

Woodward Governor Company

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## Computer aids endurance testing

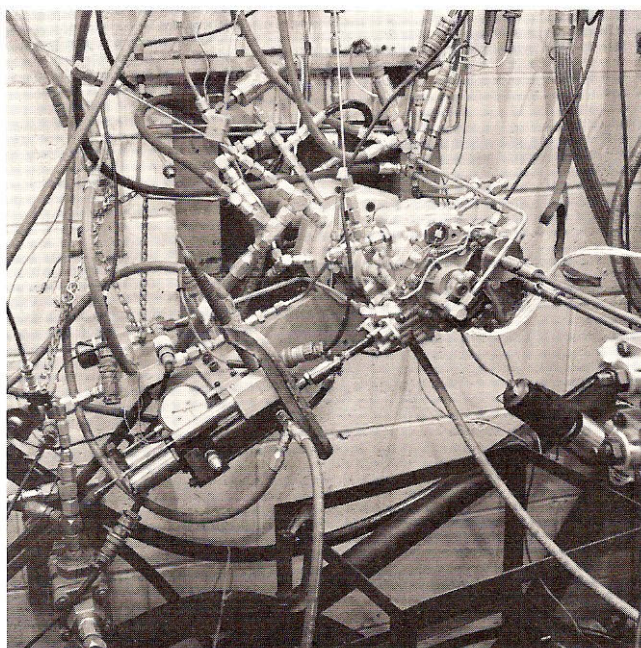
Endurance tests of controls have not changed much since Rockford's Environmental Test Building was built in 1958. Heating, freezing, and contaminating controls is not complex, but monitoring the results is a different matter.

Environmental testing became a critical part of developing aircraft controls in the '50s when jet aircraft began flying into remote areas of the world and encountered contaminated fuel.

Since the tests have to run for hundreds of hours, requiring around-the-clock monitoring to record data and adjust environmental conditions, they challenged the duration of the Development Lab's personnel along with the control's reliability. But, thanks to the computer age, the members in Development Lab are receiving a welcome change of pace.

The goal has been to let a machine monitor the endurance tests. Machines which automatically verify established parameters have been available for many years, but they were unreliable, still requiring continuous monitoring.

In December 1983, as computers became more advanced, Don Gillis wrote a program for a MacSym 350 computer to run an 8000 hour test on a 3013 fuel control. It monitored wear, not the control's design. The computer automatically collected data and signalled alarms or shut down the test if a condition were out of the specified range. The control was bombarded for 2½ years and the computer performed flawlessly, providing the most uniform and complete data ever obtained from an endurance test. The Development Lab tested the 8062-650 and 8061-800 series controls using programmable controllers, but they could not be programmed quickly and were not reliable enough for experimenting with design, so beginning in August 1986, another advance in computer-controlled endurance tests was sought.



*A T-700 control is connected to a web of pipes and wires as it goes through an endurance test.*

An assortment of WGC computer experts, engineers, and lab technicians convened to write a program for an IBM PC to control time and record data on tests. "When we started the project, we didn't know all the things the computer could do, but I think we just about have it now," said Doug Albright, who wrote most of the program. The Development Lab uses a Daytronics data acquisition computer in tandem with the IBM to measure fuel flow, temperature, pressure, and RPMs. As the Daytronics registers data, the IBM records the information and verifies that it is within parameters.

Doug knew that computers are more than storehouses and assemblers of data: they also make great clocks, and that let him design the most intricate part of the program: a timer to control test sequences. He worked with what he had and wrote the characteristics of a "drum switcher" in computer language. The switcher is a mechanical device—nearly as old as the environmental test building—which trips levers to change sequences over days and weeks, but now with the computerized "drum programmer," recording and assigning time sequences is very precise. The drum

programmer also tells the Daytronics to send the IBM a report every two minutes and commands the IBM to print an hourly report as well.

The IBM's software checks the information as the Daytronics sends it; if the data are out of the parameters' ranges, the IBM automatically shuts down the test. If an operator shuts down the test, the IBM will ask why.

The first assignment for the computer began last month in testing the new T-700 HMU. The control is running 100 hours at 260°F; 300 hours at room temperature with contaminated fuel, taking a one-hour break every five hours for the contaminants to corrode the control; and is enduring a series of 10 cold-soaks at -65°F for 10 hours each. Between soaks, the control runs for two hours. Since this is the first test of the T-700 and the new software, the Development Lab members are watching it continually, but they are looking forward to the day when it clicks and whirrs virtually on its own. 