Power It with a PULSE JET

This model plane project uses what may be the smallest successful pulse-jet engine ever built. It was developed after scores of experiments and the building of a dozen test models by Hiram Sibley, Jr., a California guided-missile engineer.

The ideal thing about this engine (Fig. 4A and B) is that it cost little and can be built by the amateur who has had a fair amount of metal working experience in his home workshop. Also, if you are interested, the same basic design can be built large-scale for use on a bicycle or boat (Fig. 31). Let's concentrate, however, on first building the model plane-size engine.

The original jet tube is made of two different diameters of stainless steel (standard airplane tubing can be used if you can't get the stainless steel). First turn and bore on the lathe a swaging block of cold-rolled steel (Fig. 6B) and make a flaring tool also of this steel. The flared tube is then drawn and swaged to the required diameter. The smaller tube is flared by tapping the tool and, when of a size to meet the swaged tube, they are welded. Park-weld in three spots, then complete the weld all around, using stainless steel rod. There is, of course, the ever-present danger of burning stainless steel, and if you are not an experienced welder, have it done by an experienced man. Grind and file the weld until no joint is visible (Fig. 6D). Also file the exhaust end of the tube to the angle shown in Fig. 6A. Now drill holes for the set screw and spark plug as shown in Fig. 6A. Tap spark plug hole 4-40 (or 32) for Champion V-4 plug. Either

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tap is correct for this plug as only about 1/4 threads engage in the thin tubing wall. Fig. 7A shows the venturi with spray-bar and

reed assembly. The venturi is turned from 1/4 in. diameter 3407 aluminum bar with a shoulder to bring against the tube, then drilled and tapped for the set screw securing it to the tube, and for the machine screw holding the reed. The reed itself is made of #000 tempered steel, and should be bent out at the bottom approximately 1/4 in. You can get the spray bar (Universal or Standard) at most model airplane stores for about 50c, which is a fraction of what your time would be worth attempting to make it yourself. To use the more elaborate nose assembly design shown in Fig. 4B, make the venturi without the spray bar and use a 6-32 x 1/4 S. H. oval point set screw to hold the nose assembly. Drill in lower part of venturi for set screw at the same point as speed bar location shown in Fig. 7. This nose design requires a special air-starter nozzle (Fig. 5). For the jet engine you build following the simplified spray-bar shown in Fig. 7A, use the air-starter nozzle made as shown in Fig. 7B.

For your compressed air get a surplus oxygen tank and have it pumped up at the filling station to a pressure of about 10 lbs. or a little more. No gage is required beyond the one at the filling station. Provide yourself with a Ford Model T roll (Sears and Roebuck, etc.), two dry cells, wire and switch, all of which most model airplane dealers can supply.

To test the engine, clamp it in a vice, fill the tank with unleaded gasoline and connect up the fuel line. Then open needle valve about 4 turns and slip air-starter over spray bar (Fig. 7B). Connect Ford coil to plug, turn on coil and turn on air supply, just enough for good
**MATERIALS LIST—Pulse-Jet Powered Plane**

**Pulse-Jet Engine**
1. pc. stainless steel or airplane tubing 4" x 3" 0.015 wall or less
2. pc. stainless steel or airplane tubing 2½" x 3/16" 0.015 wall or less
3. pc. round aluminum 3/4" x 3/4" for the venturi
4. standard spray bar for model planes
5. ac. 500 x 7/8" tempered steel age stack for the reed
6. ac. 500 x 7/8" tempered steel age stack for the reed
7. ac. 500 x 7/8" tempered steel age stack for the reed
8. pc. cut-rolled steel 1/8" x 24" for swage block
9. pc. cut-rolled steel 1/8" x 24" for swage block
10. pc. cut-rolled steel 1/8" x 24" for swage block

**Air Starter**
1. surplus oxygen tank
2. ac. 3/4" x 9/16" x 3/16" 0.015 steel
3. pc. brass tubing 3/16" x 1/2" 0.015 steel
4. 18" rubber tubing
5. 1 pc. "T" coupler (available at airplane model stores or Sears Roebuck)
6. 2 pc. 1/8" wire and switch

**Airplane Body**
1. pc. hard balsa 3" x 2½" x 2½" for fuselage (allows for trimming)
2. pc. balsa sheet 3/16" x 12" x 12" for wings
3. pc. stainless steel or 1/16" aluminum 1/8" x 3" for engine support
4. pc. stainless steel or 1/16" aluminum 1/8" x 3" for tail assembly
5. pc. plastic wire 3/16" x 12" for similar control
6. Control wire and grip from model airplane store; 1 bar 2½" x 2½", foam for bell crank.

**Launchers**
1. pc. stainless steel 3/16" x 3/16" for aluminum wheels
2. pc. model airplane wheels 3/16" dia., rubber tubing

The fuel tank of brass or tin (Fig. 8B) with soldered joints, and vent, filler and supply pipes of 1/4 in. copper tubing. (You may find suitable tank at a model airplane store in your locality.)

Apply model airplane cement and install the wings in the slots. Set the tank in the well (Fig. 8B) and cover over with balsa lid. This can be made to lift out, with a spring fastener, or sealed permanently with Plastic Wood around vent and fill tube. Cut the jet support from balsa to be determined by experiment. Control wires are carried through a guide on the tip of the wings (Fig. 8D). The tail assembly has an elevator on one side only, and is hinged with cloth, silk or mohair. The fabric should be glued on both sides with model airplane cement, before painting, of course. Use 1/4 in. piano wire for control link between bell-crank and horn. See Fig. 10 on how to build the launching dolly.

If you would like to see what the dimensions of a pulse-jet engine, based on this same design but larger enough for application to bicycles, boats, etc., would be, Fig. 11 suggests these for you. Plans for such installations are not available, since you'll probably have your hands full turning out the little engine for model planes, and the larger applications involve construction procedures and technical skills beyond the capacity of the average home workshop builder.