OLDSMOBILE SKY-ROCKET

A Unique Promotional Project Mates an Olds V-8 with a Cessna Skylane

BY ROGER HUNTINGTON

THE IDEA of putting a passenger car engine in an airplane is not new. Back in the 1930s there were several commercial conversions of standard Detroit engines for light aircraft, involving Ford Model A powerplants, V-8s and even the small Plymouth Six engine. As late as 1941 the Akron-Funk people marketed a Ford B conversion with a special aluminum cylinder block that gave 63 bhp from a dry weight of 255 lb. The attraction is obvious: Mass-produced Detroit engines are potentially much cheaper than precision-built, limited-production aircraft engines—even with the added conversion costs. And the chief problem is just as obvious: How to control powerplant weight with the cast iron engine construction and water cooling. Weight is a much more critical factor in aircraft performance than in a land vehicle.

So it was with much interest that we followed the recent experimental project to put a new lightweight Oldsmobile Jetfire Rocket 330-cu. in. engine in a modern Cessna Skylane 4-place personal plane. Admittedly, the whole project was pretty much a publicity gimmick, to demonstrate the reliability and light weight of the new Olds V-8 engine, and it was financed through the Oldsmobile advertising agency's promotional budget. The engineering, machine work and fabrication was done by Demmer Tool & Die Co. and Hughes Flying Service did the installation and testing. Both are Lansing, Mich., organizations that worked closely with Oldsmobile engineers on the project. And the whole thing was under the close eye of the Federal Aviation Agency, which had to approve the experimental plane as airworthy before it left the ground. This was no backyard job: The experimental engine installation was as neat as a pin.

The resulting equipment combination was by no means a bad airplane, although the Olds water-cooled engine installation did weigh 342 lb. more than the 230-bhp air-cooled Continental 6-cyl. installation that it replaced. This additional engine weight in the nose of the plane required 220 lb. of ballast in the rear luggage compartment to bring the center of gravity back to the proper point for acceptable stability. (This ballast weight, however, could have been removed with more time and a bigger budget to redesign the wing location.)

Another problem was that there was no practical way to get 270 lb./sq. in. of oil pressure through the crankshaft hub to operate the constant-speed hydraulic propeller. The budget didn't include a new electric propeller, so the prop pitch had to be locked in a position that would hold the engine rpm at 4400 with wide-open throttle in level flight. But this would allow only 3950 rpm on the take-off run and a little over 4000 when climbing. Full horsepower could not be developed under all conditions.

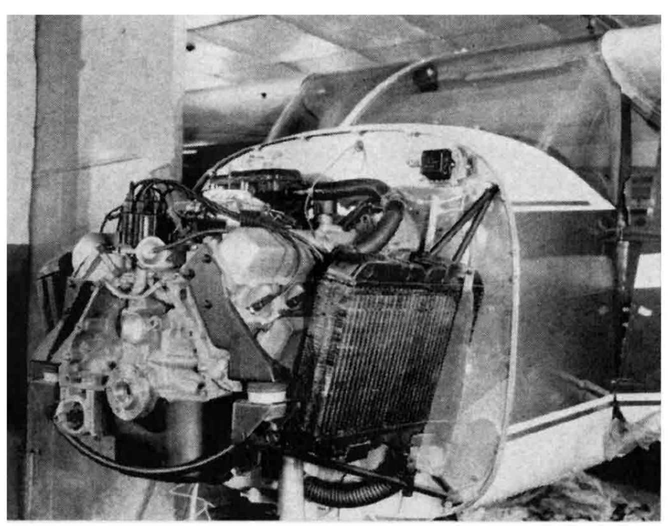
Despite this the Rocket-Cessna could get off the ground in 650 ft. and climb at a rate virtually as high as the standard plane (with equal load). The all-out top speed proved to be a shade better than the advertised 170 mph for the standard plane with 230-bhp Continental. It appeared to be between 170 and 175 mph with full throttle, at 4400–4500 rpm. This indicates that the Olds engine, advertised at 290 bhp (high compression, 4-barrel carburetor), develops just about the same true bhp as the standard Continental rated at 230 bhp. The Continental has 471 cu. in. and is rated 230 bhp at 2600 rpm. Aircraft engines are tested just as they operate in the plane, whereas Detroit engines are rated in stripped condition. The Olds engine had an open exhaust and the alternator and water pump operating, but no fan. Apparently it puts out nearly 230 bhp at 4400 rpm in this condition.

The Olds engine installation was characterized by its extreme smoothness, lack of vibration and excellent throttle response. Test pilot Dick Marsh (of Hughes Flying Service) said the smoothness was uncanny. Most inline and opposed-cylinder aircraft engines dispense with crankshaft counterweights to save weight, so a healthy engine vibration is the constant companion of the light-plane pilot. No such thing with the Olds. And the throttle response, flexibility, smooth idle, quick starting, etc., were entirely new to pilot Marsh.

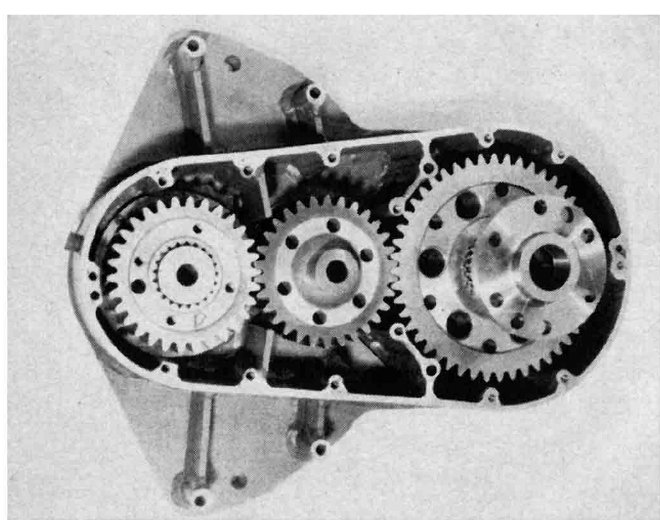
The technical details of the installation were fascinating. For one thing, a propeller reduction gear was a necessity. A prop of this size couldn't possibly operate efficiently at 4000+ rpm, because tip speed would be above sonic velocity. Also, it was necessary to raise the propeller axis about a foot above the crankshaft axis of the V-8 engine in order to fit the engine within the standard Cessna cowling (and to keep the plane looking reasonably "stock"). This gearbox was the key to the whole project. Demmer Tool & Die made a beautiful and workmanlike job of it.

The casing was fabricated out of 0.25-in. steel plate, welded up. The whole gearbox was designed so it could be mounted on the stock cylinder block bolt pattern for the bell housing. Then the top of the box (which would normally have been a simple cantilever layout) was braced solidly to the intake manifold bolts with short tie rods. This prevented thrust and gyroscopic forces on the propeller from wrenching the gearbox out of alignment. Admittedly this gearbox was probably stronger and heavier than it needed to be. Demmer used three gears of chrome-vanadium steel (SAE 6145)—rough machined, heat-treated to 50 Rockwell C, then finish machined. The gears had a full 2-in. face width and probably could have transmitted 2000 bhp without trouble! A massive roller thrust bear- ▶

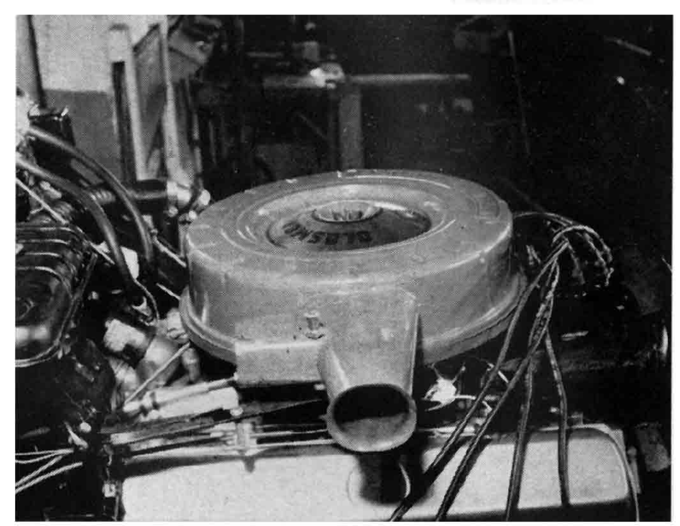
RESULTANT PUBLICITY shot paired the Rocket-powered Cessna Skylane and a Rocket-powered Jetstar 88 on a Lansing runway.



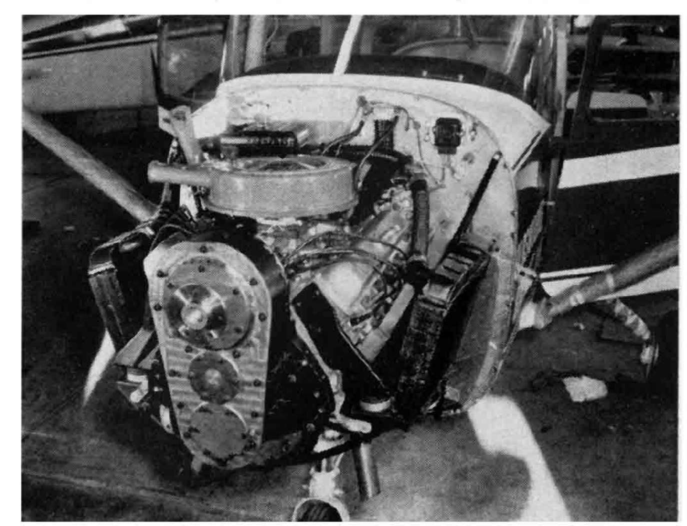
INSTALLATION OF Olds Rocket required special engine mounts.



THREE-GEAR SYSTEM reduces 4400 rpm of engine to 2750 prop rpm.



CARBURETOR HEAT was provided by tube to air cleaner extension.



SIDE-MOUNTED radiators were connected to high header tank.

ing was used on the propeller end of the box. Center-to-center distance between the two end gears is 11.5 in. The center gear is merely an idler, so it wouldn't be necessary to use two very large gears. The crank gear has 30 teeth and the prop gear 48 teeth—giving a prop reduction ratio of 8:5. The prop thus turns 2750 rpm when the engine is at 4400. The complete gearbox—three gears, six bearings, three shafts, plus the casing—weighs approximately 170 lb. It mounts to the block bolt pattern, and the regular engine flywheel is interposed between the engine crankshaft and the drive gear hub. The gears are retained by precision splines.

This gearbox, amazingly enough, hasn't given a bit of trouble. We expected to hear a tremendous whine from those straight-cut spur gears when the plane was in flight. But the only time a whine is audible is when the engine is idling on the ground. Gear alignment and surface finish must be perfect. There was a little trouble, at first, with blowing oil. The transfer box was filled up to about the center of the bottom gear—and at first a breather in the top of the box was provided by using a simple pipe T with a restriction. Some oil would blow out under the engine cowling. The problem was solved by substituting a large Zerk fitting with ball check valve.

Cooling the engine was a trial and error development. They wanted to retain the standard Cessna engine cowling, which looked practical—since it had 200 sq. in. of air opening in the front and exit flaps in the back, similar to the air ducting conditions around the standard radiator in Oldsmobile cars. Olds engineers told them they would have to get rid of between 6000 and 6500 BTU of heat per min. at 4000 rpm engine speed and suggested that the total radiator core area be kept near the 375 sq. in. used in the cars. The only way they could do this with the standard cowl was to use two smaller radiators—placed lengthwise along each side of the engine. They finally settled on two 3-in.-thick cores, 20 x 12 in., for a total core area of 480 sq. in. in the plane. They used a good big expansion tank and a 15-lb. pressure cap to help things along.

It didn't work. The engine would boil in ground taxiing before they could get into the air. The solution, however, proved simple enough: They cut large flaps in the cowl panels just outside the radiator core areas and bent the panels outward slightly to leave a long slot about 4 in. wide at the rear (see photos). This permitted the air entering the front of the cowl to pass through the radiator cores and out in a low-pressure area toward the rear of the plane. The stock cowl flaps at the bottom weren't in the direct line of air flow through the cores. This did the job. The water outlet temperature now does not exceed 220° F under any conditions. (They have also hooked up a water inlet temperature gauge on the dash, which shows that the water rises about 15° F through the engine.)

For all practical purposes the engine was kept stock for the experiment. But several interesting modifications were necessary to make it airworthy. For one thing, the capacity of the oil pan was increased from 4 to 8 qt. and a baffle was put in the pan to prevent oil starvation during climbing. It was felt that the engine needed more oil capacity to prevent excessive oil temperatures—without a separate oil cooler radiator. With 8 qt. the oil temperature holds in the 250–270° F range. Olds engineers permit a maximum of 300°. (Remember that an aircraft engine has to run most of the time at more than 75% power and nearly maximum rpm, so oil temperatures are critical.)

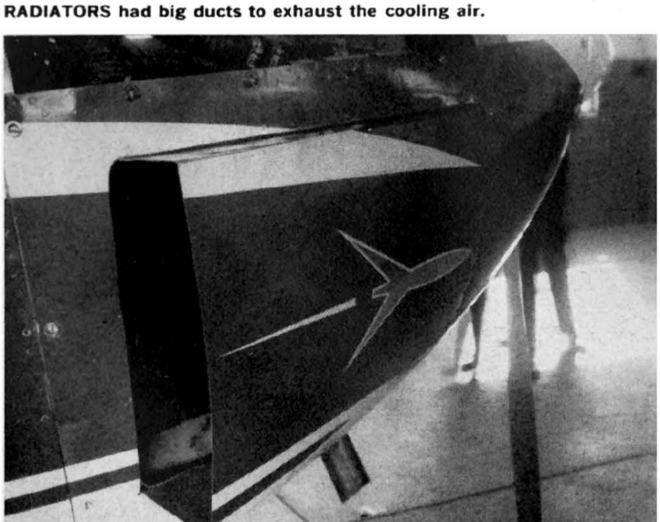
A conventional carburetor will run richer as an aircraft gains altitude, because of the decreasing air density. The engine was given a simple manual mixture control by putting a drilled rod through the two secondary nozzle passages. The drilled holes are lined up for full flow at low altitudes; but by rotating the rod (with a manual lever) the holes twist out of line, and lean out the mixture. It works on the same principle as the old barrel-type racing carburetors.

It was also necessary to provide some means for warming the air going into the carburetor, to prevent icing at high altitudes. This was done by installing a flexible tube to draw engine air into the air cleaner from around the right exhaust manifold (similar to some Ford car installations). Then they put a simple hand-controlled butterfly valve in the air cleaner inlet so that the pilot could select cold air for maximum power on take-off and climb.

Very cold spark plugs were used in the engine to control detonation on 100-octane aviation gasoline with 220° F water temperature. The stock spark advance curve was used, with initial advance adjusted for the weather and gas quality. Exhaust manifolds were fabricated from stainless steel sheet, to come out through the standard exhaust holes in the Cessna cowling. And the steel tubing motor mount framework was designed after the stock mount, but with slightly thicker wall thickness to allow for the additional engine weight.

Perhaps the most remarkable feature of the whole project was the time element. From the initial idea to the first flight was less than five weeks. ■

RADIATORS had big ducts to exhaust the cooling air.



WATER TEMPERATURE gauges were added to cockpit collection.