

# A Hawk That Wants to Fly

Here's a tale of a tiny auto engine that dreams of powering an airplane.

BY STEVE KIMBALL

**F**or everyone who has designed a better mousetrap and has been rewarded by the fabled result, there are 10 people who have built mousetraps they thought were better, yet no paths were beat to their doors.

So far, Walt Costa is in the latter group. Give him time, though. Costa is beating paths to the doors of southern California EAA chapters showing everyone his engine. The Hawk AE is his mousetrap.

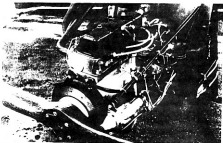
Like hundreds of imaginative pilots since Bernie Pietenpol, Costa thinks the ideal airplane engine has already been designed, and it's under the hood of an automobile. Unlike people who have converted Volkswagen engines or Ford engines, Costa has found an off-the-wall engine that appears to be particularly appropriate for aircraft use because of its lightweight design.

The Hawk AE is an 848-cc inline



A Pesa carburetor is used on the prototype Hawk AE, though any other carburetor could be adapted. The alternator on this engine is another option. With the brass radiator, weight is 125 pounds.

For demonstrations, Walt Costa has hung the Hawk AE engine on this engine mount and supplied it with a large copper radiator, hiding on the other side of the firewall.



four that produces a claimed 40 hp at 4000 rpm and weighs only 85 pounds, minus ancillaries. This is, by far, the smallest auto engine anyone has adapted for aircraft use. Though the power output is comparable with that of Pietenpol's Model A Ford engine, the displacement is even smaller than the Henderson motorcycle engine used on the old Heath Henderson.

What the Hawk AE would logically compete with is the Rotax 477-cc two-stroke. The weight, for 40 hp, is comparable. The price is comparable, all things considered. Costa says a base Hawk costs \$1195. That doesn't include ignition, carburetor, manifolds, starter, alternator, fuel pump, engine mount or radiator. Because the prices for these parts are on an automotive scale, not an aircraft scale, a complete engine with everything necessary to install and start with a button would cost no more than \$2000. The weight of such a fully-equipped engine, however, would be as high as 125 pounds, depending on the radiator used.

An aluminum crankcase and aluminum head keep the Hawk AE engine light, with iron wet liners forming the cylinders. As for other specifics, the design uses pushrod-operated overhead valves, mechanical lifters and a three-main-bearing forged steel crankshaft. Bore is 2.46 inches, stroke is 2.72 inches. On the engine, Costa is currently running, compression ratio is 9.5:1 though other compression ratios from 7.5:1 to 10.5:1 are available. Thrust is transferred through the standard automotive thrust bearing at what used to be the front of the engine, but is the back of the engine in an aircraft installation. The propeller bolts to the crankshaft with an aluminum spacer and a lightweight flywheel incorporating a ring gear for the starter in between.

Costa does not emphasize the parentage of his engine. I had to ask him twice before he said it was from



The Hawk AE engine uses a non-crossflow cylinder head, so the intake and exhaust manifolds are welded to the same flange. Different manifold systems can be supplied by Costa.

the English Reliant. To those not familiar with the Reliant, it is a peculiar three-wheeled car that is notably quicker than an electric wheelchair though often driven like one. It is to automobiles what Near Beer is to the real stuff. The engine has been around for generations, however, powering the Reliant and driving water pumps and electric generators. Costa says there are two airplanes in England using the engine.

No known aircraft flying in this country is pulled by this engine. Though the engine has been around since the time of Pietenpol and Heath, the Reliant automobile has never been sold in the U.S. Consequently, few people know about the engine. Getting someone to install a Hawk AE in an airplane has not been easy. Everyone wants to know if the engine has flown and what it fits. While Costa will build a nice-looking engine mount (18x20-inch mounting dimensions) to fit most anything, the arrangement of the crankshaft low on the engine doesn't fit most current airplane designs.

An inverted version would fit much better, and Costa is working on that. His test engine has run inverted for several hours, he says, but when the

engine is shut down the oil leaks from the wristpins, flooding the cylinders with oil. He is asking the Reliant factory in England to install Teflon plugs on the ends of the wristpins to eliminate this, and expects that this change will make the engine suitable for inverted applications.

The dimensions of the engine are small enough. By my measurements, the engine is 18.5 inches tall, 18 inches wide and 20 inches long, including the accessories. Costa's measurements are roughly the same, but he gives a narrower 14-inch width, which must not count the ignition or exhaust.

For demonstrations, the engine is equipped with a Posi carburetor and the original-equipment Lucas distributor with battery and point ignition. A Verex magneto is available, or an electronic ignition could be built, Costa says. The exhaust on the engine right now is an extractor design that would fit very few designs. A more normal short-stack straight design can be used. Because the engine uses a non-crossflow design cylinder head, the intake and exhaust manifolds are welded together on the same flange plate.

Right now, the Hawk AE is committed to a life of demonstrations. "I keep meeting people too late," says Costa. "Most builders have already decided on an engine by the time they see this one."

He reports the most interest from Mark Brown, who created the Star-Lite. The power is right and the size is right to replace the Rotax engines, but because the Hawk AE engine doesn't use a reduction drive, it will need to be inverted before it can be easily installed in a Star-Lite. There are people, Costa says, who would prefer a four-stroke engine to a two-stroke design. The four-stroke uses less fuel, and the four-cylinder design is smoother, too.

What really hurts the future of the Hawk AE is that it isn't part of any existing airplane design. But Costa has plans for the Hawk XP, a gull-wing, single-place airplane designed around the Hawk engine.

Now if only Costa can sell enough engines so he'll have money to build his dream airplane, then he'll have an airplane design to fit those engines he's sold.

**FOR MORE INFORMATION,** contact Walt Costa, *Director Mechanical*, P.O. Box 368, Arwood, CA; phone 714-970-0600.

**Need A  
Rivet Gun?  
Don't  
Buy An Air Hammer**

Free  
Catalog

**Buy An Air Hammer**

Our ATS 2802 Rivet Gun will rivet 3/32", 1/8", 5/32" & 3/16" rivets with finger touch control - no regulator needed.



**Now \$89.95 each**

**Call Toll Free  
1-800-248-0638**

Over 2,000 aircraft tools in stock - check out buying cars, rivet sets, test equipment and much more.

**Aircraft Tool Supply Co.**  
P.O. Box 372  
1800 Old US-23  
Oshtemo, MI 48850



HIPEC

FLEXIBLE FINISHES FOR FABRICS  
• Coating • Sealer • Sunscreen • Adhesive  
• Wet Look • Semi Gloss • Full Cure  
Range including Metallic

**THREE STEP PROCESS**  
U.S. Patent Pending For Complete Coverage From  
Durable, Durable, Durable. Call 419-214-1130, 104-0  
VALCONAR, Inc. 10000, 10000  
Cincinnati, OH 45241

**CRUISE 240 in a ONE PLACE  
MIDGET MUSTANG**



Low cost Airframe Kit under \$1,500. • No Jigs or Machining • Simple durable metal construction • 9G Structure • Roll Rate 300°

Large size Plane \$100.  
For info. Post Mail \$5 to:

**Bushby Aircraft Inc.**  
674 Route 52, Minooka, IL 60447

**EGT/CHT  
SCANNER**

27 SYSTEMS



27"

2 YEAR Warranty

FAA TSO/STC Approved

- AUTOMATICALLY SCANS 5 Sec. or CV
- MANUAL MODE for precision logging
- EGT-CHT in the same unit
- CHT - OVERTEMP ALARM
- TWIN EGT, left/right engine same unit
- 4000GT RED DISPLAY easy to read

**JPI J.P. INSTRUMENTS**

(800) 345-4JPI; in CA, (714) 801-0070  
P.O. Box 1233, Huntington Beach, CA 92645