New for '96: An Autopilot for Every Boat

# MOTOR BOATING & SAILING

JUNE 1996 $3.50

THE BOAT OWNER'S MAGAZINE

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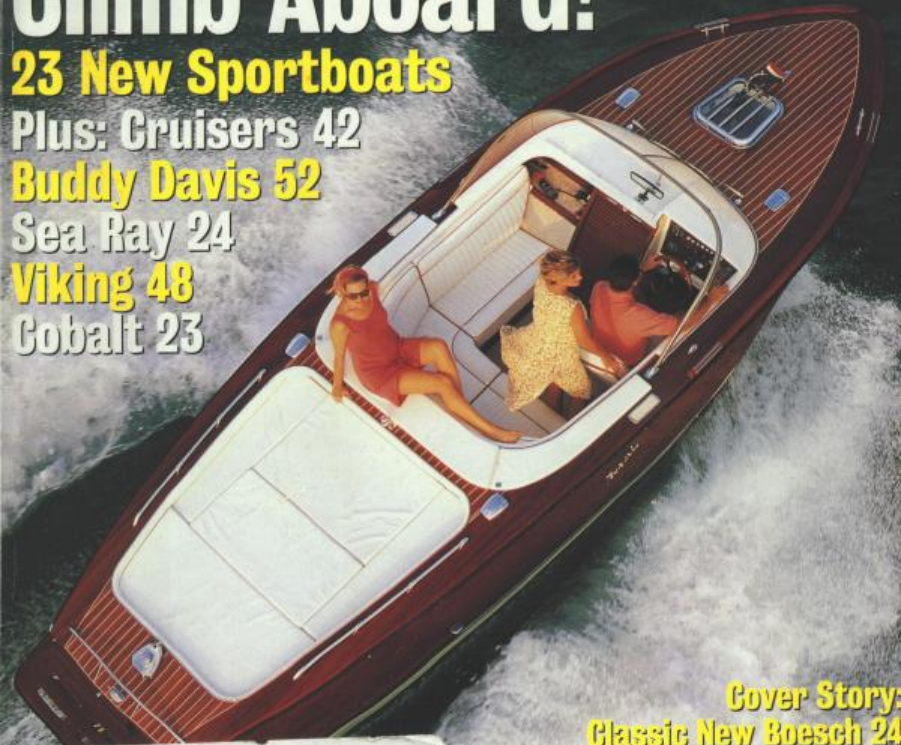

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Classic New Boesch 24



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# Flying High

Speed merchant Adam Erdberg of Tempest Engineering has modified a helicopter jet engine to propel a sleek 27-footer at 70 mph. By Jim Daly

I FIRST MET Adam Erdberg 20 years ago when we were testing a pair of 3208 Caterpillar diesels in a prototype Cigarette 41. His enthusiasm for high performance power certainly hasn't flagged since. Now he's powering a 27-footer with a jet engine.

Erdberg's sleek new Tempest XPE-27 (see "Turbine Time," March '96) currently runs in the 70-mph range, pushed by a 425-hp, 290-pound, marinized GTD-350 gas turbine engine that runs on ordinary #2 diesel fuel, coupled to a MerCruiser Bravo I outdrive. You won't find a lot of piston gasoline or diesel engines with that kind of horsepower-to-weight ratio.

Erdberg's ingenuity is evident in virtually every aspect of his new propulsion package. Aircraft engines spin clockwise, whereas most automotive engines spin counterclockwise. Marine gears are typically designed to perform in either direction equally well, so that it's easy to install counter-rotating props. MerCruiser Bravo outdrives can also be turned in either direction, with one exception: The engine must spin counterclockwise to engage the clutch, otherwise the assembly will unscrew itself—especially if it's being turned by a jet engine. Erdberg found this out the hard way. His solution was to turn the entire engine 180 degrees, reroute all of the ducts and piping and run the drive shaft from the intake side of the engine.

Piston engines idle at between 500 and 1000 rpm and spin faster as fuel is increased. The start-up speed of the GTD-350 is roughly 25000 rpm, producing nearly 4800 rpm at the shaft—not exactly the kind of torque you'd like to transfer to the propeller when shifting out of neutral.

The drive shaft of a turbine engine is not mechanically locked to the compressor blades the way rods and pistons connect to the shaft. Volatile gases are compressed as they push through turbine assemblies of smaller and smaller diameter. It's the force of the compressed gases that keeps the shaft spinning, not mechanical linkage (hence the name "gas turbine"). Thus, you can brake the shaft to the rpm you need, no matter how fast the compressor may be turning. The XPE-27's brake system utilizes Mathers controls that modulate computerized hydraulics to control shaft rpm. The gears can be shifted within 1.25 seconds from forward to reverse. The result is that operation feels the same as with a piston engine.

## Computerized start-up

Starting a gas turbine is a precisely timed, multistage process. An aircraft pilot typically does the following: engage the starting motor to establish starting rpm, open fuel to atomizing rate, start the igniters, open main fuel (continuous), and monitor temperature and rpm to determine when to close the atomizing fuel flow and turn off the igniters. An incorrect starting sequence can significantly damage the engine.

Erdberg figured that a computer could be just as precise as a human, so he devised a system that anyone can use safely. Dubbed the SSM (Simplified Starting Module), the computer follows the same sequence outlined above. It monitors temperatures, pressures, fuel ratios and rpm automatically and prevents an inadvertent, damaging hot start. All it requires from the captain is turning the key until the indicator reaches 40 percent turbine pressure. The computer handles the rest.

There's another computer called the TECM (Turbine Electronic Control Module) that monitors general engine operating conditions and governs overspeed, high temperature and other potential operating problems. Exhaust cooling comes from two electric centrifugal pumps (no rubber impellers). Because most marinas don't pump aviation jet fuel, Erdberg developed a precision filtration system to run the turbine on standard diesel fuel.

Now that he has ironed out a lot of the difficulties in converting an engine designed to fly in the sky into one that flies over the water, he's eager to attract turbine power enthusiasts to the waves—in the XPE-27 and other hulls as well. Any pilots out there? For more information, contact Tempest Engineering, Dept. MB&S, 3333 N.E. 188 St., N. Miami Beach, FL 33180; (305) 937-5064.

*Jim Daly, a boater since age 8, has been in the marine industry for over 15 years and has written extensively about diesel engines.*

## De-Bug Recirculator

**De-Bug** has released a recirculating fuel-finishing system based on its magnetic fuel-decontamination units that eliminate microbial growths that contaminate diesel fuel. The basic concept is that the biological contaminants are killed because the magnetic field bursts their cellular membranes. The magnetic field also disburses the floating colonies of individual cells that form brown mats and globules in diesel fuel. De-Bug's new "FC" series units are housed in a 22-gauge stainless steel cabinet designed for bulkhead mounting. **For more information** on De-Bug, contact Enviro Response Products Inc., Dept. MB&S, P.O. Box 4011, Ft. Myers Beach, FL 33932; (941) 463-0607.