# Computers and the U.S. Military Don't Mix

*After 9 years and more than $1 billion, the Pentagon's global computer network is still on the blink*

A few members of the day shift had started on their second cup of coffee last 9 November when the alert-code status board lit up. The men, deep inside a hollowed-out mountain in Colorado, caught their breath as computers indicated a missile attack from a submarine off the West Coast. A low-level state of "nuclear war" was declared. In minutes, ten jet interceptors took off from American and Canadian bases, and the 1000 or so minuteman missile silos scattered across the American heartlands went on low-level alert. Buzzers rang at the Federal Aviation Agency (FAA) air traffic control centers across the country, and officials radioed all commercial craft to be prepared to land. No matter. Six minutes after the alert started, the whole thing was identified as a mistake, and red lights in Colorado gave way to red faces.

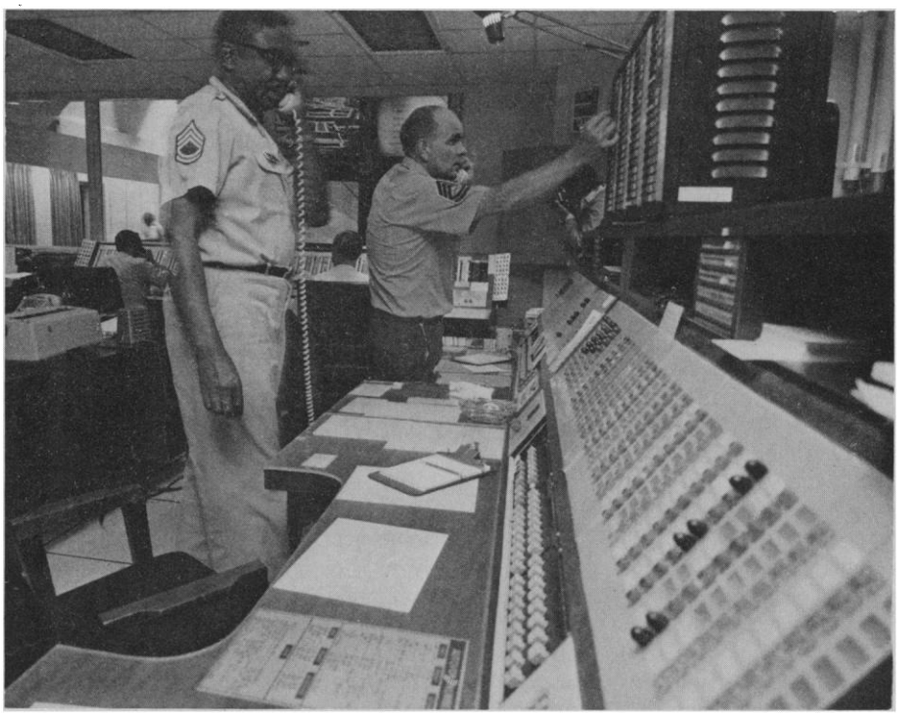
This computer-generated crisis was not unique in military history, nor was the dearth of after-the-fact explanations. Officials at the Pentagon shy away from the issue of computers and telecommunications mixups—and not just for reasons of national security.

Since 1971, the Department of Defense has sunk more than $1 billion into a computer network for gathering intelligence and controlling U.S. military forces anywhere in the world, but not everyone is happy with it. Last spring, the Government Accounting Office (GAO) found "little if any improvement [in the system] since the program's inception" and called for a reduction or cutoff of funds. Congress agreed with the suggestion, cut several million dollars out of its budget for fiscal 1980, and ordered the Pentagon to prepare a game plan for the replacement of the faulty computer system. In the meantime, the network is so bogged down in technical and administrative problems that its effectiveness is doubtful, as the 9 November incident clearly suggests.

The nuclear attack alert started with the loading of a "war game" onto a computer at the operations center of the North American Air Defense Command (NORAD) inside Cheyenne mountain in Colorado. First reports out of the Pentagon told of "mechanical malfunction" in the electronic routing of the war exercise; later ones alluded to human error. Beyond these sketchy details, and an announcement 20 days after the alert that the "problem" had been fixed, Pentagon officials have been tight-lipped. The story broke only because a reporter for the Washington *Star* happened to be at an FAA air traffic control center preparing a feature story when the alert occurred.

The underground complex in Colorado is one of 27 major U.S. military command posts around the world. The computers at these posts are the brains that tie together the Pentagon's $15 billion network of satellites, radar stations, sensors, and warning systems. This whole network is known as the World Wide Military Command and Control System, "Wimex" being the pronounceable form of the acronym WWMCCS. In emergencies, the President and the Joint Chiefs of Staff rely on the Wimex computers to warn of attacks and to coordinate and control all activity by the U.S. military anywhere in the world—at least in theory. Practice is another story.

Take an incident during the Guyana crisis. When word reached Washington on 18 November 1978 that a member of Congress and three reporters had been killed in Jonestown, the Joint Chiefs immediately turned to Wimex for details on what planes, troops, and medical aid were available. Coordinating this electronic search was the U.S. Readiness Command at MacDill Air Force Base in Tampa, Florida. At the height of the crisis, a power outage interrupted the link between computers in Washington and Florida. Power was quickly restored, and the Joint Chiefs' crisis action team tried reconnecting to the Florida computer—without luck. As far as the Florida computer was concerned, Washington was still "signed on," and the computer would not allow the same terminal to sign on twice. Eventually, the



*The emergency action room of the National Military Command Center in the Pentagon, one of 27 major U.S. command posts that rely on the computers of Wimex.*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Washington crisis team came up with a new code name for themselves and entered it into the Florida computer. The two computers were finally back in contact, but the communications breakdown had lasted for more than 1 hour.

Officials at the Pentagon brush this "horror story" aside, saying it is insignificant. For 9 days during the Guyana crisis, they note, the Wimex computers were tied together in a network involving 12 command centers, and during this time the network had a 95 percent availability.

GAO replies that availability and reliability are two very different measures of computer function. Just because a computer is working does not mean it is successfully tied into a network. In the spring of 1977, for example, the Pentagon conducted a revealing test. A festival of acronyms called PRIME TARGET, this exercise linked computers in the Atlantic Command (LANTCOM), European Command (EUCOM), Readiness Command (REDCOM), Tactical Air Command (TAC), and the National Military Command Center in the Pentagon. During the test, EUCOM attempted to obtain or send information through the computer network 124 times. It failed 54 times as the result of "abnormal" shutdowns of the computer. LANTCOM tried 295 times and failed 132 times. TAC went 19 for 63, a failure rate of 70 percent. And REDCOM found itself able to receive and send instructions in only 43 of 290 attempts—a failure rate of 85 percent.

These problems are overstated, say Pentagon officials. "If one site tried to connect to another, and received a busy signal, this was counted as a failure," said one disgruntled official. "If he waited 10 seconds, tried again, and received another busy signal, this was counted as another so-called failure." Other officials stress that PRIME TARGET was just a test of experimental systems, and that the Pentagon expected to find flaws. Since then, other tests such as NITE STRIKE, ELITE TROOPER, and POWER PLAY have shown that network reliability has improved significantly. "The stories in the press have been exaggerated," says Gerald P. Dinneen, Assistant Secretary of Defense for Communications, Command, Control, and Intelligence, and the former director of the Lincoln electronics laboratory at MIT. "I think it's a bum rap. I don't want to be overly defensive because we recognize that some of the criticism is valid, but then some criticism would be valid of any of our computer systems. But anything which sort of says, 'Wimex doesn't work,' is a bum rap."

Inspiration for a computerized command network came back in 1962 when President John F. Kennedy was unable to keep track of troops and events during the Cuban missile crisis and the Bay of Pigs invasion. He suggested that the Pentagon construct a system to help orchestrate warfare electronically in the years ahead.

By the mid-1960's, Wimex consisted of a loosely knit federation of 158 computer systems at 81 sites around the globe. Officials at each site picked their own computers and software systems, and, as a result, messages sent between computers were often mixed up or delayed. In 1966, the Office of the Secretary of Defense and the Joint Chiefs of Staff began informal discussions on how to handle the problem. These discussions quickly became more serious because of a series of increasingly severe communications failures. While cruising off the Sinai Peninsula during the 1967 Arab-Israeli war, for instance, the U.S.S. *Liberty* was fired on by Israeli gunboats. A computer error had kept the ship from receiving information that would have warned it away in time. Another communications snafu led to the shooting down of a U.S. spy plane off the coast of North Korea. And in 1968, the U.S.S. *Pueblo* was seized by the Koreans and its crew held captive for 11 months—a crisis that could have been avoided if the message warning the *Pueblo* of potential trouble had not been misrouted by a computer.

As a result of these and hundreds of smaller, unpublicized incidents, the Pentagon decided on a systemwide standardization of its command and control computers. In June 1970, Deputy Secretary of Defense David Packard (of Hewlett-Packard fame) approved the procurement of 35 standard computers and software systems. The $55 million contract was awarded to Honeywell Information Systems. In December 1971, Packard also issued DOD Directive 5100-30, aimed at reorganizing the Wimex system "to provide the means by which the President and Secretary of Defense can receive warning and intelligence upon which accurate and timely decisions can be made and assign military missions and provide direction" to the commanders in the field.

One billion dollars later, the President still does not have the system that the Pentagon promised. A key problem, according to the GAO, is that the entire

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## Institute of Medicine Names Robbins President

Frederick C. Robbins, the dean of Case Western Reserve's medical school, has been chosen the new president of the Institute of Medicine (IOM). He will begin his term in late October, at the close of the annual IOM meeting. The current president, David Hamburg, will move to Harvard University, where he will direct a new, interfaculty division of health policy research and education. Hamburg will coordinate work at the Kennedy School of Government, the Medical School, and the School of Public Health.

Robbins received baccalaureate and bachelor of science degrees from the University of Missouri, and a medical degree from the Harvard Medical School. He served at the Childrens' Hospital in Boston, and in 1954, with Thomas Weller and John Enders, he won a Nobel prize for developing a virus culture technique that led to the production of the poliomyelitis vaccine. Since 1952, Robbins has been on the medical faculty of Case Western Reserve, and he has been dean since 1966.

In recent years, Robbins has taken part in shaping national health policy. He has chaired a study for the IOM on the health effects of legalizing abortion, a review of poliomyelitis vaccines, and a report on the risks involved in the use of saccharin as a food additive. Last March, he was named chairman of the advisory council for Congress' Office of Technology Assessment.

Robbins is not regarded as an innovator among his peers, but as a problem-solver and a capable leader. A typical reaction to his appointment is that of Joyce McCann, a biochemist at the University of California at Berkeley who was one of the authors of a minority dissent from the IOM's saccharin report. McCann said Robbins has "an ability to deal with groups of people who are at opposite ends of the spectrum. He can see their arguments and bring them together without compromising his own position." He dealt "very fairly" with the minority point of view, she said. Sheldon Samuels, director of health and environ-


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network is built around Honeywell 6000 series computers, first manufactured in May 1964 by General Electric and now two generations behind up-to-date computer technology. These computers process information in what is called "batch" or "sequence" modes. They work just one step at a time, relying on patterns of intricate, preprogrammed steps. Colonel Perry Nuhn, the Pentagon's director for information systems and command, control, and communications, put it this way. "Say the PLO hijacks a plane and lands it somewhere in a desert. If I've got to provide help, I need to know where the nearest airfields are, how much fuel they have on hand, how long their runways are, and dozens of other support questions. Wimex computers can't answer questions that are this specific. They may have to dump out information about a whole set of nearby countries and all their airfields. And you've got to go through the doggone things by hand."

More modern computers, in contrast, can perform many steps simultaneously, nimbly taking instructions only from the relevant parts of a program. This also allows a computer, even while being questioned, to incorporate other information, such as data from a satellite. The GAO insists that the Pentagon back in 1971 had the opportunity to buy such "real time" equipment but decided not to. "The need for real time processing . . . was known to DOD before the Honeywell computers were purchased, and other computers available at the time could have provided that capability."

The Pentagon both admits and denies the "batch processing" problem, depending on the source. All officials, however, defend the Honeywell 6000's on economic grounds. The bulk purchase of 35 of these computers was made for 35 percent less than the General Services Administration schedule price. Skeptics at the GAO see this low bid as a "buy in" or the intentional selling of computers below cost so that the real money can be made when additions to the system are made. Indeed, extensive additions running into hundreds of millions of dollars have been made in an effort to make the Wimex system operate in an interactive mode, and much of the equipment and software has been purchased from Honeywell. Some military commands, such as the Strategic Air Command, have gone to the extra expense of installing real time computers in their efforts to "work around" the problems of the Wimex system.

Batch processing is not the only problem that plagues the Wimex system. Another is that it is operating at near capacity. "They really have no wartime or crisis surge capacity left to send the right planes to the right places and load the right stuff," says E. L. Dreeman of the Stanford Research Institute, who

# Sakharov Protests Mount

Fears that Andrei Sakharov may be expelled from the Soviet Academy of Sciences at its meeting on 4 March have prompted an outpouring of protest from Western scientists that is unprecedented in its scope and intensity.

A poll taken of members of the National Academy of Sciences shows that three-quarters of those responding intend to opt out of any official scientific exchange with the Soviet Union until such time as Sakharov is released from his internal exile in Gorki.

Many Academy members favor even stronger action. Half of the 262 respondents say they "would approve of a general cut-off in federally funded scientific exchange" until Sakharov is released. The poll of the 1280-member Academy was conducted by the Federation of American Scientists.

The Council of the Academy informed its Soviet counterpart by cable on 24 February that all bilateral symposia arranged by the two academies would be suspended for the next 6 months because of the Soviet government's actions against Sakharov. Sakharov is a foreign associate of the National Academy of Sciences.

Russian scientists heard the treatment of Sakharov criticized at the scientific forum held in Hamburg, West Germany, from 18 February to 2 March. Not only did NAS president Philip Handler warn that scientific interchanges with the Soviets might "soon dissolve in bitterness and anger," but a similar message was delivered by Alexander Todd, president of the British Royal Society. Without a change in the Soviet Union's behavior toward Sakharov and other scientists, Todd said, he saw "little future for true cooperation between us."

The outcome of the 4 March meeting of the Soviet Academy of Sciences could be of widespread significance. Some observers of the Soviet scene consider that if Sakharov is expelled from the Academy, he is likely to be put on trial, and that his trial could be followed by a wave of repression perhaps similar to that of the Stalinist era.

For Sakharov to be expelled, however, required a two-thirds majority of the Soviet Academy's 250 full members. Moreover, in a democratic vestige rooted in the Academy's charter, drawn up by Lenin himself, the balloting is secret. "The expulsion of Sakharov from the Soviet Academy would represent a politicization of the Academy which Lenin himself had sought to prevent," the Federation of American Scientists observed in appealing to Soviet scientists to resist pressure to vote for expulsion.

At a press conference held by the Federation in Washington, D.C., Sakharov's stepdaughter Tanya Yankelevich noted rumors that A. P. Aleksandrov, president of the Soviet Academy, and Nicolai Basov, a Nobel prize-winner, might be unable to attend the 4 March meeting because of illness. The Soviet authorities, she suggested, might wish these two scientists to keep their hands clean so as not to be ostracized by Western scientists on their frequent visits abroad.

Sakharov's wife, Yelena Bonner, asked members of the Academy for their support at a meeting with reporters in Moscow on 9 February. In a statement addressed to "our Soviet scientists," she noted how much conditions for scientists had improved since the Stalin era: "You are keeping silent out of fear of losing all that. But by keeping silent, you can lose even more. By your silence, you can help bring the country and yourselves back to those times, which were as terrible as a nightmare. Everyone knows that there is not a family in the land that was not touched by it, and many remember the footsteps on the stairs at night and the hushed question, 'Have they come for me or my neighbor?'

"Don't worry, they haven't come for you, not yet. For the present they have come for Sakharov and for those who do not keep silent."—N.W.


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chaired a panel that spent 18 months reviewing Defense Department computer systems for the President's Reorganization Project.* The panel was also alarmed to find that most of the Wimex computers do not have backup power systems. The National Military Command Center in the Pentagon, for example, is totally dependent on commercial sources of power. The computers at one sensitive command, NORAD, go down whenever nearby commercial power lines are struck by lightning.

And the computers of Wimex are not the only machines that bedevil the Pentagon. Take the Air Force's Advanced Logistics System (ALS). It was intended to provide central, computerized management of a global parts inventory of more than 6 million items. For example, during the 1973 Yom Kippur war, Israel early on needed new cockpit canopies for several damaged F-4 Phantom jets. Logistics Command headquarters at Wright-Patterson Air Force Base near Dayton, Ohio, searched in vain for 12 hours through its vast computerized inventory. Finally, a warehouse-by-warehouse search was started, involving hundreds of personnel at dozens of centers worldwide. By the time the canopies were located, the war was over.

After spending $250 million on ALS and after still having problems, the Air Force asked Congress in 1975 for $500 million more for an ALS "Get Well Program." Congress instead killed the program.

> "I'd wonder about an officer who wanted to make a career in computers."

The laundry list of other fiascoes is a long one. Not a few programs have been killed or cut back by Congress in the past few years. Reasons for this mess are complex and include the lengthy procurement process in the Department of Defense, fragmented control over the design of the systems, and a dearth of qualified personnel to run the actual computers. It seems, in short, that the sprawling military bureaucracy cannot cope with the rapid evolution of computer technology. The President's Reorganization Project, for instance, found that most of the computers are outdated by the time they are installed. In a system as large and complex as Wimex, this results in a crazy quilt patchwork of new and old equipment that requires major adjustments before it can be made compatible. Compounding this, according to both the GAO and the President's panel, is the lack of any single organization with authority or responsibility within the Pentagon for determining how best to use the computers. And people in the Pentagon's various organizations that deal with the Wimex computer system are often unqualified for the jobs. The President's panel found that only 6 out of the 360 generals in the Air Force have a career background in computers. Part of the problem is that the path of promotion for officers with a background in computers is almost nonexistent, and so they often end up going into industry. As one admiral told one of the Reorganization Project investigators: "There are three ways to make a career in the Navy: under the water, on the water, and in the air. I'd really wonder about an officer who wanted to make a career in computers."

A basic but unstated paradox seems to underly the problems of Wimex. Computer technology has been rapidly evolving in the past decade, making the sharing of data banks in the military more and more feasible. The military, however, is a most turf-conscious bureaucracy. In many instances, the Air Force might not want the Navy to have unlimited real time access to its Wimex computers—and vice versa. The Army is guarding its data banks against both. The result is a proliferation of "system" nullifying additions. At many bases, according to the GAO, a separate non-Wimex computer was used for each security level of data being processed. One solution to this problem is to provide multilevel security within the single Wimex system. The GAO says the Honeywell computers cannot do this. The Pentagon replies that it now has four different projects that are working on the "kernelization" of sensitive data in the Honeywell 6000 system.

Another even more fundamental paradox is that the electronic network that ties intelligence and weapons together is undoubtedly critical, but not very glamorous compared to the systems it services. Guns, tanks, satellites, and missiles are much easier to understand and manage than the transnational flow of electrons, and this fact determines in part the limited time and attention devoted to worldwide computer networks. Dinneen puts it this way. "It is easier to do the analysis on a lethal weapon system than it is on a support system. Command, control, and communication systems generally don't kill anybody—unless they get a short circuit or something. And so as a result, it is more difficult to do the analysis to justify expenditures on support systems than it is on tanks, aircraft, and ships."

Dinneen says this "glamour" issue is one of the reasons Congress has been cutting into his budget. Last year the House Appropriations Committee voted to cut various command, control, communications, and intelligence programs by one-half billion dollars. Staffers on the Hill, however, say the cuts, many of which were eliminated in House-Senate conference committees, were for programs that were mismanaged and falling apart under their own weight. The committee, more by way of mild reprimand than strict censure, recommended cuts of $9.8 million in the $140 million Wimex budget for computers in fiscal 1980, and called for a modernization plan. "Considering the deficiencies of the present Wimex automated data processing system, the inevitable need for new hardware, and the wastefulness of adding additional hardware to the present system, the committee believes the best approach is the development of a follow-on Wimex computer system."

This January, the Pentagon provided the committee with such a proposal. The 32-page document is a bland and not especially visionary look at alternatives. Even its authors seem to admit as much. "Given the scope of the problems," the report states, "it is premature at this time to present a firm and detailed plan for development and implementation." And, of course, it remains to be seen whether even a visionary master plan could in any way affect the intractable problems that beset the Pentagon's attempts at managing computer systems.

Given the gravity of the situation, as suggested by the 9 November nuclear attack alert and a long history of similar mixups, such a master plan would seem to be in order. But Dinneen may be right; the "unglamorous" aspects of the Pentagon's computer problem may keep it from receiving the attention it deserves. Take the study of Department of Defense computers performed by the President's Reorganization Project. The report still has not reached the White House, though it was initiated in August 1977 and completed in October 1978. Said an official at the Office of Management and Budget: "The President has been tied up with more important things."—WILLIAM J. BROAD

*Federal Data Processing Reorganization Study, National Security Team Report* (Office of Management and Budget, The President's Reorganization Project, October 1978).