PATTERN PUSHER

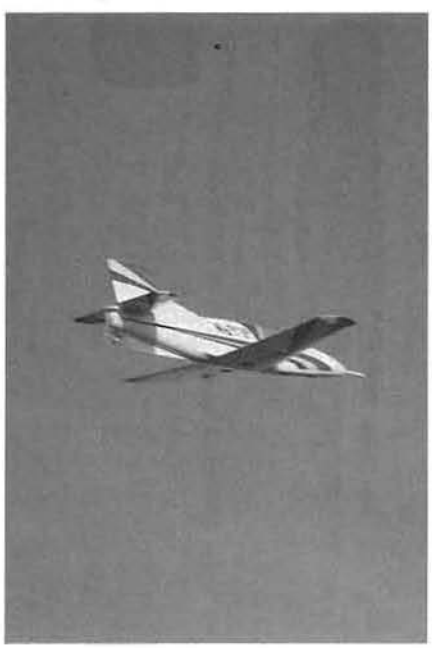
If you are looking for an out-of-the-ordinary, sleek looking pattern aircraft that is fast, maneuverable, and honest to fly, the Pattern Pusher is for you.

By Tom Prescott

A number of years ago I had visions of the beauty and lines of a pusher pattern aircraft. As is typical in the pattern world, there is never enough power and, therefore, the requirement today for a tuned pipe and a 2-stroke engine. Finally, the 4-stroke engine has come of age and thus allows a dream to come true.

Back in those early days of dreaming I conjured up rationale as to why a pattern pusher would have some definite advantages. These first thoughts included: improved control effectiveness by eliminating the propeller and, therefore, smaller control throws could be used; improved stability because of increased effectiveness of the surfaces; improved pitch stability with smaller perturbation with power changes; improved stall turns because rudder effectiveness does not change as significantly with reduced airspeed; improved noise levels and a **different** sound, I might add, by allowing use of four-bladed propellers; and, last but certainly not least, to many of us it would be nice to get the gooey oil away and off of the airplane.

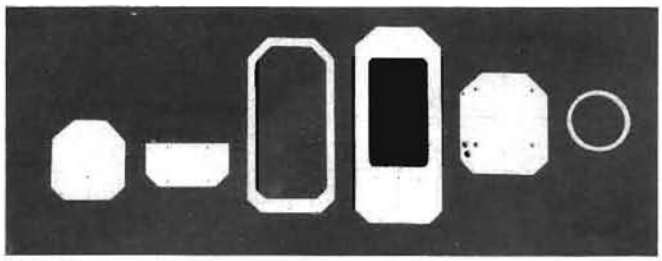
As in any aircraft design, there are trade-offs. With the Pusher there are two important ones. First is weight control. 4-stroke engines are heavy and weight aft cannot be tolerated. Weight control is critical and one must not be squeamish about adding lead weight to his beauty. The second trade-off is a propeller clearance. Long gear legs are required which make for a squishy ground handling characteristic. Prop tips are eaten on a regular basis, so get used to it! Again, the four-bladed propeller helps tremendously.



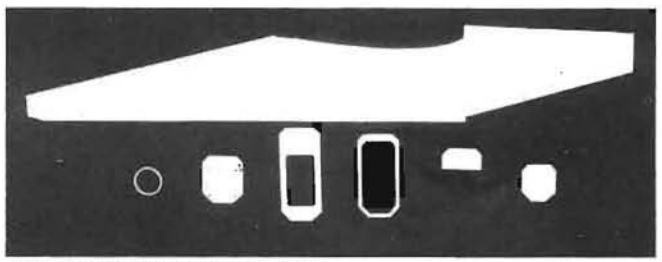
CONSTRUCTION

Fuselage:

The fuselage is designed to be constructed upside down on a flat building surface. Start construction by making the required bulkheads and fuselage sides. Note: the fuselage sides are made from 1/4" x 4" x 48" balsa sheets. The top surface of both sides must be straight. A centerline and bulkhead location should be marked on the fuselage sides to help with alignment. Also, F-5a is glued to F-5. F-5a gives F-5 enough thickness to accommodate the "T" nuts provided with the O.S. 120 4-stroke engine. If other "T" nuts are used, F-5a may not be needed. Install F-3, F-4, and F-5/F-5a, and the triangular stock on one side. Note: The engine is installed



Fuselage bulkheads.



Fuselage bulkheads and sides.

with 2° downthrust and no sidethrust. As a matter of convenience, before installing F-5, locate and install the engine mount using blind nuts. Also, pre-drill holes for the fuel tubing and throttle cable.

While the bulkheads are drying, glue the triangular stock on the opposite side. A centerline should also be marked on the building board to keep the assembly aligned. Glue the sides together upside down on the building board. Four support blocks should be nailed to the board to keep this section square. Complete the aft section assembly and locate F-6. Note: It may be required to make several saw cuts in the triangular stock to facilitate this assembly. Now install F-2. As with the engine, it is recommended that the nose gear be installed on F-2 prior to its final installation. To complete the forward section, F-1 is installed.

Next, install the nose gear floor (F-7) made of 1/16" plywood and the 1/4" balsa triangle support. The nose gear retract servo should be installed at this time and the linkage completed. Cut to shape the four balsa fuselage blocks. To conserve weight, it is important to hollow these blocks as much as possible as shown on the plans. Install the two aft blocks first. Next install the two forward upper and lower blocks. Install the nose block. Place the partially completed fuselage aside for now and begin construction of the vertical fin.

Vertical Fin:

Make all the required parts for the vertical fin including VFJ-1 through VFJ-5. These vertical fin building jigs are laid out on the building board at their respective positions. Once these jigs are secured in position, the vertical fin is constructed in sequence from one side to the other. Start construction with the right skin properly located on building jigs.

Next, install and glue to skin the main spars and ribs. After this assembly has dried, the left side skin is glued in place. At this stage the rudder and 3/16" sheet balsa forward section of fin are completed.

PATTERN PUSHER
Designed By:
Tom Prescott
TYPE AIRCRAFT
Pattern
WINGSPAN
64 Inches
WING CHORD
14.6" (Root)
9.0" (Tip)
TOTAL WING AREA
759 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Swept Taper
DIHEDRAL EACH TIP
1¾ Inches
O.A. FUSELAGE LENGTH
55 Inches
RADIO COMPARTMENT SIZE
Ample Room
STABILIZER SPAN
25½ Inches
STABILIZER CHORD (incl. elev.)
8½ Inches
STABILIZER AREA
183 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
8½ Inches
VERTICAL FIN WIDTH (incl. rud.)
9 Inches
REC. ENGINE SIZE
1.20 4-Stroke
FUEL TANK SIZE
14 Oz.
LANDING GEAR
Retractable Tri-gear
Tricycle (Retracts)
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Ail., Elev., Flaperons
Retracts, Rud., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Ply & Foam
Empennage	Balsa, Ply & Foam
Wt. Ready To Fly	136 Oz.(8½ lbs.)
Wing Loading	25.8 Oz./Sq. Ft.

Horizontal Stabilizer:

Standard foam core construction was utilized on the horizontal. First cut the cores using the stabilizer templates. The core blocks are used to complete the assembly. Lay lower skins in the blocks first and paint with Formula II epoxy. Install the cores.

Next, epoxy the top skin and install. Weight the two assemblies down on a flat building board and allow to dry overnight. After the assemblies have dried, carefully align and epoxy halves together. Install the 1/2" x 1/2" balsa leading edge.

Next glue the balsa tips in place and sand the completed assembly to final shape. Now fiberglass the center section, both top and bottom. The elevators are made from 3/8" lightweight balsa. An easy construction method is to glue in place a 3/32" square spruce trailing edge. Then sand the sheet to final contour. Temporarily install hinges.

Wing:

The wing construction again utilizes standard foam core techniques. Cut the foam cores as illustrated on the plans. Note: The cores are cut with the dihedral installed. They require a 32" length block. The tips are trimmed at a 45° angle. After cores are cut, use a modified tip soldering iron as a cutter to slot area for retracts and aileron

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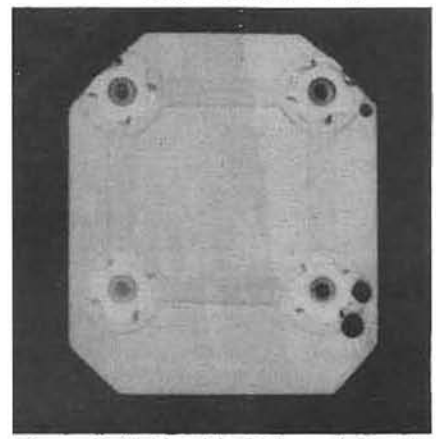
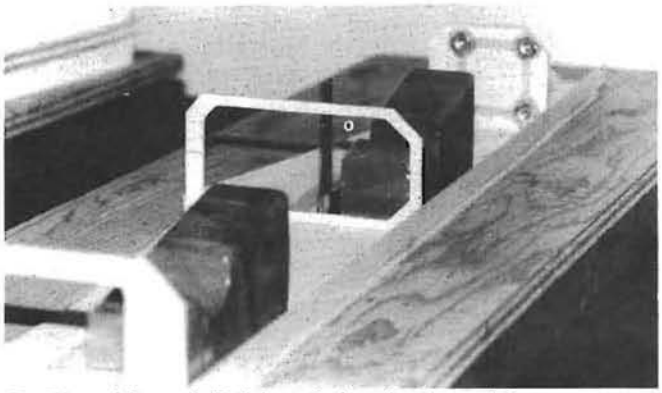
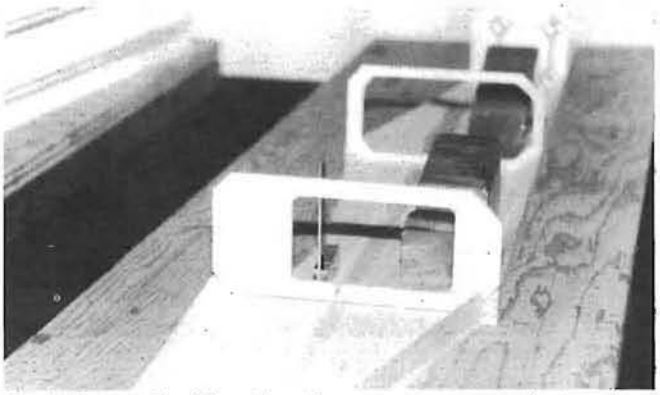


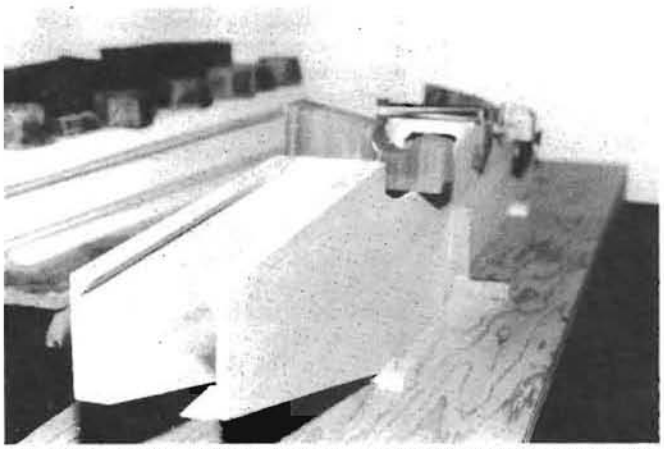
Firewall (F-5) with F-5a and T-nuts installed.



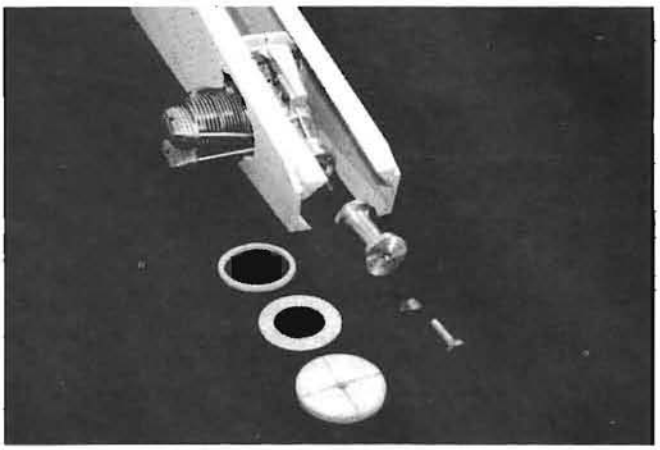
F3, F4, and firewall (F-5) installed on fuselage side.



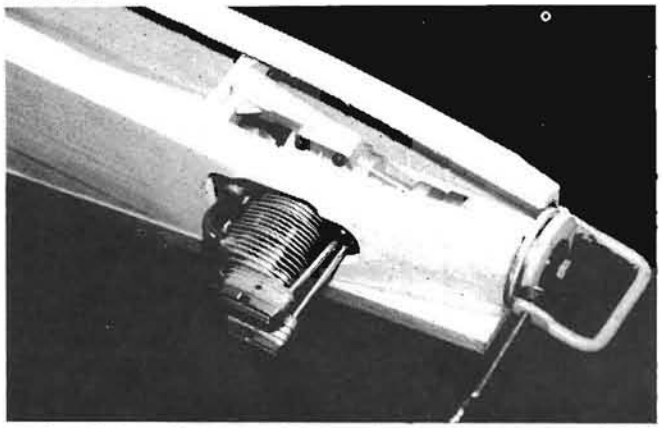
Centerline and bulkhead locations ensure proper alignment.



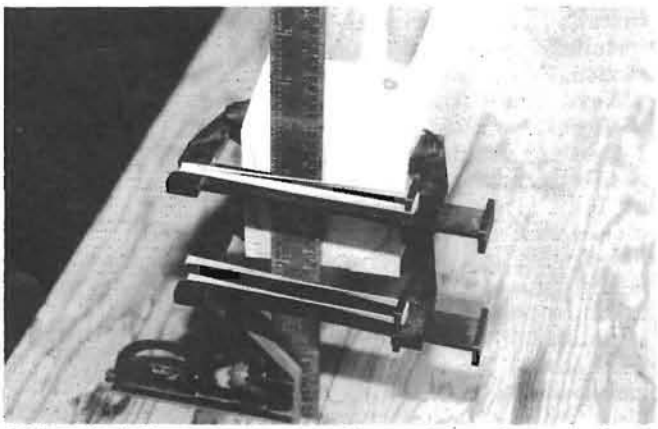
Fuselage sides joined. Note support blocks to help hold fuselage.



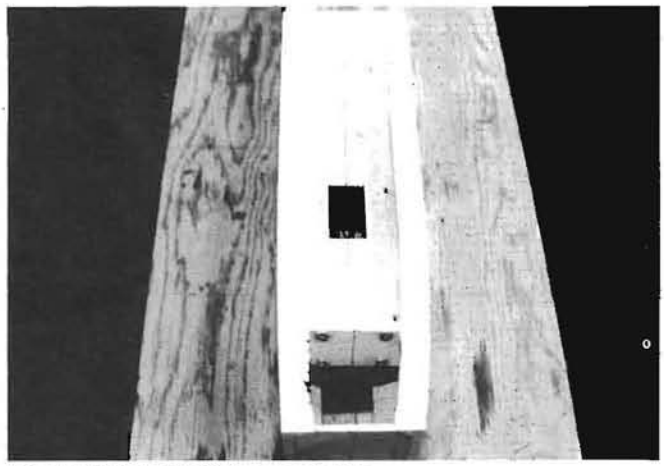
Engine installation detail.



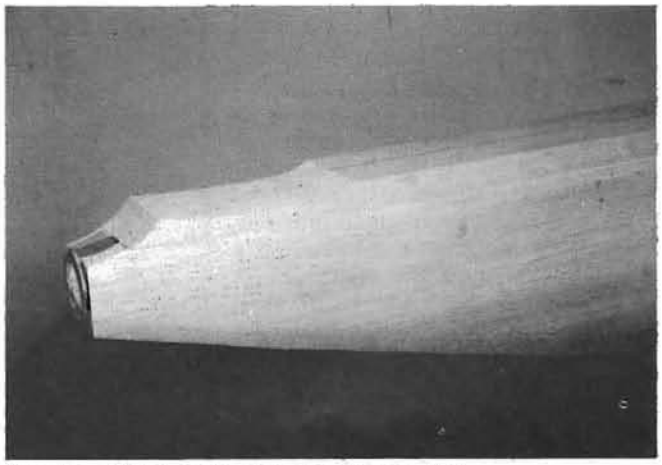
F6 Installation. Note: cuts in triangular stock may be required.



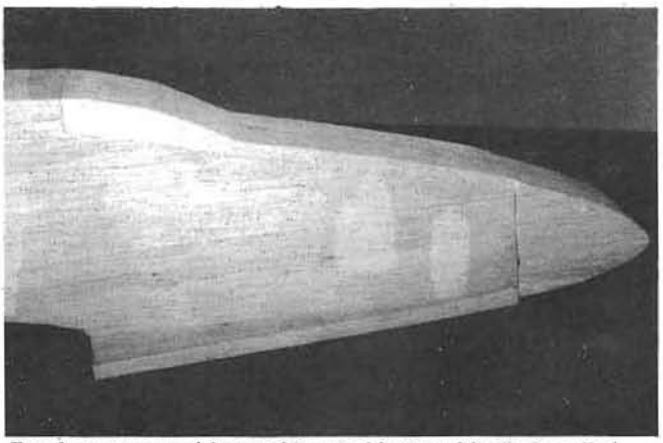
F1 installed. Note: cuts in triangular stock may be required.



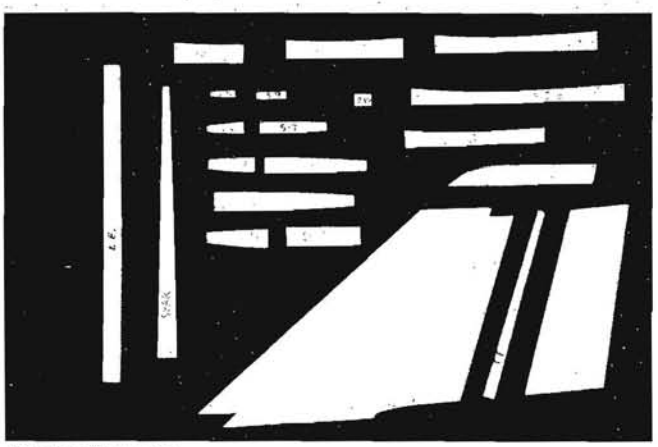
F2 and F7 installed in nose section.



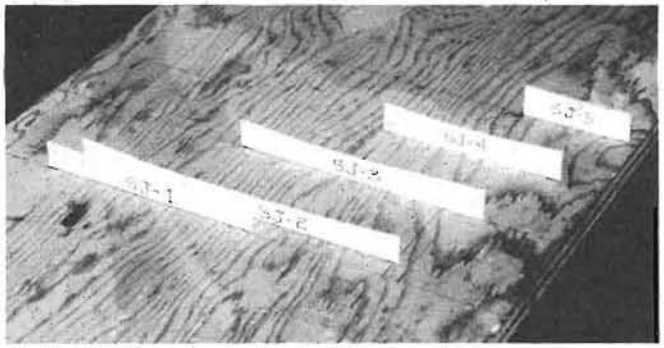
Fuselage aft top and bottom blocks installed.



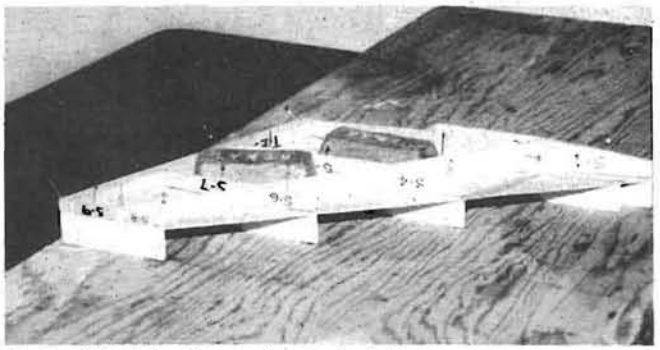
Fuselage nose and forward top and bottom blocks installed.



Vertical fin parts.

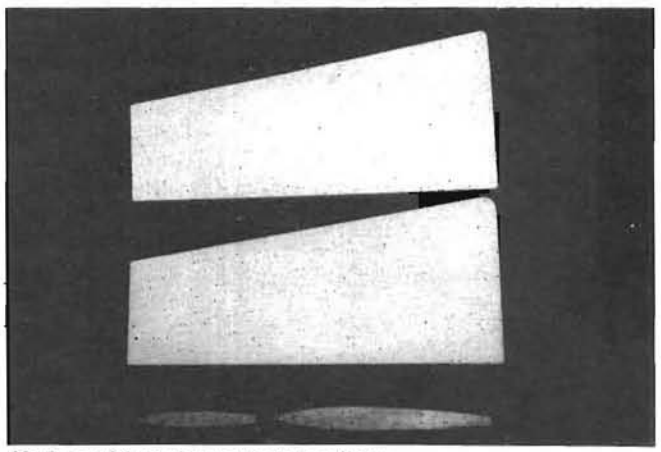


Vertical fin jigs mounted on building board.



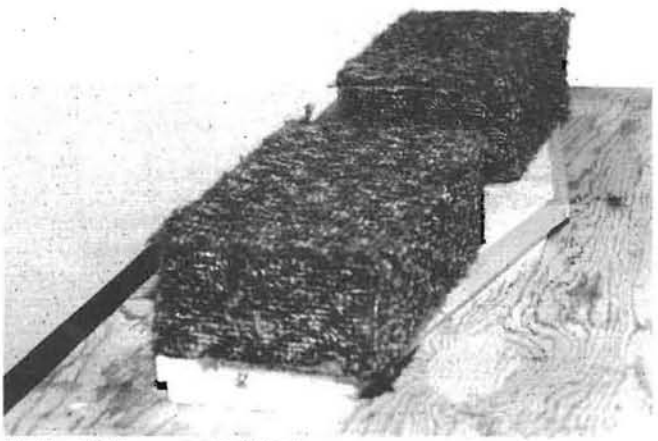
Vertical fin side, ribs, and spars installed.

Remaining vertical fin side installed.

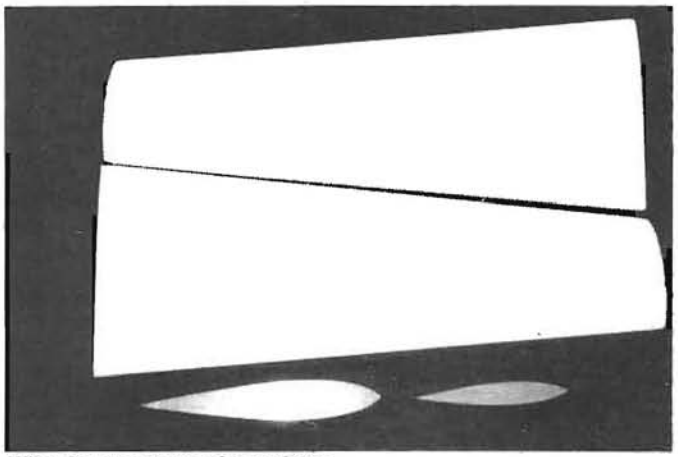


Horizontal foam cores and templates.

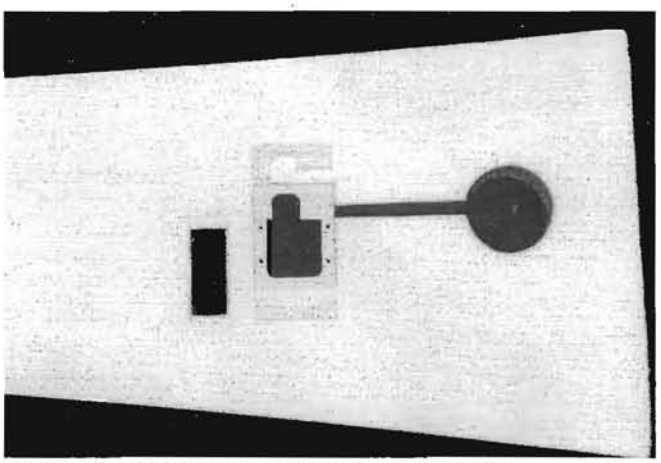
Horizontal foam cores sheeted with 1/16" balsa sheet skins.



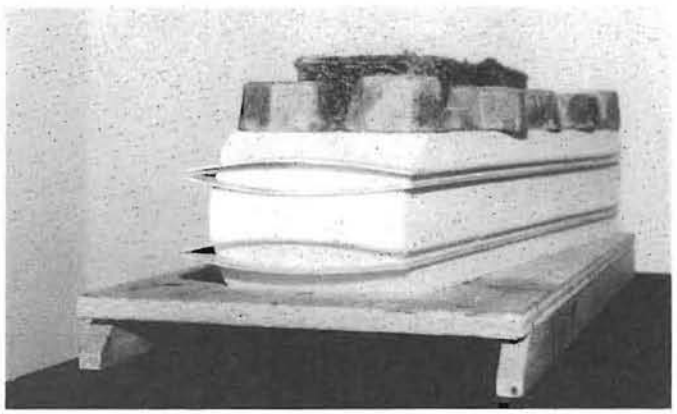
Horizontal foam cores joined.



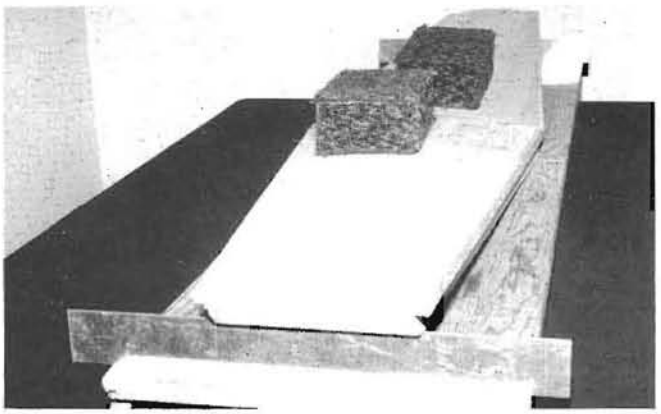
Wing foam cores and templates.



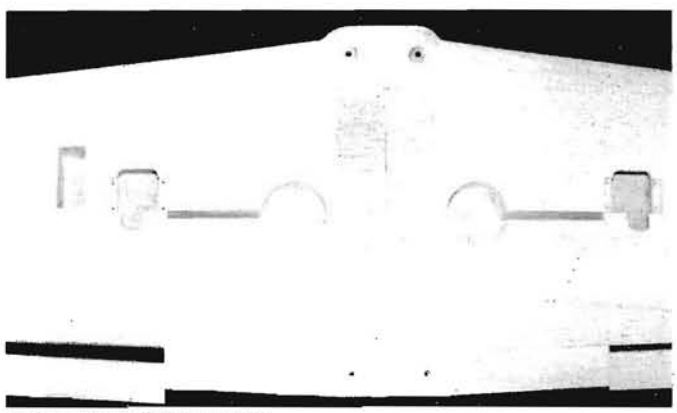
Goldberg retract mount; wheel and servo cut-out.



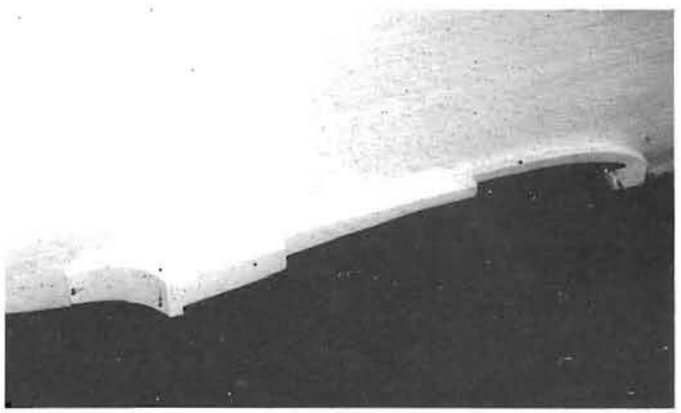
Wing foam cores sheeted with 3/32" balsa sheets.



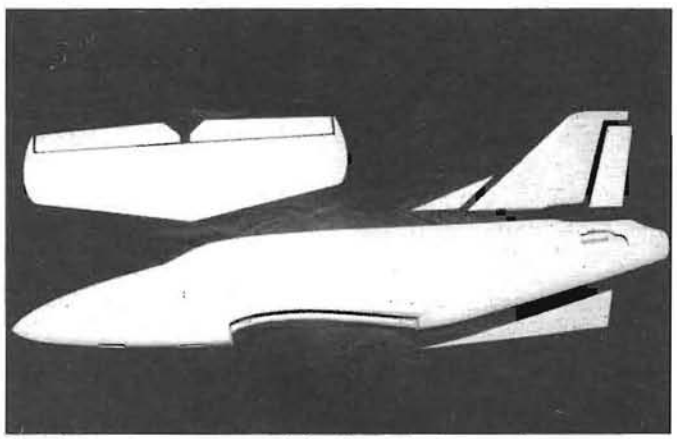
Wing foam cores joined.



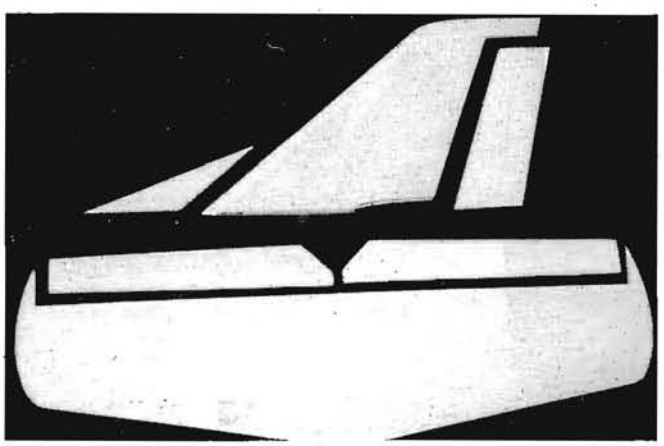
Retract installation detail.



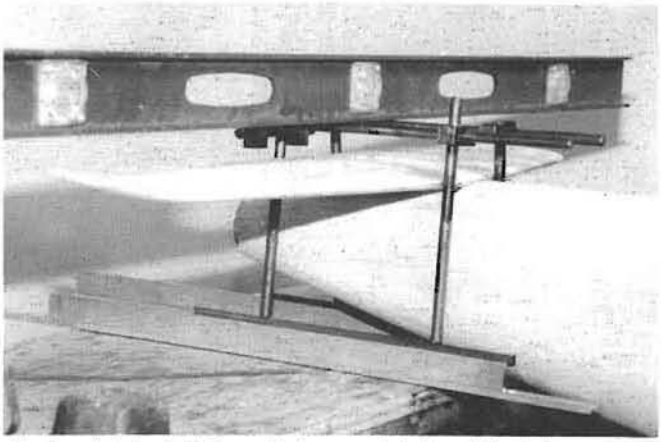
Wing fillet construction detail.



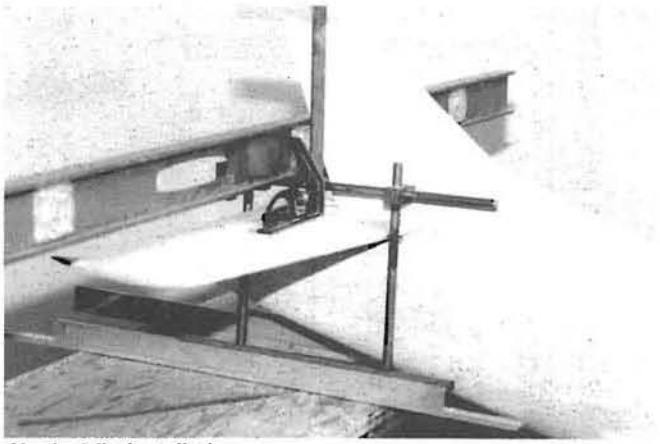
Fuselage components sanded prior to final assembly.



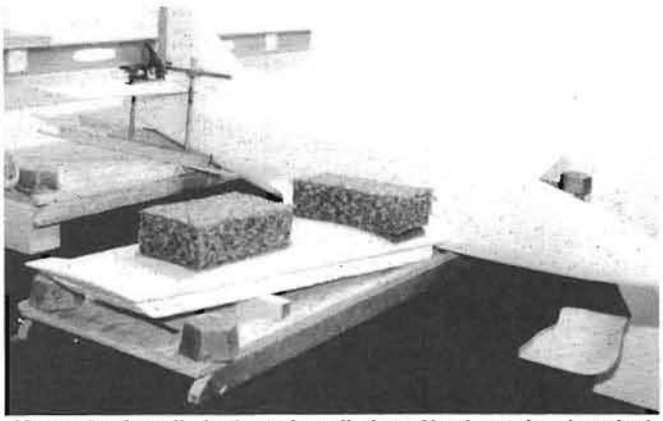
Vertical fin and horizontal final sanding.



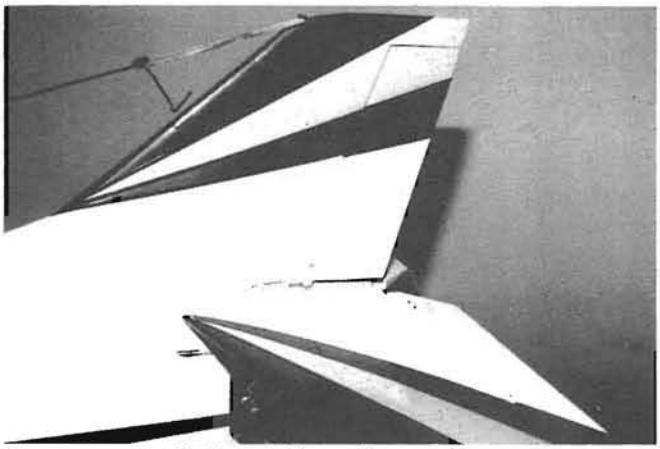
Horizontal installation. Note special jig utilized to ensure horizontal incidence.



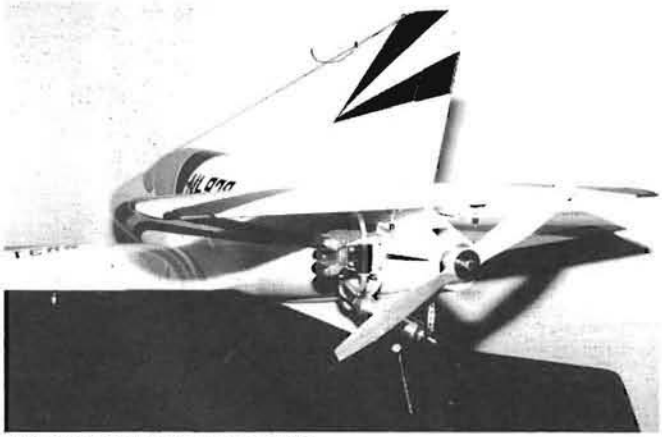
Vertical fin installation.



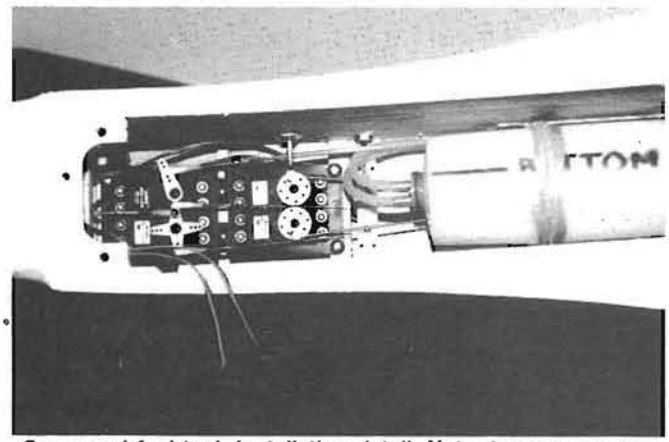
Note: wing installed prior to installation of horizontal and vertical fin, and that two parallel boards were used to ensure proper alignment.



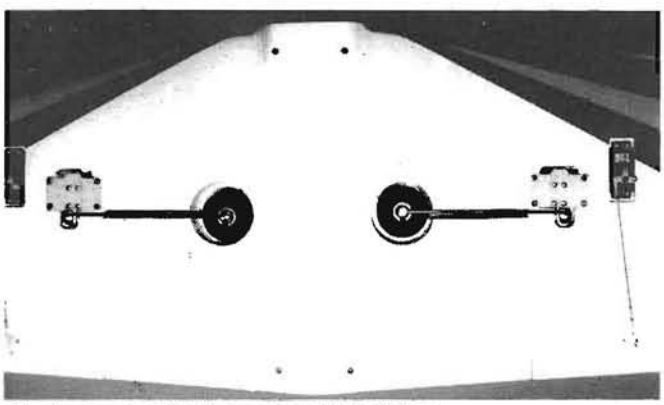
Empennage detail. Note rudder cables used.



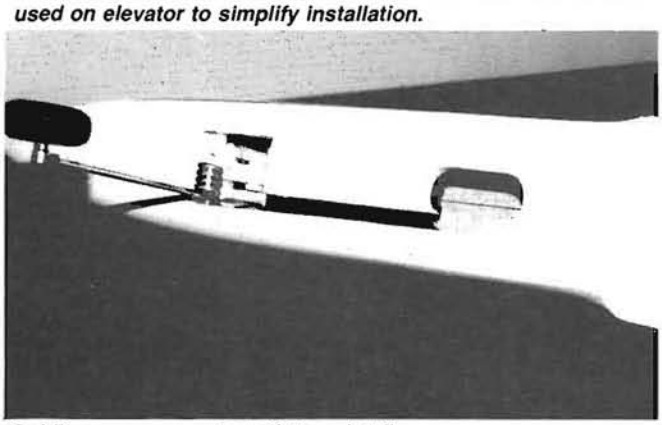
Aft view of fuselage assembly.



Servo and fuel tank installation detail. Note: two servos were used on elevator to simplify installation.

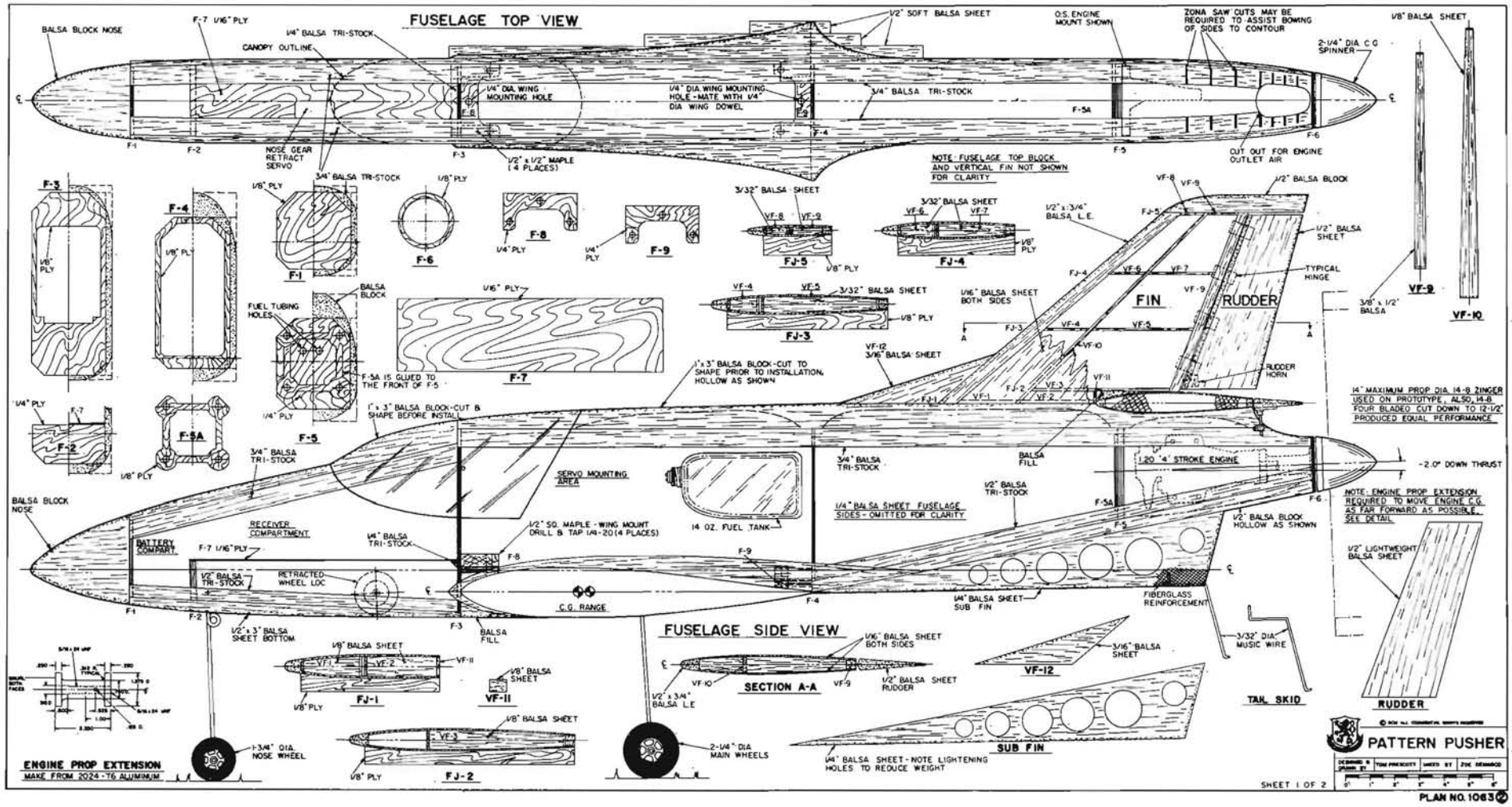


Final retract and aileron servo installation.



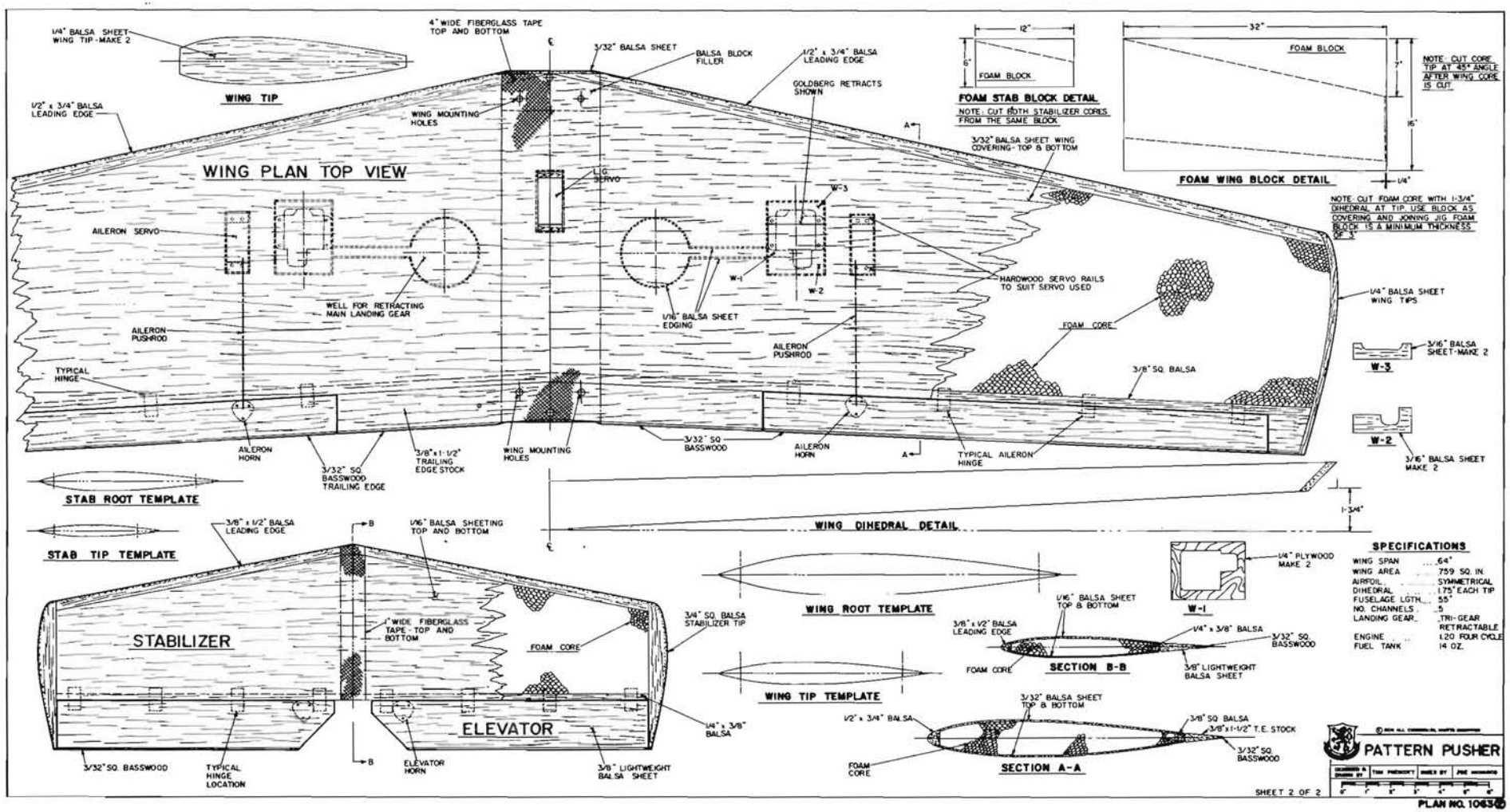
Goldberg nose gear installation detail.

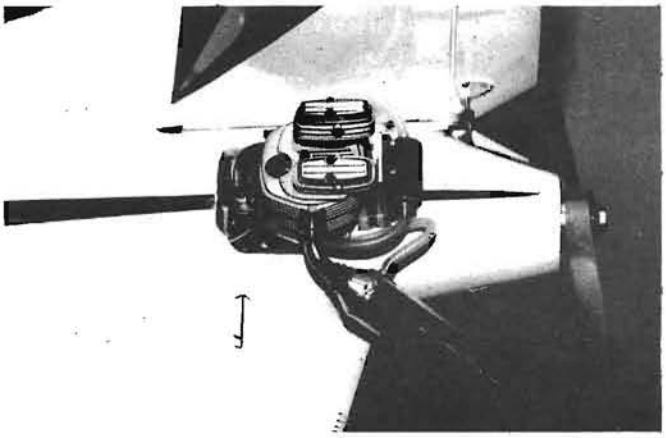
FULL SIZE PLANS AVAILABLE SEE PAGE 280



FOAM WING AND STAB CORES AVAILABLE FOR THE PATTERN PUSHER (1063) FROM WING MFG. CO., 306 E. SIMMONS, GALESBURG, IL 61401, (309) 342-3009. WING CORES $19.95, STAB CORES $9.95. ADD $4.50 POSTAGE AND HANDLING FOR COMPLETE PACKAGE.

FULL SIZE PLANS AVAILABLE SEE PAGE 280





Engine installation detail.

Completed Pattern Pusher.

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servos. Close out these areas with 1/16" balsa sheet pieces. Assemble four each 1/16" balsa skin. Lay the lower skin in the bottom of core block and coat with epoxy (Formula II).

Next install the filler blocks. Also install the plywood retract mounting plate. These items should be coated with epoxy before installing. Place the core on top of the lower skin. Epoxy the top skin and core. Install the top skin. Weight the assembled blocks down on a flat surface and allow to dry overnight. Before proceeding with the wing final assembly, cut out retract and aileron servo areas and do not forget to channel an area for the retract linkage and aileron servo wires. Use a 3/16" piece of music wire heated on an electric stove.

Return the wing panels to the foam blocks and epoxy halves together. When dry, epoxy in place the 1/2" leading edges. Trim the center section as shown on the plans and install the 3/32" balsa facing. Temporarily install hinges in the aileron. Epoxy in place the 1/4" balsa wing tips. Make cut-out for the retract servo and close out with 1/16" balsa sheet pieces. Fiberglass center section of wing.

At this stage the wing mounting hardwood blocks are installed in the fuselage and the wing mounting is completed. After the wing is bolted in place, then the wing fillets can be installed and shaped. Sand the fuselage and fillets to final contours. With the wing installed to insure proper alignment, glue the horizontal stabilizer in place. Using the horizontal stabilizer to ensure proper alignment, glue the vertical stabilizer in place. Install the sub-fin.

Finishing:

The prototype model was covered with Super MonoKote, trimmed, and then painted with clear Super Poxy paint. The key is to use the lightest possible finish to keep the model weight as low as possible. Cables and dual horns were used on the rudder to get the control past the firewall. Also, two elevator servos were used to make this control easier to install.

Flaperons were obtained electronically through a programmable transmitter. Originally, an O.S. Max 120 4-stroke and Perry oscillating pump was tried with poor results. A new Surpass O.S. was installed and worked great. Nose weight will be required to properly balance the airplane.

Flying:

This R/C model is a dream to fly, and it is fast! Its flight characteristics are similar to any finely tuned tractor pattern aircraft. It completes loops, rolls, knife-edge flight, stalls and spins effortlessly and has power to spare. The model has been flown with the C.G. limits as shown on the plans, but prefers the more forward positions. The prototype model has been flown with an O.S. 120 4-stroke. The 120 has plenty of power and a 90 4-stroke may be more than adequate. Both two-bladed and four-bladed propellers have been used. The four-bladed propeller (made from two two-bladed Zingers), works extremely well on this aircraft. The added disc area creates a bit more drag at low throttle settings to slow the model down for landing. The landings are a beauty to behold. The prototype used flaperons primarily to keep the take-off and landing rotation angle to a minimum. Without flaperons, a bit more care and runway is needed to save prop tips.

If you are looking for that aircraft that has pizazz, looks and sounds fantastic, and is capable of that "barn burner flight," the Pattern Pusher is for you. □