

DO-IT- YOURSELF ENGINE

Superior's supervised engine build becomes
the highlight of the project

Tom Deutsch

I have been involved in aviation since I was 14 years old. I'm now in my mid 50s; you do the math.

In all that time, I never had any desire to build an airplane. I knew I didn't have the patience or the ability. But to make a long and sometimes funny story short, I attended EAA AirVenture Oshkosh 2003 and came home having ordered an RV-7 quick-build kit. I tell my friends my wife will never let me go to Oshkosh alone again.

Move ahead seven months: my kit

was looking very much like an airplane, and I was having a great time. It was time for me to face the engine choice issue, which I soon learned was not an easy one. There were just too many choices with too many options for various configurations. I always thought I would settle on a new Lycoming, but didn't have a clue what the size or configuration would end up being.

A year ago I was looking through the ads for 180-hp engines. I called three of the leading rebuilders and Superior. After lots of investigation





Post-run inspection revealed the engine to be leak-free.

and thought, I decided on the Superior XP-360.

I felt Superior had improved the lubrication system substantially and that the Millennium cylinders were better than the stock issues. Another big plus was that the cost was less than the competing factory-new Lycoming. Superior has four ways to purchase an engine: order the engine and have it shipped assembled and tested, order it in a box as a bunch of parts to be assembled, go to the engine build facility and observe your engine being built,



Rex at Custom Airmotive puts the XP-360 through its paces.

or go to Dallas and build it yourself.

The range of choices intrigued me, but I knew I didn't have the knowledge and skill to order it in the box. And because budget is always an issue, I didn't think I wanted to spend the \$500 to build it myself at their facility. After all, shouldn't I get paid to do the work?

In a moment of weakness, however, I decided I needed a break from my job and thought this might be a good short vacation activity. So I called Superior, and I was enrolled before I could say, "Twenty how many thousand?"

The salespeople at Superior are all great folks to work with, and there was no sales pressure. If there had been, I

would have gone elsewhere.

As the date for my "class" neared, I found myself getting more and more excited at the prospect of spending three days building and learning. I arrived in Dallas Monday evening to begin early Tuesday. From the time I arrived at Superior's facility, I felt like a true guest of honor. Staff members knew I was coming, and they welcomed me like I was their new boss or something.

There were only two of us in class that week. The first day consisted of two to three hours of orientation, engine-building basics, and a facility tour. Then Bill took us to a local restaurant for lunch. After lunch, the fun started.

We were taken to the build center to start the process. Wow, what a place to build an engine. It was more like Class A office space than an engine shop: neat, clean, well lit, and thought-out to the smallest detail.

My engine was there in a thousand pieces on a cart custom-designed to accommodate every part. Glancing at the array of materials reminded me of a primary tenet of engine building: At the end of the three days, there shall be no parts left over.

Evan Yearsley is in charge of the build center and is responsible for building all of Superior's engines. During this week he was also our personal instructor. Evan ran one of the largest engine-rebuilding companies in the country for many years before being hired by Superior to design the company's build center and to build the new XP-360 engines.

He knows the right way to do it, and he wanted to make sure I knew the right way to do it, too. Time was not an issue. I got the impression each day that we would spend whatever time it took to get it right. As for the \$500 class fee, well, I think I received more than that amount in personal attention from the

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management just the first day.

By the second day we had all the cylinders installed and were ready for the accessory case and gears. The third day I installed all the accessories and learned the proper way to install and time the mags. That was it. We were done. That afternoon we sat down to debrief and go over break-in procedures and maintenance.

Superior is in the process of building a state-of-the-art test cell, but it is not completed yet. Until it is, the company outsources the testing to several different facilities. Mine went to Custom Airmotive in Tulsa, which has a long history of rebuilding engines. It is one of just two facilities in the area that have a dyno to test for engine power.

I was able to work with Mark at Custom to coordinate a trip to Tulsa for the all-important test. I showed up at Custom at 8 a.m. on April 1 to find it already had my engine hung in the test cell, hooked up and ready to start. With all of the tubes, wires, and connections, it looked like a patient on life support in a hospital.

Rex, the cell operator, started the engine, which is an exciting event when you are the one who built the thing. He warmed the engine at 1000 rpm for about 10 minutes while carefully checking all instrument readings.

With everything in the green, he progressively increased the power settings in four increments for about 10 minutes each, all the while checking and adjusting items such as oil pressure and cylinder head temperatures until, after about one hour of operation, it was time for the power run-in.

For 10 minutes he ran the engine at full power. The result: 188 hp at 2700 rpm, which is not bad for an engine rated at 180 hp. Rex said this engine was at least 10 or 12 hp stronger than the factory IO-360s he tests. He also stated this was the ninth Superior engine he has tested and that all run smoother than their competitors. I can only take his word for this comment, but it does make me feel good. I came away convinced that the enhancements Superior said it had made to the engine make it a smoother and more

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The author at work turning the parts into a powerplant.

powerful IO-360.

We cut open the oil filter and found no foreign material at all—not even any gasket sealer or shop rag lint, which I think is a true testimony to the way Evan at Superior controls the build process. After checking the oil level (none used and absolutely no leaks), Rex stated this is the way an engine should test. We pickled the engine, and I set off on the four-hour drive home with a warm engine in the back of my Jeep and a warm feeling about the test.

I have had a great time building my airplane, but this was the best experience on the project I've had yet. I can't imagine a production worker at one of the big builders taking the time and paying attention to detail on a standard factory engine like these folks took on my engine.

Evan even allowed me to pick out my own pistons and rods so I could satisfy myself that the weights were identical—even though their standard is to balance these components within 2 grams. I think that resulted in much closer tolerances than most manufacturers or rebuilders would accept.

I am convinced that anyone who is building his or her own airplane would enjoy the experience of working on the inside of the engine. I know I have a great engine; I saw how it was designed and spoke to the engineers in person.

I know how it was built, because I did it. I know how my work was checked and rechecked, because I was there.



Finished.

In my opinion this is the best-kept secret in the amateur-built market. When the word gets out, Superior will be very busy.

While I was there I got the impression that there are other good things in the works at Superior. Imagine a virtual engine-build site that would allow you to build an engine in your own shop with the help of the experts on a computer.

Maybe we will see a new O-320 or IO-540 soon. How about a certified XP-360 powered Archer?

If there is a new airplane in my future—maybe an RV-10—I won't have to agonize over the engine choice again.



Tom Deutsch operates Aircraft Training Services, which specializes in providing insurance-approved initial and recurrent instruction in all models of the Piper PA-46.

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