



into an accessory cabinet located beneath the control and instrument console.

Instrumentation includes digital readouts indicating rotational velocities, thrust and

exhaust gas temperatures; mechanical gauges for engine pressure ratios, oil pressure and air start pressure (the engine is started using shop air); an annunciator panel, throttle and control switches.

Kutrieb points out that for years engineering schools have used miniature robots to avoid the high cost of full size robots in teaching the fundamentals of robotics. He wanted to apply the same principle to teaching students about turbine engine technology in a hands-on environment.

He says his mini laboratory can be used to set up numerous demonstrations and experiments, such as measuring air velocity at the inlet and exhaust ends of the engine; measuring temperatures at various places in the engine; performing heat transfer studies; performing sound level measurements; performing static and dynamic thrust studies; monitoring fuel flow versus thrust; and comparing theoretical versus actual engine parameters.

Kutrieb says he started his company for the sole purpose of designing and building these miniature gas turbine engines. His northern Wisconsin engineering and manufacturing plant fabricates all parts in house, even the most complex vacuum-cast components.

His engine designs have been used in military drones and remote piloted vehicles and various research efforts, but Kutrieb believes one of the best applications may be as a teaching aid because of the engine's comparatively low cost. He estimates the price of the laboratory installation described above at around \$34,000. At this writing, the company has placed two mini labs in service, including one at Japan's National Defense Academy in Tokyo.

For more information on the training module, contact Wolfgang Kutrieb, Turbine Technologies, 430 Phillip St., Chetek, Wisconsin 54728, telephone 715-924-4876.

## Rolls-Royce Claims World's Biggest Test Cell

Rolls-Royce has reached the mid-way point in construction of what the company is calling the world's biggest turbine engine test bed. The test cell is being developed primarily to house and test Rolls-Royce's Trent engine, a 70,000 lb. thrust (and higher) member of RB211 line being developed for the new generation of twin engine extended range airliners such as the Boeing 777 and the Airbus A330. When completed late in 1993, the test bed will be used to evaluate the Trent as well as IAE V2500 and Rolls-Royce Tay engines.

The test facility is located at the company's primary manufacturing facility in Derby, England. The building itself is well over 300 feet long and will be able to handle two of the big (about ten



The Rolls-Royce test cell is being built to test the 70,000-lb. thrust Trent version of the RB211.