mand signals and signal input voltage would be supplied to the chip from external instrumentation. The overall size of the unit on the outer end of the rod assembly (including the ASIC) would be of the order of 1 in.^{3} (≈16 cm^3).

In a typical case, it would be necessary to place gauges at several locations. Then the fuel-level readings from the several locations could be processed by an algorithm that would take account of the shape of the tank in determining the amount of fuel remaining. It should also be possible to implement some form of autocalibration in software. The level readings or the final calculated quantity of fuel could be integrated or averaged before being displayed in nearly real time (update every few seconds).

With respect to initial costs, the proposed gauges would be competitive with capacitive fuel gauges. However, recurring costs of the proposed gauges would be much lower because their rodlike assemblies could be replaced in minutes instead of days.

This work was done by Philip Moynihan, Paul Henry, Tien-Hsin Chao, William Lincoln, William King, and Lloyd Adams of Caltech for **NASA's Jet Propulsion Laboratory**. *For further information, access the Technical Support Package (TSP)* ***free on-line at www.nasatech.com*** *under the Physical Sciences category. NPO-20105*

Shape-Memory-Alloy Thermal-Conduction Switches

These devices would be simple, cheap, and reliable.

NASA's Jet Propulsion Laboratory, Pasadena, California

Variable-thermal-conduction devices containing shape-memory-alloy (SMA) actuators have been proposed for use in situations in which it is desired to switch on (or increase) thermal conduction when temperatures rise above specified values and to switch off (or decrease) thermal conduction when temperatures fall below those values. The proposed SMA thermal-conduction switches could be used, for example, to connect equipment to heat sinks to prevent overheating, and to disconnect the equipment from heat sinks to help maintain required operating temperatures when ambient temperatures become too low. In comparison with variable-conductance heat pipes and with thermostatic mechanisms that include such components as bimetallic strips, springs, linkages, and/or louvers, the proposed SMA thermal-conduction switches would be simple, cheap, and reliable.

The basic design and principle of operation of an SMA thermal-conduction switch is derived from an application in which thermal conduction from hot components to a cooling radiator takes place through the contact area of bolted joints. The thermal conductance depends on the preload in each joint. One could construct an SMA thermal-conduction switch by simply mounting an appropriately designed SMA washer under the bolthead. As the temperature falls below (or rises above) the SMA transition temperature, the SMA washer would contract (or expand) axially by an amount sufficient to unload (or load) the bolt, thereby shutting off (or turning on) most of the thermal conduction through the joint contact area. SMA washers with various transition temperatures can be made to suit specific applications.

This work was done by Virginia Ford and Richard Parks of Caltech for **NASA's Jet Propulsion Laboratory**. *For further information, access the Technical Support Package (TSP)* ***free on-line at www.nasatech.com*** *under the Physical Sciences category. NPO-20437*