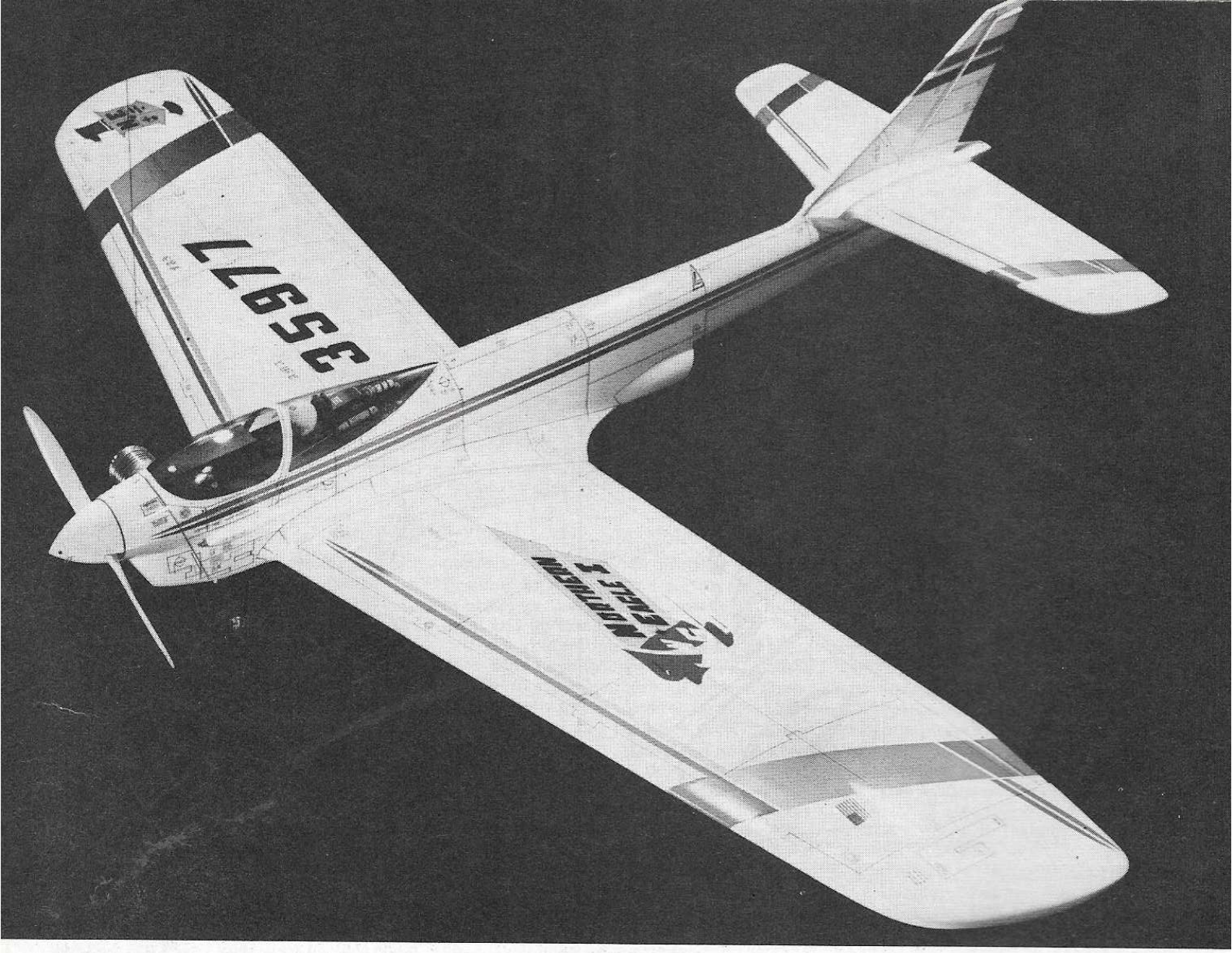


A vision of flight. Dave's planforms are symbolic of what designs should be. Conventional techniques must give way for a better idea. Beautiful.

Lower right: Practical in planform, exciting in concept. Pride has its place in flight for it encourages a flier to excel. Dave and his Eagle.

The "Northern Eagle"

by Dave Gierke

Sculptured lines mark this exotic machine. A marriage of Controline and R/C thinking. Slight on room, but great performance.

The *"Northern Eagle"* was conceived in the Fall of 1968. It was intended to transfer controline stunt design and styling into the radio control field.

Ralph Perillo and I each built a version of the basic design concept specifically for the Toledo Mid-Winter Show of 1969. My model was completed in time for Toledo where it won best finish and best sport design category. Ralph's model was completed in time for the Buffalo show where it won best design.

For those of you who are familiar with the controline flying events you will probably see a resemblance to certain design types, as exemplified in the *"Eagle."* To some people the aircraft looks like a team racer while others see a definite stunt influence.

The model was set-up to fly full pattern competition. Wing area is only 600 square inches but performance, especially in high wind conditions, proved to be impressive, as exemplified by Ralph's initial flight testing. My Toledo version of the *"Eagle"* was never flown and now rests comfortably on the conference table of Bernie Paul of Associated Hobby Manufacturers in Philadelphia. Bernie made me "an offer I couldn't refuse" at the Toledo Show.

During the design phase it was decided that a swept-back wing would be advantageous to superior performance. This, however, created problems concerning tank location and radio equipment space. Notice that the wing root has located itself quite far forward on the fuselage. With the advent of very small, lightweight radios the equipment space problem with the design has diminished somewhat. We utilized a 225 milliamp battery pack to conserve on space with the original model.

A sidewinder engine was chosen as a matter of operating convenience. For some reason a stunt engine seems to be a real pain in the neck to set-up and operate from the inverted position. Inverted engines are not impossible for stunt, but they offer a considerable handicap to the serious competition flier. The radial mount concept was utilized in order to maintain a clean, low, frontal area nose section. Blind mounting nuts are used behind the ¼" firewall.

Initially the aircraft was designed to run a Super-Tigre .51 for power. It has successfully operated on this as well as

with a variety of 60's. With a Veco .61 the ship is a real bomb. One problem with the .60 size engine is having a large enough fuel tank in which to complete the entire pattern. Actually, the K&B .40 front valve engine with Perry carburetor is ideal if the total model weight is kept below about 6½ pounds.

As you can see, the original model was equipped with fixed landing gear. The model was never tried with retracts because of the nose gear space problem.

With the new retract systems (especially pneumatic) it may be possible to fabricate a retractable nose gear. However, *"Northern Eagle"* functions admirably the way it is.

The knife-edge maneuver was found to be impossible using the smaller power plants. Air frame speed (relatively low) combined with the small fin/rudder area is the culprit. With the larger engines the fin/rudder area is quite adequate with increased speed. If a .40 size engine is to be used, I would advise adding about 30 square inches to the fin/rudder combination (20 sq. inches to the fin, 10 sq. inches to the rudder).

From the photographs, you will notice that there is considerable sculpturing performed on the fuselage/empanage unit. On my version you will notice the dual exhaust exits on the fuselage. These were eliminated on Ralph's model, thus saving considerable time. Also note the stabilizer fairings. These fairings were primarily added as a visual consideration. They do, however, add a certain amount of structural stability to the empanage. These may also be eliminated if you wish to save construction time. More time may be saved if you wish to go without the cockpit detail. In the final analysis it is left to the individual, the amount of effort to which he will exert himself.

Since there is a considerable amount of sculpturing involved with this model, the block construction method was utilized. All fuselage/empanage blocks were "tack" glued in place with cellulose cement and shaped to final size. The blocks were then broken apart and hollowed to save weight, especially in the aft section. Final assembly was made using Tite-Bond glue.

Initial construction is started with its wing. The wing, as you can see, is of foam core construction, sheeted with balsa wood. The airfoil sections as shown on the drawings are used as the root and tip templates. The airfoil sections are: 64-018 root and 64-012 tip. The root section is less efficient than the tip, thus it tends to stall first, initiating tip stability. Mr. Stott of *Foam Flite* fabricated the initial set of wings for us, with very satisfactory results, at a reasonable fee. Notice the two plywood spars used in the center-section of the wing. Strip ailerons were incorporated with satisfactory results. Observe the main landing gear mounting method. The gear is first J-bolted to a ⅛" plywood base which is epoxied into the matching foam core cutout. A balsa sheet "cap" is cemented over the open area around the landing gear. The idea of using the plywood mount plate is to increase the gluing surface contact area, thus reducing torsional failure during a hard landing. This system works extremely well for our application!

The stabilizer was also constructed from a balsa sheeted foam core, similar to that of the wing. Notice that the stabilizer has been joined together at the root utilizing its own spar. The elevator linkage is internal and adjustable at the horn by utilizing a clevis. This is accomplished by turning the pushrod from the radio compartment.

The fin/rudder is constructed from ¼" quarter sawed medium weight balsa. The rudder control horn is external and may be adjusted at the horn by its clevis.

The fuselage is constructed primarily from 1/16" plywood doubled balsa fuselage sides. With the addition of formers the basic structure will take shape. The before-mentioned block construction constitutes the major allotment of activity concerning the fuselage. It will undoubtedly help to make styrene or cardboard templates in order to adequately match the left to right side shape at various fore to aft sections.

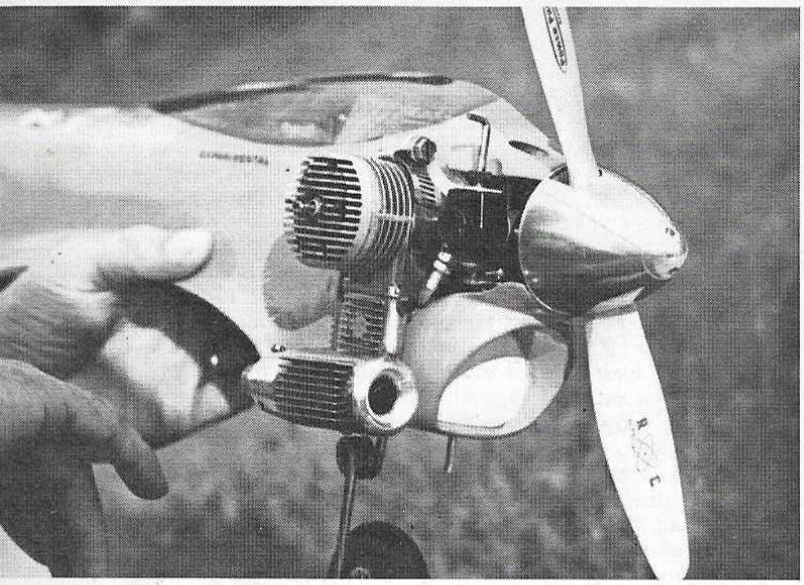
In our prototype models a specially fabricated metal tank was included as an integral structural component of the fuselage. This added tremendous structural strength to the model's front end, and saved considerable space (the tank's top formed the floor of the cockpit). This metal tank was serviced from the radio compartment via removable screw on/off cap, enabling the changing of fuel lines and filter.

The canopy was vacuum formed from .040 acetate plastic and epoxied in place over the cockpit detail. All fillet work was accomplished through the use of Sig Epoxolite which is unbeatable (as far as I'm concerned) in this application.

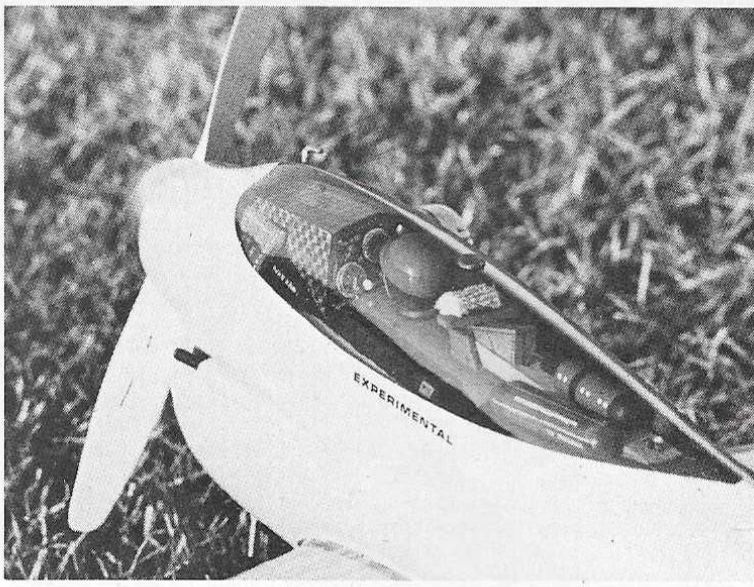
I apply my fillets *over* the Silkspan covered and doped structure. This works extremely well with no tendency to lift or not adhere to the dope.

My model was finished in acrylic lacquer

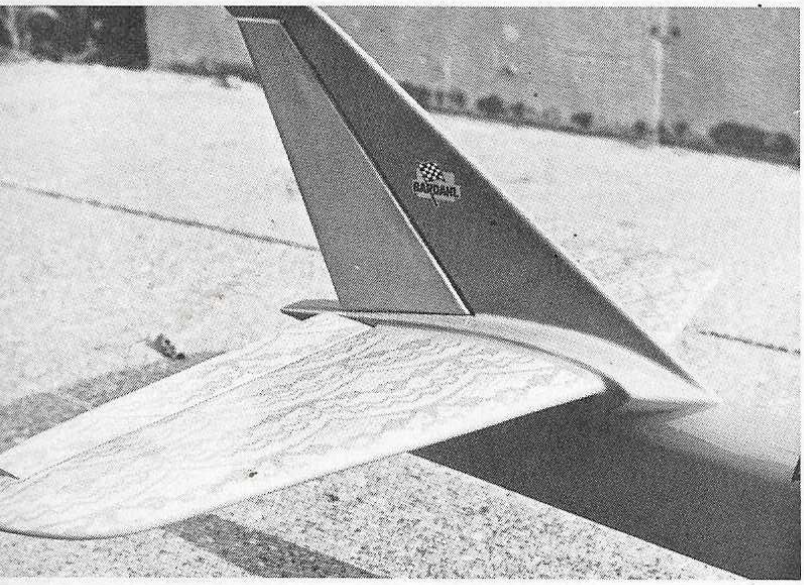
Photos by the Author

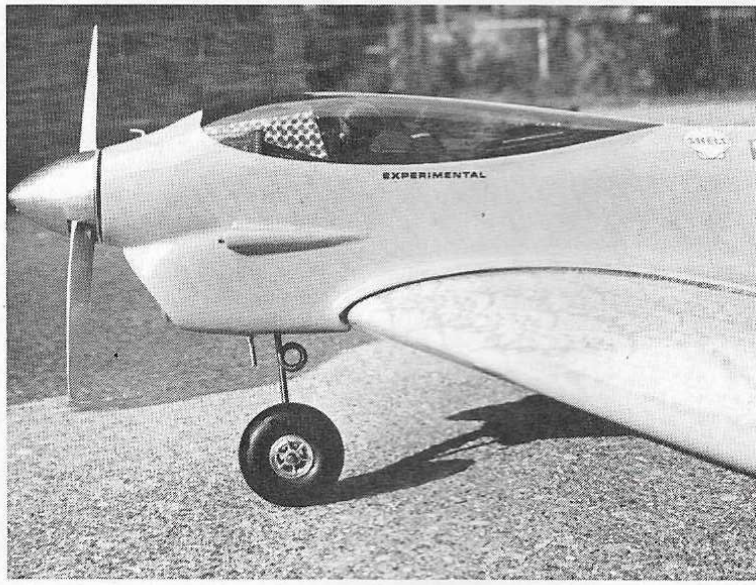


All the thrust you can stand. A Veco .61, side mounted, Perry carburetor and an 11-7½ Power Prop. The S.T. muffler modified to suit the occasion. Below: The stab fairings clean the airflow and add structural strength.



Call in an interior decorator. Ralph Perillo went to work beneath canopy in spite of the close quarters. Cockpit detail is always a focal point. Slipstream pressure utilized on the fuel feed, as on Controline designs.





after initial doping. Acrylic lacquer is fine as far as being fuel-proof up to approximately 15% nitro-methane content. Briefly, here's a rundown on the finishing procedure:

Surface Preparation

Sand the surface carefully with #400 grit wet or dry sandpaper. Apply two coats of clear dope to the entire surface (Sig is best). Sand with #400 (dry) after the fifth and each succeeding coat. Apply all fillets (Sig Epoxolite) and later sand them carefully.

Apply two heavy coats (flow them on) of filler coat (unscented talcum powder and clear dope). Coat the entire airplane. Sand with extreme care after each coat. A good method of checking your work is the reflection of light off the work surfaces. If any shiny spots or "pin holes" appear, it indicates a low spot which must be sanded off (if enough filler remains) or must be refilled.

Note: This is the most important single phase of the finishing procedure, and much care must be taken.

Base Color

Wipe entire model down with either DuPont "Prep-Sol" or Martin Semour "Kleenz Easy." This removes all grease and dust.

Choice of color: Light colors (white, gray, light blue, light greens, etc.) are the most forgiving. They don't show flaws nearly as much as dark colors. Dark colors (black, deep blue, maroon, dark green, etc.) show mistakes and flaws more readily, but have a much deeper gloss than any light color. Metallics (green, blue, silver, etc.) are very difficult, and require an almost flawless base in order to obtain desirable results.

Suggestions

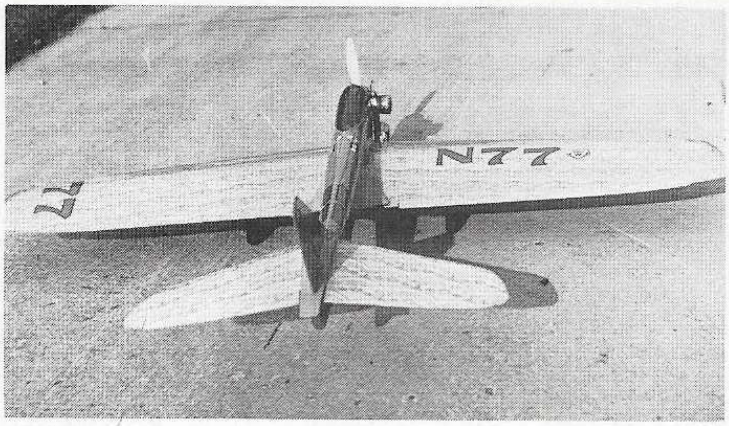
If you are attempting your first *good* finish, try one of the light colors. If you are a patient, experienced modeler, you could probably handle the dark colors easily. For the perfectionist, shoot the works —metallic. I thin colored dope, one-third thinner to two-thirds pigment. (Note: All figures are based upon Sig dope products.)

Keeping the thinner content down when spraying insures a minimum penetration into the dope. Spraying should not be attempted when the humidity is above 85%. A milky white film will usually appear, known as "blushing." Water is trapped under the dope. When spraying in a relative humidity of less than 50%, generally a retarder should be added. Retarder prevents the dope from drying before it hits the surface of the model. At 50% relative humidity, approximately one teaspoon of retarder should be added to each mixed pint of dope. A fairly good rule—for every 10% of relative humidity below 50%, add an additional teaspoon of retarder, or until the paint hits the surface and "flows." Retarder may be purchased at most airports where light, full scale aircraft are repaired.

Pigmented Base Coat

Conditions—dust-free room, 65-75 degrees room temperature. Always strain dope before pouring it into the pot of the spray gun—use a commercial strainer or a silk or nylon stocking. Spread and tape newspapers over the work surface.

Quantity needed depends upon the size



Finish is a delicately handled lace paint job on both the wing and stab. Also notice the anhedral stabilizer design. It's an exotic bird to see. At left: A paper mask technique and india ink produced unique insignia.

of the aircraft and the color. Be certain to have enough without running short. Adjust the fan (spread of the paint particles) down to about two (2) inches and spray all edges with about two to three coats: leading and trailing edges of wing, stab and elevator; flap and elevator hinge line, etc. Readjust "fan" to approximately five inches in diameter and apply enough paint to uniformly cover the entire model. (No need to pile the paint on here, as will be explained.)

Trim design: The simplest solution for this problem is to follow some full scale aircraft. If an original trim and color configuration is desired, care should be exercised. The most common problem here has to do with overdoing the job. "More" is not always "better."

Trimming Tips

Keep the general trim design simple. Have the general trim color compliment the pigmented base coat. Try to arrange your fuselage trim parallel to the thrust line on the sides in stripe or similar configuration. This tends to make the fuselage appear longer and add direction. Try to establish a point of visual interest, other than the basic trim and color design, i.e., the *"Northern Eagle"* design on the wing. Add scale-effect detail: flap, rudder, elevator, etc.

Wing walks, access hatches, rivets, sheet metal panel lines, etc. are all part of a model's overall impression. For further details concerning dry transfer lettering and India Ink techniques, refer to my previous articles in *Flying Models* concerning these topics.

Application of Trim

Mask the trim areas desired (Scotch Brand 3M-½" wide). Seal the tape with one coat of clear dope (this prevents trim color from seeping under). Apply trim colors with an air brush (miniature spray gun). Allow trim to dry a minimum of two hours before removing tape in order to realize clean, sharp edges. Apply all other trim and details.

The Clear Overcoat

With the spraying of clear dope over the entire model, the painting is complete. The overcoat (top coat) provides high gloss and visual depth to the pigmented dope. The same steps should be followed for applying the clear as were for the color coat. Note: If the clear does blush, don't panic, it will polish out. I usually apply at least 4-6 coats of clear over the entire model. Sig dope has one great advantage over all other brands which I have tried: it will not yellow over light colors (primarily white). Don't expect the high gloss to appear yet. After drying, the finish must be sanded (#600 wet or dry) and polished. If you have the time, allow the completed job to age (complete the majority of its shrinkage) before sanding—approximately three weeks to one month.

Sanding and Polishing

Care should be taken when sanding (#600) the clear dope to an even dullness—especially on a covered ribbed wing. A good practice is not to sand at all on the ribs. Note: The degree of fineness in the final product is again dependent upon how well the above is performed. Take your time.

Polishing to the highest degree involves a very fine compound (DuPont #7 Polishing Compound) and plenty of hand rubbing. Use a relatively coarse rubbing rag (a bath towel is good) which has been wet with water initially. Rub in one direction and refrain from circular motion. A good hand-rubbed finish can always be detected by the straight scratches in the finish. There will always be scratches (fine ones) in the finish but they may be hidden effectively in this manner. Straight scratches reduce the amount of light reflection normally encountered with a machine driven buffing pad (circular scratches).

Apply any good paste wax, making certain there is no cleaner (coarse compound) added. (Turtle wax is good.)

If you have been following along through this finishing disertation, I'm sure that you have noted my adhering to the dope finish exclusively. This is because there is no finer finishing material. For the ultimate in finishes, dope is virtually unbeatable in every respect. The gloss may be improved significantly by substituting acrylic clear lacquer in place of the clear dope top coat. This material may be rubbed to a very high gloss with procedures similar to those outlined for dope.

I have had many requests for this basic informational material on my method of finishing with dope, so I hope this has been of assistance to some of you. Good luck.

The nose moment appears short, but the swept wing planform places the center of gravity further aft than might be imagined. Note rakish tail, clean lines, low canopy profile, use of fillets.