MAC's Global Decision Support System

By Gen. Duane H. Cassidy, USAF

Where is the Military Airlift Command (MAC)? For the Commander in Chief, MAC (CINCMAC), that simple question is the bottom line for effective command and control (C^2). However, until about four years ago, that question could not be answered simply. The command could not pinpoint how the entire MAC system was functioning at a given point in time, and it also could not track people, airplanes or cargo in real time. Shortly after the Grenada operation in 1983, MAC began an aggressive upgrade program for a new C^2 system. The centerpiece of that initiative was the Global Decision Support System (GDSS).

Designing a C^2 system for MAC was a tall order. Because MAC operates on a global scale (nearly half of its 1,100 aircraft are in the air daily), it needed a large capacity system. Yet the command also needed a flexible system that could handle operations across the entire spectrum of conflict.

GDSS began with a memorandum of agreement between the Chairman of the Joint Chiefs of Staff, the Air Force Chief of Staff, CINCMAC and the Defense Communications Agency (DCA). The purpose of that agreement was to clear the way for MAC to evaluate C^2 technologies and advocate the state of the art using untraditional methods. In effect, it created a team of professional designers, engineers and visionary airlifters, who quickly took a well-defined project from inception to completion.

Before GDSS, MAC controllers had numerous computer systems that stored information about MAC's own airlift operations. They required repetitive input of the same information at every level of command and provided little incentive to do it right because the user received no direct benefit from inputting the data. As a result, the accuracy of the data provided was always suspect, and the telephone was used to confirm the automated information. In reality, most airlift decision making was based on information taken from greaseboards and telephone calls.

GDSS immediately was different from other systems, because MAC went to the users to determine what the system should do and how it should do it. This method helped ensure GDSS's success. MAC built GDSS to meet operational needs, and the people who understood those operational needs built the system.

Figure 1. MAC's command center.

GDSS Meets Operational Needs

Before GDSS, MAC used telephones and Automatic Distribution Network (AUTODIN) messages to pass C^2 data up-channel while each level maintained a mixture of both manual and computer based documentation. Typically, when an airplane landed, a telephone call was made from the base to the Airlift Division, then passed to the numbered Air Force level and finally to MAC headquarters. The information being passed upstream often was garbled by the many levels of repetition.

Now, with GDSS, the information automatically flows to the appropriate level. The system reduced the telephone calls and personnel hours by approximately 50 to 70 percent. Because MAC command and operations centers used to make or receive more than 5,000 calls per day, a 50 percent savings represents many personnel hours. GDSS also gives MAC controllers accurate and timely information, which is the key tool of their trade. For the first time, MAC can track aircrews as well as it tracks airplanes—a key ingredient to decisions involving special mission requirements such as air-refueling or Special Operations Low Level II.

GDSS now consists of seven sites, which are located at Scott AFB, Illinois (Headquarters, MAC [HQ MAC]) (Figure 1), McGuire AFB, New Jersey (21st Air Force), Travis AFB, California (22nd Air Force) and Hurlburt Field, Florida (23rd Air Force), the Air National Guard Support Center, Andrews AFB, Maryland, and MAC's two Airlift Divisions at Hickam AFB, Hawaii, and Ramstein Air Base, West Germany. At the Airlift Wing level, MAC will continue the C^2 upgrade through its C^2 Information Processing System (C^2 IPS), a program that will bring complete automation down to the unit level. Currently, MAC squadrons or wings must telephone information to the airlift division or numbered Air Force operations center where the data are entered into GDSS. Similarly, they have to call to find out what is happening to their airplanes or crews. GDSS generates messages to let the bases know when airplanes will arrive. When C^2 IPS becomes operational, units will be able to input and receive the data directly. This program is on track, and the contract has been awarded.

Survivability

GDSS inherently is survivable. As Dr. David T. Signori, Jr., explained in the March 1987 issue of *SIGNAL* Magazine ("The Command Center Improvement Program: An Innovative Approach," pages 63-70), GDSS initially was composed of five nodes, and each contained the same replicated data base. The system is self-healing. If one or more sites goes down, the remaining ones continue to function without being degraded. When the faulty system comes back on line, the other sites automatically regenerate all the missing data. The old system had one central site; if it went down, the whole system was useless.

GDSS also proved valuable when MAC practiced moving its C^2 to an alternate operations center. Whether the command is operating from headquarters or from one of the other locations, GDSS provides identical and totally replicated computer capability. MAC effectively has four alternate headquarters.

Off-the-Shelf Hardware and Expandable Architecture

GDSS also helped MAC meet its goal to use commercial, off-the-shelf hardware whenever possible (Figure 2). In some respects, the command even used off-the-shelf software. This drastically cut research and development (R&D) costs and allowed MAC to begin using the prototype system immediately. This procedure, called rapid prototyping, lets the user find out if a system meets the

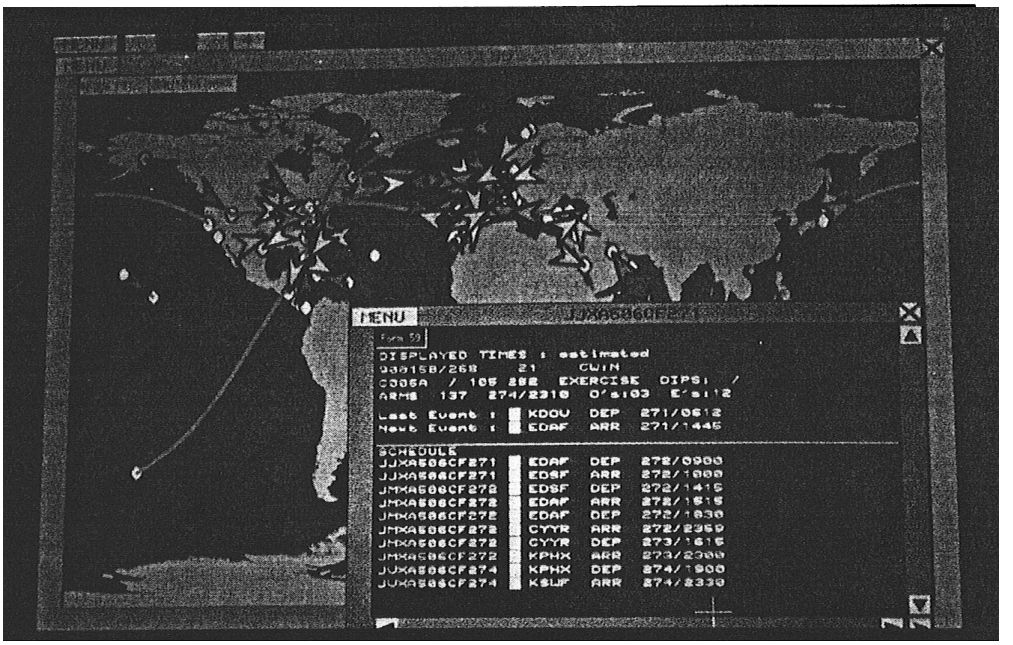

Figure 2. GDSS's main laser screen. The arrows access menus that are interactive with GDSS's data base.

requirements at an early stage rather than finding out after years of acquisition and wasted funds. At one point, MAC took the first production models of the VAX 8550 computer right off the assembly line and flew them to its two overseas sites for installation.

The decision to go with an expandable architecture also ensured GDSS's success. MAC used new equipment or software as soon as it was available. The GDSS expandable and completely compatible architecture is a tremendous cost saving feature. For example, when MAC wanted to connect the Air National Guard Support Center to GDSS, it simply made the center an additional site. As a spin-off of this architecture, DCA currently is spreading the lessons MAC learned to other U.S. Department of Defense (DOD) agencies. They also are incorporating GDSS's advantages into other command, control and communications (C^3) programs through DOD's Command Center Improvement Program. Information is available through DCA workshops, newsletters and on-site "tiger teams."

Information Rather than Data

GDSS also has improved the quality of the information available to MAC decision makers. In the past, C^2 has been very data intensive. GDSS also collects data, but unlike old systems, it automatically produces decision level information. Installing the laser projector and the high resolution plasma screens in the MAC Command Center has contributed to this effort. Research on the GDSS project produced the laser, which has a 12 X 32 foot screen and a resolution of 2,560 X 1,024 pixels (Figure 3). One of GDSS's goals was to develop a presentation capability that would use graphics and colors to assimilate volumes of data into useful information. Because the human mind picks up on colors and symbols to convey messages that take many lines of text or numbers, the graphics display system allows decision makers rapidly to probe the data base for the necessary information.

During the March 1988 U.S. military deployment to Honduras, the MAC Crisis Action Team (CAT) used the laser to display the C-141 flow to focus on the needed immediate actions. The CAT director's job was more responsive, less prone to error and much simpler. CAT workers did not have to make calls or leave the command center for information. The screen continuously displayed the real time airplane and schedule situation. MAC was able to use fewer airplanes because it could "see" what to divert and what not to divert through GDSS. The system helped MAC make better C^2 decisions and eliminated the potential waste of airlift.

System Execution

A real contingency such as the Honduras deployment quickly demonstrates the value of GDSS. The system

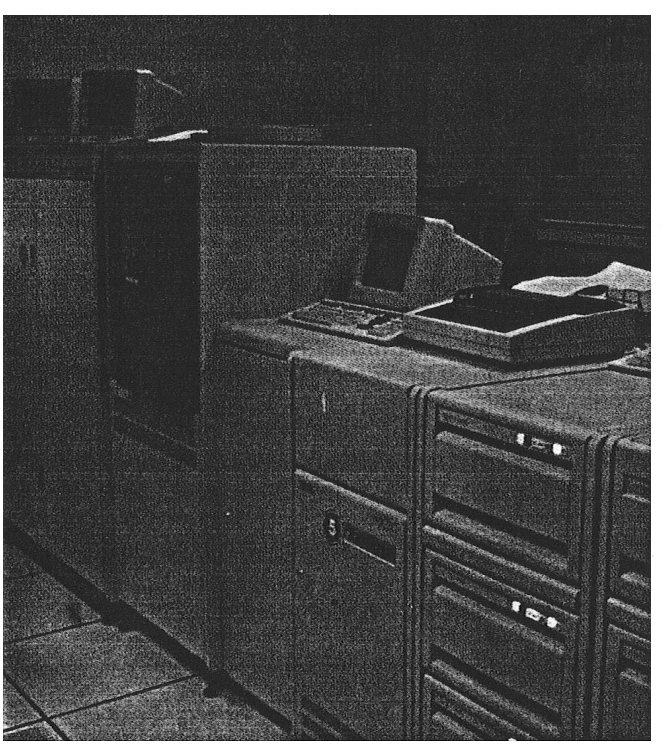

Figure 3. GDSS's hardware.

effectively tracks current status and therefore greatly improves execution control. It does not, however, focus on the planning side of C^2. Now that MAC has succeeded in the execution area, the command is turning to the planning phase. MAC has been collecting data during the past year and a half from the users to try to determine the precise CAT planning requirements. When CAT is active, MAC gathers data by documenting what users really do. With 18 months of experience, MAC personnel are much more GDSS-literate and are better able to define their own requirements.

Although MAC did not originally put much effort into supporting CAT, the command now is putting more people on that part of the project. MAC also will replace the current work stations with VAX units that will run more cooly, provide more capability and be less expensive. VAX work stations also will allow MAC controllers to use more of the available GDSS software.

The request for proposal for the final upgrade to the laser projector went out in October 1988. MAC expects a 40 percent upgrade in resolution and brightness and a 350 percent increase in operational reliability. This final upgrade will allow the graphics system to catch up with the capability of the data base, and the visual display will inspire the same high level of confidence that MAC leaders have in the rest of the GDSS system.

Offsite GDSS Users

The primary GDSS users are not located at HQ MAC. A large share of C^2 work is done at the airlift divisions and the numbered Air Force levels. MAC has applied the capability of GDSS to automate the entire airlift process from the original requirement through allocation, scheduling, execution and tracking. When MAC gets an airlift requirement through AUTODIN, that requirement becomes part of GDSS through a revolutionary interface that was developed exclusively for this system. The MAC staff uses GDSS to allocate airlift, and the numbered Air Forces use GDSS to keep track of airplanes and crews.

Because GDSS enhances the entire process, ancillary benefits have emerged. For example, when one of MAC's airplanes breaks down somewhere around the world, the command can go into the GDSS data base and, with a program called PATHFINDER, find the best route for a part or the repair team to repair the airplane much quicker than in the past. GDSS has given MAC a new flexibility to keep its airlift system moving.

Outside Interest

The commercial C^3 community already has taken interest in the GDSS approach to C^2. Representatives from several airlines have toured the MAC facility. While their needs are somewhat different, they also need to keep close track of their airplanes. Although the commercial airline industry has automated the passenger reservation process completely, most airlines still are operating with manual tracking devices when working with C^2. In addition, the U.S. Space Command has expressed interest in some of the significant technological offshoots from GDSS, such as replicated data bases, laser displays and AUTODIN interfaces.

Praise from the Field

In the final analysis, the highest praise for GDSS has come from the field. A recent letter from MAC's 834th Airlift Division in the Pacific said, "Before GDSS, we just reacted. We spent most of our time confirming information or relaying changes. Now, we have time to plan our actions calmly and rationally." Another letter from a master sergeant at the 322nd Airlift Division in Europe said, "We were always trying to solve problems before. Now we can look forward. This is the best thing computer automation has done in my career. It cut our workload and helped us do the job better. It gets C^2 out of the reactive mode and puts us back in control."

Conclusion

GDSS has broken new ground in C^2 by providing real time information and simplifying the airlift business from start to finish. GDSS has finally answered the long-standing question, "Where is MAC?" because it helps track people, parts, status of bases, maintenance, cargo and airplanes. It covers the entire MAC system with efficiency and speed, making it a model system for DOD. This is just the beginning of more sophisticated developments for MAC.

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