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WWMCCS AND THE COMPUTER THAT CAN

by

PERRY R. NUHN

The View from the Fourth Estate feature of the March 1980 issue of Parameters reprinted articles by James North ("Hello Central, Get Me NATO: The Computer That Can't") and Frank Greve ("Pentagon Calls Super-Computer a 'Disaster'"), both highly critical of the Department of Defense's World Wide Military Command and Control System.¹ In the interest of providing readers a balanced perspective, Parameters invited the Office of Dr. Gerald P. Dinneen, Assistant Secretary of Defense for Communications, Command, Control, and Intelligence, to provide an authoritative public reply to the charges by Messrs. North and Greve. The article below by Colonel Perry R. Nuhn (USAF, Ret.), formerly Director of Information Systems in the Office of the Assistant Secretary, was submitted in response to Parameters' invitation.

* * * * *

Since mid-1978, numerous articles have appeared in the nation's press describing the "horrors" of the World Wide Military Command and Control System—especially regarding its computers and data communications network. With few exceptions, the articles have been both mistaken in their general thrust and inaccurate regarding important details. These errors have been, in general, uncritically repeated from article to article, like echoes rebounding between canyon walls. My purpose is to discuss the more important allegations and present another side of the picture.

Before considering these allegations, however, it is important to establish what precisely the World Wide Military Command and Control System (WWMCCS) is, since much of the press criticism reflects poor understanding of what constitutes the system and what it is supposed to do. WWMCCS is the composite of warning systems; central command and control facilities; interconnecting voice, record, and data

communications; automated information processing systems; and procedures and people which provide the means for national command authorities to direct the use of US military forces. As such, it encompasses military command and control support at the national level, the service headquarters, and the unified and specified commands and their components. In geographic terms, it circles the globe, extending from Korea eastward across the Pacific, across the continental United States, and over the Atlantic to major US headquarters in Europe. In addition, certain backbone communications, such as the Defense Communications System and the DOD Intelligence Information Systems at the various commands, are WWMCCS-related. In total, WWMCCS represents a national asset costing \$2 billion annually. In peacetime crises or in war, WWMCCS permits decisionmakers to direct responsive military actions in support of national policy.

The WWMCCS Information System consists of the WWMCCS automatic data processing (ADP) equipment, interlinked

computer networks, message handling systems, and command center display systems. Currently about six percent of the WWMCCS budget, about \$140 million annually, is spent on the information systems. Most of this money is for operating and maintaining existing systems. Planning for the future, conducted by the WWMCCS Engineering Organization, should produce more modern systems able to meet the greater demands of the late 1980's and 1990's.

It is in addressing the WWMCCS ADP Program that one encounters the 35 standard Honeywell computers which have figured so prominently in adverse press reports. Responsibility for coordinating the overall use of the computers lies with the Command, Control, and Communications Systems Directorate of the OJCS, but supported commands operate their own computers.

The WWMCCS ADP Program resulted from decisions made in the late 1960's. The objective of the program was, and remains, to improve the exchange and processing of data among WWMCCS command centers by systematically standardizing and improving the ADP equipment. The program has been quite successful. The computers now have standard hardware, standard software, and, in cases where common requirements and reporting systems prevail, standard applications.

The hardware consists of the 35 Honeywell 6000 computer systems and related minicomputers located in 27 major military command headquarters in the continental United States and overseas. This equipment is used daily to support a wide range of military operations, including the development of contingency and integrated operations plans; military air, ground, and sealift management; nuclear stockpile control; warning systems correlation; crisis and force deployment planning; and tactical air operations planning. The WWMCCS ADP Program is also able to assist in monitoring force execution under general war planning and limited reconstitution planning.

Although these systems are used for essential military tasks, they *do not* directly generate execution orders for military

operations. The information they produce is used to create necessary plans, and, after execution, to assist in monitoring operations. The systems were *not* installed to warn the President of impending crises, *nor* can they be considered the hub of the command and control system around which military planning revolves. True, one system at the North American Air Defense Command does process missile warning data, but it is neither the sole nor necessarily the most important source of that information. Because reliable processing of any warning is so essential, alternate means exist to process and display critical warning information at the National Military Command Center and its alternate, at Strategic Air Command Headquarters, and at Aerospace Defense Command Headquarters. This function is accomplished by the Command Center Processing Display System, consisting of dual UNIVAC computers and associated display terminals which are directly connected to both sensor input information and to the information processed by NORAD. This system permits the United States to detect an enemy missile launch within minutes and presents decisionmakers with the information they need to make force survival decisions while waiting for confirmation of the attack from Aerospace Defense Command. The system at SAC Headquarters integrates the information with other intelligence and force posture data and provides a timely, accurate picture of the attack and its effect on SAC force survivability. This system is part of the WWMCCS Information System, but is separate from the WWMCCS ADP Program.

In instances where minutes are not so precious, WWMCCS ADP systems receive data through older, slower methods of communications and joint reporting. This information is kept on tap to provide the national command authorities, the Joint Chiefs, and service and theater commanders with information on the status of military organizations and significant resources and facilities. Unit Reports, for example, set forth detailed information on force status.

Because the nature, timing, and duration of crises are so unpredictable, it is obviously

impossible to anticipate all the information required by the people who must respond. As a result, commanders and staffs rely on telephones to gather data in rapidly developing situations, especially with regard to current assessments at the unit level.

To improve the rapid transfer of information within WWMCCS, computer-to-computer connections are being developed through the WWMCCS Intercomputer Network Program. This and other modernization efforts are designed to insure that the practices and technology used in the next decades will provide our nation with the most effective and reliable information system possible.

Improved system interlinkage is needed, for example, to collect and disseminate information to support airlift monitoring and control, especially when the operations are conducted in remote areas. With regard to the SAC Automated Command and Control System, direct data connections have existed between the headquarters and the forces since the mid-1960's; yet, a new SAC Digital Network program has been designed to bring more modern technology to the task. The automated support needed for command and control of strategic forces is also being extended to the SAC airborne platform and the National Emergency Airborne Command Post. A limited suite of common hardware employing Rolm brand minicomputers, with a common data base and information retrieval packages tailored to mission support, is under common development by OJCS, SAC, and the Defense Communications Agency. The result of these efforts will be greater information handling capacity and minimal need for manual updating of force and target status.

Contrary to reports in the press, the Honeywell computers perform their functions effectively, with a reliability factor in excess of 95 percent. Why, then, all the fuss? Why so many alarming reports in the press? There may be several reasons.

First, there is always a certain amount of technical disagreement and rivalry among the "experts" in any field of technology. When

outside experts review a system, as has been done with WWMCCS ADP, they tend to concentrate more on criticism than praise. In effect, that is what they are paid for. *It is the invariable nature of any complex ADP system that there will be tasks that could be performed better or features that could be improved.* A number of independent reviews of WWMCCS ADP have been conducted over the past three years—by the President's Reorganization Panel and the General Accounting Office, to name two. Their findings were predictably critical; the Department of Defense, however, disagrees with a number of those findings. The reports allege that in several instances the system is not supportive of the user—yet, based on a recent survey of all command locations, 90 percent of the users find the computers fully adequate and fully supportive of their command mission. The difference of opinion comes about because the outside experts first

From October 1977 until his recent retirement from the US Air Force, Colonel Perry R. Nuhn was the Director of Information Systems, Office of the Assistant Secretary of Defense for Communications, Command, Control, and Intelligence. He is now a staff director with the Telecommunications and Computer Applications Board, National Research Council of the National Academy of Science. After a decade of various combat crew assignments in B-26, B-57, and B-47 aircraft, he entered the command and control automation field in 1962 with duty at SAC Headquarters in support of the development of the SAC Automated Command and Control System. Assigned to 7th Air Force in Vietnam in 1968, he played a major role in the design and development of automated Tactical Air Control Systems. In 1969, Colonel Nuhn was assigned to the Directorate of Operations, Headquarters USAF, where he served as the Chief of Requirements, Command and Control Division. He was assigned in 1974 to the Staff of the Commander-in-Chief Pacific as the Director of the Automated Data Processing Support Group, where he was responsible for the Pacific Command WWMCCS data processing systems. In 1976 Colonel Nuhn was transferred to the WWMCCS Engineering Organization as the Deputy for Performance Evaluation. Colonel Nuhn is a graduate of the Industrial College of the Armed Forces and has bachelor and master degrees from the University of Nebraska at Omaha.



look at technical implementation and then question whether the job was done to perfection—measuring perfection by what might be technically achieved today. The users, with less breadth of technical experience, ask a simpler question: How well does it serve my needs? Both sides have some good arguments in their favor. But the bottom line is whether paying more dollars for the technically ultimate system really makes a difference operationally. With WWMCCS ADP, we have achieved a good cost-effectiveness balance.

Second, there is a mystique about computers that tends to credit them with omniscience. They are viewed by many people—those who don't use them—as wizardlike boxes that can answer any question put to them, instantaneously. The fact is, however, that computers are only as good as the information fed into them. Hence, there are limits to what we can expect of computers and limits to what they can do to help a commander resolve his control problems.

Third, bad news, no matter how ill-founded, seems to be of more interest to the public and gets broader coverage than the good. I do not wish to be too critical on this point because the press is a primary means of getting authentic issues before the public and Congress. The process of public disclosure is vital under our system of government. But it is also important to recognize the real tendencies toward sensationalism and distortion in news "exposes." Certainly such tendencies can be seen in the press treatment of WWMCCS.

It is not possible in a short article to present a line-by-line rebuttal of every damaging accusation, nor an exhaustive technical exposition of the merits of the Honeywell computers. Yet several of the more flagrant and irresponsible charges beg direct response. Arrayed below are several such charges, each having appeared in the printed media, followed by a statement that sets the record straight:

► "Since 1966 our military has paid out between \$10 and \$15 billion developing its centralized computer network."

Fact: The 35 WWMCCS computers were bought in 1972-73; total procurement and operating costs through 1980 have been \$900 million. It is true that the entire WWMCCS has cost approximately \$15 billion, but only six percent of the system consists of computers. Furthermore, the lion's share of the \$15 billion covered 10 years of operation and maintenance of WWMCCS—not development of it.

► "As the shortcomings of the Honeywell computers became evident, the military attempted to compensate by spending \$1 billion on 'software' to beef up WWMCCS capabilities."

Fact: Software development is a normal part of a computer system life cycle to adjust to changing needs—not a compensation for hardware faults. In 10 years, software costs, including development and maintenance, have approximated \$600 million.

► "Since 1966 the Pentagon's multibillion dollar computer program has been a continuing horror story. Despite a decade of expense the machines are still so unreliable and incompetent that military personnel are forced to 'work around' them using telephones and other old fashioned forms of communication—not only in crisis but in the everyday conduct of their jobs."

Fact: WWMCCS computers average 96-98 percent reliability, comparing favorably with those of industry. The computers were never intended to replace the telephone. Voice communications are and will continue to be a vital means of passing orders and getting information. The press report is analogous to saying that your car is a disaster because you still have to walk some places.

► "Honeywell machines are designed to receive or communicate data in 'batches'. . . . What the military needs—and could have bought—is a computer that can do what is called 'real time' processing."

Fact: Simply not true. Honeywell's 6000 series computers used in WWMCCS are "real time" systems!

► "The worldwide computer system built to warn the President of an enemy attack or international crisis is prone to break

down under pressure, according to informed sources who have worked on or examined the system."

Fact: This assertion confuses the computers with the larger command and control system which does serve a warning role. The overall system performs this function reliably through redundant means that can and do function independently of the WWMCCS computers. Only one of the 27 computer sites plays a role in attack warning.

► "The computer-related foul-ups are so serious that some experts think they have jeopardized the military's ability to handle crises!"

Fact: The computers have at most a minor role in crisis management and cannot jeopardize the capability to respond.

► "Pentagon calls super computer a disaster."

Fact: This is headline hyperbole, pure and simple. The Pentagon has not termed the system a disaster, nor is it one!

In sum, suffice it to say with respect to the press charges treated above that the Honeywell computer systems passed stringent testing based upon operational requirements, were selected on a competitive basis over other major brands, and, since their original procurement, have received continuous evolutionary upgrading to keep pace with technology and a changing operational environment.

A further word is in order regarding criticism of the responsiveness of the computers in supporting crisis decisionmaking. Any time lag experienced is not due to poorly chosen or aging hardware. Rather, it is due to the requirement to answer a tremendously broad spectrum of possible questions on the spur of the moment. The press criticism has been based on the unspoken assumption that it is humanly possible to foresee every imaginable crisis and collect all information bearing on it beforehand. But such is not possible.

To illustrate the difficulty, suppose that, to meet a broad range of crisis possibilities,

we decided to catalog the fuel stocks at every civil and military airfield in the world. A lot of people could spend a lot of time keeping such data current. How often should they update the information—weekly, monthly? The process could become extraordinarily expensive—and for only a single item of information. It is more practical, accurate, and cost-effective to get the information over the telephone when it is needed. If we were only concerned with fuel stocks, perhaps we could afford to keep the information on file in the computers' memory banks and updated. But insisting on an all-knowing computer would involve a similar collection-and-storing effort for literally thousands of categories of information. Such an approach is simply not practical. Rather, it is far more reasonable to rely on the staffs and their communications for quick, current, and accurate answers to many of the questions asked in crises.

Computers do play a vital role in our command and control system, of course, and their responsiveness is a matter of importance. Substantial automation is needed to deal with the extensive quantities of detailed information needed to direct the employment of modern weapon systems. Strategic and tactical planning require massive amounts of computation. The coordination of force deployment activities requires an extensive exchange and processing of information regarding movement schedules; crew and aircraft availability; size and quantity of cargo; coordination of strategic and theater transportation resources; and coordination of delivery schedules with combat operations. The WWMCCS computers are designed to perform these and related functions, and the hardware is adequate to the task. The system is not perfect, but evolutionary upgrading and modernization programs help the system to keep pace with the expanding demands of modern warfare.

Most of the difficulties lie not with technology, but with the ability of human managers to make better use of the processing power available to them by devising effective

management procedures and reporting systems. This difficulty is not unique to the military; it is a problem for industry as well. Our insight into applications has not grown apace with technology, as evinced by the fact that software costs now often exceed hardware costs in new ADP systems.

Important though computers are, it is possible to overemphasize the degree of dependency on them for command and control, and I think the press accounts have done so. The press has tended to confuse the overall WWMCCS with its component computers. Command centers, communications, and missile warning sensors comprise 94 percent of the system, by resource count. The commander, his staff, and the communications that link them with operational units and higher headquarters remain the most important parts of the system. Even if it were possible to have all the information needed for control resident in a computer, we would demand human supervision, monitoring, and execution as a necessary safeguard in military operations. In the final analysis, it is the experience of the commander and his staff that determines the responsiveness of a headquarters in a military

situation. Much of the communications between echelons of command is by voice, and will remain so, in order to provide the human interaction so necessary for the coordination of operations. Computers and data communications are important, too, for many kinds of information, but they are not sufficient by themselves, nor are they the heart of the system. Especially at the higher echelons of command, judgments and decisions must meld computer data with other operational inputs. In short, computers are but one of many sources of information for the commander.

In my professional judgment, Americans can take solid comfort in the knowledge that the country's wartime command and control apparatus is both functional and effective, and is manned by the most skilled and dedicated people. WWMCCS works.

NOTES

1. James North, "'Hello Central, Get Me NATO': The Computer That Can't," and Frank Greve, "Pentagon Calls Super-Computer a 'Disaster,'" reprinted in *Parameters*, 10 (March 1980), 91-97.

