More About My Corvair And VW Conversions

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AMATEUR AIRPLANE builders became very excited a few years ago when the automotive magazines announced that the Corvair car was going to have a six-cylinder air-cooled engine. When it appeared, it proved to have many features in common with the popular six-cylinder horizontally opposed aircraft engines and it was evident that a lot of aviation experience went into its development. When the Corvair engine is stripped of automotive accessories and fitted only with what is needed for flight, it becomes a "natural" for aviation enthusiasts.

It affords us an engine built by a large and reputable firm, incorporating the latest in design and materials, available at reasonably low first cost, and capable of being maintained inexpensively for many years to come.

In my small experimental shop I have worked out a simplified Corvair conversion which I shall describe here. This 145 cu. in. displacement powerplant normally delivers 84 hp at 4400 rpm, and Fig. 1 is Chevrolet's graph of the output of the various models of the Corvair engine they have produced. After evaluating this graph I felt that it would be reasonable to run the Corvair as a direct-drive engine at around 2800 rpm, which is within reason from the standpoint of propeller efficiency and coincides with the peaking of the torque curve. Propeller diameter and pitch have to be selected to get the best results from the available power, which in my conversion is 65 hp. For the amateur, the cost and work involved in a reduction gear is avoided and the engine's output makes it just right for use in popular designs intended for 65 hp aircraft engines. It has the added advantage that one can judge the Corvair's performance in an airplane by comparing it with what the same type of plane is known to deliver with an airplane engine installed.

In a car there's no propeller thrust operating on the crankshaft, so the design and location of that item can be made to suit the designer's convenience. Thus in the Corvair the thrust bearing is normally in the back of the engine. If a propeller were installed on the Corvair's flywheel flange the thrust pull would go all the way through the crankshaft and this could bring on unusual troubles. Also, the flange is not part of the crankshaft forging but is a separate piece pressed into position, and it won't stand a propeller. When the clutch housing is removed the timing gears are left exposed as in Fig. 2. I designed a cast aluminum cover plate that fits against the crankcase flange here. To the flywheel flange of the crankshaft is fitted a propeller hub extension, bolted directly to the flange, Fig. 3. This has an integral propeller mounting flange and a thrust flange. A split nose cone, containing a split type Continental aircraft engine oil seal, is bolted to the aforementioned gear cover plate as in Fig. 4. This extension of the crankshaft thus incorporates a thrust bearing and is long enough to be stiff against propeller vibration and bending loads. The thrust goes through the flange into the nose cone bearings so that none of it reaches the flywheel flange pressed onto the crankshaft.

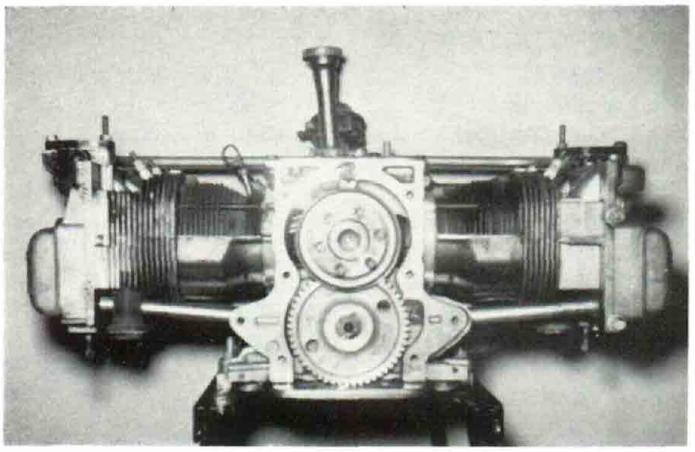


Fig. 2

Changes to the other end of the engine are as follows. In Fig. 5 is seen the back end of the engine as it looks when the blower V-belt pulley has been removed. The pulley is replaced by a magneto drive gear and a dual magneto mounting plate attached as in Fig. 6, which shows one magneto attached. Simple induction pipes are made up so that an updraft Stromberg aviation carburetor can be mounted low under the engine, favorable for cheap and dependable gravity-feed fuel systems. Fig. 7 shows the rear of the completed modification. The ignition distributor housing and shaft are cut off and the stubs that remain are drilled and slotted, and threaded, to take the end of a stock aviation tachometer cable.

I have had this engine running and it seems to work well. By the time this appears in print I will be able to provide more information. In the meantime, though, many *SPORT*

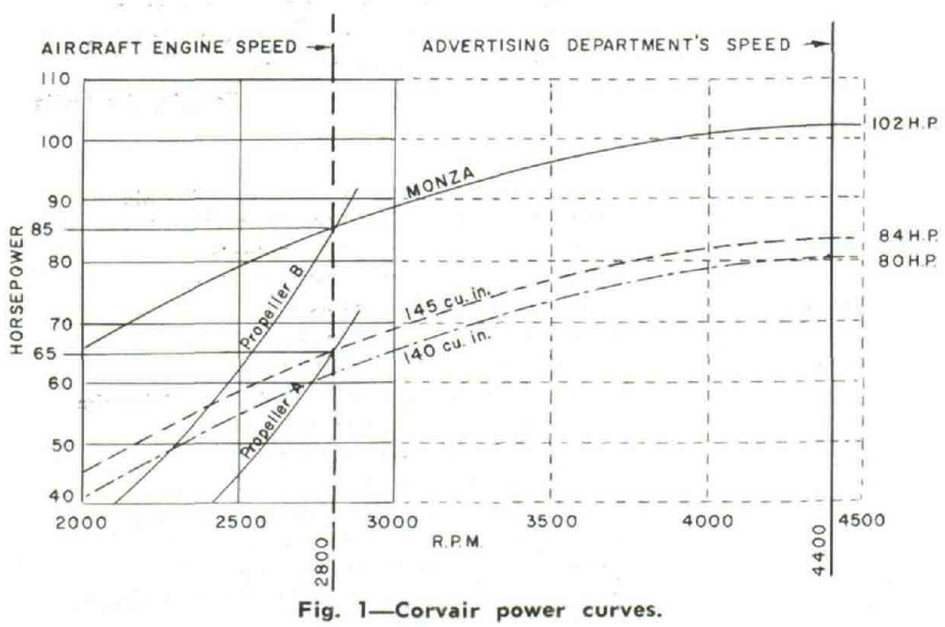


Fig. 1—Corvair power curves.

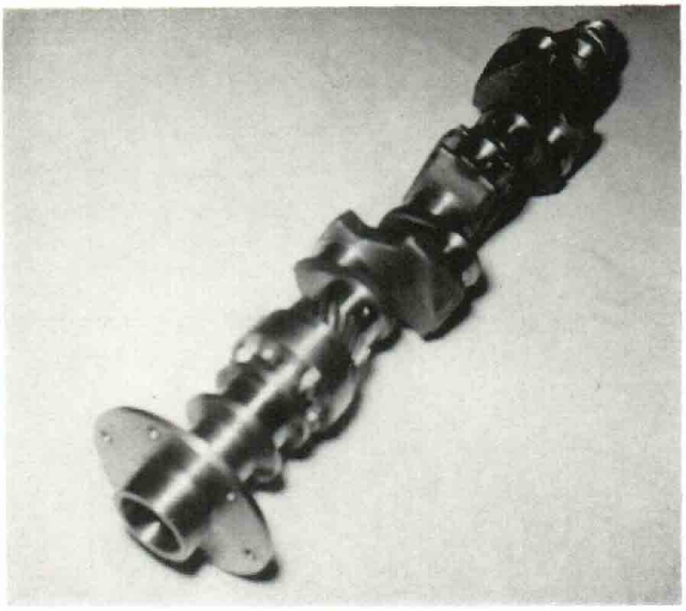


Fig. 3

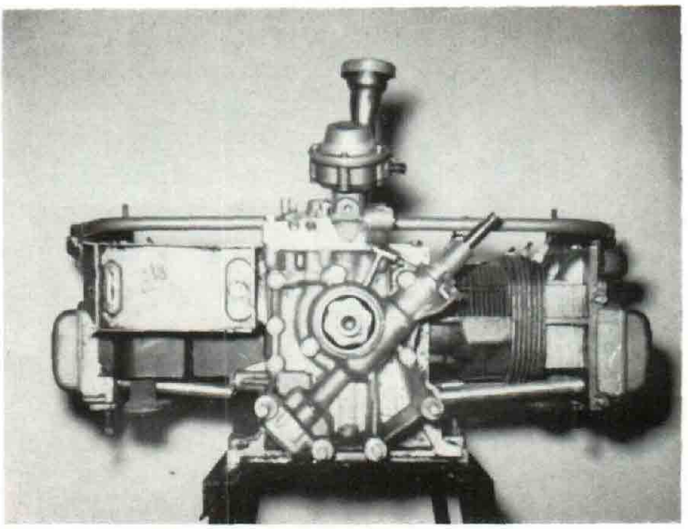


Fig. 5

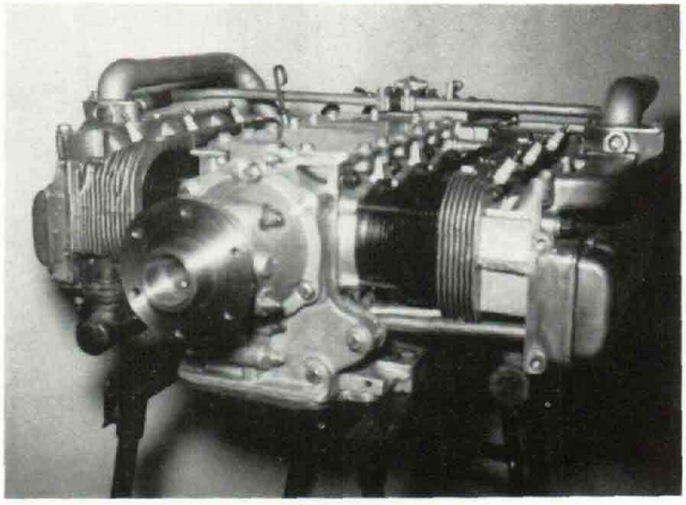


Fig. 4

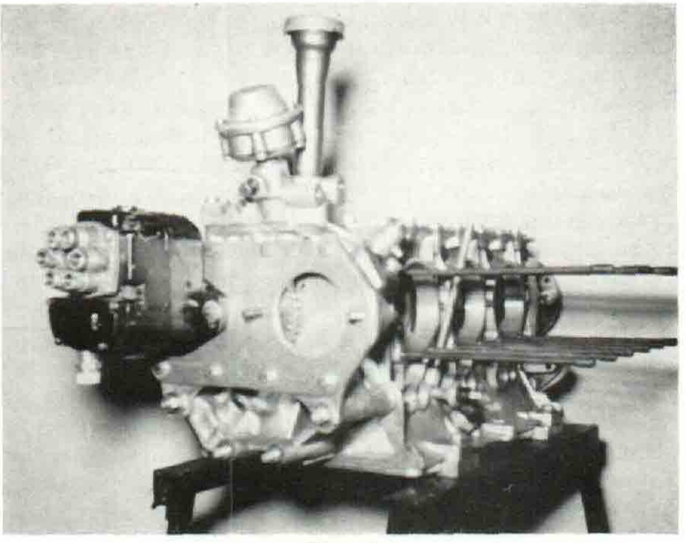


Fig. 6

AVIATION readers will be interested in what I have been doing to Volkswagen engines.

The stock VW engine in its late models has had 72.74 cu. in. displacement and produces 40 hp at around 3800 rpm, this speed being too high for propeller efficiency. Most conversions have held the rpm down to just below 3000 rpm, at which speed about 30 hp is produced. This is just barely enough to fly a plane designed for the engine, and while it can fill the needs of the fellow who wants only to fly locally for fun, the performance won't impress anyone accustomed to even the average factory-built lightplanes. In Europe they often substitute the more powerful Porsche engine in airplanes such as the Druine Turbulent, to get really useful, satisfying performance. These modified Porsche engines run into money, however, and would not be the answer we are looking for, for a true low-cost ultra-light engine.

Recently the Volkswagen factory started producing the larger VW-1500 model. The displacement is 91.09 cu. in. and advertised horsepower 53 at 4000 rpm. It is being used in Volkswagens sold in Europe and other

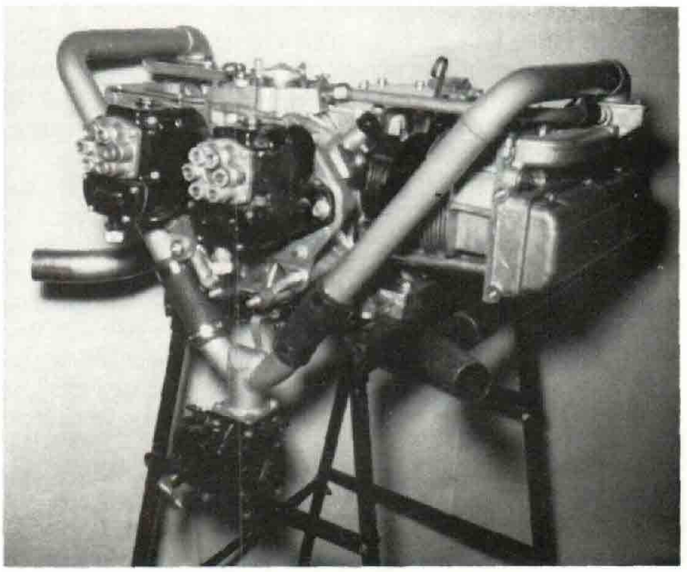


Fig. 7

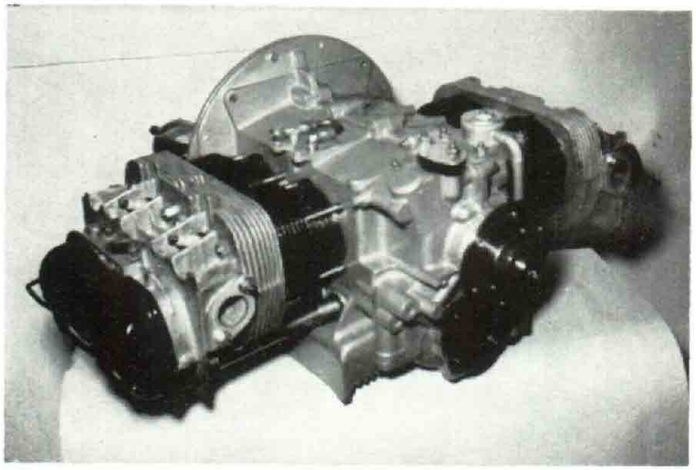


Fig. 8

countries but not in the cars shipped to the United States. The little VW car has won a distinct place for itself in our automotive market; it's very popular, but our domestic manufacturers don't feel they could sell enough cars in that size to justify competing with it. At the same time VW does not want to get their size and price up into a range where they'd have to compete with the many good American compact cars. Studying the newest VW engines, I found that the ones now coming to our country have the bigger crankcase and crankshaft of the VW-1500 but with the old small cylinders that give 72.74 cu. in. displacement. The bore centers on the new engines are 0.394 in. farther apart to allow the larger cylinders to be installed, and while it looks the same as before, the crankshaft is slightly longer, has thicker cheeks and larger bearings.

As I was not able to get a VW-1500, and the average amateur could not get one easily either, I hit upon the idea of using Corvair cylinder barrels on one of these late VW engines to increase displacement and power. I should mention here that the cylinder heads are of a new pattern with smooth-running, wedge-shaped firing chamber that allows a useful compression increase. Intake valves and ports are larger, and so are the exhaust valves, the valve guides are longer and the valve gear has been completely redesigned. The new ruggedness and efficiency make it an ideal subject for an all-out high-performance aircraft engine conversion.

The job of installing Corvair cylinders (available from any Chevrolet dealer) turned out to be quite simple. The VW crankcase is bored out just deep enough to accept the Corvair cylinder skirts. The Corvair piston is longer from the center of the piston pin to the top of the piston than is the VW one, so a spacer ring approximately 3/16 in. thick is placed between the cylinder and the crankcase to hold the cylinder far enough out for interference-free piston movement. The VW connecting rod piston pin bushing is reamed out a few thousandths of an inch to take the Corvair piston pin. Aluminum buttons are made to fit into the ends of the piston pins as per standard aircraft practice. The new Corvair cylinders and pistons cost less than the VW assembly would cost. Valve push rods are made about ¼ in. longer by replacing the tube with a longer one. Since the copper-asbestos gaskets for the Corvair cylinders are at the tops of the cylinders, combustion pressure does not reach the side walls of the VW cylinder head so they act as cooling fins only. Combustion pressure is taken by the top of the head casting, where no metal is removed.

When the engine is assembled it looks as it does in Fig. 8. It is hard to tell the difference as the engine is

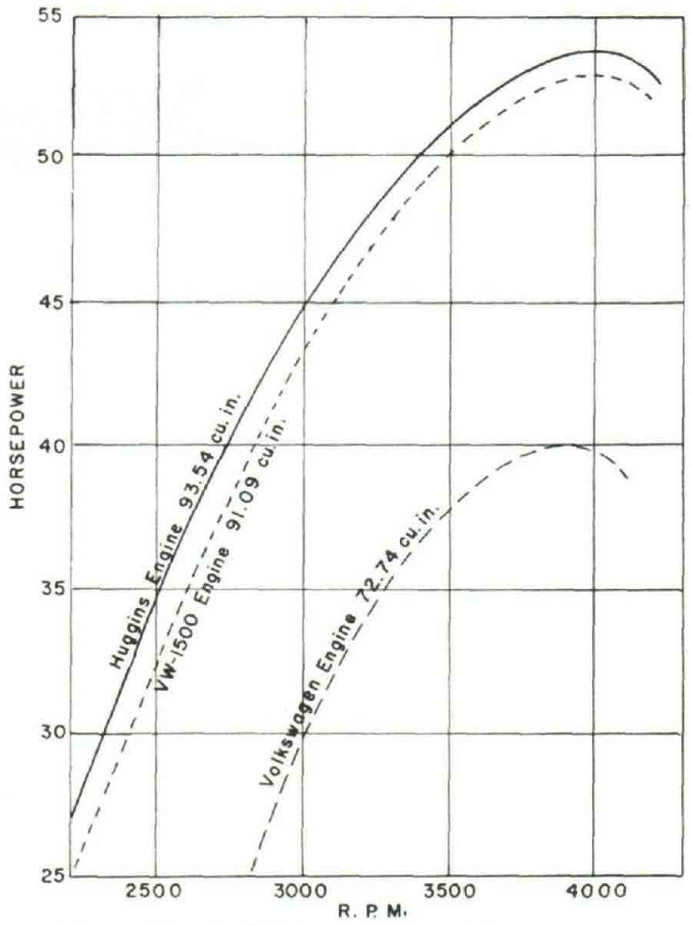
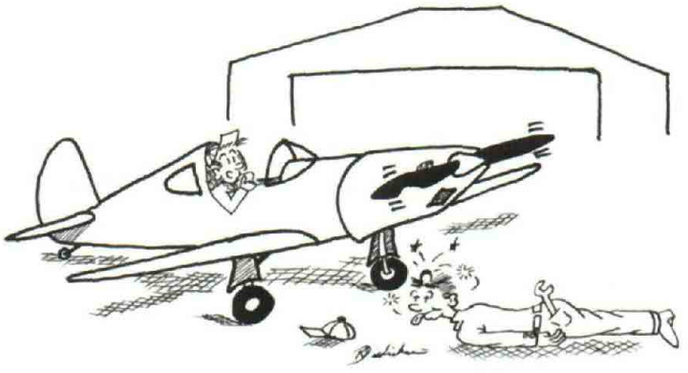


Fig. 9—Performance curve Huggins engine versus Volkswagen.

only ½ in. wider than the unmodified VW. BUT now we have a little engine with plenty of spunk, capable of putting truly acceptable performance into VW-powered airplanes. Fig. 9 shows curves for the small and large VW engines and for the Corvair-cylindered Huggins conversion. You can take it from here!

SPECIFICATIONS

	40 hp VW	VW-1500	Corvair-VW
Number of cylinders	4	4	4
Bore	3.03 in.	3.30 in.	3.4375 in.
Stroke	2.52 in.	2.70 in.	2.52 in.
Displacement	72.74 cu."	91.09 cu."	93.54 cu."
Compression ratio	7 to 1	7.2 to 1	8 to 1
Advertised hp & rpm	40@3900	53@4000	—
Aircraft hp & rpm	35@3300	48@3300	50@3400



"Did you say 'switch off'?"
Cartoon by Roy Didriksen