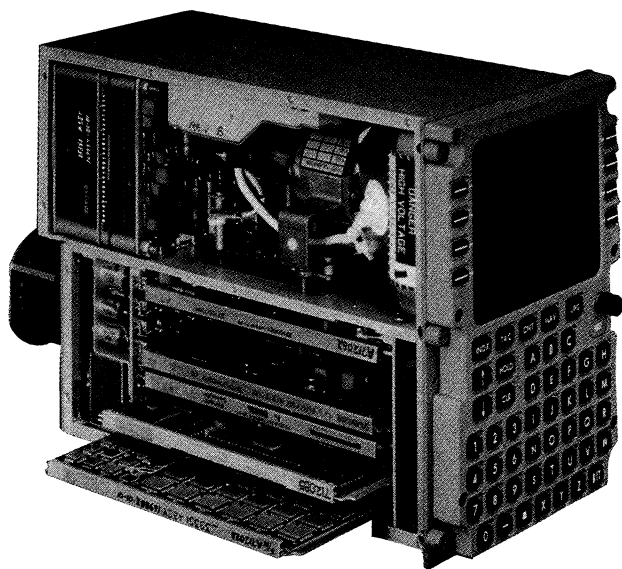# Thermal Analysis

Designing reliable aviation electronic equipment requires precise predictions of the unit's thermal performance. Packaging engineers can avoid unnecessary and costly redesign of the product through use of tools such as the SINDA '85/FLUINT software system for predicting thermal performance. SINDA is made available to industrial and government clients by NASA's Computer Software Management and Information Center (COSMIC).

SINDA '85/FLUINT is an acronym for Systems Improved Numerical Differencing Analyzer and Fluid Integrators. It is a program for solving the physical problems governed by flow and diffusion type equations and is most widely used as a general thermal analyzer. An example of a SINDA user is the packaging and engineering group of Smiths Industries, Grand Rapids, Michigan division, which designs navigational aides and other avionics for commercial and military aircraft.

A 20-year user of SINDA, the division has applied the upgraded design tool to a fiber optic gyro and in the Integrated Display Computer (above) for a Navy aircraft. By applying finite modeling techniques to develop a model of the structure, engineers can obtain thermal predictions typically within two degrees Centigrade of measured values. When an abnormality, such as a localized hot spot, is predicted, a change in the product design can be made early to eliminate potential problem areas.

Another SINDA '85/FLUINT user is Corning Inc., a Corning, New York specialty glass and ceramics firm. One application of the program is modeling the heat flow in catalytic converters; shown below is a catalytic converter during heatup. The hotter a converter gets, heated by engine exhaust, the better it is at removing hydrocarbons, hence more efficient in controlling emissions. A SINDA '85/FLUINT thermodynamic model can be used to predict the time necessary for optimum converter functioning during a standard Environmental Protection Agency test cycle.

Corning has also found SINDA '85/FLUINT valuable in research on glass forming processes; the program models the thermal behavior of molten glass during shaping and cooling. Additionally, company researchers are studying the visco-elastic behavior of glass by stretching furnace-heated fibers; SINDA '85/FLUINT helps in modeling the elongation of the fibers.