

Part #43

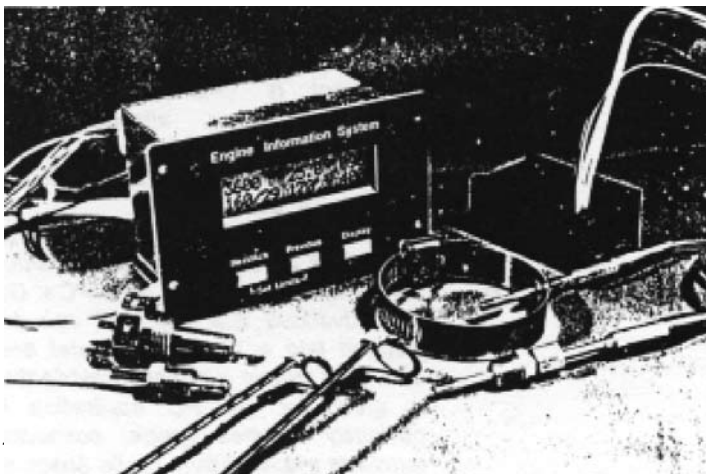
Automated Engine Monitoring

by Mike Stratman

It's not often a product comes along that can truly be classified as a break through in safety. Ballistic or Rocket deployed parachutes and strobe light systems are a couple industry innovations that have added a margin of safety to the Ultralight and Lightplane market. Throughout the "The Proper Care & Feeding of the Rotax Motor" series and the "Rotax Operator's Seminar" presentations, I've stressed the importance of monitoring the engine's vital signs. As any experienced operator knows, a perfectly functioning two cycle engine will normally operate within a few hundred degrees of the melting temperatures of certain components. Up until now only a properly monitored engine and a vigilance by the operator could detect an impending problem.

Finally, there is an affordable engine monitoring system that does more than just display information. The new Engine Information System or EIS by Grand Rapids Technologies is a user programmable, digital readout, audio/visual warning system that announces trouble long before engine damage can occur.

This month we'll take an in depth look at the EIS. How it works, what it can monitor, how to custom program the EIS, and how trouble will be displayed to the pilot. It usually not my policy to plug anybody's product in my column and that is not my intention this month. The safety aspects of this system are why I feel it justifies a review by the C&F series.

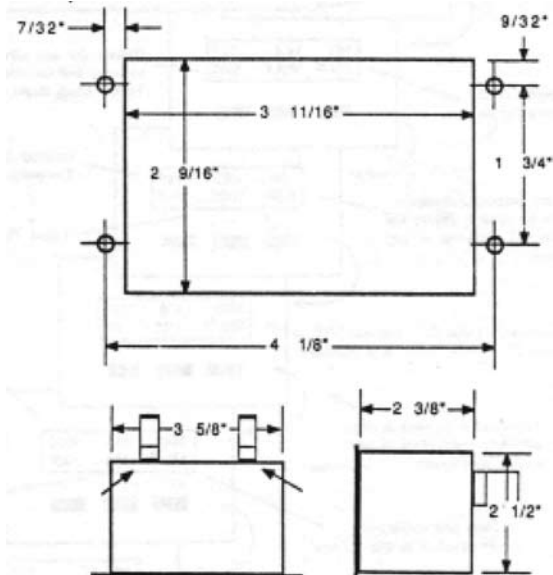


Each display screen provides a different set of information to the pilot. The various display screens used by the EIS are illustrated below. As can be seen from this illustration, selecting the desired display screen requires no more than the push of a button.

Panel Space Requirements: The size of the EIS puts an incredible amount of information in a small package. The face measures only 4 1/2" wide x 2 3/4" High x 2 3/8" deep. See figure # 1 for full dimensional specs.

Figure #1 - Dimensional Information of the EIS

What The EIS Can Do: Following the tradition set by today's aerospace industry is the incorporation of automatic

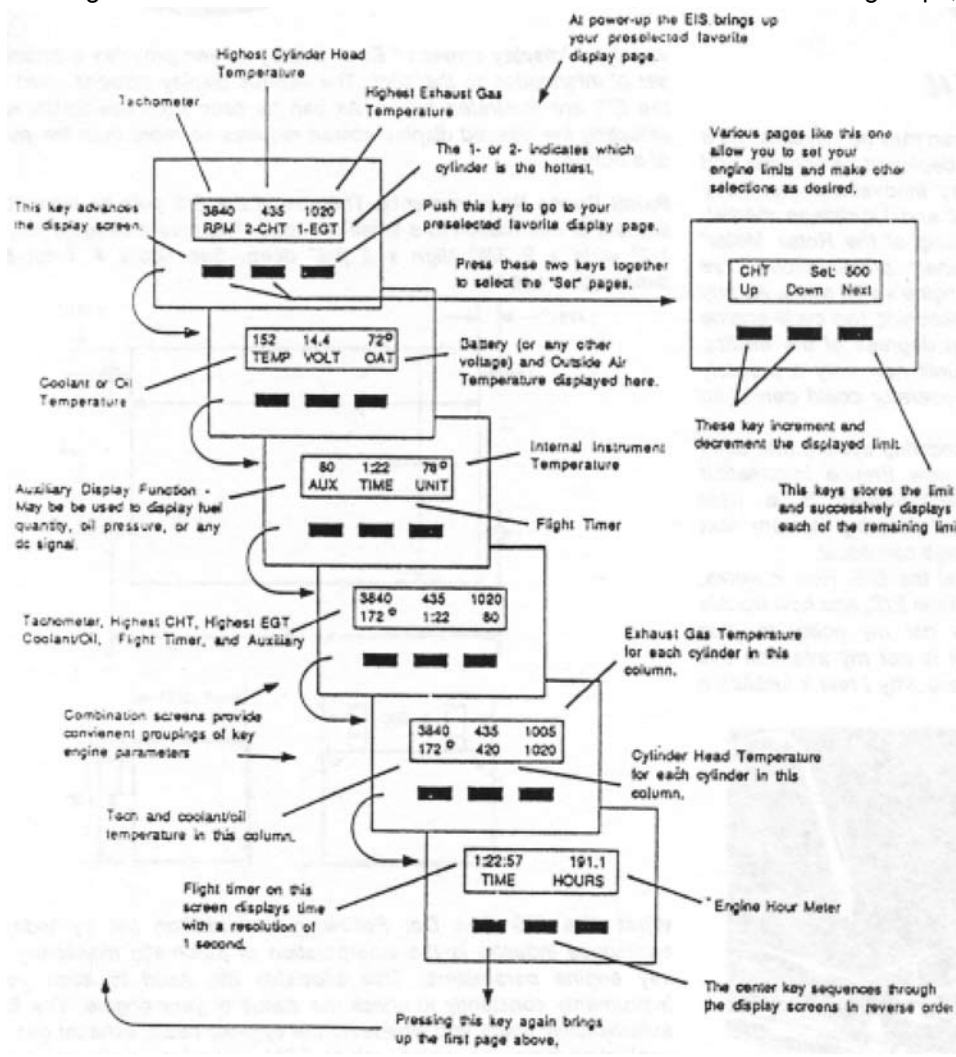


monitoring of key engine parameters. This alleviates the need to scan your Instruments constantly to check the status of your engine. The EIS automatically alerts you whenever the cylinder head, exhaust gas or coolant/oil temperatures as well as RPM exceed the limits you have set for them. The auxiliary function also includes an alarm that can be set to warn you when its input falls below a lower limit, making it especially useful for fuel level or oil pressure. A limit can even be set for the flight timer so that the EIS can

remind you to check your fuel or head for home!

The EIS is currently available in five different versions to cover a wide range of engines. The Standard EIS (part # E821) is designed for 2-stroke air and water cooled engines including Rotax, Hirth, Zenoah, AMW, Arrow, etc. Functions for the #E821 Standard EIS include the following functions:

- Tachometer
- Dual Cylinder Head Temperature
- Dual Exhaust Gas Temperature
- Fluid Temperature
- Auxiliary output (you choose - fully programmable)
- Voltmeter
- Outside Air Temperature
- Hourmeter
- Flight Timer



comes with the unit covers this process in detail. This information is displayed on a progression of six screens that can be arranged in any order by the owner. Shown here is a progression of six typical screens:

Simply press the left or right function button to move forward and backward between the pages. Press the left and center function buttons together and the EIS will display the screen on the right which will allow you to set the limits for each function. If the limit is violated the EIS will immediately change to a special screen and start flashing that particular reading on the screen. If equipped with the warning light and/or buzzer the pilot will be alerted at the same time. When you cure the problem to the satisfaction of the EIS, the flashing stops, and the EIS returns to the display page

you were previously on. In the event your difficulty is not so easily cured, the left button (ACK) of the EIS can be pressed to acknowledge the problem. This leaves the warning light on steady as a constant reminder of your problem, returns the EIS to the previous display page, and makes the EIS available to announce a further problem. If multiple problems occur at once, the EIS prioritizes them and provides them to you one at a time with each press of the ACK button.

Advanced EIS: The EIS is made in several other versions for three cylinder engines, Rotax 912, Rotax 914, Lycoming, Continental, VW, Mosler, etc. The Standard EIS - 3E/1C (part # E823) is the same the Standard EIS except provides 3 EGT inputs and 1 CHT. The Advanced EIS - A (part # E827) includes the following functions:

- Oil Pressure
- Precision Tachometer (10 rpm resolution)
- Auxiliary input scaled and calibrated for use with manifold pressure sender.
- Warning light output switchable to serial output for data reading using laptop computer.
- User definable EGT/CHT configuration - allows 4@ EGT and no CHT, 3 @ EGT/ 1@ CHT, etc.
- A second fluid temp (oil or coolant) replaces outside air temp

By using the function buttons on the face the operator can program the upper limits of any of these functions so the excess reading will automatically flash at the operator. Using the auxiliary output the owner can attach either a red warning light and/or warning buzzer that will sound in the event of an excess reading. The instruction manual that

The Advanced EIS has the ability to calibrate the tach to most any kind of engine or pulse. Electronic tachs are designed to measure the number of pulses per revolution to

determine the engine rpm. Trouble is many engines use different pulses per revolution. The Advanced EIS lets the user program the number of pulses per rev. Making it completely compatible with most any engine system. The resolution is a very accurate 10 rpm. The Standard EIS is good to from 20 to 60 rpm depending on engine type.

Senders & Options: Other impressions of the EIS is the attention to detail on the senders. In addition to the standard CHT & EGT senders is a wide range of senders are available including water temp senders, oil pressure senders, outside air temp, and the new screw in type Rotax EGT senders. Special attention has been given to the type of joints used with the thermocouples making ht readings more reliable. Use of the matching extension wire supplied with the probes allows the EIS to correct for changes in ambient temperature that would otherwise affect thermocouples. This technique is known as cold-junction compensation. The instrument is unaffected by long extension runs, although the manufacturer recommends the use of matching extension wire allow accurate cold-junction compensation.

The wiring is handled through the rear of the EIS by a multiple pin connector the same used on serial ports PC's. On the Advanced EIS this port can be plugged into a Laptop Computer and download certain information. While this is great for the PC application it obviously requires special connector terminals available from Radio Shack or from the EIS people.

While my overall impression of the EIS is good, the EIS people could make the unit a little easier to buy by offering everything you need in package for each kind of engine. I found the vast array of EIS, probes and senders a little difficult to clarify. Currently the buyer must buy a whole lot of probes, senders, and extension leads to make a complete unit. While this gets you everything you need, it makes the unit difficult to buy and makes the final costs a little harder to visualize. As with any gauge you buy now days, you have to be specific about your needs with special attention to the type of senders needed. A lot of the newer Rotax engines are equipped with ports to accept screw type EGT senders. Be sure to specify this when ordering any kind of instrument.