Quarterly Technical Report:

The Development, Demonstration, and Documentation of Advanced Command and Control (C2) Computer-Based Systems

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James F. Wittmeyer, III

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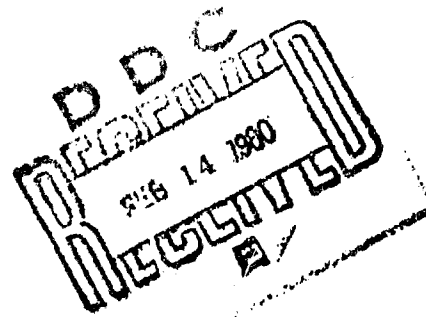1300 WILSON BOULEVARD, SUITE 102 • ARLINGTON, VIRGINIA 22209

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by

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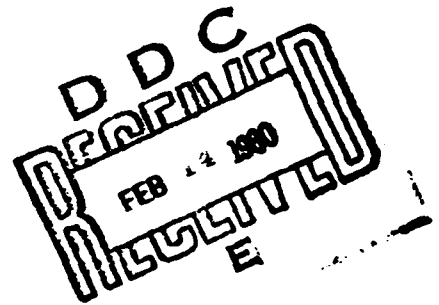
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TECHNICAL REPORT 80-01

QUARTERLY TECHNICAL REPORT:

THE DEVELOPMENT, DEMONSTRATION, AND DOCUMENTATION OF

ADVANCED COMMAND AND CONTROL (C^2) COMPUTER-BASED SYSTEMS

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The conduct of research into the nature and use of advanced command and control (C2) computer-based information, decision, forecasting, training and readiness systems requires efforts in the C2 computer-based systems design, development, demonstration, transfer, and documentation areas. This report examines the development, demonstration and documentation areas and presents a dual PDP 11/70- and microcomputer-based research configuration and a large screen display, interactive demonstration and testing system, and a multi-faceted documentation plan.

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SUMMARY

This Quarterly Technical Report covers the period from November 5, 1979 to December 31, 1979. The Tasks/Objectives and/or Purposes of the overall project are connected with the design, development, demonstration and transfer of advanced command and control (C^2) computer-based systems; this report covers work in the computer-based development and demonstration areas only. The Technical Problems thus addressed include providing support for C^2 systems development in the information, decision, forecasting, training and readiness areas via computer timesharing and demonstrations and how to accelerate development through structured documentation. The General Methods employed have involved building and maintaining a dual PDP I1/70 timesharing system and simultaneously configuring multiple microcomputer systems. In addition, problems have been approached via the structuring of a realistic demonstration and test environment. Technical Results to date include a seven day, twenty four hour a day C^2 development support system, the development of realistic testing and demonstration scenarios and capabilities, and the completion of a plan for the documentation of C^2 system development. The Hardware Configuration utilized for this research is entirely GFE. The systems software includes the UNIX operating system, FORTRAN IV PLUS, C, and some limited statistical packages; the applications software consists of numerous programs in the C^2 information, decision, forecasting, training and readiness areas. Future Research will be conducted in the C^2 computer-based systems design and transfer areas.

THE DEVELOPMENT, DEMONSTRATION, AND DOCUMENTATION OF
ADVANCED COMMAND AND CONTROL (C^2) COMPUTER-BASED SYSTEMS

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1.0 INTRODUCTION

1.1 Problem Statement

The Defense Advanced Research Projects Agency's Cybernetics Technology Office (DARPA/CTO) has as its primary mission the development, application, and transfer of computer-based systems for improved Department of Defense (DoD) information mangement and display, forecasting, decision making, training and human performance, especially as such activities occur in Command and Control (C^2) environments. Unfortunately, however, the research and development (R&D) process connected with the development of advanced C^2 computer-based systems is fraught with problems. Specifically, such problems may be categorized as follows:

1.1.1 Computer-based Systems Design

1.1.1.1 Neglect of "front-end" analysis. This problem runs rampant throughout all of the projects that have as a final product either computer-based systems software or analytic or descriptive data sets. Moreover, front-end analysis has seldom been conducted in any of the areas of the computational needs of the hardware and software spectrum. Neglect of such analysis invites disaster and circumvents normally acceptable programming practices. An example

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illustrating the myriad of problems that can occur without proper design analysis is the current state of the Terrorism Research and Analysis Project (TRAP).[1] TRAP software is a TEKTRONIX 4051 resident BASIC program. Many demonstrations of its capabilities show the extreme value it has as a sophisticated Indications and Warnings (I&W) and operations research system. However, it is designed to sun on a very specific type of graphics microprocessor for which there is only one manufacturer. It can also only be demonstrated on large screen projection via a Hughes scan converter and a specially modified 4051 (of which there are only two in the Washington, D.C. area). "Front-end analysis" was neglected in this example. Had it been conducted such potentially costly oversights in hardware and software design might have been prevented. (This example is not intended to undermine the research efforts of specific individuals or organizations, but rather to illustrate a critical problem in the design of complicated computer-based systems.)[2]

1.1.1.2 <u>Expensive and fundamental "disconnects" among the programmer, the intended product, and the ultimate user.</u> So often, through a very basic misunderstanding in the design phase, there occurs a strange phenomenon which seperates the

intended purpose of the reseach tool from its preparation
and construction. This "distance" often causes enormous
problems in the final stages of software implementation
and transfer. If in fact, the product delivered is
neither what was intended nor what can be used, it must be
re-written, re-tested, re-validated and re-documented--
generally a very expensive process. The cost in man-hours
alone is sometimes staggering. Further costs of late-
delivery, and other projects suffering because of a re-
shuffling of priorities are also not inconsequential. It
is important to keep sight of who the ultimate user is,
where the tool will be utilized, when it must be ready to
be effective, and how it should be implemented. For example,
if the product is a low cost, short lead-time one, it need
not go through a rigorous design stage once the above
criterion are met. Restated, if the product is to be
"quick and dirty" this fact should predict to overriding
developmental techniques. However, these are the only
kinds of products which should be allowed to slip through
an intensive design critique. Examples demonstrating
this "fundamental disconnect" are plentiful; e.g. the
Early Warning and Monitoring System (EWAMS) was produced
with great care and planning. The goal was to create a
unique monitoring and forecasting system that would be
both focused and easy to use by the intelligence community,

especially through the Defense Intelligence Agency's
National Military Intelligence Center (DIA/NMIC).[3]
The (interim) product transferred to the DIA/NMIC had
no user manual; it used too many research and statistical
terms; it did not reflect the needs of a daily "watch"
analyst; and it was not written so that it could be trans-
ferred easily to a non-UNIX*,[4] non-timesharing, and heavily
utilized DIA/NMIC computer system. Again, the purpose is
not to undermine legitimate efforts, but rather to point
out the critical necessity of exacting procedures that
must be followed early in the design phase, and that a
"fundamental disconnect" between the developer and user
can increase transfer cost by orders of magnitude.

1.1.1.3 Non-standardized data sets and codebooks.
In the early years of the conceptualization and creation
of the Demonstration and Development Facility (DDF), it
became evident that a large portion of the DDF user com-
munity would be tasked with the creation and maintenance
of various data sets. This function has no less impor-
tance than the analytic software tools which often evolve
from such data sets. But, here too we find design flaws.
Care should have been taken, at the outset, to standardize
the coding and collection of the data, particularly with a
view to how they might later be analyzed and processed via

a computer-based delivery system. Two examples of where improper data standardization in the design phase resulted in unnecessary man-hour efforts include the Cross National Crises Indicators (CNCI)[5] project, which collected a very specialized data set consisting of "surprise attack" event data. The data collected was intended to follow World Event Interactions Survey (WEIS) codebook techniques; however, the resultant data, differed so severely from pure WEIS data that a special version of the EWAMS program had to be adapted to utilize desired indicators and graphics. The modification of EWAMS to fit the "surprise attack" data was a relatively small task, but costly nonetheless. In the second case, data driving the CACI, Inc. U. S. Executive Aids (EXECAID) had been so well designed, it could easily fit, in its entirety, on one TEKTRONIX 4051 casette tape. But problems resulted when members of the Inter-university Consortium for Political Social Research (ICPSR) wanted copies of the data only, and found that it was uniquely tied to the software with which it is used. In both cases errors in data set standardization occurred causing delays and expensive efforts to correct.

1.1.2 Computer-based Systems Development

1.1.2.1 <u>Hardware.</u> Here selection and usage problems are often encountered in many of the more advanced research

projects. Research products that use ineffective computer
systems will fail no matter how excellent the value of the
research product. Correct hardware selection is critical
to the successful development and transfer of a research
product. Factors such as portability, maintenance costs,
backup systems, commercial availability, and life-expectancy
are all important to the hardware/software marriage. For
example, the earliest application of the Perceptronics,
Inc., Ultra-Rapid Reader (URR) was written on the DDF using
a TEKTRONIX 4025 graphics terminal.[6] The problem with this
selection was the combination of phosphorous persistance
and character size for projection. Even though this was a
pilot application much of its success depended upon the
readability of the output. The method of "hardware selec-
tion by availability" is insufficient when the hardware
inhibits the applications software. It also is extremely
important to address the data requirements as they apply to
hardware selection. Problems in this area have plagued the
DDF since its inception. For example, the size alone of the
WEIS data set is so large that in many instances the data
set required so much DDF disk space that there wasn't suf-
ficient space remaining to permit further software develop-
ment on either EWAMS or other projects.[7] Proper product
design and development could have by-passed these problems.

1.1.2.2 <u>Software.</u> Here, development problems arise

throughout all programming activities in every organization.[8]
Poor software development procedures result in much wasted
time, effort and cost. Typical problems concentrate usually
around language selection and implementation. Many langu-
ages are incompatible with one another. This problem of
imcompatibility exists not only between operating systems
(such as UNIX vs. RSX11-M) but on computer systems such as
HONEYWELL Level 6 vs. DEC 11/70 as well. For example, most
UNIX trained systems programmers use a term called "vanilla
UNIX". Vanilla UNIX is the basis for the next level of in-
compatible versions of the same Bell Laboratories software.
The others, "BBN UNIX", Rand UNIX", "NSA UNIX" (closest to
vanilla) and "ISC UNIX" all differ so dramatically that it
becomes difficult to easily transport user or system soft-
ware from one UNIX system to another.[9] There are of course
literally hundreds of modifications of the UNIX version 6
operating system. This may all be corrected with the
release of version 7 UNIX and PWB UNIX, but history will
most likely repeat itself and lend more versions of more
levels of the same complicated operating system.[10] This
problem (multi-UNIX's) is further complicated by the fact
that UNIX has the ability to support many compilers,
interpreters and assembly languages. In fact UNIX has a
language 'C' and YACC--The 'C' System Compiler and "Yet
Another Compiler Compiler"! The languages of the system

could include three or four BASIC's, AS, RATFOR, FOR, FC, F4P, PASCAL, LISP, and so on. The problem is real, and a pragmatic approach must be taken to proper software language development. Decisions must be made at the operating systems level as to the availability of S/W facilities such as DoD1.[11] Decisions must be made when and how DoD1 should be addressed. For example, what research now under development will still be so when DoD1 becomes universal?

Pragmatic decisions must be made not only as to the user availability of such languages but the fundamental choice of a language for an application. For example, if a short term project, with a specific transfer application requires APL, then it should be used. But, on the other hand, if the need for the resultant research tool is more universal, then it would be wrong to allow programming to begin in APL. For example, Decisions and Designs, Inc. and the Computer Corporation of America, Inc. constructed a very valuable set of decision making and evaluation aiding tools for the U. S. Marine Corps.[12] The results were spectacular but the software was written in APL, and the Marines could only accept transfer of software written in COBOL.

Also under the jurisdiction of software development comes the very important topic of documentation. Throughout

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the development phase of either software tools or data sets, time <u>must</u> be spent on building effective documentation. Documentation takes the forms of internal documentation, systems specifications, users manuals, and codebooks. Improperly documented code, or code without documentation lives only as long as its author. It loses its efficiency; it can no longer be maintained; it becomes forgotten. The cost of rewriting software, because the documentation no longer exists, is prohibitive. For example, the first release of the BBN "steamer" program to the DDF had no users manual and no system specifications. The program could only be run by guess work, and modifications to it were difficult and time-consuming.

1.1.2.3 <u>Coordination.</u> Far too often redundant code, or redundancy of effort exists in program development. The problem comes about partially through the "not invented here" syndrome. Competitive researchers do not wish to admit that there may be others that have attacked a similar problem with success. Therefore, they close their minds to the existance of a solution to the problem at hand. In other cases the "re-invent the wheel" syndrome applies. By sheer fact that competition exists between contractors, inventions, new ideas and methods are not shared among the user community. Result: the wheel is re-invented over and

over and over again. An example of lack of coordination
can be seen in data collection efforts by both the
Brookings Institution and CACI, Inc.[13] Both research
projects collected similar crisis data sets. At no time
during these projects was there any interfacing of data
or ideas. At the end of these projects the DDF received
two tapes, one from each contractor, both similar, and
neither acknowledging the existance of the other. Other
examples of poor coordination exist. Software written at
the University of Southern California (USC) to allow ef-
ficient terminal input for data collection and management
was installed on the DDF for use with the WEIS data set.[14]
However, many of these utilities are not used, causing
wasted efforts, on the part of others who could use the
techniques for WEIS and other data collection.

Falling also under the heading of poor dissemination
and coordination, is the management of research tools for
internal development. Part of the DARPA/CTO mission is the
development of computer-based systems for improved informa-
tion management, display, forecasting, decision making,
training and human performance research products. These
new tools could be used internally by the researchers to
help achieve a "bubbling-up" or "percolator" effect. For
example, Decisions and Designs, Inc. constructed many useful

tools in decision making. Many of these tools such as
the Multi-Attribute Utility (MAU) program could be used
to make more efficient research decisions.[15]

Another problem in coordination is the "closed com-
munity" syndrome. Too often researchers within the CTO
program refuse to look beyond work outside of their own
community. For example, Artifical Intelligence (AI)
techniques developed by the Information Processing
Techniques Office (IPTO) may be useful to CTO researchers.
It is cost effective to glean all relevant work regardless
of the sponsoring office, agency or department.

1.1.3 Demonstrations

1.1.3.1 Opposing "cultures". Contractors typically
by the nature of their roles as researchers are disconnected
from the the nature of organizational decision making. As
a result, contractors are seldom able to provide the neces-
sary context for an effective demonstation. This is not
meant that they cannot (or are unwilling to) bridge the gap
between product development and application. Instead, it
is to highlight the issue of "comparative advantages".
Researchers are good at what they do, but seldom can make
an effective leap from development to application. They are

often at a comparative disadvantage when they try. Without
this leap however, work may be rendered useless and inef-
fective. Here, the real value of a Demonstration and
Development Facility (DDF)--cognizant of the critical dis-
tance between the researcher and the "user"--comes into
play. Since contractors are generally unskilled in the
art of interacting effectively with government, military
and civilian personnel at all levels, they harbor latent
misunderstandings and confusions about the nature of the
operational world. All of this predicts to the failure
on the part of the researcher to incorporate into his or
her computer-based system the necessary user-oriented
features so critical to generating interest, appeal and,
ultimately, acceptance. An anecdotal example recalls the
first use of the Joint Chiefs of Staff (JCS) regional
capability of the EWAMS for use by a military analyst,
who promptly asked why he must relearn all the nations of
the world in three letter WEIS representation rather than
the SOP military two-letter designation.

1.1.2.3 Demonstration staging. The success or failure
of a developed software product often completely depends
upon the nature of the environment in which the product is
first introduced to a potential user. Nothing is so dis-
connected from (or detrimental to) a presentation of
significant work, than to present it in a bad environment.

It most surely will jeopardize the acceptance of that
product. For example, imagine the effect of a demonstration
of EWAMS in an environment cluttered by bearded professors
and disorganized papers (a not untypical research environ-
ment) versus one that takes place in a controlled and
secure command-center-like environment. The results are
obvious.

1.1.3.3 Premature demonstrations. Another problem
all too often encountered is the premature release and
demonstration of a product. Contractors by their nature
have very little feeling for the proper timing, and in this
regard, often demonstrate too early with disastrous possibly
even fatal results. A brief discussion of an advanced
computer-based training system failure will drive this point
home. Recently, during a set of training system demonstra-
tions to the Director of DARPA, one system implemented on
an APPLE II micro-computer failed to meaningfully communi-
cate the value of the training aid. This resulted in an
unwarranted skepticism of the value of micro-processor-based
training aids. Quite simply, this was a problem which
could have been averted by more careful planning and evalua-
tion of the system's "readiness".

1.1.4 Transfer

1.1.4.1 Targeting. Too often we are not cognizant of
the overall requirement that we are trying to address via
the development of a computer-based system. That is to
say, we must remain mindful of the target, need, use and
problem to be solved, and avoid becomming overly impressed
with techniques or inventive solutions, which although may
be major breakthroughs in and of themselves, must address
a targeted need.

1.1.4.2 Transfer site requirements. There exists a
significant problem in the failure to adequately survey
the hardware and software at a proposed user's site, often
resulting in a serious mismatching. Transfer efforts
must be done professionally and expertly. Those individuals
responsible for the evaluation of the users hardware con-
figuration and facilities have little room for error. Be-
ginning with the design phase, all work should be aimed at
effective solutions to specific development problems. The
final phase in the solution of that problem must take into
consideration every possible condition which could prevent
the integration of the new work with the existing technology.
Problems encountered in the transfer process are highly
visible to the ultimate user and may overshadow the

impression of competence as well as confidence in the
delivered work. No matter how valuable the analytic tool,
if its final installation appears to be a comedy of errors,
then a value of similar worth will be placed upon the pro-
duct being installed. As yet this situation has been only
narrowly avoided.

1.1.4.3 Documentation. More commonly, there is a
failure to provide necessary instructional documentation
along with the software and data sets being transferred.
This problem has the potential of being as dangerous as
a faulty transfer. Without the proper documentation, in-
terest in the product will wane. Because it is too diffi-
cult to understand, it will not be used. An example
which fits the above problem description occurred at the
very first DDF transfer to the Naval Postgraduate School
(NPS) in Monterey, California. The software and data
transferred was the complete crisis management system.
The software products included the URR, U.S. Executive
Aids (EXECAID), EWAMS, and various utility programs. The
data sets transferred included the URR and supporting data,
EXECAID and supporting data, and a complete set of WEIS
analytic and descriptive data. The installation of the
software onto the NPS PDP 11 went reasonably well. All
programs tested well and transfer was complete. But, when
asked for more information about how to use all of the

capabilities of the software--adequate documentation was unavailable. When asked about some of the statistical techniques used by the creators of the software, again there were problems. Although overall the transfer was quite successful, without sufficient documentation including users manuals, sample output and succinct research papers the initial impact of the products was minimal.

1.1.4.4 Marketing. Another problem that can occur is the failure to adequately assess the bureaucratic back-drop necessary for thorough, formal transfer. While this is not to say that informal transfer is not valuable, it is to say that often without top-down approval from the "chain-of-command", transfer could be at best delayed, or at worst, prevented. A clear example of this failure to "market" a transfer at the proper decision-making levels exists in the "continuing" transfer of the EWAMS software and data to DIA/NMIC. Just prior to final transfer of the software to the NMIC assurances were made as to the availability of a "stand-alone" PDP 11/45 computer system, complete with assistance and guidance from the pentagon staff. This never occurred. The "stand-alone" computer system never became available, and the DIA internal and contractor support never materialized. Even though the DDF did in effect manage to demonstrate that the software and data

were ready to be transferred, and that it all could be
done to the original DIA specifications, it was still
delayed indefinitely. Why? Simply because of the
failure to realize an everyday axiom of marketing, that is,
to gain approvals from those in key decision-making
positions.

1.2 Proposed Solution

It has become clear that the research and development process especially as it applies to the development of advanced C^2 computer-based systems has many problematic areas. The cataloguing of these problems is the first step toward the framing of a solution. Step two requires the establishment of a set of general and specific mission-oriented objectives by which the solutions can be determined and applied. The general solutions (and overarching project goals) appear below; some specific solutions appear in section 2.0.

Objective 1 - The establishment of a new and vital design phase for all candidate DARPA/CTO contractor software. A rigid set of design standards will be applied to all new and intended software products. Through the application of these standards the software and data requirements can be categorized into groups which will serve to indicate the needs of the project which are to be provided by DDF personnel. Further analysis can be made at this time to determine the pre-estistence of data sets that may fulfill the requirements of the effort. As a function of this design phase clear cut alternatives can be examined, weighed and selected thereby insuring that the proposed

effort is both well conceived and within the limits of acceptable programming practices.

Objective 2 - Provide a superstructure of effective hardware and software development capabilities. Every effort will be made to accommodate the hardware and software requirements of the DDF user community. This effort will be centered around the operation of DEC PDP 11/70 dual mainframe computer systems. The full resources of this service will be extended in an attempt to adequately support the on-going development, design and transfer efforts. However, the provision of this service is not the only goal. Also included in the development phase are: hardware selection assistance, programming assistance, training and advice, creation of documentation standards and a concerted effort to keep all researchers informed of technical advances made both inside and outside the DARPA/CTO community.

Objective 3 - Take a leadership role in the organization and presentation of professional and effective demonstrations. The advanced computer-based systems and data developed for DARPA/CTO must endure intensive critique by a viewing audience. Therefore, it becomes increasingly important that a concerted effort be made to establish and

conduct policies for and training about effective demonstrations. Here too resides the need for physical as well as consultantive services. It is very important to provide a well organized program of demonstrations in an environment conducive to generating interest, appeal and hopefully acceptance of the research products being developed by those representatives of the operational world who may wish to adopt new computer-based systems.

Objective 4 - Provide expertise ready to address the problem of transferring selected software and data from research status to operational service. As part of the overall mission of DARPA/CTO successful research products must, after design, development and demonstration, be transferred to a proposed user's site. Care must be taken to adequately analyze the systems and facilities available at the transfer site so as to assure that the least amount of difficulty is encountered during the transfer. During the transfer phase all supporting documentation should be assembled to accompany the software and data, comprising a complete package which is useable and understandable. Also, care should be taken to coordinate with the transferee to insure that the products being delivered are what is expected as well as needed.

Objective 5 - Create a new management approach to the

organization of the DDF. Most, if not all, of the technical problems currently facing the DDF user-community cannot be resolved by technical adjustments alone. These problems require a new management model, a re-organization to accomodate technical advancement.

In the coming months--indeed throughout Fiscal Years 1980 and 1981--Computer Systems Management, Inc. will endeavor to solve these problems through the implementation of a specific technical/management/administrative approach. This report covers our first efforts and covers the peroid from November 5, 1979 to December 31, 1979.

2.0 THE DEVELOPMENT OF ADVANCED C^2 COMPUTER-BASED SYSTEMS

2.1 The Design, Development, Demonstration, Transfer and and Documentation Tasks

During the course of Fiscal Years 1980 and 1981 all of the tasks associated with computer-based systems research will be addressed. After briefly addressing the context for our work--the DARPA/CTO FY80 research program--we will turn, in section 2.1.2, to computer-based systems development and, in section 2.1.3, to computer-based systems demonstration.

2.1.1 FY80 DARPA/CTO Research Program

It must be noted that the DARPA/CTO research program is constantly evolving. CSM is now working from one blueprint (presented in APPENDIX A of this report); at the same time we continually monitor changes in the nature and direction of the program in order to assess possible impact upon the operation of the DDF.

2.1.2 Computer-Based Development

2.1.2.1 Hardware. As noted in section 1.1.2.1 the selection of hardware is of critical importance to the success success of a computer-based system. CSM has implemented a threefold strategy for the selection of the most appropriate hardware. First, and as a function of the design analysis, CSM can recommend a specific hardware

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configuration. Secondly, and with cost effectiveness in mind, CSM will canvass both the in-house and other DARPA/CTO-owned hardware in an effort to assure timely and appropriate selection(s). Too often it is the case that hardware selection is made solely on the basis of what is immediately available to the researcher. While this may stimulate rapid software production, it often creates sets of chain-reaction problems. Accordingly, before production begins, CSM attempts to match system design requirements with available (though not necessarily "at hand") hardware. Finally, CSM attempts periodically to assess the "state-of-the-art" and the "state-of-the-art likely to be", of computer hardware technology in order to avoid short-sighted implementation. In this regard, periodic memoranda are provided to DARPA/CTO focusing upon new and innovative developments in computer hardware technology.

2.1.2.2 <u>Software.</u> Software selection is also a function of design requirements, availability, and technological advances. CSM recommends to "developers" that computer-based systems be implemented with languages that adhere to these three criteria.

First, as a function of the design analysis, CSM will recommend a specific software language compiler or

interpreter to be used. Secondly, and with cost effective-
ness in mind, CSM will evaluate languages available on-line
versus those generally available but not resident on the
DDF computer system library. As in the hardware selection
process so to it is the case that the software language
selection is made solely on the basis of what is immedi-
ately available to the researcher. While this may stimu-
late rapid software production, it often compounds transfer
and conversion problems later on in the life of the soft-
ware system. CSM, therefore, before coding begins,
attempts to match system design requirements with available
(through--again--not necessarily "at hand") languages.
Finally, CSM attempts to periodically assess the state-of-
the-art and the state-of-the-art to be, of computer software
technology in order to prevent short-sighted implementation.
Here too periodic memoranda are provided to DARPA/CTO
focusing upon new and innovative developments in computer
systems software languages.

When possible, the "consistant strategy" also ap-
plies to the selection of computer software. Too often,
systems have been implemented in different languages
because they were either available or preferred. Indeed,
there are instances of multi-language system implementation.

CSM thus attempts to assure intra- and cross system software compatibility.

CSM also attempts to develop and rigorously apply accepted standardized (but not inhibiting) programming practices, such as structured, top-down, modularized, and flow-oriented coding techniques.

2.1.2.3 Coordination. Through its internal staff, a judicious set of reports and memoranda, and an extensive program of seminars, CSM attempts to coordinate among the user and transfer community the development of research and applications software and data. Every effort is thus made to acquaint the DDF community with each other's work. It is hoped that through an elaborate set of communications practices, the DARPA/CTO research program will not be retarded by the "not invented here" and "re-invent the wheel" syndromes. Clearly, these syndromes are the direct result of difficult "people problems". Through the establishment of a genuine user camaraderie, CSM has attempted to attack these problems.

2.1.2.4 Time-sharing and stand-alone computer support. In order to support the design, development, demonstation (see section 2.1.3), and documentation (see section 2.1.4) of

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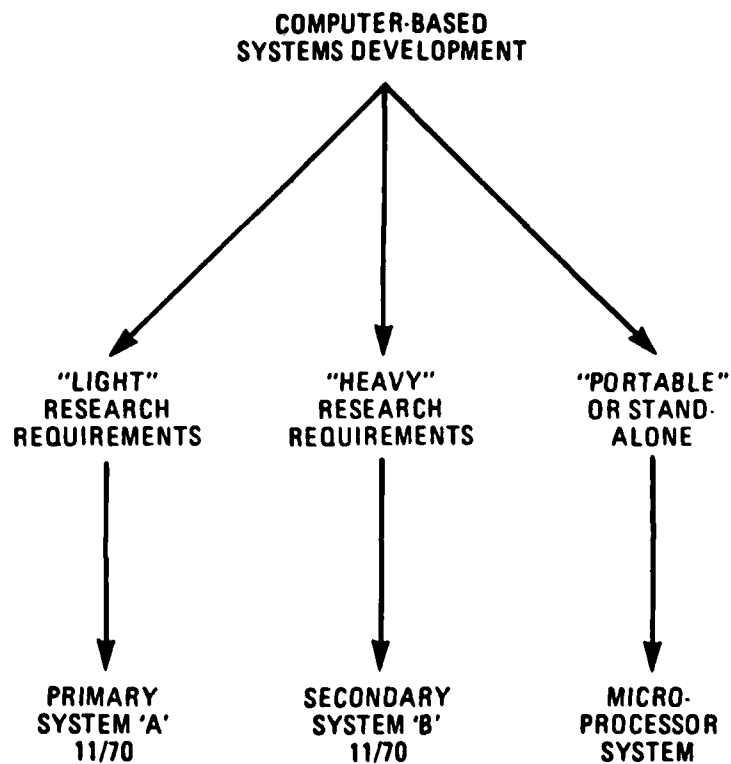
Figure 1
TIME-SHARING AND STAND-ALONE COMPUTER SUPPORT

computer-based systems, CSM operates a multiple
DEC PDP 11/70 timesharing system and other real-time or
stand-alone micro-processor-based computer systems as
so directed by DARPA/CTO.

As figure 1 suggests the computer-based systems
development function must be prepared to support the
three possible paths of advanced research. First,
CSM responds to development requirements arising from
the typical user which reflect a "light" computer require-
ment research effort. The second path has requirements
which demonstrate a set of special needs, reflecting a
research effort relying more heavily upon the computer
than is typical. These special needs may range from
real-time applications to very large memory specifica-
tions, storage, or heavy central processing unit (CPU)
utilization. This need can be satisfied by scheduling
dedicated time on the secondary "heavy research" system.
Third, a very special applications requirement may arise
that cannot be easily categorized as either heavy or
light computer-based research, and thereby not be assigned
to the primary or secondary system. The solution to this
requirement often is found in the selection of a micro-
processor based computer system. More and more frequently,
the hardware selection process defines a clear need to

adopt the portability and stand-alone capability that a
micro-processor can provide. CSM attempts to pay special
attention to the developmental needs of research which
fall into the micro-processor category.

The areas in which CSM concentrates primary
development support ensure that the hardware and soft-
ware configurations are providing maximum utility to
the user community are:

- Operation of the time-sharing service both
  systems "A and B".

- Providing user-community programming and
  software support.

- Expanding the facility library to track the
  needs of the users and DARPA/CTO.

- Providing engineering support to all areas
  inside and outside the DDF.

- Providing new product support.

In the area of time-sharing operations it is important
to be aware that CSM operates a dual-system configuration.

Systems "A" and "B" will be tied to one another by the existence of a UNIBUS peripheral switch. The primary function of system "B" is to back-up system "A". Beyond that, system "B" is available for "heavy research". CSM supports the operation of both GFE PDP 11/70's as one "complete" system even though they may often be performing entirely different and separate tasks. The activities that CSM attempts to perform in the operations area include:

Maintenance and operation of two GFE DEC PDP 11/70 mini-computer systems. The operating hours are 24 hours a day, seven days a week with one shift (prime working hours) of attended operation. The remaining time is unattended. The only exceptions to this schedule include normal Preventative Maintenance (PM) conducted by the manufacturer, Emergency Maintenance (EM) downtime, and at the direction of the director of DARPA/CTO.

Performance of quarterly hardware evaluation. This evaluation brings to the surface all difficulties in "throughput" as related to hardware errors, failures, and configuration flaws. Information from these evaluations is then reported to the manufacturer, CSM management, or DARPA/CTO with recommendations for corrective action.

Execution of software programs to gather data on the
usage and other accountable resources utilized by the user
community on a monthly basis; and the performance of
daily, weekly and monthly system dumps to assure a cur-
rent back-up of the users files. The method of back-up
is always efficient enough to insure that no single user
could lose any more than one-day's programming or data
collecting effort, at any time.

In the area of software support it also must be noted
that more than one configuration is being considered. The
primary system ("A") and secondary system ("B") may often
require redundant software capabilities. However, there
is just as great a chance that system "B" will not be run-
ning UNIX but another operating system. CSM will support
both operating systems. Also CSM will stands ready to
support the software needs of the micro-processor users,
as they are defined. Related to all software activities,
CSM attempts to take positive action in the performance of:

- assistance to the user community to correct
  coding errors ("bugs");

- assisting or advising users in the selection
  and use of all DDF software packages and languages;

- assistance to users in the proper development of
  their applications software coding design and
  testing;

- responsiveness in the creation of new software
  utilities by addressing the problems of new or
  modified software; and the

- performance of ad hoc software performance
  evaluations to determine the "state-of-the-software".
  Reports describing the performance and existing
  problems will be distributed in such a manner as
  to insure prompt attention to the repair or re-
  placement of that software routine.

Because of the ever heightening activity in computer-
based systems research the DDF facility library has increased
importance in its role as a repository of completed works.
Research conducted now will hopefully become the foundations
upon which future breakthroughs will occur. Because of
this philosophy, CSM is currently expanding enormously
the facilities library to include activities such as:

- maintenance of all codeable inventories and lists
  of DARPA/CTO owned hardware and software for in-
  stantaneous retrieval;

- maintenance of all relevant reports, sample-
  output, documentation, demonstration aids and
  codebooks for further distribution at the direc-
  tion of DARPA/CTO;

- creation of an on-line system tutorial to assist
  in the education of new users, as to the policies,
  procedures, and capabilities of the CSM/DDF. Also
  included should be sound, informative sections on
  packages, languages and utilties resident on the
  primary system; and the

- maintenance of data and program inventories and
  biographies for shared access by the user community.

Especially because of the size and complexity of the
CSM/DDF operation, it is becomming increasingly more appro-
priate to become less reliant upon the services of outside
or even non-DDF personnel. Therefore, CSM believes that
an engineering support function should be included in the
development function. The very first effort in this re-
sponse area is the construction of a new and environmentally
sound computer room. Since nearly all of the existing DDF
inventory is government furnished equipment (GFE) it is
essential that it be given the undivided attention of
specially qualified personnel. Other than the initial phase

of computer-room construction, CSM believes the following activities should be conducted under engineering support:

- Electronic component parts repair;

- Facility layouts, and design in the areas of drawings, construction, mechanical and electrical plans;

- Terminal repairs and renovations that require few spare parts inventories;

- Power consumption level monitoring and conservation;

- Special wiring, cabling, and inter device/system connections;

- Special small projects design, (e.g., small relays for voice actuated system, or control podium for demo room); and

- Communications equipment support and performance of quarterly status evaluations. These reports

are to be forwarded to both CSM and DARPA/CTO
management explaining difficulties and alterna-
tive solutions.

Finally, new products are always appearing in the
market place. It is the function of computer-based systems
development to be aware and educated about the capabilities,
weaknesses, cost and availability of these new devices.
CSM believes that the DEC PDP 11/70 may very well be the
"dinosaur of the 1980's". We feel that it is very impor-
tant to be prepared for an 11/70 replacement. By doing
this we will facilitate a smooth "down-grade" toward what
the technology future has already predicted. More speci-
fically, CSM will as a function of the role which it pro-
poses to play for DARPA/CTO through the DDF, examine in time
the full range of implications for the development of
computer-based systems which have already been suggested
by the current revolution in very large scale integration
(VLSI).

2.1.3 Demonstration

If one is at all familiar with the DDF, one realizes
the importance of the role of the demonstration at the DDF.
A new and exciting era is about to dawn in computer

audio-visual techniques via the first production version

of the spacial data base management system (SDMS). More

importantly, the SDMS is coming to the DDF. This will

open up entire new vistas of demonstrational techniques

and the realization of a demonstration that just cannot

be ignored. This exciting event will further propel

the DARPA/CTO into the services and acceptance

of its products as "real" research. Moreover the need

for a particularly professional demonstration room

becomes apparent. CSM intends to accept as GFE delivery

the Computer Corporation of America's, Inc. version of

the SDMS in its entirety (both hardware configuration

and software). This will require the creation of addi-

tional environmental facilities in the new CSM/DDF computer

room and demo room to accommodate the DEC PDP 11/70 used

by the SDMS. CSM has already procured power,

environment and space to demonstrate the system. CSM

is also prepared to assist in the transfer of all cur-

rently demonstratable software and data from the primary

time-sharing system to the SDMS.

    2.1.3.1 Opposing cultures. In order to assure that

applied computer-based systems are tailored during the

design and development stages, CSM intercedes (only)

at the direction of DARPA/CTO during these stages to

evaluate systems development against perceived user needs
and requirements. At a general level this will result
in the application of known and standardized user-oriented
programming techniques, including ease of input, menu
selection, and effective display, among other features.
At the more specific level, attention is devoted to
the particular intended use of the system to be demon-
strated. For example, demonstrations of systems designed
to enhance I&W capabilities will be conducted around an
environment and senarios familiar to the intended user.
At the direction of DARPA/CTO, CSM/DDF staff demonstrates
extant "products" to prospective transferees. Such demon-
strations must thus be conducted only by those cognizant
of the users requirements and then only after a background
analysis has been conducted of the users environment. It
is hoped that such rigorous analytical preparation will
minimize user indifference and hostility. (While we do
not presume "routine" user hostility, we must nonetheless
assume that the introduction of advanced technology to
highly proceduralized environments is delicate.)

2.1.3.2 Demonstration staging. Extending from our
concern about the inherently opposing cultures is a con-
cern for the physical environment in which the demonstra-
tion takes place. Accordingly, very special care must always
be taken to create a positive professional demonstration

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milieu. At the most basic level, this care is mani-
fest in an overt marketing strategy, from which a user is
"handled" in a mannèr appropriate to his rank and respon-
sibility.

2.1.3.3 <u>Premature demonstrations.</u> In an effort to
avoid at all cost a demonstration failure resulting from
the premature release of a computer-based system, CSM
has developed and applied   a set of demonstration
"readiness criteria". Specifically, the criteria are
relevant to the "state-of-the-system" in the following
ways: "Has the system been thoroughly checked for all
software errors and bugs?" "Has a coherent demonstration
sequence been pre-tested?" "Can the user operate the
system easily by himself?" "Is the system flexible enough
(and, where appropriate, are the data sets extensive
enough) to permit a flexible demonstration?" "Have back-
up technical and non-technical materials been adequately
prepared?" "Have likely questions been anticipated?"
"Has the back-up system been thoroughly tested?" "Has
supporting (carry-away) documentation (sample-output and
user's manuals) been prepared?" (See APPENDIX C)

2.1.4 <u>Documentation.</u>

If all of this is to be routinized, we must begin to

document all of the problems and progress made toward the development and transfer of useful C^2 computer-based aids of all kinds. CSM has prepared and submitted a plan for such documentation. It appears in APPENDIX B.

3.0 CONCLUSION

This first Quarterly Technical Report has examined the
issues of computer-based development, demonstration, and docu-
mentation connected with the design, development, demonstration,
and transfer of advanced command and control (C^2) computer-
based information, decision, forecasting, training and readi-
ness systems. Future reports will deal with design and transfer
and other related issues.

4.0   FOOTNOTES

[1] The TRAP system was developed by CACI, Inc. for DARPA/CTO.

[2] Similar problems occurred in connection with the development of the DARPA/CTO Early Warning and Monitoring System (EWAMS) and the Executive Aids for Crisis Management.

[3] See S. J. Andriole, Progress Report on the Development of an Integrated Crisis Early Warning System, Decisions and Designs, Inc., McLean, Virginia, December, 1976; and Judith Ayres Daly and Thomas R. Davies, The Early Warning and Monitoring System: A Progress Report, Decisions and Designs, Inc., McLean, Virginia, July, 1978.

[4] UNIX is a trademark of the Western Electric Company. It was developed at Bell Laboratories by Kenneth Thompson and Dennis Ritchie.

[5] See Gerald W. Hopple, Final Report of the Cross-National Crisis Indicators Project, University of Maryland, College Park, Maryland, forthcoming.

[6] The ultra-rapid reader (URR) was developed by Perceptronics, Inc. for DARPA/CTO. Succinctly, it is a system for rapid reading which presents text in short bursts, one word at a time in the center of a CRT. The technique enables a user to focus his or her eyes in one position and not move them as the words appear one at a time on the screen. See Steven Levin, The Ultra-Rapid Reader, Perceptronics, Inc., Woodland Hills, California, February, 1979.

[7] The WEIS data set contains approximately 24M bytes.

[8] The software problem is so visible in the DoD that it attracks a disproportionate amount of attention (in terms of dollar investment) each year during Congressional budget testimonies.

[9] Bolt, Berenek, and Neuman, Inc. (BBN); National Security Agency (NSA); Information Science Center (ISC).

[10] Prudence dictates that version 7 of UNIX be scrutinized carefully before implementation in order to avoid unnecessary problems.

[11] DoD1 is the intended (higher order) language to be adopted by DoD as DoD standard at some point in the future.

[12] See James J. Allen, MCCRESSA Users Guide, Computer Corporation of America, Arlington, Virginia, August, 1978.

[13] See Leo Hazlewood, et.al., Planning for Problems in Crisis Management, CACI, Inc., Arlington, Virginia, June, 1977 and Barry M. Blechman and Stephen S. Kaplan, Force Without War, The Brookings Institution, 1978.

[14] See Gary M. Guilbert, The GEN System for Entering, Validating, Updating and Reporting of Events Data, International Relations Research Institute, University of Southern California, August, 1978.

[15] See Ward Edwards, How to Use Multi-Attribute Utility Measurement for Social Decision-Making, Social Science Research Institute, University of Southern California, August, 1976 and Dennis M. Buede and Janice E. Ragland, Cost-Benefit Analysis Applied to the Program Objectives Memorandum (POM), Decisions and Designs, Inc., McLean, Virginia, November, 1978.

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Blechman, Barry M. and Stephen S. Kaplan. <u>Force Without War</u>. Washington, D. C.: The Brookings Institution, 1978.

Buede, Dennis M. and Janice E. Ragland. <u>Cost-Benefit Analysis Applied to the Program Objectives Memorandum (POM)</u>. McLean, Virginia: Decisions and Designs, Inc., November, 1978.

Daly, Judith Ayres and Thomas R. Davies. <u>The Early Warning and Monitoring System: A Progress Report</u>. McLean, Virginia: Decisions and Designs, Inc., July, 1978.

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Guilbert, Gary M.   The GEN System for Entering, Validating,
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California: International Relations Research Institute,
University of Southern California, August, 1978.

Hopple, Gerald W.   Final Report of the Cross-National
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California: Perceptronics, Inc., February, 1979.

APPENDIX A

THE DARPA/CTO FY80

RESEARCH PROGRAM

THE FY80 DARPA/CTO PROGRAM

The Computer Systems Management, Inc. (CSM) technical
approach is a function of: (1) the structure and direc-
tion of the overall CTO research program, and (2) the
computer-based systems design, development, demonstration
and transfer requirements which flow from that program.

The DARPA/CTO Research Program

Figure   presents the current CTO organization by
function and program thrusts. As stated in section 1.0
above, the DARPA/CTO has as its mission the development,
application and transfer of computer-based systems for
improved DoD information management and display, forecast-
ing, decision making, training, and human performance
especially as such activities occur in command and control
environments. More specifically, this mission is realized
through distinct research programs.

- Command and Control Information Systems (C^2IS)

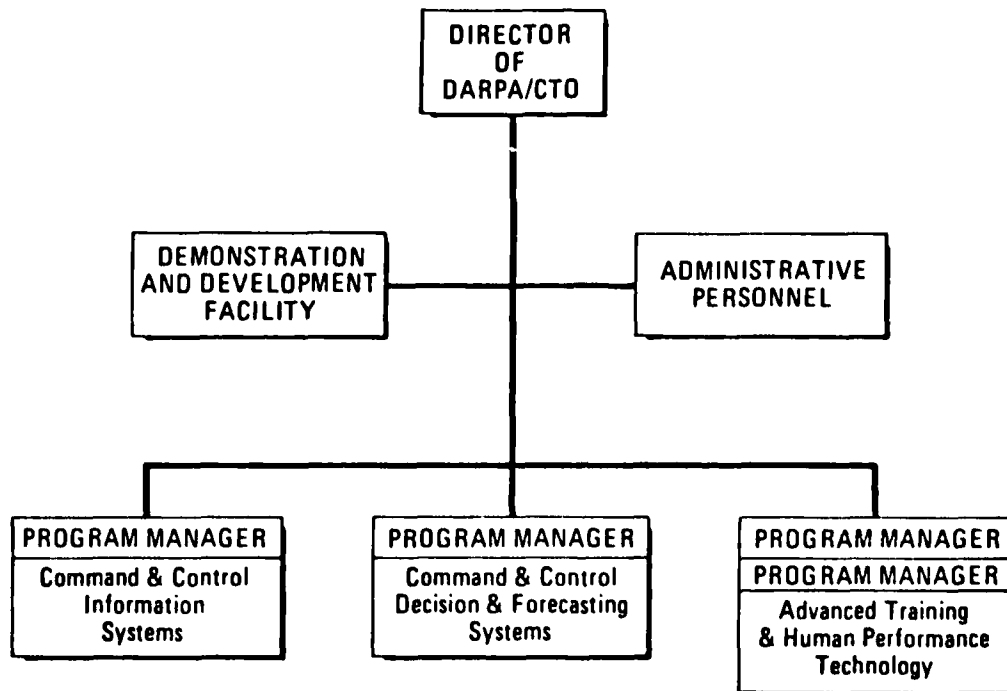 - C^2IS consists of four main research thrusts:

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                        ┌─────────────┐
                        │  DIRECTOR   │
                        │     OF      │
                        │  DARPA/CTO  │
                        └─────────────┘
                               │
      ┌────────────────┐       │       ┌────────────────┐
      │ DEMONSTRATION  │       │       │ ADMINISTRATIVE │
      │ AND DEVELOPMENT├───────┼───────┤   PERSONNEL    │
      │    FACILITY    │       │       │                │
      └────────────────┘       │       └────────────────┘
                               │
        ┌──────────────────────┼──────────────────────┐
┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
│ PROGRAM MANAGER │   │ PROGRAM MANAGER │   │ PROGRAM MANAGER │
├─────────────────┤   ├─────────────────┤   ├─────────────────┤
│ Command & Control│  │ Command & Control│  │ PROGRAM MANAGER │
│   Information    │  │ Decision & Forecasting│├─────────────────┤
│    Systems      │   │    Systems      │   │ Advanced Training│
└─────────────────┘   └─────────────────┘   │ & Human Performance│
                                            │   Technology    │
                                            └─────────────────┘
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Figure A

THE CYBERNETICS TECHNOLOGY OFFICE:
FY 80 ORGANIZATION & PROGRAMS

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spacial data base management, advanced map displays,
teleconferencing and man-machine relations. Each of
these areas of research aims at the development of
basic technology for new and unique man-machine systems
to aid command and control and intelligence (C^2I).
Spacial data base management is a new technique for the
retrieval of information from computerized data bases.
Information is retrieved by its location and appearance,
relying on human spacial memory functions. The advanced
may display research is developing technology for the
creation of realistic computer-generated images, movies
and video-disk-based photographic systems for presenting
geographic information. Teleconferencing research is
developing a system for high fidelity distributed con-
ferencing. Research in the area of man-machine relations
focuses upon the development of basic technology for im-
proving DoD "attitudes" toward computer use.

Some of the systems developed thus far in the C^2IS
program include a prototype spatial data base management
system, a PDP 11-based "production" SDMS, an adaptive
(intelligence) information filter, an automated desk SDMS,
a computer based message typography system, a group
decision aid, computer generated (from digital data bases)
movie maps, interactive video-disk-based photographic

movie maps, and an ultra-rapid reader. Many of these systems reside at the DDF; the remainder are intended as additions to the DDF demonstration program.

• Command and Control Decision and Forecasting Systems (C^2D&FS).

- The C^2D&FS program attempts to develop new, and improve old, methodology for: (1) I&W and (2) operations. The objective in the I&W thrust of the program is to develop and improve methodologies for forecasting, estimate generation, and assessment of soft, "non-quantifiable" data. On the operational side, research is intended to develop and test technologies and methods for improved decision-making and rapid option/action selection. These two new over-arching initiatives, when combined with the integration of basic research to improve decision and forecasting systems in general, seek to enhance I&W and operations functions and thereby improve command and control on all levels.

Some of the computer-based systems developed thus far include the EWAMS, three executive decision aids for crisis managers relevant to U.S. actions/objectives, problems, and descriptions of past crises, a Soviet crisis

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management decision aid, a data entry utility program, a counter-terrorism research aid, and numerous other analytical programs. The C^{2}D&FS program has also produced numerous empirical data bases. Nearly all of these (software and data) systems now run on the DDF; others are awaiting implementation, while still others are in the planning phase.

The contribution of the former Advanced Decision Technology (ADT) program deserves special mention. Selected computer-based systems include: OPINT, EVAL, POM & SCORE. OPINT is an aid to decision making when the key variables are unknown. OPINT provides dyadic influence diagramming to aid decision makers in the selection from various options. EVAL, does hierarchical decomposition evaluation of complex systems. The user can create models and assign weights to various components thereby assigning its importance. The system generates a final score and produces the ability to detect the key factors which were significant in the ultimate score. POM, (Program Objectives Memorandum) assists in budgeting analysis by generating a profile of items considering both cost and effectiveness, and the rationale used in the determination of this effectiveness. POM is generally most useful in budgeting cycle areas. SCORE, is an application which implements a computer-based scoring rule technique. A trainee's ability to give

accurate probabilistic assessments to a series of mul-
tiple choice questions is tested. After several tests,
the trainee has usually learned to give significantly
better assessments. All of this Advanced Decision
Technology software will reside on the DDF in FY80.

- ● Advanced Training and Human Performance
Technology (AT&HPT)

- AT&HPT has a dual mission: (1) develop
advanced training methodologies and computer-based
systems for the maintenance and operation of complex
military systems and, (2) to understand both the limits
of human performance and methods for extending them. At
a time when human performance is treated as an after-
thought in the design, maintenance, and operation of
military systems it becomes increasingly more evident
that an increasing need for the upgrade of the quality
of manpower capabilities is paramount. Initial research
has shown promising returns in training, selection and job
design methodology as investments are made to better under-
stand the limits of human performance capabilities.

Most of the computer-based systems developed in
AT&HPT may be viewed as extensions from the PLATO IV and V

computer-assisted instruction (CAI) systems. However, the current emphasis is upon the development of low-cost, rugged, and distributed micro-processor based systems.

All of these research programs thus call for the development of advanced computer-based systems across a wide number of areas. Computer Systems Management, Inc. (CSM) intends to support for twenty-four months the design, development, demonstration and transfer of these systems for DARPA/CTO.

APPENDIX B

A PLAN FOR THE DOCUMENTATION OF

DARPA/CTO-SUPPORTED RESEARCH

AT THE DARPA/CTO/DDF

A PLAN FOR THE DOCUMENTATION OF DARPA/
CTO-SUPPORTED RESEARCH AT THE DARPA/CTO/DDF

James F. Wittmeyer, III

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1.0 INTRODUCTION

Over the years DARPA/CTO has supported numerous research projects in the C^2 information, decision, forecasting, training, and combat readiness/effectiveness areas. Much of this support has been devoted to the development, testing, and transfer (to the Services and the Intelligence Community) of computer-based systems and computer aids while other support has been devoted to more basic research necessary for the development of such systems and aids. Since much of this research is cumulative in nature, and since it is conducted in divergent fields and disciplines, it is necessary to establish procedures for acquiring, storing, documenting, and distributing the information, reports, software, and hardware connected with the research. This plan thus presents a number of ideas and suggestions for gathering, processing, and distributing information important to the chronology and progress of DARPA/CTO, ideas and suggestions which will be implemented, modified, or dismissed at the direction of DARPA/CTO.

2.0 APPROACH

2.1 Problem Scope

DARPA/CTO generated information takes many forms, including:

- Written Technical Reports;

- Written Technical Memoranda;

- Filmed Technical Reports;

- Filmed Technical Memoranda;

- Written Demonstration Scenarios and "Sample" Output;

- Filmed Demonstrations;

- Minicomputer Software;

- Microcomputer Software;

- Seminar/Workshop/Conference Proceedings;

- Minicomputer Hardware Configurations;

- Microcomputer Hardware Configurations;

- Other Hardware;

- Miscellaneous Briefing Materials; and

- Funded Technical Proposals.

All of this information could easily overtake one's organizational resources. Since DARPA/CTO is not structured to maintain such information beyond its own purposes, CSM here proposes to assist DARPA/CTO with this information management problem.

2.2 Proposed Solution

2.2.1 Information Organization

With DARPA/CTO approval, CSM proposes to organize the information according to the current CTO program thrusts cross-referenced by CTO contractor. This will facilitate the organization, retrieval, and distribution of information in a timely and efficient manner. In addition, fixed categories will be set up in an effort to maintain consistent documentation procedures, as suggested below.

Program: C² Information Systems

Contractor	MIT	CCA	BBN	ITC	Percept	DDI	ESL
Information							
Written Technical Reports							
Written Technical Memoranda							
Filmed Technical Reports							
Filmed Technical Memoranda							
Written Demo Scenarios & "Sample" Output							
Filmed Demonstrations							
Minicomputer Software							
Minicomputer Software							
Seminar/Workshop/ Conference Proceedings							
Minicomputer Hardware Configurations							
Microcomputer Hardware Configurations							
Other Hardware							
Miscellaneous Briefing Materials							
Funded Technical Proposals							

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It is recommended that the matrices for all of the CTO programs/information/contractors be computerized into a master inventory which would guide the collection and maintenance, and distribution of materials. INGRES could easily be used to cross-reference the inventories for information type, contractor, and/or program or, just as easily, a small utility program could be written.

2.2.2 Information Collection

There is no question that CSM will need the assistance of DARPA/CTO to gather the suggested information. Fortunately, the CTO/CSM/DDF already has a good number of reports and other documents gathered over the past three to four months. These reports have been cataloged and organized for easy library-like retrieval. They have not been computerized, however. Also, the annual CTO Hardware/Software Inventory has yielded a good deal of information about hardware and software configurations. Finally, the DDF equipment inventory constitutes another excellent source of information.

In order to gather and organize information beyond DDF's immediate resources, the CTO contractor community will have to be contacted and be willing to cooperate. In the past, contractor response has been at the 60% level. This response rate will have to increase if we are to assemble a representative collection of materials; certainly "encouragement" from CTO will greatly improve our chances for success.

Finally, for organization purposes we feel that a test case involving either a single contractor (like MIT or Perceptronics) or one CTO program should be attempted first so we can identify the issues and problems relevant to the collection and organization process.

3.0   TIMETABLE

The target date for the computer-based working information management system has realistically been set for March 31, 1980. However, in order to meet this date we will require prompt response from the contractors and our consultants. If we are able to receive the information from the contractors (including lists, reports, films, and the like) within sixty (60) days, then we can maintain the schedule. If not, then our schedule will slide accordingly. Further, with good cooperation, we should be able to get a single contractor or program system running by January 31, 1980.

4.0 CONCLUSION

All of this is subject to DARPA/CTO review. We are anxious
to build the proposed system and invite comments, criticisms, and
suggestions.

APPENDIX C

READINESS STATUS REPORTING FOR THE

DEMONSTRATION OF ADVANCED C^2 COMPUTER-BASED SYSTEMS

MONTHLY SOFTWARE DEMONSTRATION AND TRANSFER READINESS REPORT

SUMMARY

Date: February, 1980

Software Systems:	Demonstratable	Transferable
Early Warning System	Yes	No*
Executive Aids	Yes	No*
TRAP	No*	No*
OPINT	No*	No*
EVAL	No*	No*
RAM	No*	No*
SCORE	No*	No*
DECISION	No*	No*
Group Decision Aid	No*	No*
STEAMER	No*	No*
PLATO	No*	No*
PRESS	No*	No*
AIS	No*	No*
Computer Generated Maps	No*	No*
Duncan/Job Estimator	No*	No*
Ultra-Rapid Reader	No*	No*

* See attached elaboration.

MONTHLY SOFTWARE DEMONSTRATION AND TRANSFER READINESS REPORT

ELABORATION

Date: February, 1980

System	Status
Early Warning System	Demonstratable primarily because of continued familiarity with system; no back up slides; no draft system specification or functional description; no internal documentation.
Executive Aids	No draft system specification, functional description, or internal documentation; no back-up demonstration slides; no continued training on capabilities or evolution of system(s).
TRAP	Unclassified version not supported by training, viewgraphs, reports, internal documention, system specification, or functional description.
OPINT, EVAL, RAM, SCORE, DECISION	No software delivered; no other supporting documention except DDI's documention which is generic and (probably) peripheral to software.
Group Decision Aid	No software documention of any kind; no reports; no viewgraphs.
STEAMER	No documention of any kind.
PLATO	No documention of any kind.
PRESS	Minimum software documention; no slides; no reports; cursory user's "guide".

System	Status
AIS	Undelivered.
Computer-Generated Maps	No documention of any kind.
Duncan/Job Estimator	No documention of any kind.
Ultra-Rapid Reader	No documention of any kind except for a cursory user's manual.

Special Note: Obviously DDF personnel can--and have--given demonstrations of some of the above listed undemonstratable software systems without the requisite back-up materials. However, as we hope is clear, CSM will not always be able to give proper demonstrations without the necessary back-up and training. Transfer is much more difficult without good documention. We believe that totally effective demonstrations can only be given when all materials and serious training has been delivered.