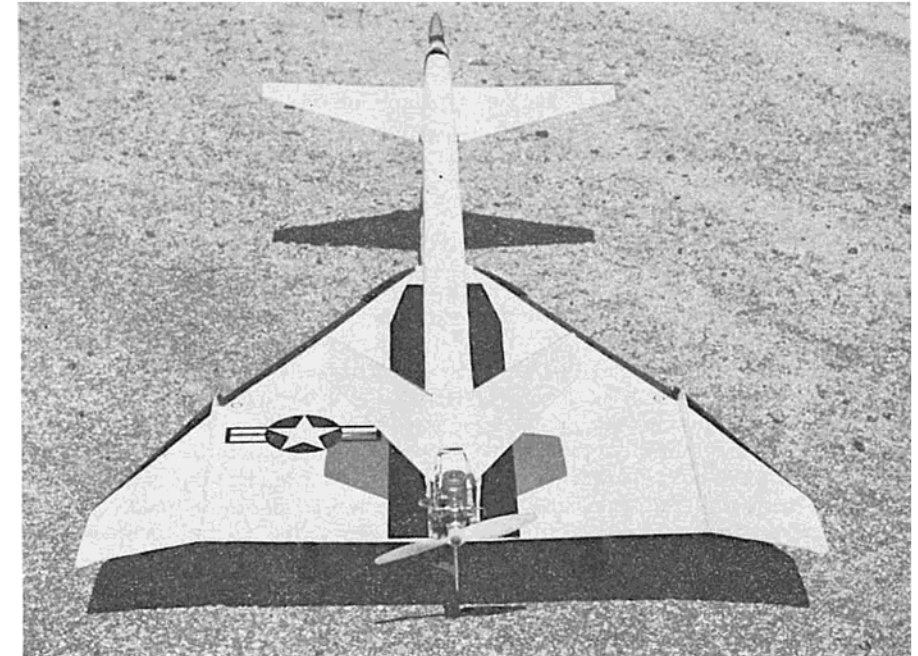


"This little fellow is not so little, being six feet long, yet it performs on single channel servos just like the big boys. The stability is phenomenal, and the takeoffs put you in the Jet Set!"



## WHITEY PRITCHARD:

# PRAYING MANTIS

*If you think today's designs are in a rut, you won't be able to resist this XB-70 type design. And you won't believe it even after you fly it!*

**W**OULD you believe a supersonic transport? A Graf Zeppelin?

Would you believe a single-channel B-70 type canard?

The latter is what we've got. This little fellow is not so little, being six feet long, yet it performs on single channel servos just like the big boys. The stability is phenomenal and the takeoffs put you in the Jet Set. The flying platforms (wing and tail) are all sheet-wood with the only built-up construction utilized being in the fuselage. It is a simple straightforward design that is easily constructed and which lends itself to the Sunday Flyer.

Due to the canard configuration the Praying Mantis is very forgiving in stalls and will not slip off into a spiral dive in the turns. As a matter of fact, the first prototype might have been considered too stable, inasmuch as the only way to get it down was to reduce power. We have increased the rudder area on subsequent versions and it is now capable of a gentle spiral, this area change incorporated into the plans presented with this article.

The original Mantis is equipped with F&M receiver and Royal Products single channel servos driving throttle and rudder. Galloping Ghost equipment can be used, and even though it has an all-sheet wing, it has the weight carrying ability to accommodate the receiver, battery pack, and two servos of the larger proportional systems. The installation of the latter would require a wider fuselage to accommodate the receiver and servos, but other than that, the ship would remain the same with no C.G. change. If you decide on the latter course, widen the bulkheads accordingly.

The prototype made its maiden flight with a .15 engine, but once airborne, it would not sustain this design. As the nose angle increased, the mass area of the rear wing acted like an air brake and she settled back to earth. It was decided that a .23 would be a better choice. A visit to the local hobby shop didn't produce a .23, and inasmuch as Sunday was drawing near, I decided to use an OS .35 which I had on the shelf. There was also an ulterior motive in this decision,

for if I could control the beast with a .35, then I could go to a reverse crank K&B .35 and forget the pusher prop, which can be a problem if your local hobby dealer doesn't stock them.

On a cold, wet, foggy Sunday morning, the OS .35 was fired up. Small children were gathered up, and with their mothers, took shelter in the cars. A few dedicated modelers remained exposed — taking faith in being behind the Mantis as the canard was aligned with the runway. The group quieted as the control functions were given the final check. Someone piped up — "You've got your ship on backwards" — and with that, the Mantis leaped down the runway. At seventy-five feet the nose broke ground and the ship arched up in one sweep to a near vertical ascent with a gentle rotation to the right. At 200 feet medium speed was programmed and the nose dropped to a more normal attitude. A couple of circuits of the field and the model was in the cloud bottoms! Full right rudder was held for a descent, but she continued to climb. Left rudder produced

the same results. It was now flashing in and out of the fog. Low engine was blipped, and on the second try, the engine was heard to throttle down and it reappeared out of the fog like some demon from the deep!

Further flight tests showed that full throttle produces better than a 45 degree climb; medium speed, a normal flight attitude; and low speed, a very slow power descent. With power off, the glide is flat and fast, but the overall descent is quite mild. Contrary to what might be expected, the sheet wing does not fall out of the sky, but it does require keeping up air speed.

The main wing (rear) has two features which increase the lifting ability of the all-sheet wing. Fifteen inches of the leading edge has been turned down much like the leading edge slots on swept wing jet aircraft. The "down-droop" of the outer wing panels function similar to tip plates inasmuch as they work in conjunction with the simulated fences on top. This anhedral theoretically decreases stability, but this ship has so much inherent stability that

it doesn't miss it, and like the bumble bee which aerodynamically can't fly, doesn't know it and goes on and flies anyway! The "turned down" outer panels have an aesthetic value that gives it that B-70 type look which influenced the design. The cranked fuselage was done for the aesthetic value but is also functional as it places the forward plane out of the line of the main wing, thus producing a better airflow over the latter.

In summing up, I can never be sure I understand all I know without a wind tunnel, but I am satisfied that this bird flies well and won't look out of place on the jet taxi apron!

#### CONSTRUCTION

##### Wing:

Glue 8" wide x 1/4" sheet balsa edge to edge to form an area slightly larger than the triangle shown on the plans. When this is bonded as one piece, draw the outline of the main wing and cut out. Take 1 1/4" trailing edge stock and glue to the bottom of all leading edges and tips **BACKWARDS**. This is to give more body to the leading edge and to produce a slight curl not unlike a bird's wing. Sand the leading edges, tips and flat surface to prepare for filler or sanding sealer. Prior to applying sanding sealer, cut half way through the wing from the top at the anhedral break points (6" from tip). Using a straight edge aligned on top and bottom, break this joint over a table edge. (Not all the way through.) Apply pressure to the straight edge on top so that the break will be even and true. Turn the wing upside down on a flat surface and block up the tips to form the 1 1/4" anhedral. Glue the unbroken creased joint with epoxy cement, and when dry, reverse the wing, blocking up the center and gluing the open joint. Sand, and apply sanding sealer, or filler as desired, to prepare the wing for covering. (Leave the 2" top center section clean with no filler to insure a good glue board when mating the wing to the fuselage.)

##### Forward Plane

Make the forward plane in the same manner as the main wing, gluing trailing edge stock to the leading edge and breaking and gluing the 2 dihedral joints. Each side should have 3 1/4" dihedral. Apply sanding sealer and sand. Cover with silk or silk span tissue as desired.

##### Fuselage

Cut the four pieces that make up the two fuselage sides from 3/16" x 3" sheet balsa. Join each of the two sides together by aligning the forward and rear section on a flat surface and gluing. Cut out the 1/16" sheet doubler that goes between station C & D and glue this in place to patch across the joint of the forward and rear section of the fuselage side. When cutting this 1/16" doubler, allow 1 1/16" clearance on the bottom, as it rests on top of the 1/2" x 3/8" rail stiffen-

er. Another 3/16" must be allowed for the flooring. With the doubler glued in place there will be an 1 1/16" space from the bottom of the fuselage to the bottom of the doubler. When dry, join the two fuselage sides together by gluing in the 3/8" rear flooring that appears over the wing as well as the 3/16" forward flooring, adding bulkheads A, B, C, D & D. Glue in the nose piece by laminating 1/2" sheet stock into the forward area. Cut 1/4" plywood to form fuel tank bulkhead (F) and fire wall bulkhead (G). Cut 1/4" x 1/2" hardwood engine mount rails and glue bulkhead F & G together with the engine rails within the ship, forming the fuel tank engine compartment area. Hobby Poxxy AB glue should be used throughout this area, coating walls and flooring.

Sand the fuselage sides and carve and sand the laminated nose (do not round off the top edge of the fuselage sides where the hatch or top planking will glue down later). Now that the fuselage is assembled, install the 1/2" x 3/8" rail stiffener that runs forward of the wing up to the rear cockpit bulkhead (A).

The forward part of the rail is notched out to accept the 1/4" battery compartment sheet base. After installation of the rail, glue in this 1/4" base and add a 1/8" sheet under that and between the two rails. This now makes a solid section from the battery compartment to the top of the forward plane.

The last construction step before mating the wing to the fuselage will be cutting the leading edge slots in the wing, cutting through at H & I, and by cutting half way through along J. Bend this slot down on either side, with a straight edge between the two bent slots at the bottom and is even by placing a straight edge between the two bent slots at the bottom and making periodic 1/2" measurements along this line to the bottom of the wing.

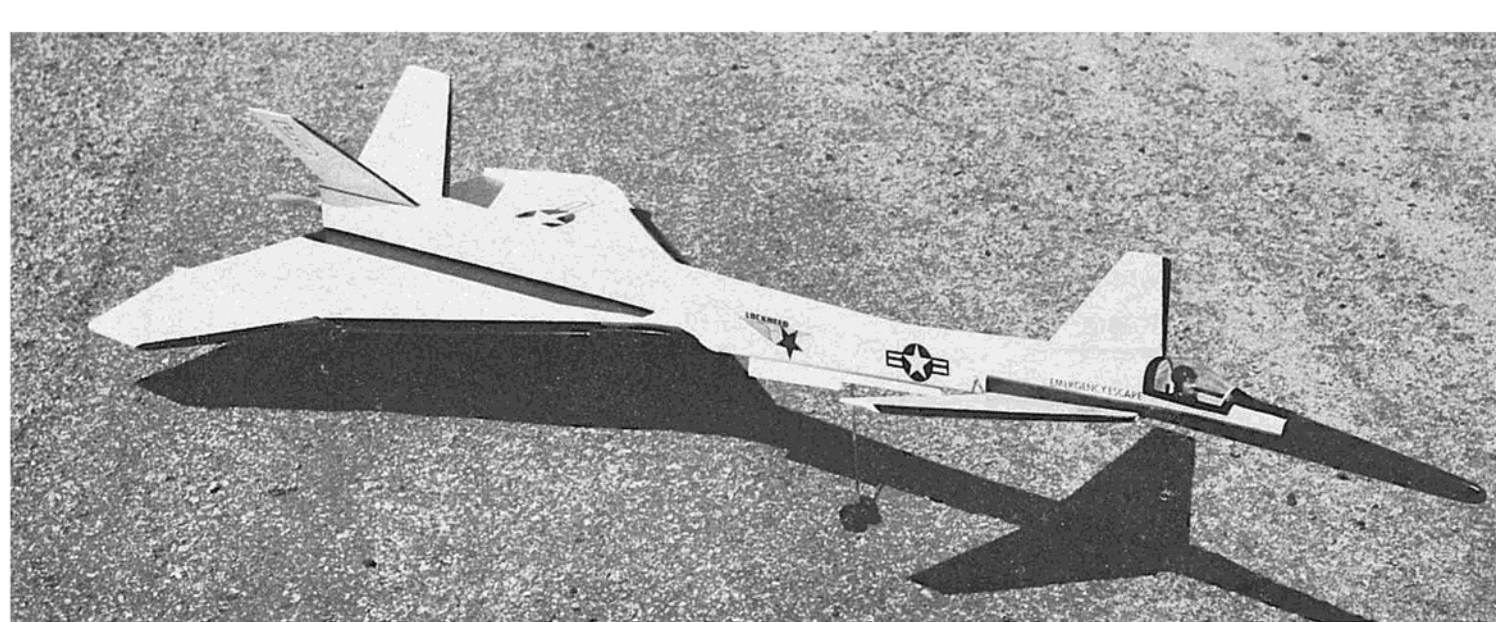
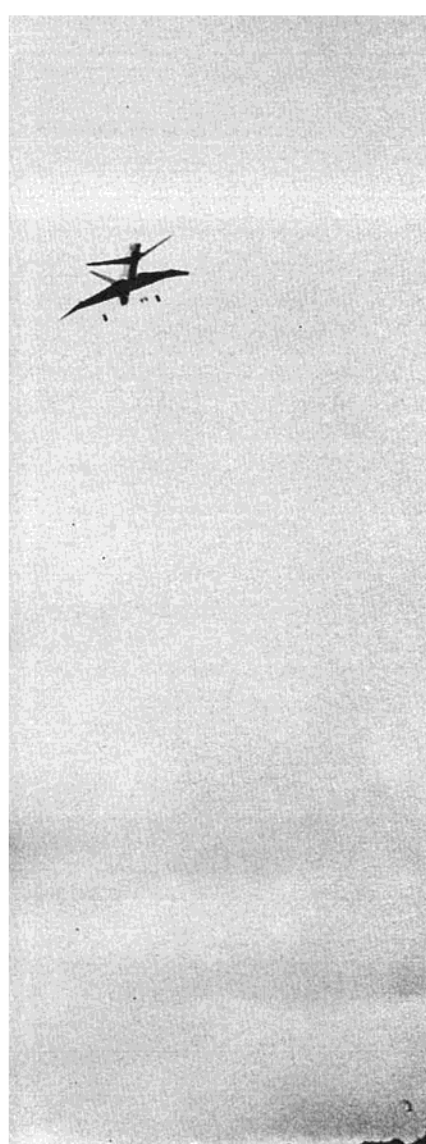
##### Mating

Prior to mating the wing, cut the first 3 1/2 inches of the leading edge half way through from the top every 1/2 inch. This is to allow the front of the wing with the trailing edge stock to negotiate the curved area of the fuselage. To reduce cracking and brittleness, wet this 3 1/2 inch area on top with water just prior to mating the main plane to the fuselage. Glue and join the main plane (wing).

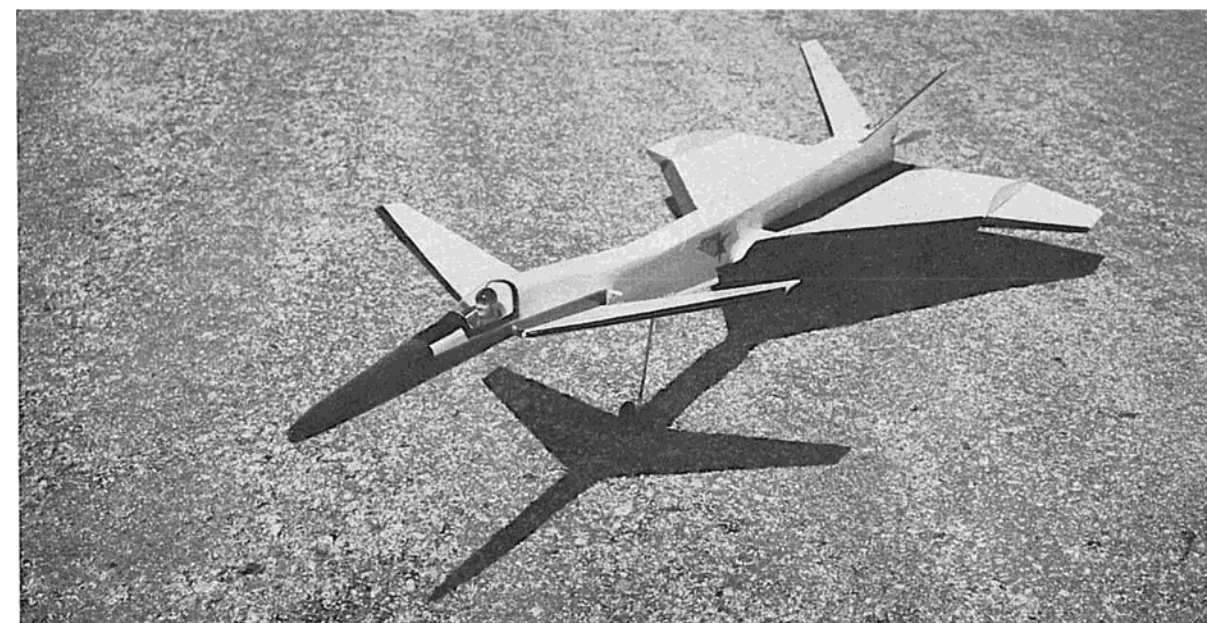
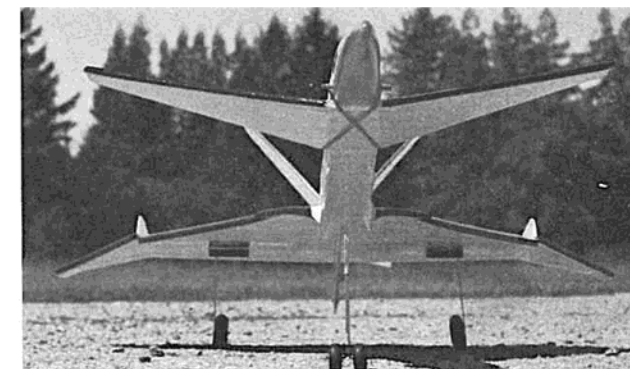
##### Landing Gear

The landing gear installation is a type I have used for years on Sunday flier free flight models. As the Mantis has a sheet wing, this type of installation is simple and effective; I have never had one tear loose. The landing gear wire is bent into a box at the wing base with a 1 1/2 square wood block recessed to accept the wire glued to the bottom of the wing with the landing gear sand-

(Continued on Page 84)



Whitey Pritchard's Praying Mantis bears a planned resemblance to the XB-70. Whitey, a member of the Lockheed photographic staff, has come up with a remarkable design that can be flown with single channel servos, as was the prototype, or with reeds or proportional control. Only throttle and rudder is utilized for flights that have to be seen and which are still hard to believe!



The Praying Mantis attracts attention on any strip. As easy to build as it is to fly, an inherent stability combined with its unique appearance, makes Whitey's six foot design a natural choice for anyone looking for more than just a run-of-the-mill design.



## THE PRAYING MANTIS

*(Continued from Page 16)*

wiched between. The front of the landing gear retaining block is painted black in front to simulate an air scoop.

The dual nose gear is done in much the same manner with one wire strut bent in a box going forward and the mate going aft. These two wire struts are mated together, wound with wire, and soldered. The completed dual strut is lowered into the fuselage from the top with the wheel axles passing on through the fuselage through a slot that is cut in the fuselage bottom length-wise and later replaced. After the wheel axles pass through the fuselage, the landing gear is rotated back to a normal position and a wood retaining cap is glued over it that has been recessed to accept the wire, as was done on the main landing gear.

### V Tail

The V Tail is cut from  $\frac{1}{4}$ " sheet which is sanded, sealed and covered prior to installation. The base of the twin tails rest on a  $\frac{1}{8}$ " sheet platform that is glued in above the fuel tank area with the outside surface of each tail glued to the inside of the fuselage. A  $\frac{3}{16}$ " sheet strip is then cemented in the center of the  $\frac{1}{8}$ " platform between the two tails as an additional retainer. The angle of the V tail is established by spacing the tips 12" apart with the distance from the wing to a tip being  $8\frac{1}{4}$  inches.

### Sub Fin

The sub fin and rudder are cut from  $\frac{3}{16}$ " sheet stock. The entire assembly is sanded and covered with the rudder mated prior to gluing in place under the wing on the center line. It is best to roughen the lower wing surface with sandpaper where the fin is attached prior to gluing in order to insure a good bond.

### Equipment Installation

This has not been detailed as it will vary depending upon the type of equipment installed. The original ship had the engine servo mounted flat above the wing. The rudder servo was mounted on the right side of the fuselage to obtain a vertical axis on the servo wheel. A one piece wire push rod through the center of the curved fuselage wing section was used with a single keeper glued to the fin to restrict any flexing of the wire.

When installing the fuel tank, remember that this is a pusher and the fuel will be forced forward, rather than aft, in the tank. If you are using a clunk tank, double the fuel line back inside the tank so that the metal fuel pick-up is at the neck, or front. After the equipment has been installed and operated the top hatch can be glued in place. On the original ship no equipment access hatch was made, the entire top portion of the fuselage from the cockpit to engine compartment being glued in solid. If you desire equipment access, make a detachable hatch above your gear.

### Flight Trim

The engine should be offset about  $3\frac{1}{2}^\circ$ . If you are using a standard engine with a reverse pitch prop, the offset would be to your left as you face the rear of the ship (the engine shaft moves from center line to the left). With a 35 engine some downthrust should be used. Start with about one washer under the rear engine bolts and progress as required. An important point to remember is that you are aft of the CG and you want to push up on the rear of the ship to achieve down.

You will find the Mantis less critical



to CG location than a tractor aircraft. The ideal CG location should be about 8" back from the leading edge of the main wing (rear) but it can be shifted back as far as 12" or forward 6" and fly successfully. A more rear-ward location simply changes the trim on the forward plane, **but a word of caution:** you will find that a Canard configuration flies with a much more pronounced angle of attack on the smaller plane than a tractor aircraft. It is well to start with the forward plane well on the positive side and work down. If the angle of attack is too great, the result will be a pronounced nose high flight attitude, or a mush, rather than a full stall. On a tractor configuration, the front wing stalls first and as it holds you aloft the results are a considerable loss of alti-

tude. On a Canard the forward wing is a trim plane, and when it stalls, the nose drops, and this reduces the angle of attack on the main wing (which is in the rear) and it does not completely stall out. On the other hand, if you start with too negative a setting the ship will tuck or zero out as speed increases.

The original ship flew well from the first without any adjustments other than a larger engine and more offset for torque. As the V-tail and sub-fin produce a strong weather vaning effect, the rudder area has been enlarged to produce a more responsive turn.

One last word of advice — if when you finish you just don't have the heart to take it off, a high speed taxi is guaranteed to clear the field of all dogs, cats and small children.

