



The aerodynamic propeller spinners on the Angel are unusually large—38 inches! Notice the three-blade, Q-tipped prop.

the control surface movements. A backup hand pump is installed for the landing gear, which actuates the gear into a free fall.

After the performance testing of the Angel is complete, the structural phase of the testing will begin. This will entail some fatigue tests, but mostly structural test of the wing spars and carry-through structures.

The complete structural test program is expected to run about a year and Mortenson anticipates another six months will be

required before the FAA awards the Angel a Part 23 normal category type certificate. "Because we work solely on contributed funds," says Mortenson, "everything can take longer should donations be slow in coming in."

The ultimate goal of the King's Engineering Fellowship is to produce an airplane for missionary use at the lowest possible cost. According to Mortenson, the target price is \$300,000 and the production potential is one unit every three months.

FOR MORE INFORMATION, contact King's Engineering Fellowship, Municipal Airport, Orange, IA 51041; telephone (712) 737-4444.

Angel

Specifications:

Wingspan	40 ft.
Wing area	225 sq. ft.
Wing chord	7.5 ft.
Overall length	33.25 ft.
Overall height	11.5 ft.
Wheelbase	15 ft.
Landing gear	Tricycle
Tire size, mains	8.50x10
Tire size, nose	8.50x6
Seats	8
Fuel capacity	232 gal.
Fuel consumption	28 gal./hr.

Engines:

Two, Lycoming IO-540-M, rated at 300 hp at 2700 rpm, turning two 3-bladed, Q-tip, 76-in. diameter, full-feathering Hartzell propellers.

Weights and Loadings:

Gross weight	5800 lb.
Empty weight	3750 lb.
Useful load, std.	2050 lb.

Performance:

Cruise speed, 65% power	174 kt.
Range, 65% power	1391 n.m.
Rate of climb, sea level	1500 ft./min.
Service ceiling	19,000 ft.
Stall speed, clean	57 kt.
Takeoff ground roll	600 ft.
Takeoff over 50-ft. obstacle	1200 ft.
Landing over 50-ft. obstacle	1100 ft.
Landing ground roll	600 ft.

Single-Engine Performance:

Rate of climb, sea level	300 ft./min.
Service ceiling	7000 ft.

Manufacturer:

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New Turbo Conversion Makes the Tiger Roar!

TurboTech beefs up the performance of the Grumman Tiger with a new turbo conversion.

By Don Downie

SEATTLE CENTER, this is Grumman Tiger 74625 at FL 180. Request winds at FL 230," requested Portland pilot Sid Saul.

"625, you're a WHAT and you want to climb to WHERE?" said the controller. That was the controller's usual reply before Center became accustomed to Saul's high-flying turbocharged Tiger.

Saul, who has been retired for 10 years, has been flying for four years. After he had accumulated 130 hours in Cessna 150s and 172s, he took his first flight in a Tiger; he promptly bought the aircraft. "All the hype from its last owner wasn't far off," says Saul. "It really would fly circles around most of its competition, but the Tiger can't do everything."

"Two years later," says Saul, "after having to cancel IFR with mountains growing in the windshield and MEAs beyond reach, I was on the hunt for something with bigger lungs. All along, as I looked at those heavy gas-gulping, maintenance-craving beasts, I knew that with a blower up front, my little Tiger would be quite a match for most high-performance singles."

Saul contacted several maintenance shops in the Pacific Northwest, but no one would tackle his proposal—to put a turbocharger in the Tiger. Finally, he visited TurboTech, Inc. (formerly Seaplanes, Inc.) at Pearson Airpark, Vancouver, Washing-

ton. This small company has a long-standing reputation for turbo conversions, primarily on floatplanes.

"I figured if anyone could transform my Tiger, TurboTech could," says Saul. He met with TurboTech owner Lou Soukup and his foreman, Dirk Witting, who eventually became the principal designer on the project.

The modification took two and a half months to complete, and finally was given STC approval by the FAA. It involves the replacement of the standard air cleaner with a Brackett Air unit, similar to the one on a Cessna 172. It has an intake behind and below the propeller. Installation of the air filter eliminates the need to comply with AD note 81-24-03. A spin-on oil filter adapter also is included.

The Tiger modification also includes a new stainless steel exhaust system and heat muff. Cooling louvers were added, which, according to Saul, look like shark gills. He says he thinks the conversion should be called "Tiger Shark."

For cooling, retractable cowl flaps were added, which permit rapid descents without sudden engine temperature changes. Originally, these cowl flaps sealed too tightly and ram air inside the cowling prevented the cowl flaps from closing completely.

Inside the cockpit, a combination manifold pressure gauge and temperature gauge is installed. Compression of the intake air by the turbocharger causes a rise in carburetor air temperature that must be limited to 150°F, so an Electronics International digital gauge with an annunciator warning light set at that temperature was added. This turbo system has a manual wastegate and the cowl flaps also are controlled manually.

A 66-inch fixed-pitch Sensenich propeller replaces the original 60-inch prop. Saul carries a 40-cu. ft. oxygen tank behind the right seat. He advises that nasal cannulas work fine for the passengers, even above 20,000 feet, but the pilot uses a Scott rebreather with built-in microphone above FL 180, "for peace of mind."

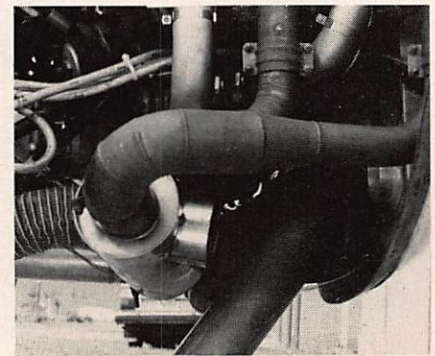
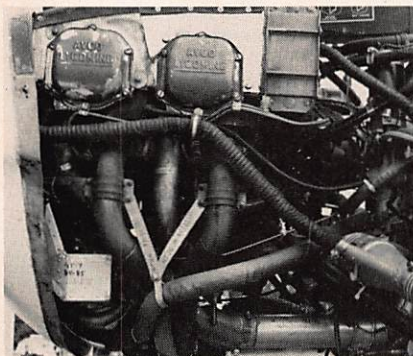
The entire turbo installation weighs 30 pounds, while only 17 pounds of accesso-

ry equipment is removed. The turbocharger is installed where the original muffler was located. This permits a simple and secure bracket for the turbo and short, efficient ducting of induction and exhaust systems.

The actual turbocharger is an AiResearch Model TA04, used on the turbo RG Cessna T-182, the AG Husky and several other aircraft powered with the 180-hp Lycoming engine. Turbo boosting is done by turning on the high-pressure fuel pump and slowly advancing the wastegate control to achieve the desired manifold pressure. Saul explains, "The Tiger reverts to its old self with the turbo control all the way back. At FL 180, this brings about a predicted descent. Push it in halfway and you would swear someone just lit the JATO (jet assisted takeoff) bottles."

Copilot and data recorder on all of Saul's test flights was Jeff Filler. Saul says "On one flight, after leveling off at FL 250, I accidentally advanced the boost until 35 inches registered. With the sudden pitch up and rocketship ride, you never saw two pilots reach for the same control so fast. At least we know what's available up there. Fuel consumption is between 9.5 and 11.5 gph, depending upon the amount of boost used."

The AiResearch TA04 turbocharger is installed where the original muffler used to be; it is the same turbocharger used on the RG Cessna T-182.





Service ceiling of the Tiger is raised from its original 14,000 feet to 25,000 feet with the TurboTech modification.

Takeoff manifold pressure of 29 inches is permitted, while continuous operation is restricted to 27 inches. Rate of climb at gross weight is 800 fpm at 10,000 feet with 400 fpm reported at 25,000 feet. Service ceiling has been raised from 14,000 to 25,000 feet.

Saul has been an aviation enthusiast since his childhood. "As a boy, I made plenty of 20-mile bike trips just to watch little airplanes from behind the fence," he says. Now, he has an instrument rating and is working on his commercial certification. "When I was a student pilot," says Saul, "I had a couple of presolo hours under my belt when my instructor asked me to go along for a few touch-and-goes in our club's Grumman Cheetah at the Troutdale Airport near Portland. When he cracked open the canopy on downwind, I was hooked. My goal was to check out in the AA5-A as soon as I completed the private; but unfortunately, the owner of the Cheetah pulled it out of the club before the ink was dry on my license."

Normally, Lou Soukup does all test flying for TurboTech, but he had the owner handle the proving flights, because he thought Saul would benefit from the experience. "I was fortunate to have taken part in all the test flights with the FAA boys up in Seattle," Saul says. "Flying through FL 180 every few days became as routine as reaching 8.0 before and FL 250 became like 10.0 in the 'old' Tiger." The owner is happily putting time on his turbo Tiger and now is contemplating a long-range fuel tank modification. He has more than 50 hours on the modification and already has

taken the "blown" Tiger to Guadalajara, Mexico. He said, "The conversion pays for itself time and again with a smoother ride at altitude from Portland to Guadalajara. Considering a 5000-foot elevation at Guadalajara, 90° temperatures, high humidity and full gross weight all rolled into one, it would have been doubtful with a standard Tiger; but with my turbo Tiger, it was no trouble at all!"

Saul Soukup thinks the new cooling louvers on the side of the Tiger look like shark gills.

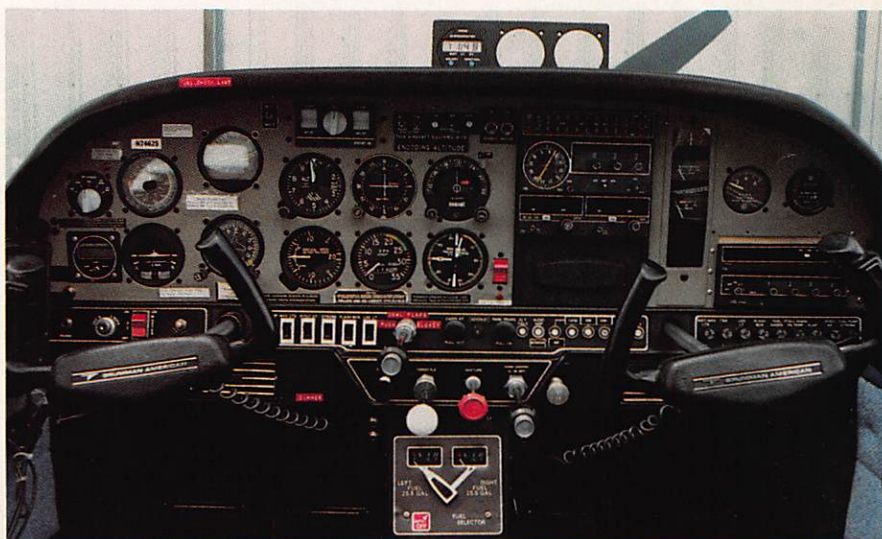
After some experience with this conversion, Saul advises that he now prefaces his FAA weather briefings with "turbo Tiger."

TurboTech, Inc., plans to upgrade the system to a multiple STC if sufficient interest is shown. The best price estimate of the unit installed in Vancouver, Washington, is \$12,000, but the company hopes to produce kits for less in the future.

FOR MORE INFORMATION about the turbocharged modification of the Tiger, contact TurboTech, Inc., Pearson Airpark, P.O. Box 61586, Vancouver, WA 98666; telephone (206) 694-6287.

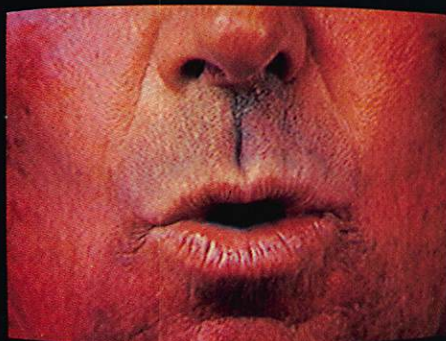


Photos: Nancy Soukup



The panel of Saul Sid's turbocharged Tiger includes an Electronics International carburetor air temperature gauge (lower left) and a combination manifold pressure and temperature gauge (center).

Talk. Talk. Talk.



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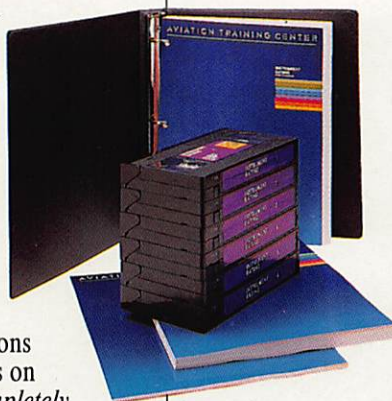
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