

Author John Whitmore proudly displaying the F-4 Phantom.



women of the night? Heck no, the F-4 Phantom! The Blue Angels flew her remember? As you might expect this was a complex undertaking. The F-4 took a few months of heavy research before I was able to produce a set of working drawings that I was comfortable with. The essence of this design being a simple box type construction. Since the F-4 has large intakes and abundant wing area, it lends itself perfectly to a ducted fan model. The F-4 builds very fast, and when you look at the drawings, you can see how close to scale it really is.

A famous quote from a very famous modeler, Charlie Grant, was, "Build and add lightness." I believe it, and you should too! Most of us fly off grass and don't have the luxury of paved runways, you want to keep the thrust to weight ratio as high as possible. So if your jet weighs 10 lbs., you want at least 10 lbs. of static thrust, which will be one to one. The higher the thrust to weight ratio the better your model will perform. Plain nitro pipes are too darn noisy. Muffled pipes are only a little quieter and that's like being only a little pregnant. I needed something that offered a major improvement in sound reduction. Having read a lot of positive reviews on the Soundmaster mufflers I decided to call and find out if there was a high performance ducted fan pipe for pusher installations available. So I gave my old buddy, Bob Davis, of Davis Diesel a call to find out if he had developed such a pipe. I was delighted to find out, that although there were only a limited amount out in the field, results being fed back showed sound drops of over 8 DBA when compared to other muffled pipes available.

In pursuit of doing my part to improve the

FUN SCALE F-4 PHANTOM

**At last, a simple, easy to build ducted fan model
(for .65-.90 D.F. engines and a Byron fan unit)**

By John Whitmore

It all started with a long term love affair and a heavy dose of jealousy. No she wasn't a gorgeous brunette, she wasn't even a blonde, but boy she was sexy. Actually she had great curves and was a beautiful shade of blue. The Angels loved the way she responded to their every command. Hey! you guys, what do you think we're talking about here, some

*Maiden flight take-off with dieseled
Rossi .65.*



state of the art in our wonderful hobby, I believe it is perfectly okay to get something for less. Maybe a lot less. Maybe even free. It isn't that I'm cheap or anything, let's just say if there's a way to get something for less (stealing is definitely out since I'm too nervous) I'll find a way.

I decided to pay a visit to the Soundmaster himself. Just as an aside, I've often considered using one of his products on him, especially when he appears to be getting the best of me in a debate which I believe I should be winning. But a better and more helpful person I would be hard pressed to find. So I appealed to his good nature and listened to him expound on the supposed virtues of his latest gizmo's for a few hours, then left for home clutching a brand new Soundmaster high performance turnaround pipe. Free I might add. The only promise he extracted from me, was to provide him with data.

sheeting and lay side by side. Now glue to form bottom. Draw a centerline down the length using a soft pencil. Mark positions for bulkhead F-4 and F-5 and trim outline to match top view. Please note that the thrust tube has a 4 degree down thrust angle just like the real F-4. Make a 4 degree angle gauge using plan as reference and install bulkheads F-4 and F-5. Glue in 1/2" balsa tail blocks at F-5 locations. Now glue down 1" triangle stock taking care to position flush with edges.

Thrust Tube:

The thrust tube is fabricated in two parts from 1/64" plywood and you must first determine the bending direction prior to cutting. The front section is cut 4" by approximately 20" long. Use F-5 through hole as gauge, then trim for butt joint. Glue the joint and add a 1/4" strip of 1/64" x 4" plywood to O.D. for seam reinforcement. You may now trim the plywood

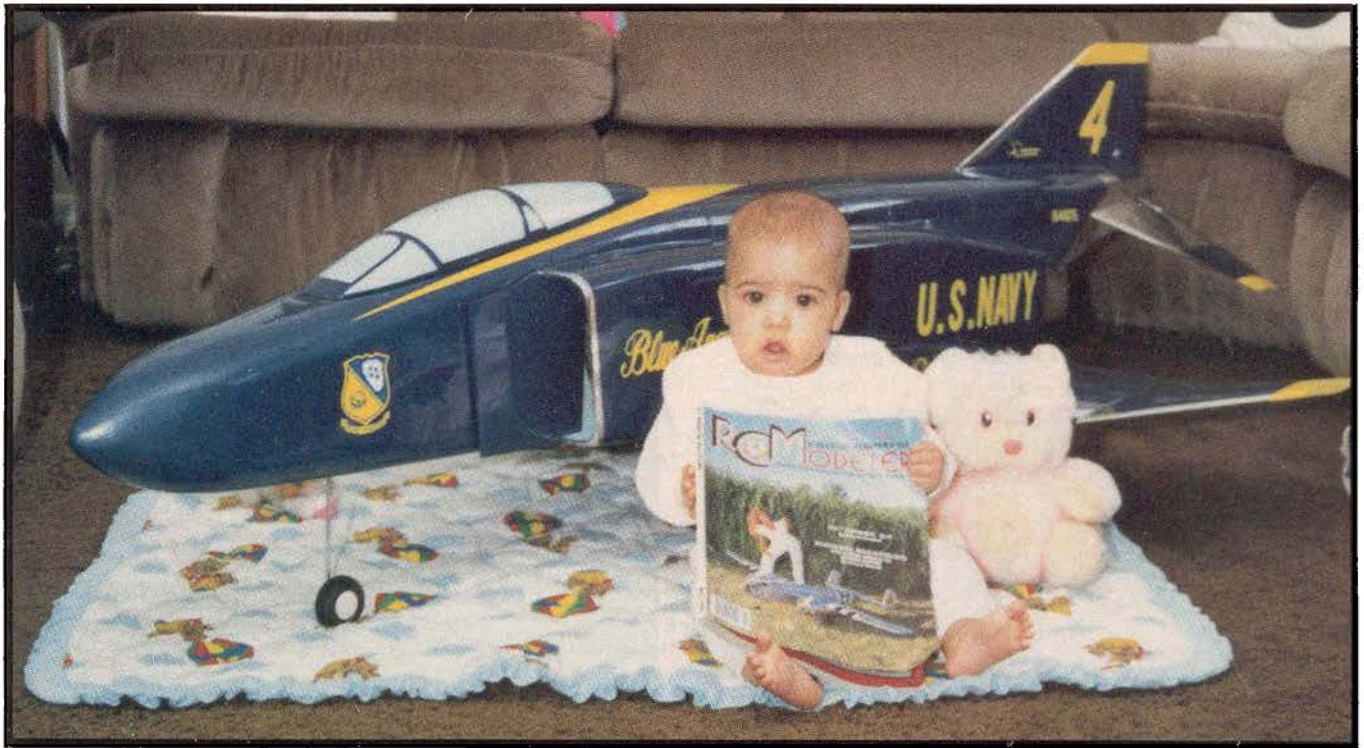
glued in place.

Nose Section:

We are now ready to build the nose section. Lay out nose sides on board and mark locations of F-1, F-2, and F-3. Next add 1" triangle stock to top and bottom. Cross cut triangle stock forward of F-2 for both sides. This is to aid in bending the sides forward of F-2 when F-1 is added later on. Glue F-2 and F-3 in place and attach the other side of nose section, then glue on F-1. Add bottom sheeting from F-1 to F-3. Position nose section on main fuselage bottom and center. Mark location of nose section. Do not glue nose section in at this time, just put it aside. Next, add fuselage sides to bottom.

Tail Boom:

Mount the tail boom sides to the main fuselage taking care to align top edge with building board. This is a very important step in building in the zero incidence. Pull tail



Kristin Whitmore with the F-4 Phantom reading her favorite magazine!

CONSTRUCTION:

Start by tracing and cutting out all bulkheads, patterns, and tail feathers. Drill fan mounting holes in bulkhead F-4 for blind nuts. I chose to use Soundmaster Iso-Mount's to deal with one facet of noise reduction vibration induced noise. This aircraft design lends itself to either tractor or pusher fan. I just happened to have a Byron Fan unit laying around gathering dust. I chose to isolate the Byron fan assembly with Soundmaster Iso-Mounts. Follow manufacturer's instructions on installation. And by the way, they install easier than plain blind nuts. Now remove the fan assembly and put it aside.

Fuselage:

Let's start with the bottom first. Cut 10 pieces of 4" wide 3/16" x 10" long

reinforcement back 3/16" to clear the bulkhead diameter and glue in place. The rear section is 20" x 18" x 1/64" plywood. Cut and insert this through F-4 into F-5. Mark overlapping plywood edge, remove and trim with straight-edge. Glue the butt joint and reinforcing as you did for the front section, then reinstall and check fit prior to gluing. Trim excess even with outer surface of F-5.

Now take a fuselage side and lay a length of 1" triangle stock along the top edge. If the wood is soft you will be able to bend it to follow the contour of the top outline. If on the other hand the triangle stock is too hard to bend, then you will have to cross cut it. Repeat for second side. Make sure that you make a left and right side so that the triangle blocks both face inward when the sides are

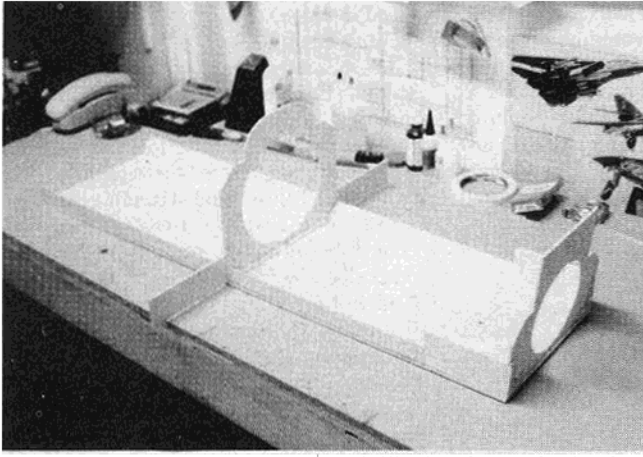
boom ends together and install T-1, T-2, and T-3. Add top and bottom 3/16" sheeting to tail boom. Cut sheeting away to clear thrust tube. Add top 3/16" sheeting to main fuselage sides.

Final Fuselage Assembly:

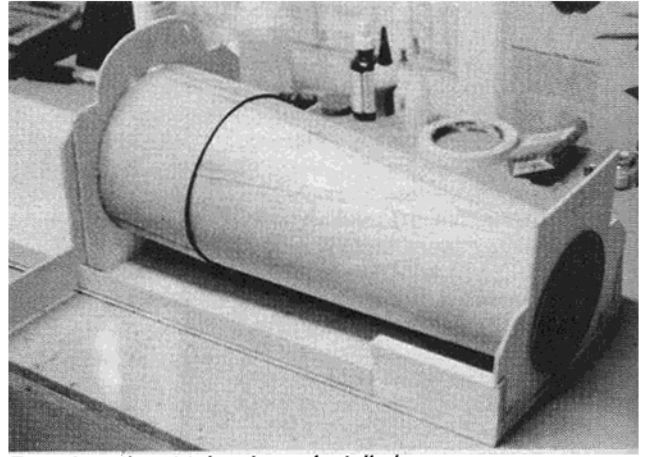
Now glue nose section to main fuselage where previously marked. Install 3/16" sheeting support rail between F-4 and top edge of nose section. Add remainder of top sheeting to fuselage sides and nose section. Congratulations you have finished the hardest part of this aircraft.

Horizontal Stabilizer:

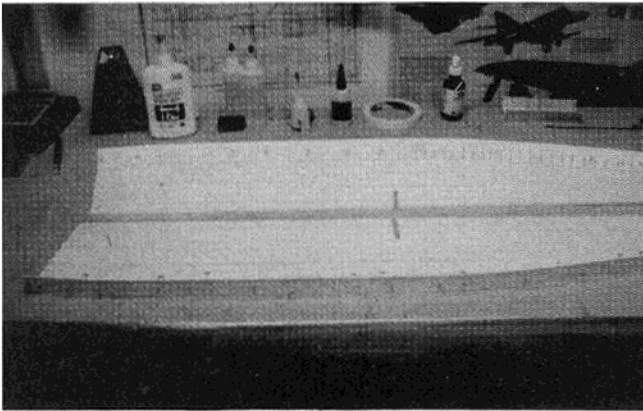
Add the 1/64" plywood fillet to the main fuselage and tail boom. Be careful to follow the contour shown on top view of plans. Using plans as a reference, mark tail boom and then cut opening for stab. Glue F-6 into



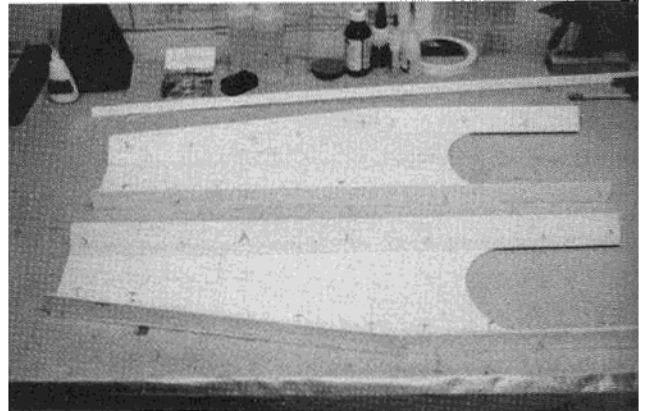
Bulkhead F-4, F-5, tail blocks, and 1" triangle stock glued to bottom sheeting.



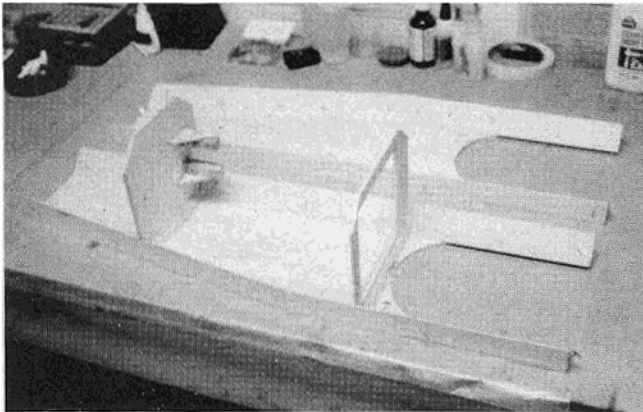
Two piece thrust tube shown installed.



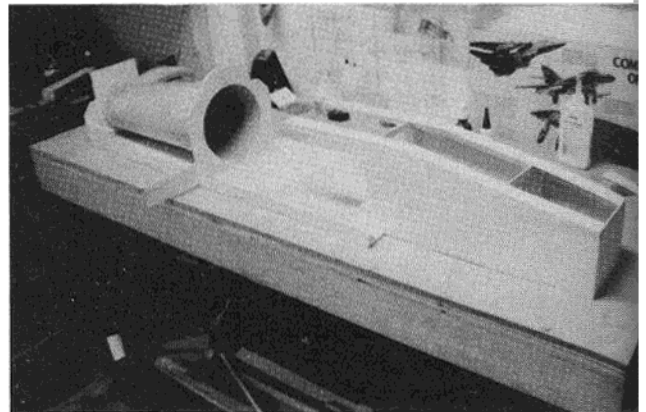
Fuselage sides laid out with 1" triangle stock glued in place.



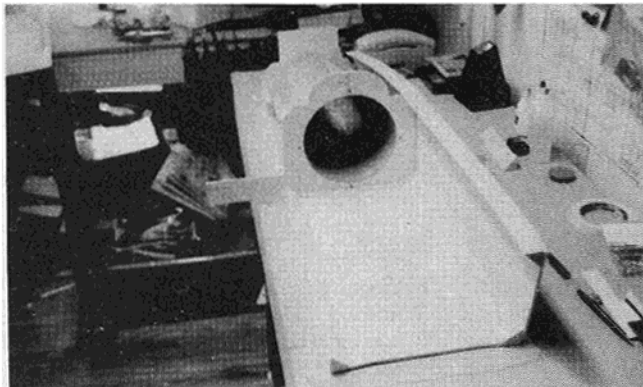
Nose section side with bulkheads' location marked off.



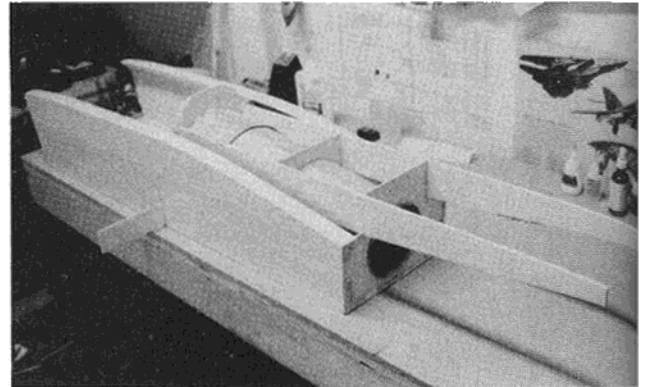
Nose section with bulkheads F-2 and F-3 glued in place.



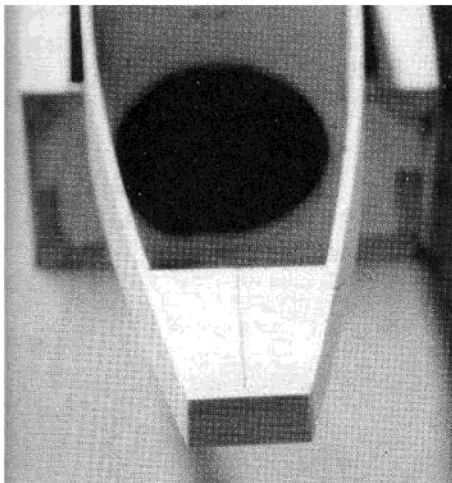
Nose section positioned and marked on fuselage bottom.



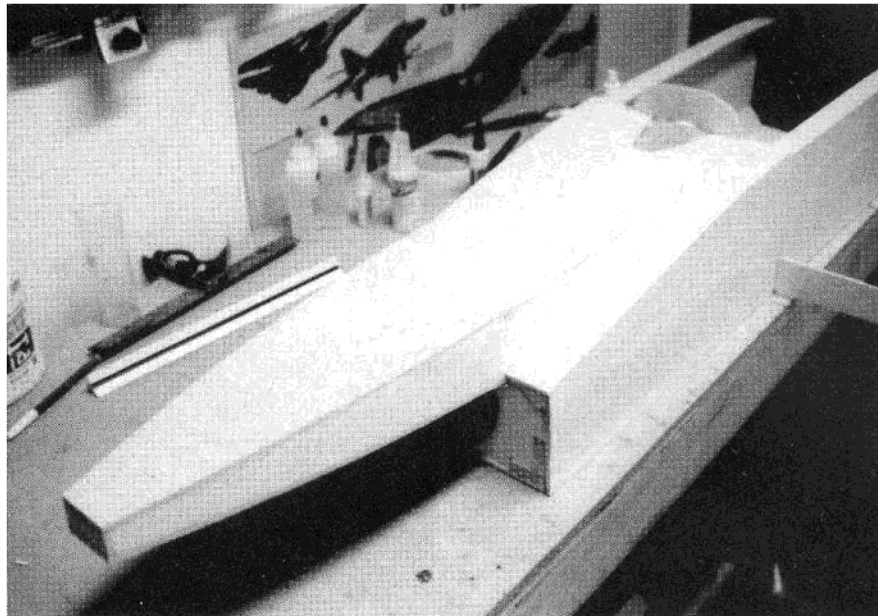
Left side installed to fuselage bottom.



Tail boom mounted to main fuselage.



Tail boom end pieces installed.



Fuselage starts to take shape as top sheeting is added.

F4 PHANTOM

Designed By:
John Whitmore

TYPE AIRCRAFT

Fun Scale (Ducted Fan)

WINGSPAN

44 1/4 Inches

WING CHORD

9 3/4 Inches (Avg.)

TOTAL WING AREA

870 Sq. In. (Approx.)

WING LOCATION

Low Wing

AIRFOIL

Symmetrical

WING PLANFORM

Modified Delta

DIHEDRAL EACH TIP

12 Degrees

OVERALL FUSELAGE LENGTH

69 Inches

RADIO COMPARTMENT SIZE

Ample Room

STABILIZER SPAN

19 3/4 Inches

STABILIZER CHORD (incl. elev)

6 1/2 Inches

STABILIZER AREA

132 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

6 1/2 Inches

VERTICAL FIN WIDTH (incl. rud.)

13 Inches (Avg.)

REC. ENGINE RANGE

65-90 2-stroke D.F.

FUEL TANK SIZE

20 Oz.

LANDING GEAR

Tricycle

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rudder, Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam & Balsa
Empennage	Balsa
Wt. Ready To Fly	176 Oz. (11 Lbs.)
Wing Loading	27.5 Oz./Sq. Ft.

place. Put four of the eight 1-A formers aside for servo and engine hatches. You may now glue the remaining formers to their respective location on the fuselage taking care to note hatch locations.

Install rudder and elevator flexible pushrods as shown. Using F-6 as an angle gauge, sand edges of stab for a good butt joint. Test fit stab before gluing to fuselage.

Incident must be zero!

Turtle Deck:

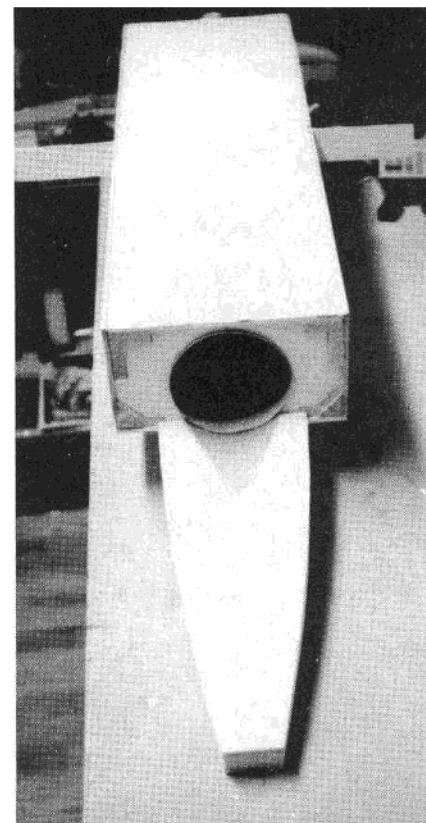
Glue 1/4" x 1/4" stringers into all formers, then sheet with 1/8" sheeting. I chose to use pin latches to hold down all the hatches, you may use whatever method you prefer. Make servo and engine hatches. Notch out 1A in servo hatch to clear pushrods. Do the same to engine hatch to clear fan shroud.

Vertical Fin:

I highly recommend the use of a functional rudder for any airplane whether jet or not. Some other designers say you don't need rudder control. The Phantom responds very well to rudder, especially on cross wind take-off and landings. Tack glue the fin in place along with the two filler blocks as shown on sheet two. Now remove fin and sand filler blocks to shape. Glue fin in place.

Contouring:

Add wood blocks to front of fuselage for canopy support and nose section. Sand to shape using plans as a reference. Sanding is a dirty word to a lot of modelers, me included. But I wouldn't wear my little fingers to the bone doing needless sanding when fingers have better uses, don't they! The way that I accomplish this task I have found to be both easy and fast. You take a trusty old electric drill, install a rubber sanding pad with a course disc and go to it. Knocking off the corners and rounding off the nose should take less than 30 minutes. Finish sanding is accomplished with a flexible foam rubber sanding block, available at any hardware store.

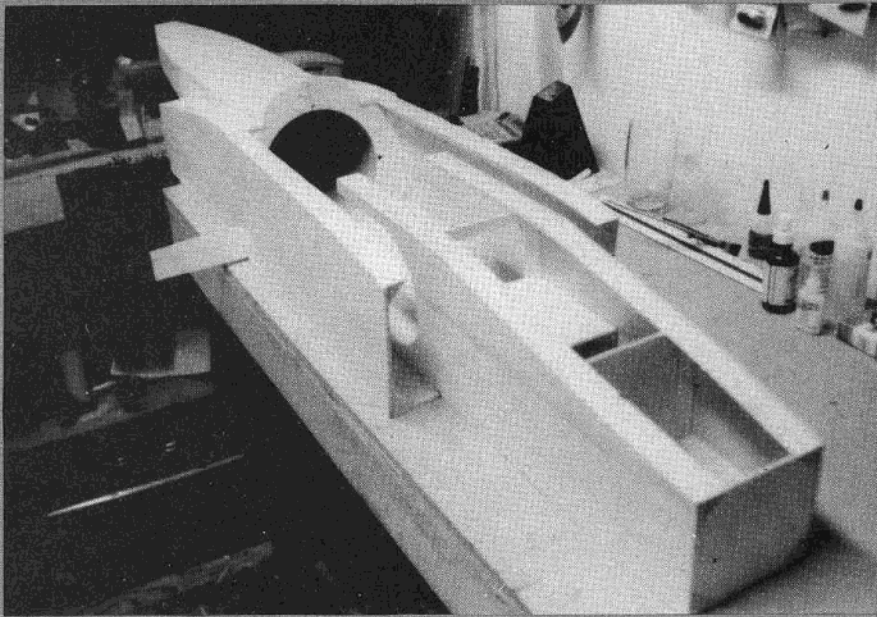


1/64" plywood insert formed into the bottom of the tail boom for thrust tube clearance.

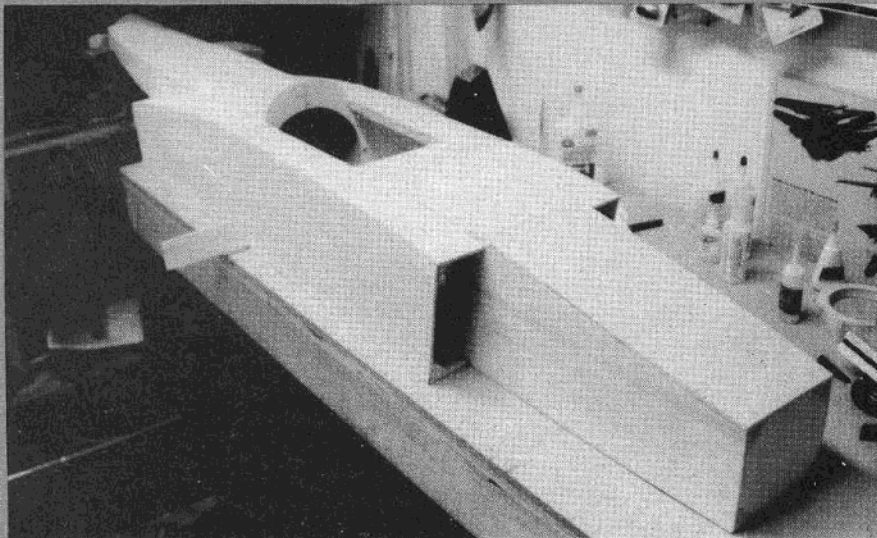
Wings:

Many articles have been written on cutting foam, so we won't get into that here. Foam cores were cut from building insulation sheet bought at the local lumber yard, cheap, and sheeted them with 3/32" balsa. Not so cheap! A fixed, rather than removable wing was chosen because it's stronger and at 54" it fits in my car.

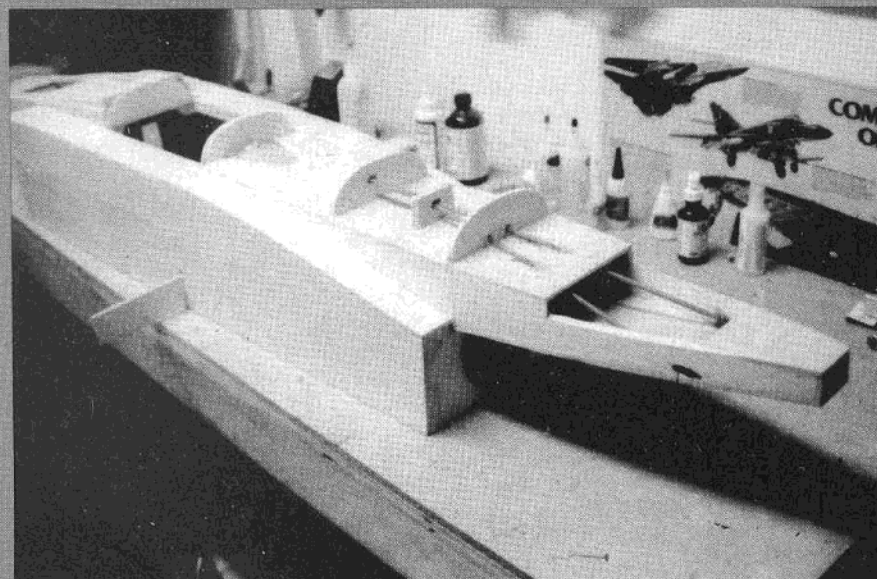
Total cost for foam and wood to complete the model is about \$50.00. Cut wing cores using patterns provided then sheet with



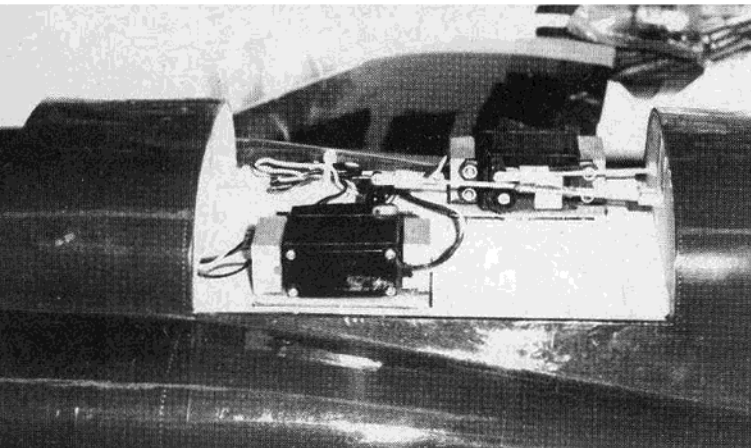
Nose section is now added to the fuselage.



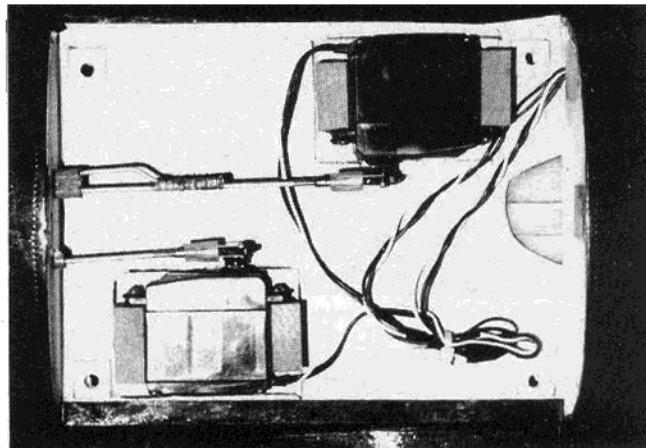
Remainder of the top sheeting added.



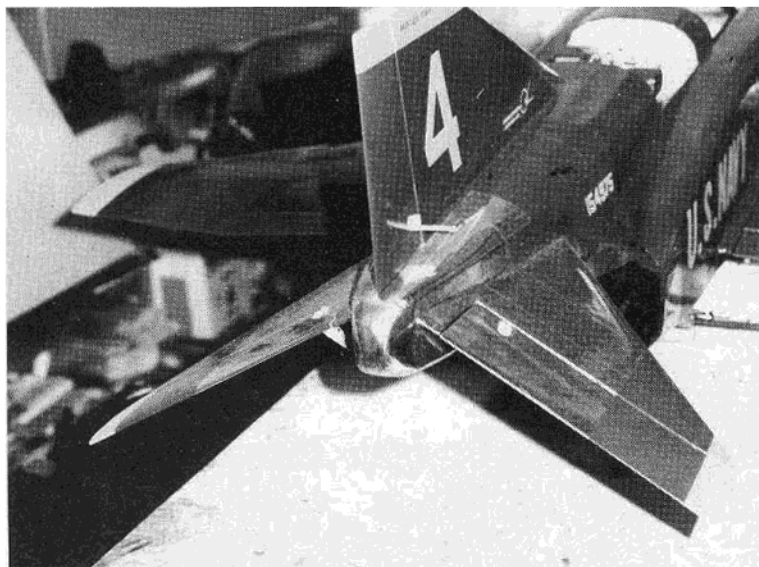
Top formers added with pushrods in place. Also shown with stab mounted.



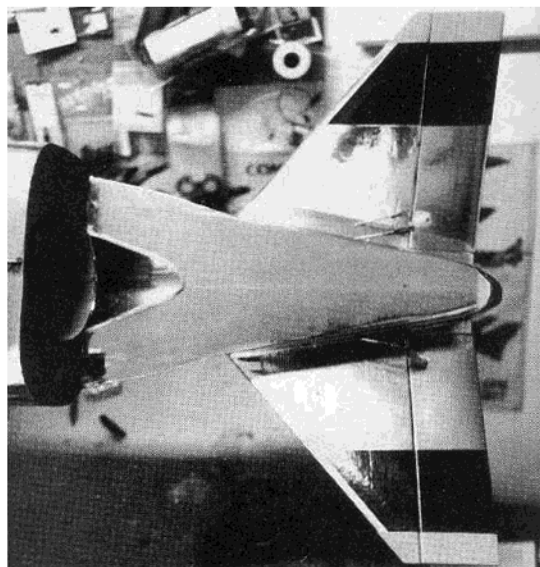
Elevator and rudder servo installation.



Elevator and rudder servo installation as seen from above.



LEFT: The unique tail feathers distinguish the F-4 from any other fighter jet. RIGHT: Inverted view of the tail assembly showing elevator controls in place.



3/32" balsa. Cut slots for wing spars and landing gear blocks. Test fit both wing panels to the fuselage. Wing panels must be set at zero incidence and flat when the wings are slid in place. Remember, the wing must be flat to the building board. Remove and cut outer wing panels as shown on sheet two and glue at proper dihedral angle. Glue on leading edges, and sand to proper shape. Cut two pieces of 1/4" x 3/4" x 11" for wing and aileron caps. Now glue in place and sand to shape. Next add 3/16" sheet side caps to wing and aileron, then install hinges of your choice.

It is very important that all hinge surfaces have zero gap. This will serve to eliminate high speed flutter and improve the efficiency of the control surfaces at landing speed as well.

You may now glue the finished wing panels to the fuselage. Use a medium weight glass cloth to reinforce wing to fuselage. If you choose a fixed gear installation then follow plans. If on the other hand you choose retracts, then consult manufacturers instructions.

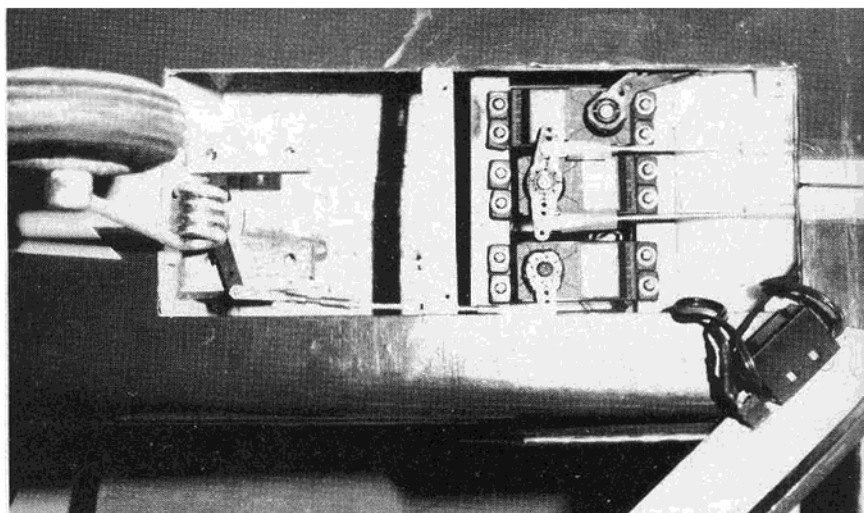
Engine And Radio Installation:

Install the fan unit and engine. You will be installing a two fuel tank system to

guarantee constant feed to the carburetor. The main tank should be at least 16 ounces and the feed tank may be 4 to 6 ounces. Install tuned pipe using a bracket mounted under the canopy hatch. For further details consult the plans. Radio components are installed at the locations shown on plans.

Finishing:

I chose to use MonoKote to save weight, time, and stink. It worked out very well in the Blue Angels' colors. I think I would be leaving out something important, if I were not to tell you some handy hints on the art of MonoKoting that I learned over the years.



Note simple installation of throttle, aileron, and steering servos.

From RCModeler July 1991

Be sure to use a thinned out adhesive undercoating, such as Balsarite. Use the medium heat setting on your MonoKote Iron so as not to cause bubbles under the film. The Top-Flite hot sock works miracles in keeping unwanted scratches and blemishes at bay. To achieve the best scale appearance as well as making life a little easier I apply the covering, panel by panel. I think you will find this to be a much faster method.

Using 3-view drawings that can be found in most aviation magazines, note the panel line locations. Starting from the rear of the aircraft, pick the largest paneled area, cut the panel to suit and apply. Don't be nervous if you cut the panel a little too short or too long. Remember no one is going to come up to your plane with a ruler and measure it.

The Moment Of Truth:

With all the gear installed, I went outside to start the engine and make necessary adjustments. Holding the model straight up at full throttle, it supported its own weight. The prototype weighed 11 lbs., so the thrust to weight was about one to one. It was very apparent that the exhaust and vibrational noise was greatly suppressed by the pipe and Iso-Mounts. Pretty good gizmos! Those of you that have tried to get an accurate tach reading on a ducted fan know how difficult, if not impossible it is. Reading a prop on the front of an engine is a piece of cake by comparison. In order to get the best tach reading possible, I decided to go back to Davis' plant and use his expensive and very accurate general radio strobotach. In the plant, we ran up the engine. The readings reached over 20,000 rpm. At this point, I decided to move the pipe forward and back to check tuning. Hey, guess what? One inch in either direction caused no change, which indicated a very broad tuning band.

A slight adjustment of the needle caused a further increase in power, and with a loud metallic clank, the engine said sayonara. We decided to do a postmortem and see if there was any hope of resurrection. Careful examination revealed that, the rod/bone disconnected from the crankbone, and oh what a mess of bones them was! A short service was held prior to burial. I guess there's nothing left to do, but go home!

Here I was, already to test my new design on Saturday, it's now Thursday night, no engine and it's getting late. Bob looked at me and said, "You know John, I have a Rossi 65 with a diesel head already to go. As a matter of fact, I've had it sitting around for 5 years". I asked Bob, did you do any modifications to the engine other than just putting your diesel head on it? "No", he replied. A Rossi 65 can't produce enough power to fly this plane I said. "Hey John, Dieselizing only requires changing the head". Being in a weakened and depressed state I decided to forego what could have been a long debate and install the darn thing right then and there. The change took only 10 minutes. All that was involved was changing the fuel tubing and fueling it up.

With one bump of the starter the diesel came to life. At first it stuttered and burped

and sounded like the little engine in the fairy tale that could. I looked at Bob and said, "Are you kidding or something?" Bob looked back and said, "It's 35 degrees and the poor little thing has to warm up, give it a break".

Making a few adjustments, I advanced the throttle and read the tach. I couldn't believe my eyes, or my ears for that matter. I stared at a reading of 18,400 rpm and with a few more adjustments, it jumped up to a shade over 19,000. That should translate to about 9 lbs. of thrust. A real feat for a .65 turning a 6" fan. Something else I observed was that with the .65 at full throttle I could hear every word that Bob was saying. I'm back in business!

Saturday morning dawns, with temperatures hovering at a not so cozy 35° and a wind chill factor of minus 10. Man does it get cold here in New England. All you fellow modelers in those balmy climates just don't know what fun your missing, or do you! The sky is blue and visibility is unlimited so let's go for it.

Once at the flying site everything was laid out ready for the big moment. My mind flashed back to a similar moment 12 years earlier when at the same site I successfully flew the world's first largest diesel powered R/C airplane, a scale P51 Mustang, which flew with authority. I now felt a little more confident. Putting the starter to the dieselized Rossi 65, it burped its way to life. Making a few adjustments to the carb for the cold, which you would do for any engine, all was ready to fly. I taxied out, lined up into the wind, my heart pumping like crazy. What's going to happen? Because this was a new design and the first dieselized jet, I let the Phantom run for about 50 yards, eased in a little elevator and was off!

How many of us can be personally involved in doing something for the first time. Mount Everest has already been climbed. And anyway I don't like heights. The north and south pole have already been reached. I think it's cold enough here in New England, thank you!

Back to the moment at hand, the Phantom was climbing out at a good steady rate. The little engine that could, certainly could! I've been flying jets for over 10 years now and could definitely tell if there was a shortage

of power. The Phantom was constantly building speed as I banked into the first turn. The high speed sound was there but without the ear piercing scream of a typical glow powered jet. A few passes across the field with a four point roll thrown in for good measure showed the design to be both stable and aerobatic. As I set up on final I reduced power to one-third. It was at that point I could not hear the engine, was I dead stick? A little forward throttle proved I was wrong and that the little engine that could, still was! As I approached the field I went back to one-third power and eased in some up elevator. The Phantom settled into its typical nose high jet style landing. While taxiing back I thought to myself, why didn't you ever think of dieselizing before.

Reviewing the projects pluses and minuses, there appears to be no minuses, everything's plus. Sound levels of 110 DBA or higher for glow, are now down to 100 or below on diesel. No more glow plugs to burn out at the wrong time or to replace in great number. Fuel consumption is down from over 3 oz. per minute to about 1 oz. per minute. This means my plane wouldn't have to carry 2 lbs. of fuel added to its own weight every time it left the ground. Last, but certainly not least, the biggest killer of high performance engines (excessive heat) is banished, since diesels run much cooler than glow to start with.

Using some lyrics of a famous song I quote, "To Dream The Impossible Dream", and make it possible. "To Right the Unrightable Wrong" and correct misconceptions.

Good luck with your Phantom.

Note: A formed canopy and foam wings are available from the author; John Whitmore, 32A Karen Court, Bridgeport, Connecticut 06606, (203) 372-5347

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