government is capable of swiftly analyzing crucial intelligence. He also said that no one has systematically studied White House crisis management requirements, although this was a problem that he was trying to redress (*Science*, 31 August, p. 907).

No decision has been made yet on his successor.—**R. JEFFREY SMITH**

## Pentagon Hit by New Microchip Troubles

A government investigation into inadequate testing of computer chips embedded in military aircraft and weapons systems has now widened to include the Signetics Corporation, the sixth largest microcircuit manufacturer in the United States. The Defense Department began the investigation in September, after officials of Texas Instruments (TI) disclosed that millions of integrated circuits, installed in more than 270 major weapons systems by 80 different contractors, might not have been properly tested. TI is the largest U.S. microcircuit manufacturer (*Science*, 5 October, p. 24).

The resultant publicity prompted Signetics officials to begin an internal audit, and last month they concluded that as many as 2460 different types of microcircuits supplied to Pentagon contractors similarly might not have been tested according to specification. Since then, the company has cleared roughly 1600 types of circuits, but it still has more than 800 under investigation. At least 60 different types of chips, all sold to the Pentagon through the IBM Corporation, have been determined to have "confirmed problems," according to an informed source. A detailed audit of Signetics by the Defense Logistics Agency was completed on 9 November, but no results have been released to date.

Thus far, the process of "clearing" the Signetics microcircuits has not involved any retesting. In many cases, the company and its customers have simply decided that the original testing requirements were unwarranted. Similarly, little or no retesting has been done by TI, although in several cases Pentagon acceptance of weapons containing suspect TI chips has been temporarily delayed. "Nothing has been disassembled," says TI company spokesman Norman Neureiter. James Harroun, a spokesman for IBM, confirms that "we have had no requests to retest our [weapons] in the field" containing TI parts. One reason is that the cost of such testing is enormous, both for the government and the weapons suppliers, according to government investigators. Another is that defects from the inadequate testing may not turn up for years, and the passage of time conveniently clouds responsibility.

None of the microcircuits involved were produced specifically for military applications. Instead, they were standard commercial chips, supposedly tested to withstand the extraordinary stresses of a military environment. Government and industry sources now suspect that deliberate shortcuts in the testing of such parts are commonplace, and expect to hear confessions from other manufacturers in coming months.—**R. JEFFREY SMITH**

## Renewable Energy R&D Favored by Small Nations

*Paris.* An inverse relationship appears to exist among Western nations between the size of a country's economy and the proportion of its resources that are spent by governments to develop renewable sources of energy.

This, at least, is the conclusion of a top-level committee of the Paris-based International Energy Agency (IEA) in a report just published on the energy research and development programs of its member states (essentially the non-Communist industrial countries apart from France).*

The committee calculates that total support by IEA member governments for energy R&D dropped by 6 percent in real terms between 1982 and 1983. The cuts were concentrated largely in support for research into renewable sources of energy, with changing energy research priorities in the United States alone accounting for more than half the decline.

All these reductions partly reflect relaxed pressures due to recent decreases both in the price of oil and in predictions of future energy demands. One result of this trend, however, has been to accentuate significant differences in strategy between larger and smaller IEA member countries.

Thus the committee points out that when total government expenditure on energy R&D is calculated as a proportion of the gross domestic product, five of the six top spenders—Italy, Germany, Japan, Canada, and the United Kingdom—belong to the group of seven Economic Summit countries (with France excluded, the remaining member of the group, the United States, comes ninth on the list).

However, the IEA report describes as a "remarkable result" the fact that when research on all forms of nuclear energy (including fast breeders and fusion) is omitted, the situation is the reverse. In this case, only one summit country (Canada) is represented among the top six in terms of the proportion of domestic resources spent on nonnuclear energy research and development.

The economic summit countries, according to the report, spend in general no more than about 10 percent of their energy R&D budgets on renewable energy technologies, even though in most cases this still means large sums of money. "Conversely the smaller economies like the Netherlands, Spain, and Sweden, appear to invest increasing proportions of their budgets in this area." This tendency, it adds, is even more pronounced in the smallest member countries of the IEA, those whose research budgets were less than $10 million in 1983.

"In the majority of cases, it appears that the relatively modest financial and other resources available to these countries can be usefully employed for the development of 'mainly' indigenous energy sources or the adaptation of imported technology for local use," says the report.

As for advanced nuclear technologies, the report points out that there was an overall reduction of 18 percent between 1982 and 1983 in aggregate spending on fast breeder research, mainly due to reduced expenditure in the U.S. and West German programs. In contrast, there was no significant decrease in countries' funding of fusion R&D, with aggregate IEA spending for 1983 identical to that in 1982 at about $800 million.—**DAVID DICKSON**

**Energy Research, Development and Demonstration in the IEA Countries* (International Energy Agency, Paris, 1984), F110.