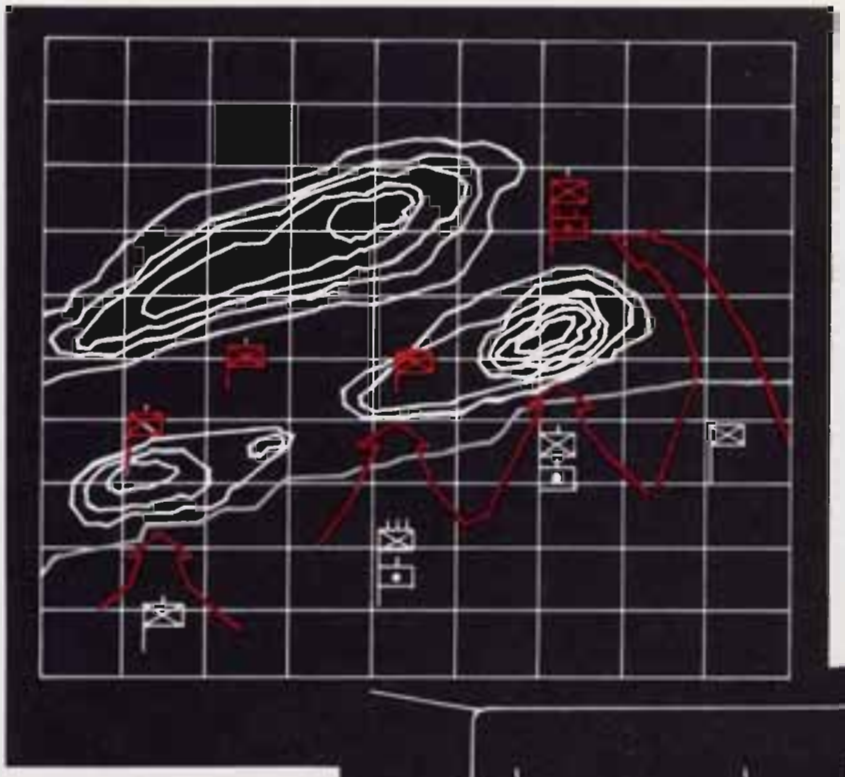
by Capt. Glen E. Barlow

"Captain, we've got to take that hill; our success is the key to winning this war."

"Sir, we haven't gotten the G2 reports in yet; a patrol should be back anytime now. Earlier reconaissance indicated heavy troop concentrations building up, but information is fuzzy."

"OK, we'll give G2 some time to get their information together before I decide if we attack. Notify me as soon as we have an update; we'll have to act soon."



THE FUTURE:

Tactical automated C^3 systems

A scenario such as this, with a few variations, may well have happened in any war — any war that is, but the next one.

The effectiveness of a military force depends upon its ability to move, shoot, and communicate (well worn, but still true). This ability is dependent upon the commander's capacity to utilize effective command, control and communications (C^3) so that he may orchestrate the movement and action of his forces. The Army Command and Control Master Plan and the Division 86 Study have shown that the predominately manual C^3 systems currently in use can no longer provide the commander with sufficient, accurate, and timely information that would allow for the successful accomplishment of his mission on today's fast-paced battlefield. There is, therefore, an urgent need for a reliable, survivable, and flexible automated C^3 system employing current technology and adapted to provide the accurate and timely information flow required by the tactical commander.

Computer-provided data distribution and information interface must eventually be as convenient and comfortable for the commander and his staff as voice communications are today. Digital data networks will provide secure digital-voice circuits and easy, fast access to data information sources. This increase of available information will come from various new systems displaying up to the minute status on both friendly and enemy forces. Blending this type and quantity of information will require new techniques in communications networks and command and control procedures.

Today's sophisticated, fast-moving weapons systems no longer offer the commander the luxury of excess time in making decisions, nor his staff the opportunity to await additional data prior to making recommendations. Additionally, current technology and automated systems already available provide data far in excess of man's ability to absorb it and manually translate it into useful information. To achieve effective C^3, the commander must have relevant information on a real-time basis and the ability to respond and initiate action faster than his opponents. With huge volumes of data of varying degrees of relevance and accuracy, it is unlikely the best decision can be made in time without computer assistance to select and formulate this information. The days of "Take that hill, men!" are gone. Without numerical superiority, we must first know what is on the other side, and we must know fast.

The Army has recognized this need and is doing something about it. For example, approximately 250 tactical automated systems are scheduled for fielding during the 1980-1990's. While technology has provided new methods and systems for performing certain defined functions, such as fire direction (TACFIRE) and position location (PLRS), there has been a noted lack of cohesion to satisfy an overall systems need. Among its other missions the TRI-TAC System architecture has been attempting to develop this cohesion to provide the responsiveness, flexibility, security, and survivability required for the C^3 system of the 1980's.

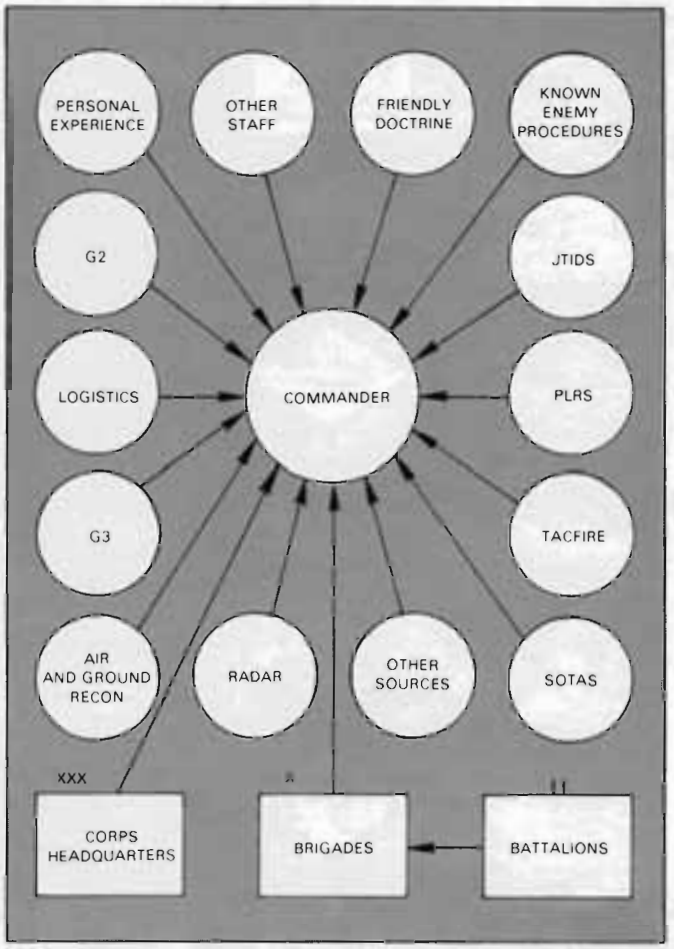


Figure 1. One example of a commander's decision-making input.

However, several problems still remain. Though computers have proven very successful in accomplishing routine and well-defined functions, computer software has fallen short of expectations in the area of decision-making. The computer can only perform when the problem can be described by an algorithm. The decision-making process has not yet been sufficiently defined to the step-by-step process required for an algorithm that is consistent to all levels and types of command and adaptable to the personalities of different commanders (figure 2).

Another important area in automated C^3 is man's ability to readily input and receive data as information. This man-machine interface is as critical to the mission success of C^3 as the decision-makers and the computers themselves. If the computer does not present the information in a form that can be quickly and easily understood, there is little need to present it at all. Color Cathode-Ray Tube (CRT) systems and color graphics have been identified as two of the more useful types of interfaces, but many types are available and are

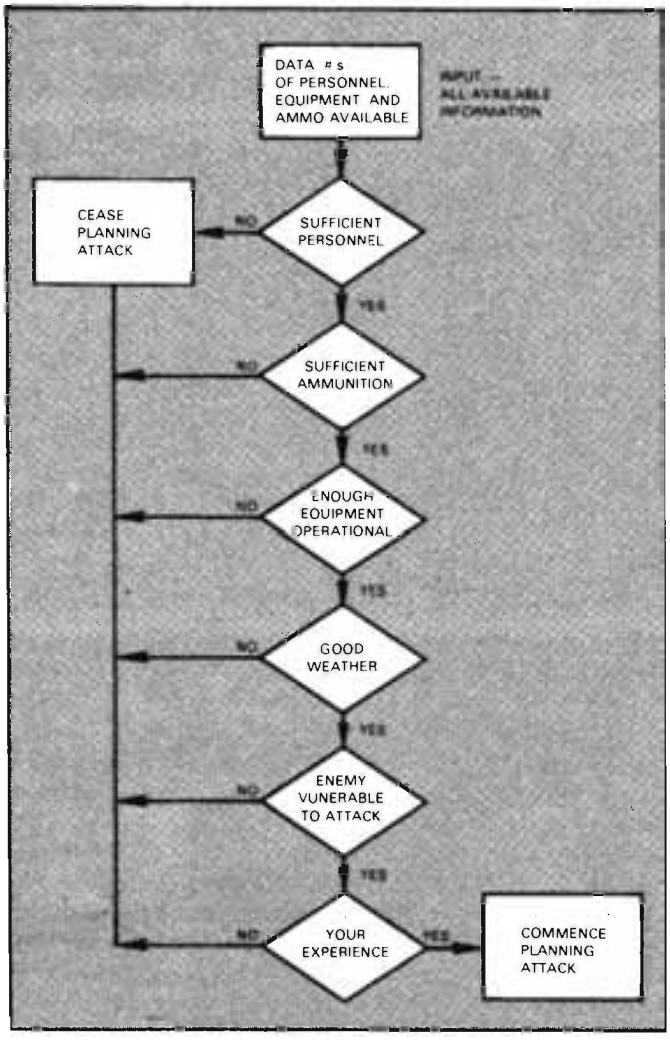


Figure 2. A simple algorithm for designing computer software. One for accurate decision-making would be much more complex.

being studied for possible integration into Army systems.

If automated command and control systems are to be effective, they must attempt to satisfy many of the following suggestions:

a. The communications means must consist of an internetwork architecture consisting of multichannel, switched systems, satellite, and HF and FM radios. Current radio based data distribution systems under development must be internetted as well.[1] Both primary and alternate routes must be provided.

b. Continued funding and increased demand for experimental C^3 (C^3I) automated systems research and testing, such as the Automated Data Distribution System (ADDS) Testbed conducted at Fort Bragg, N.C. and aspects of the TRI-TAC program at Fort Huachuca, AZ. must continue to determine the automated C^3 systems and procedures optimum for Army use.

c. Software engineering techniques must be developed that allow for modification of the existing computer program as required by the situation. If the user understands why the program was written and knows how to adapt it to new situations, he will be better able to make decisions based on the information the system displays.

d. From the start, a Distributed Data Processing System that links all the sub-elements that are required for command and control must be developed. All those systems that are separated geographically, that utilize various forms of communications and that perform independent and diverse functions should be tied together in such a manner that their information can be readily displayed at a source terminal. There are several needs for such a system; the primary one is the need for the transfer and access of information for C^3. A secondary reason is the increase of survivability through back-up and redundacy of systems.

e. We must continue to develop procedures and technology that will allow easier and faster man-machine interface.

f. We must institute "Top Down" computer design to develop decision-aiding automated systems by continuing research to define an algorithm and software that are applicable to decision-making.

Computer technology is a fast-changing science; many of these problems will soon be solved, but undoubtedly new ones will appear. Regardless, we as communicators must learn to support the use and development of these systems. For the nature of command and control is such that automated C^3 systems are necessary in order to make viable decisions concerning the management of personnel and equipment. The research and development process must be stepped up, and these systems provided as quickly as possible to the tactical commander in the field. More important, we must sell these commanders and their staffs on the practicality of these systems. They must learn to accept automation as a necessity and apply themselves to learning its uses and advantages. The ability of our forces to win the first battle may well depend on information obtained from a tactical automated C^3 system.

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**Those interested in looking at the essays Barlow cites above may do so at any Army Technical Library by pulling them from the Defense Information Retrieval System.*