

PHANTOM & CRUSADER

by BILL SUAREZ

THE NAVY'S BLUE ANGELS have opened a new chapter with not only a new show but also a new plane: the McDonnell Douglas F-4 Phantom II. However, long before the Blue Angels ever received their Phantoms, I formulated the idea for a model of this ship.

With two P-38's behind me and experience in semi-stunt, I was looking for a new subject. It had to be impressive, easy to identify, have a trike gear, and be original to the Stunt event. The free world's most successful jet fighter, the Phantom II, was the answer. When the Blue Angels received their Phantom a few seasons later, my choice proved to be right.

After much thought and a little experimentation, I concluded that such items as gigonda (super-large) air inlets, anhedral-high-sweep stab, and dog-tooth leading edge could be included if the right combination of variables were determined. The large inlets are possible because of the relatively slow velocity of a stunter and the air vortex created by the prop blast. Placing inlets in already disturbed air makes an insignificant difference in drag.

The wing was designed with the ability to flex, thus allowing the airplane to turn a smooth tight corner and maintain stability. This old concept is a good one. The dog-tooth leading edge acts as a fence, preventing airflow from slipping outward toward the tips, and thereby maintains good lift on a high wing-sweep stunter.

Since realism also was one of the goals, the cockpit is strictly military and not like something out of "Star Trek."

Make no mistake, the model presented here is a true contest performer, capable of flying the AMA pattern to the book. It is impressive not merely by virtue of its shining blue and yellow dope. Although much of the spectator appeal lies in the fact that Angels fly Phantoms, this model probably would fare just as well with many of the other paint schemes. The Air Force Thunderbirds also fly Phantom II's now—another exciting possibility.

My Phantom model was ill-fated at the 1970 Nationals. During practice, the down line (flying cable) broke, resulting in a heavily damaged stunt ship. Only with the unending help of my partner, Guy Fletcher, in making repairs in the midnight hours was it possible to fly the ship on qualification day. It missed placing by three points, but it did receive 32 appearance points—not bad for a damaged airplane!

Construction

Wood selection is important. Choose strength where necessary, but use the lightest



by VIC MACALUSO

WHY THE CRUSADER? Stunt has come a long way since the Barnstormer and Profile Mustang, and today's trend is toward larger, more realistic aircraft. Seeing all the semi-scale stunt ships at the 1969 and 1970 Nats convinced me that scale-like planes are going to be around for quite some time. For that reason, I've switched from the Classic stunt ships, such as the Nobler, Smoothie, etc., to designs like the Crusader.

The Crusader was chosen because of its unique look, high wing, ventral fins, Sidewinder missiles and drop tanks—all things the ordinary stunt flier would not consider. Something completely different was what I wanted, but could it be made to fly? If a low wing with dihedral could be flown successfully, why wouldn't it also work upside down? Thus the Crusader was born.

The plane's construction is kept fairly simple through the extensive use of hollowed balsa blocks and box-type construction of the fuselage, balsa sheet for the tail surfaces and flaps, and a slightly modified foam wing. By paying particular attention to the selection of light wood and hollowing out the blocks as much as possible, the plane's weight should be 50 to 52 oz., about right for a good 35 engine.

Construction

Epoxy was used for laminating the nose section and for installing the motor mounts and wing; white glue was used for most of the other construction. However, the choice of glue or epoxy is up to the individual.

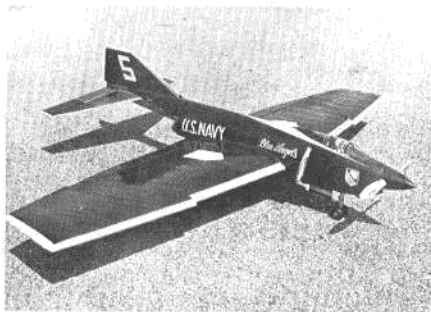
Fuselage: Cut the fuselage sides from 1/8" sheet balsa and the doublers from 1/16" plywood. Glue the doublers to the fuselage sides. Next, cut 1/2 x 3/8" hardwood engine mounts to the proper length and cement them to the fuselage sides where indicated. Engine mount location must be exact because the thrust line with the anhedral wing can be critical.

While the fuselage sides are setting up, cut out formers F-1 through F-5. Draw a vertical centerline on all formers and a straight line on the work table. These markings will aid in aligning the fuselage during assembly. Cement F-1 and F-2 in place. Using their centerlines, line up the formers on the table and align the fuselage. Hold in place until set.

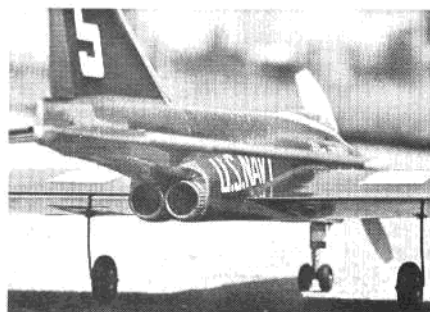
Glue in the remaining formers and again use the lines on table to align the fuselage structure. Hold in place while the assembly dries. When completely set, drill engine mounting holes (for a Fox 35) and install blind nuts to the top of the engine mounts. Install the engine, extension shaft, and spinner.

Photos by Bill Boss

Two consistent contest-winners, these semi-scale stunters are based on the Navy's best current jet fighters. Should be most effective at the Nats.



Overall view of Phantom shows mirror-like finish and built-in leading edge steps.



Exhaust pipe simply made from spray can tops. Rudder off-set also evident.



Even simple cockpit detail attracts attention. Fuel line filter always kept handy.

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wood where strength is not a must. Although the model will fly well at higher weights, the best performance can be obtained at about 47 oz. Sig balsa was used throughout and is recommended.

Start wing construction by shaping the ribs. Place 11 rib blanks between templates W-1 and W-12A and then carve and sand them to contour. Discard the 5 outer ribs. Ribs for the outer panel are developed by placing 5 rib blanks between W-7A and W-12A. Shape and contour as before. Next, produce W-1, W-7A, and W-12A in 1/16" balsa.

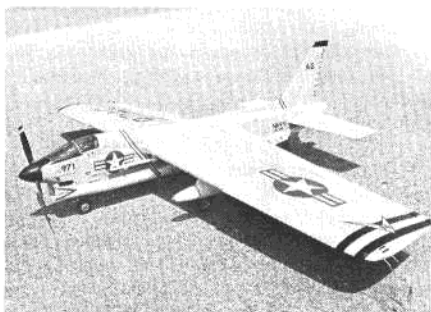
All ribs for the outboard wing can be duplicated from the first set (note that W-12A is omitted from the outboard wing). Finally, form sub-ribs W-S1 and W-S2, using the leading section of W-7 and W-7A, respectively.

Pin down the trailing edge to a flat building board and glue the ribs in place, making sure that each one is straight. Carefully notch the ribs and add spars. The main leading edge is fitted to the wing by allowing it to pass through the ribs of the outer panels. Trim, as necessary, the main leading edge and fit the minor leading edge to the wing.

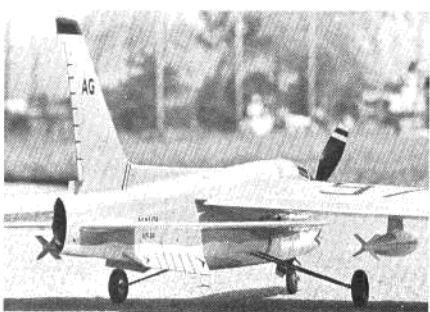
Next, add the trailing edge top plank and cap. Install the bellcrank platform and add the control system. Leading edge planking is done now, by cutting the planking at the dog-tooth edge only as far back as necessary to match rib contours of W-7 and W-7A ribs. Check for warps and steam them out if they occur. Plank the center section and add cap strips.

Glue wing tip blanks in place and carefully shape them. Remove the tips and hollow out. Add a 1-oz. weight to the outboard wing tip and glue the wing tips back in place.

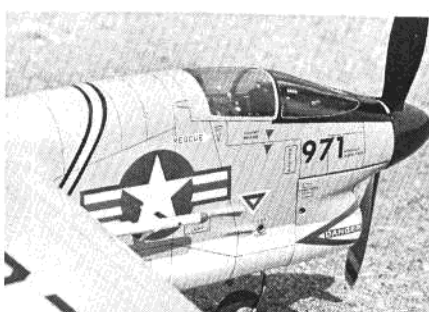
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It is the fine detailing that makes this model look like the Crusader. Takes patience.



Rear view shows wing's anhedral, unusual ventral fins, drop tanks and rockets.



More of that beautiful detailing. This is a much-flown model kept clean and waxed.

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Next, build up the top, bottom and tail of the fuselage by tack gluing a 1 x 2 1/2 x 36" block to the fuselage top. Permanently glue a 1 x 2 1/2 x 20" block on top of the 36" block at the nose end to provide sufficient thickness for the cockpit area.

The fuselage bottom is formed from a 1 x 2 1/2 x 36" plank cut as shown at former F-3. Tack glue the bottom blocks in place. Using the plans as a guide, shape the fuselage as shown in the top and side views. Pay particular attention to the contours in the cockpit area, which will be used later as a

mold for making the canopy. When all carving and shaping is done, pop off top, bottom and tail blocks and hollow out as indicated by the dotted lines. Hollow as much as possible for the lightest structure.

The landing gear is made up next and installed. Attach the nose gear to former F-1 with J bolts. Mount the main gear on a 1/8" plywood plate and install it in the fuselage.

Wing: The wing was made from a Chipmunk wing (Foam-Flight Wings, 628 W. 6th St., Mankato, Minn.). Start construction by sanding the anhedral angle in the root of each panel. To achieve the proper angle, place

the root of each panel at the edge of a straight table or work bench and block up the other end of the panel (before wooden wing tip is installed) 1 3/4" off the table. Holding a coarse sanding block exactly vertical, sand across the wing root until the proper angle is obtained.

Before the wing sections are assembled, install the 3" bellcrank and leadouts in the correct inboard panel. For mounting the bellcrank any of the several methods suggested on the instruction sheet with the wing kit may be used. After the bellcrank and

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Crusader

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leadouts are installed, assemble the wing. Using the foam packing blocks as a jig, set up the wing halves so that the center joint is aligned perfectly. Remove the wing halves from the jig, and let cure overnight. The center joint then is wrapped with fiberglass tape and epoxy and again left to cure overnight.

At this point, add the wing tip blocks which are made by tack gluing two 1 x 3 x 10" soft balsa blocks together. Tack glue the assembly to the wing and carve the tips to shape. Next, remove and hollow out the carved tips. Add a 3/4-oz. weight to the outboard tip and mount both tips permanently. Make flaps from 1/4" balsa sheet, add hinges and control horns and install on the wing.

Tail Surfaces: Butt join as many pieces of 1/4" sheet balsa as needed for the fin and rudder and cut them out. Sand in the airfoil shape. Cut out the rudder and reglue it with the offset shown on the plan. The stabilizer and elevators are made from 3/8 x 3" sheet. Cut all the pieces to shape and tack glue them together. Using a sanding block, sand a taper from 3/8" at stabilizer root to 3/16" at the stabilizer and elevator tips. Next, sand in the airfoil shape shown on the plans. When all shaping is done, separate the elevator from the stabilizer and round off the elevator-stabilizer joint. Add the control horn and hinges to complete the assembly.

Final Assembly: Use epoxy to attach the wing in the fuselage cutout already provided. The wing must be square to the fuselage. While this is curing, bend the elevator pushrod to shape from 3/32" dia. music wire.

When the wing is permanently affixed to the fuselage, make the appropriate cutout in the fuselage to accept the stabilizer-elevator assembly (cut former F-5 at dotted lines). Attach the pushrod to the flap and control horns. Slide the stabilizer back and forth to get a zero-zero indication on flaps and elevator. Then glue in place. The remainder of the fuselage cutout is filled in. Replace part of former F-5 and cement the tail block in place.

Hollow out the engine cowling and cut in all necessary holes. Add cowl fasteners of your choice.

I used a jack for engine starting, since it provides a neat appearance, is convenient, and requires fewer holes in the cowling. The jack installation can be eliminated if desired. Top and bottom fuselage blocks, as well as the rudder-fin assembly and ventral fins, are permanently glued in place. The model is now ready for the final sanding.

Cockpit Canopy: Carefully draw the outline of the cockpit canopy on the nose section and cut along those lines. Remove the canopy area in one piece so that it can serve as the mold for forming a plexiglass canopy. Heat a piece of 1/16" plexiglass in an oven and, when pliable, draw it over the mold. Cut away excess plexiglass and fit the canopy to the model. Before installing the canopy permanently, add cockpit detail. For a free ready-made canopy, send me a photo of the Crusader in its final construction stages. Write: 384 Central Islip Blvd., Ronkonkoma, N.Y. 11779.

Finish: AeroGloss paints and plenty of rubbing were used to finish the plane. Details for color and markings came from *Profile Publication No. 90, Chance Vought F8A-E Crusader*. Lettering detail was done with Instatype dry transfer lettering.

Phantom

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After the control horn is properly fitted, carefully shape and assemble the flaps. For long life, use epoxy in this operation. Finally, hinge the flaps to the trailing edge and again check the wing for warps.

The main landing gear is bent to shape, J-bolted to the plywood platform and glued into place.

Assemble the fuselage main section (excluding scoops) in the conventional manner. Tack glue the top block and shape. Remove it and hollow it out. Join the main section to the wing, using fiberglass cloth and polyester resin. Check alignment. Shape and hinge the stab and elevator and add anhedral as shown on the plan. Reinforce the joint sparingly with fiberglass cloth and resin. The half horns must be fitted properly. Using one 3/32" section and two DuBro Kwik-Links, assemble the pushrods. Wrap the joint at 1/2" intervals with uncoated copper wire. Then solder it, using silver solder if possible. A good solder joint here is a must. Adjust pushrod ends and install them on the elevator. Install the other end of the pushrod on the flap control horn. Align and glue the stab to the fuselage.

The elevator and flaps must be neutral, and the controls must have free movement. Bend the axle section of nose landing gear wire. Join two sections with copper wire, wrap and solder. Slide copper or aluminum tubing over the joint and make final bends. J-bolt the nose landing gear to plywood platform. Add all other necessary components, such as the nose landing gear, the tank, etc., to the fuselage main section. Now match the fuselage top block for rudder and stab and glue it to the fuselage. Shape the rudder and install. Glue air scoop bulkheads in place as shown on plan. Scoop sides are shaped, installed on the model and tack glued at the wing joint only. When dry, carefully bend scoop sides around the bulkheads. Add 1/4" sq. filler to scoop sides and 1/8" sq. to the main fuselage.

Fit and glue 3/16" thick sections to the top of scoop sides and fuselage. Glue and shape the 1/4" sheet fuselage bottom in place. Scoops are now fully contoured. Add all other details, such as fillets, spinner, etc.

Using a sanding block whenever possible, carefully and thoroughly sand the entire framework with fine sandpaper.

Much has been done with new finish and covering methods, but I still prefer the dope method. However, the choice is up to the modeler.

Brush on one coat of clear dope and sand lightly. Next, brush on two coats of a wood

filler consisting of one part talcum powder, one part AeroGloss filler coat, and one part thinner. Sand between each coat.

Cover the wing section with medium Silkspan. When the covering is tight, brush on five thinned coats of clear. Sand off any roughness. Silk-cover the entire nose, including the cowling. Then, add cockpit detail. The seats as well as instrument panels were made from pressed cardboard and epoxied into place. Mold the canopy from .040 acetate butyrate or plexiglass. Epoxy the canopy to the fuselage and add a 1/4" silk strip over the joint. Mask the canopy for painting.

Make up a filler consisting of one part thinner, one part talc, one part color finish, and one half part clear dope. Two coats of this filler are sprayed on, allowing at least one day for drying thoroughly. Sand between each coat. One coat of clear dope is sprayed on to seal off these coats.

By now the finish should be perfectly smooth and ready for color. Spray four to five coats of finish color but do not sand. Finally add the markings and AMA numbers, then spray on two final coats of clear. Allow the dope to dry for at least a few weeks before rubbing out.