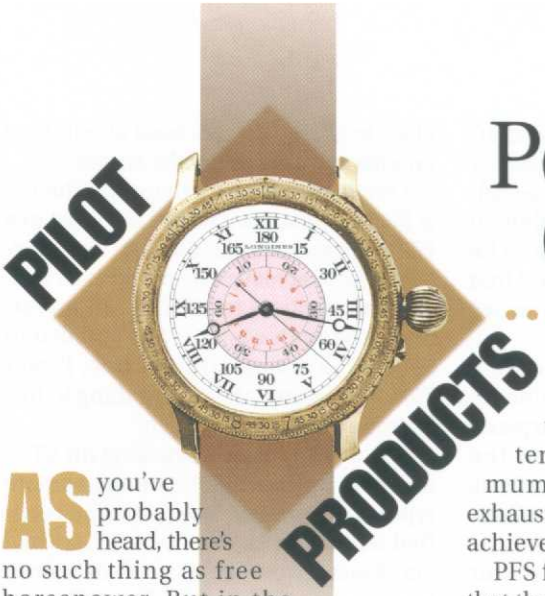
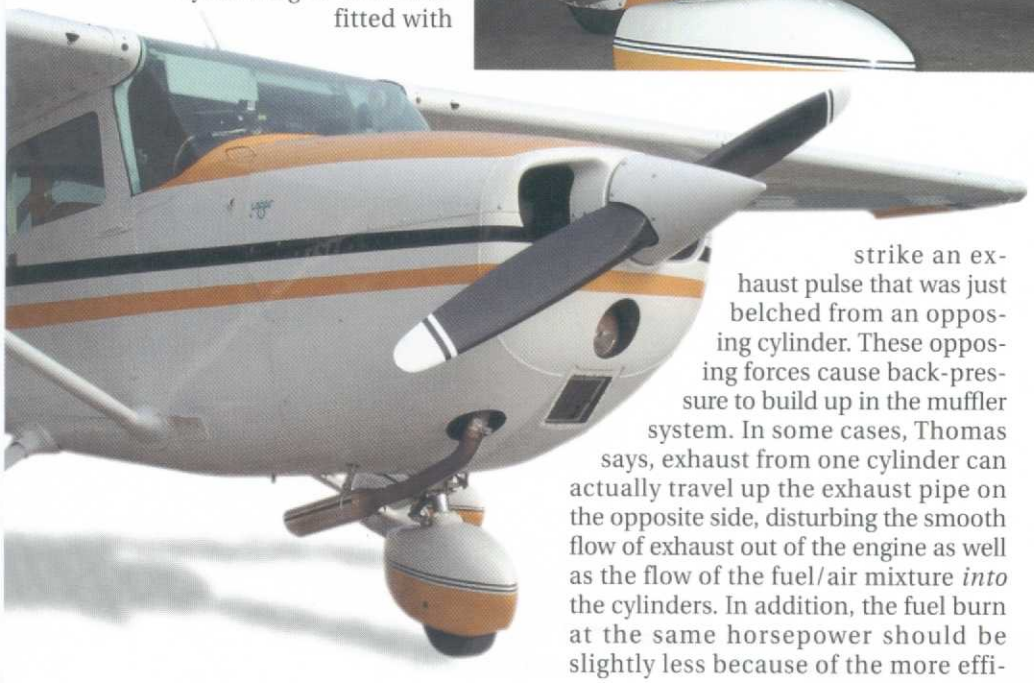


Power Flow Systems' Cessna 172 exhaust

As you've probably heard, there's no such thing as free horsepower. But in the case of Power Flow Systems' tuned exhaust for Cessna 172s, you can increase the power of your Skyhawk by extracting more exhaust from the engine—and not too much cash from your wallet. Tuned exhaust systems scavenge an exhaust pulse with the suction created by the previous outgoing pulse. This effect makes a given engine more efficient by generating the same power at a lower fuel burn.

When Power Flow Systems (PFS) first introduced its new tuned exhaust for the 172, the performance claims seemed too good to be true. Of several tests performed, a maximum increase of 23 horsepower was noted by Ly-Con Aircraft Engines in Visalia, California. Using a dynamometer, Ly-Con determined that a 150-hp Lycoming O-320-E2D fitted with the stock Cessna exhaust system could only produce a maximum of 134 hp. But with the PFS exhaust system, the same engine could achieve 157 hp.



PFS founder Robin Thomas explains that the stock Cessna exhaust, which has four short exhaust tubes emptying into a common muffler can, does little to efficiently extract exhaust out of the engine. The unequal lengths of the tubes send exhaust pulses from one cylinder down into the muffler can, where they can strike an exhaust pulse that was just belched from an opposing cylinder. These opposing forces cause back-pressure to build up in the muffler system. In some cases, Thomas says, exhaust from one cylinder can actually travel up the exhaust pipe on the opposite side, disturbing the smooth flow of exhaust out of the engine as well as the flow of the fuel/air mixture *into* the cylinders. In addition, the fuel burn at the same horsepower should be slightly less because of the more efficient breathing of the engine.

To perform our own controlled tests of the PFS exhaust, we pitted two identical 172s in a fly-off competition. Both airplanes were flown in formation so that there would be no atmospheric errors, as there would have been on a before/after test using the same airplane. The first flight would be made with a stock exhaust system installed on both airplanes in order to get good baseline data. Then Thomas' airplane would be fitted with the PFS exhaust, and we would fly again.

The first flight revealed two closely matched airplanes with Thomas' besting our Skyhawk by about 25 fpm in climb and 1 kt in a full-throttle dash. After about 45 minutes, two Power Flow mechanics had the stock system off and the tuned system installed.

A full-throttle static runup revealed that the PFS-equipped engine could turn the prop about 100 rpm faster than the standard airplane. That fact alone told us we were going to lose this race. From brake release, the PFS-equipped Skyhawk left our 172 in the dust. In fact, the takeoff roll of the PFS 172 was four seconds shorter in time and used about 235 fewer feet of runway, figuring an average takeoff speed of 35 kt.

After takeoff, we performed a formation climb from 1,000 to 4,500 feet. The stock airplane spent five minutes climbing the 3,500 feet for an average of 700 fpm. The PFS-equipped airplane took 4.2 minutes for an average rate of climb of 833 fpm, a difference of 133 fpm or 16 percent—a substantial difference, in our opinion. Driving home the proof that the PFS airplane creates more power was the fact that during the climb, the modified airplane was indicating 2,450 rpm at 12 gallons per hour vs. 2,400 rpm and 11.5 gph for the stock airplane.

In cruise, where the bug-smacker aerodynamics of a 172 really take over, the performance margin narrowed but

still heavily favored Power Flow's 172. Unfortunately, the Power Flow exhaust is limited by the 172's fixed-pitch propeller. The added power causes the 172's propeller to go over redline rpm in level flight. While the stock airplane could muster only 2,700 rpm in level flight at full throttle, the PFS airplane went far beyond redline and recorded a 5-kt higher indicated airspeed. If a higher cruise speed is desired, Thomas recommends that owners repitch the propeller to absorb the added power. Runway performance and climb would fall back toward the previous figures, but cruise speed would increase handily.

Since both Skyhawks were equipped with fuel-flow instruments and multiprobe engine monitors, we were able to perform some leaning tests. At high-cruise power settings, the unmodified airplane was not able to lean to peak EGT without copious amounts of engine roughness that occurred as fuel flow reached about eight gallons per hour. The Power Flow airplane could lean to peak and slightly beyond before roughness settled in, at which point the indicated fuel flow was around 6.7 gph. At full throttle the difference spread to a maximum of 2.4 gallons per hour, but we don't recommend aggressive leaning at power settings higher than 75 percent, especially with the imprecise fuel/air distribution found in a carbureted engine. The demonstration, however, points out that the Power Flow exhaust helps even out mixture distribution.

An AOPA employee had the system installed on his Cessna 172 to allow us to test the performance of the airplane before and after the addition of the Power Flow exhaust. Although the tests weren't entirely precise because of differing atmospheric conditions for the tests, he noted similar results to our testing in regards to takeoff times and climb rates. The owner said that the airplane could reach redline rpm in cruise, something his Skyhawk was unable to do before. Heater performance also was reported as adequate to temperatures below 10 degrees Fahrenheit.

Keep in mind that some installations may require that a hole be drilled into the lower cowl to allow the muffler's support rod to pass through. You also may have to redirect the outlet of the gascolator sump drain in order to avoid having fuel streaming onto a potentially hot exhaust pipe. In all, the system adds about three pounds to the weight of the airplane.

Cost of the all-new exhaust for the 172 is $3,425. That may sound like a lot to a 172 owner, but consider that the next-best way to achieve this power is to convert the airplane to 180 hp—an investment that can easily reach $20,000 to $30,000. Although it's not free, Power Flow has created the closest thing to free horsepower that we've seen.

Power Flow is now working on STCs to install tuned exhausts on many more types of airplanes. Soonest to be certified will likely be the Cessna Cardinal and Piper Arrow series airplanes. Work is also progressing on the Beech Bonanza and other designs that make use of big-bore Continental engines. It is hoped that airplanes equipped with constant-speed props will see more benefit since the propellers can automatically absorb the increase in power.

For more information, contact Power Flow Systems, 1585 Aviation Center Parkway, Hangar 804, Daytona Beach, Florida 32114; telephone 877/693-7356 or 386/253-8833; or visit the Web site (www.powerflowsystems.com).

—Peter A. Bedell

Price of kit was updated on 12/8/03, nothing else changed.
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