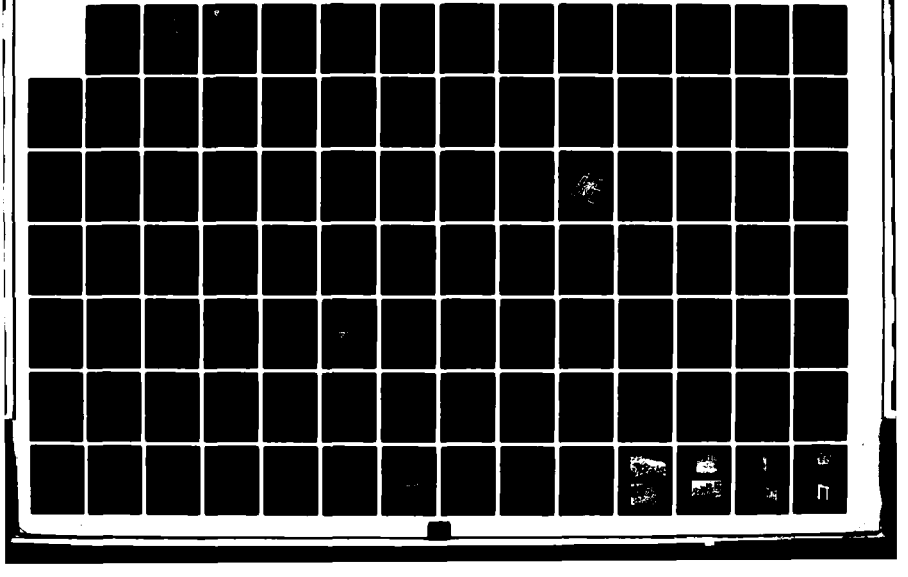
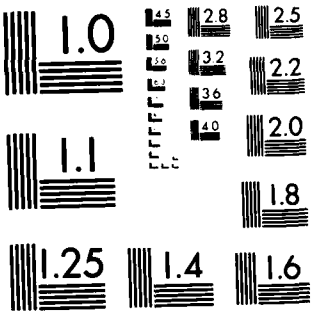
AD-A136 271 PROCEEDINGS OF THE MEETING OF THE TECHNICAL DOCUMENTATION DIVISION OF THE..(U) AMERICAN DEFENSE PREPAREDNESS ASSOCIATION ARLINGTON VA 27 MAY 83 1/3

UNCLASSIFIED F/G 5/2 NL





PROCEEDINGS

TWENTY-FIFTH ANNUAL MEETING

TECHNICAL DOCUMENTATION DIVISION

23—27 May 1983

Fort Monroe
Hampton, Virginia

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

NATIONAL HEADQUARTERS: Rosslyn Center, Arlington, Virginia 22209

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION
DEDICATED TO PEACE WITH SECURITY THROUGH DEFENSE PREPAREDNESS

Founded 1919

THE MISSION

OF

THE AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

The American Defense Preparedness Association exists solely for the advancement of adequate national defense of the United States in the fields of weapons technology, production, and logistics. We strive to improve the effectiveness and efficiency of the Government-Science-Industry relationship in the development and production of weapons and weapons systems. Our field of interest covers all ordnance, armament, weapons, weapons systems, and related equipment for the Armed Forces of the United States. Our interest also includes techniques, processes, and materials that have wide application in the development, production, and logistics of weapons.

Through its publications and meetings--national, local, and technical--the Association endeavors to educate its members and the public on problems affecting weapons preparedness. Our technical divisions provide advice to Government agencies on weapons technology.

The Association, founded in 1919, is a non-profit and non-political organization. It is an association of individuals as distinguished from an organization of commercial companies. The ten persons nominated by company members participate as individuals.

It is not within the scope of any American Defense Preparedness Association meeting or activity to discuss or be at all concerned with matters of trade, procurement, price, market or control or with placement of specific contracts or allocation of materials.

The Association cooperates to every practical extent with other recognized technical and industrial associations in assisting the Armed Services of the United States. Its mission is to keep America's armament strong in peace and in war. Its functions are as important and as worthy of support in times of international quiet, as well as in emergency. It is a peace society in purpose, in operations, and in fact.

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

TECHNICAL DOCUMENTATION DIVISION

STATEMENT OF AIMS AND PURPOSES

The Technical Documentation Division is part of the Defense Management Group of the American Defense Preparedness Association. The division was formed to provide the government and industry access to a group of experienced and responsible administrators and specialists from various sectors of industry, qualified to assist in the formulation of government and industry requirements for technical documentation. The members participate as individuals rather than representatives of their companies.

The division is concerned with all aspects of technical documentation: conception, analysis, preparation, management, control, and dissemination. The division's field of interest includes engineering drawings and standards, policies and procedures, technical publications, specifications, configuration controls, computer-aided documentation techniques, and methods of data communication. Duplication of effort by other technical and industry associations is avoided.

Sections/Committees are established to study problems and submit resulting reports and recommendations. Section/Committee participation by an individual is voluntary and evidences his desire to comprehend government and industry needs, to reduce the complexity and cost of technical documentation, and to enhance standardization with a sincere interest to serve with other members to achieve these goals.

Division/Section members interface frequently with their counterparts in government and industry. This association serves as a clearinghouse for professional information interchange and provides a stimulation which contributes toward the success of the participant's work and enhances the individual's value to his employer.

In addition to section/committee reports on subjects completed or in process, the Technical Documentation Division convenes annually and conducts a program of timely subjects to keep the members and the public informed, alert, and interested in the problems and solutions associated with technical documentation vital to our national defense, industrial accomplishments, and other related programs.

CONTENTS

SESSION 3

SESSION 4

SESSION 5

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

TECHNICAL DOCUMENTATION DIVISION

OFFICERS

Chairman: MR. THEODORE L. GOLMIS
Hughes Aircraft Company
Bldg 604, Mail Station F122
P.O. Box 3310
Fullerton, CA 92634
(714) 732-2876

Secretary: MR. RICHARD R. BARTA
IBM Corp, FSD
002A579
Owego, NY 13827
(607) 751-5381

Membership Chairman: MR. MICHAEL R. LONG
E-Systems Incorporated
Melpar Division
7700 Arlington Blvd
Falls Church, VA 22046
(703) 560-5000, X2885

EXECUTIVE BOARD

MR. SAMUEL ALVINE, JR.
Kearfott Division
The Singer Company
150 Totowa Road
Wayne, NJ 07470
(201) 256-4000, X 3033

MRS. LORNA BURNS
Hughes Aircraft Company
Bldg 100, Mail Station A765
P.O. Box 90515
Los Angeles, CA 90009
(213) 670-1515, X6570 or 3717

MR. ROBERT H. CARRIER
Raytheon Company
Equipment Development Laboratory
Boston Post Road
Wayland, MA 01778
(617) 358-2721, X448

MR. JOHN D. COOPER
Anchor Software Management, Ltd
P.O. Box 11046
Alexandria, VA 22312
(703) 750-0340

MR. DONALD C. DEROSIA
General Electric Company
1285 Boston Avenue
Bridgeport, CT 06602
(203) 382-4220

MR. CHARLES J. EMBREY
Advanced Technology, Inc.
2711 Jefferson Davis Hwy, Suite 300
Arlington, VA 22202
(703) 553-7299

MR. CHARLES D. FISHER
RCA, Government Comm Sys
Bldg 10-6-2
Camden, NJ 08102
(609) 338-2008

MR. ROBERT F. FRANCIOSE
General Electric Company,
Nuclear Engineering Dept.
175 Curtner Avenue, MC 721
San Jose, CA 95125
(408) 925-6880

MR. CHARLES W. GEDNEY
RAM Corporation
2555 Research Blvd.
Rockville, MD 20850
(301) 840-5960

MR. JOHN R. HART
Boeing Aerospace Company
P.O. Box 3999, M/S 21-50
Seattle, WA 98124
(206) 655-4783

MR. RICHARD E. KNOB
Sperry Corporation
Sperry Gyroscope Division
(516) 574-2436
*****Mailing Address*****
3311 Austin Avenue
Wantagh, NY 11793
(512) 221-4416

MR. JOSEPH R. MEITZ
General Motors Corporation
Delco Electronics Division
6767 Hollister Avenue
Goleta, CA 93017
(805) 961-5288

MR. BURTON G. SCHAEFER
Pitney Bowes
Business Systems Engrg
380 Main Avenue
Norwalk, CT 06852
(203) 853-7113

MR. JOHN R. SUTTON
General Electric Ordnance Systems
Bldg 8, Room 8112
100 Plastics Avenue
Pittsfield, MA 01201
(413) 494-3308

MR. ROBERT A. TIMLIN
Martin Marietta Corp.
Box 5837, MP 221
Orlando, FL 32805
(305) 352-4393

DR. PETER C.C. WANG
Code 53 WG
Departments of Mathematics and
National Security Affairs
Naval Postgraduate School
Monterey, CA 93940
(408) 646-2622

EXECUTIVE BOARD LIAISON MEMBERS

MR. RICHARD L. BERRY
NAVMAT 04345
Naval Material Command
Washington, DC 20360
(202) 692-3134

MR. MAURICE E. TAYLOR
ARRADCOM Technical Support
Specifications and Stds Branch
Picatinny Arsenal
Dover, NJ 07801
(201) 328-4210

MR. GILBERT T. LUSSIER
Dept. of the Navy
Hq. U. S. Marine Corps.
LMA-1 I&L Department
Washington, DC 20380
(202) 694-2606

MR. ROBERT L. TISCHER
ASD/AWZ
Wright-Patterson AFB, OH 45433
(513) 255-5441

MR. J. H. DALGETY
Defense Logistics Agency
DLA-SCT
Cameron Station
Alexandria, VA 22312

ADPA HEADQUARTERS

Capt. NELSON P. JACKSON, USN (Ret)
American Defense Preparedness Association
Rosslyn Center, Suite 900
1700 North Moore Street
Arlington, VA 22209
(703) 522-1820

TECHNICAL DOCUMENTATION DIVISION

SECTIONS AND COMMITTEES

	Chairman	Vice Chairman
Awards Committee	J.R. Meitz	
Computer Software Section	J.D. Cooper	
Configuration Management Section	C.J. Embrey	G.W. Jarkey
Contract Data Management Section	J.R. Hart	C.E. Franklin
Defense Acquisition Regulation Section	C.D. Fisher	
Engineering Data Automation Section	Dr. P.C.C. Wang	H. L. Atkins
Engineering Drawing Requirements Section	J.R. Meitz	R.A. Timlin
International Data Requirements Section	T.L. Golmis	
Metrication Section	Lorna Burns	
Micro-Reproduction Systems Section	S.R. Sutton	
Preparation and Management of Specifications Section	S. Alvine, Jr.	
Technical Publications Section	R.E. Knob	

SESSION 1

Chairman: MR. RICHARD E. KNOB
Sperry Corporation
Sperry Gyroscope Division

1983 ANNUAL REPORT

OF THE

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

TECHNICAL DOCUMENTATION DIVISION

by

THEODORE L. GOLMIS

MANAGER, CONFIGURATION AND DATA MANAGEMENT OPERATIONS

HUGHES AIRCRAFT COMPANY

and

CHAIRMAN, TECHNICAL DOCUMENTATION DIVISION

Ladies and Gentlemen, I would like to take this opportunity to congratulate the Technical Documentation Division on its 25th birthday.

Twenty-five years ago, under the banner of Engineering Documentation Section and American Ordnance Association, the section became actively involved in matters associated with Defense and Space Documentation. A small dedicated group, interested in problem solving, initiated a movement that has lasted twenty-five years.

Twenty-five years ago terms such as "Data Management", "Form 1423", Levels of Drawing, Computer Aided Engineering, and Tailoring were not part of the vocabulary. The problems of that era were associated with lack of communication between customer and contractor, compounded by the lack of attention to the problem by both Military and Industry.

Twenty-five years ago, men with insight set as their objective for this section the establishment of a two-way channel of communication between Military and Industry. They hoped to provide a sounding board by which the Military could obtain the benefit of a cross-section of industry experience and could circulate information quickly regarding new requirements and problems. Industry on the other hand hoped to contribute to improvement in military practices.

What was our first annual meeting like? At that first meeting 25 years ago:

A team of experts (Chet Nazian, Jim Mars, Russ Eaton, Dan Bennett, and John Dunn) were discussing military plans for implementation of MIL-D-70237.

Stu Miller was clarifying the grey areas of true position dimensioning.

Thurber Moffett reported on a new EAM Documentation records system developed at General Dynamics.

Bob Franciose was predicting problems with Numerical Control Documentation.

The discussion on whether BuShips and BuOrd would require all Class I customer-formatted drawings was held.

There was open debate on what size microfilm should be recommended to the military as a standard.

That was the start and not once have our associates, Government and Industry with their diverse interests, widely different points of view, and different personalities, ever faltered from their objective. This week's meeting, like last year's meeting, and all the years before, is testimony to the unselfish dedication for a common objective of problem solving and improved communications.

I could continue looking back, highlighting the past and reminiscing, but I have no intention of doing so--our past speaks for itself. What I do want to address is our aims and purposes and direct our attention to the future.

The Technical Documentation Division is part of the Technology and Management Advisory Group of ADPA. As previously mentioned, the Division was formed to provide the Government and Industry access to a group of experienced and responsible specialists from various sectors of industry, qualified to assist in the formulation of Government and Industry requirements for Technical Documentation. The members participate as individuals rather than representatives of their companies.

The Division is concerned with all aspects of Technical Documentation: conception, analysis, preparation, management, control, and dissemination.

The Division's field of interest includes Engineering Drawings, and Standards, Policies and Procedures, Technical Publications, Specifications, Configuration Controls, Computer Aided Engineering Techniques, and Methods of Data Communication. Duplication of effort by other Technical and Industry Associations is avoided. Sections/Committees are established to study problems and submit the resulting reports and recommendations. Participation is voluntary and evidences an individual's desire to comprehend Government and Industry needs, to reduce the complexity and cost of Technical Documentation, and to enhance standardization . with a sincere interest to serve with others to achieve these goals.

Our aims and purposes were well satisfied this year. We have had four meetings, starting in January 1982 in Arlington, Virginia, hosted by Advanced Technology, Incorporated. At this meeting, Dr. Stephen Bryen, Deputy Assistant Secretary of Defense, International Trade and Security Policy, provided us an informative presentation on indiscriminate publication of defense information.

It was also at this meeting that staff members of ASTM provided a presentation on the development of ASTM documents, as well as the aims and purposes of ASTM.

Sam Miller of Defense Materials Specifications and Standards Office, cited the 33 initiatives for improving the acquisition process.

I am just highlighting a few things that have taken place because some of the key people are here and will provide the current status of these projects.

Our annual meeting was held 25, 26, and 27 May at the Honalai Hotel in San Diego, California. September put the Executive Board at the Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania. Ms. Anne Polivka, Chairman of the ADPA Central Pennsylvania Management Chapter and Capt. Thomas Burke, Commanding Officer, Naval Sea Systems Command Logistics Support Engineering Activity, hosted the meeting. We were welcomed by Rear Admiral Edward H. Kocher, Commanding Officer, SPCC, who encouraged a free exchange of information.

Our most recent meeting was held at Wright-Patterson Air Force Base, Dayton, Ohio. In addition to our normal Section Reports, Ray Sugimoto, Air Force Systems Command briefed us on the methodologies used in acquiring the F-16 data. Col. Zaleski provided an overview of General Marsh's and General Chubb's new plan to reduce data costs within the Air Force. Roger Faust reported the status of the revision of MIL-STD-143. And Don K. Swanson presented "Cost-Benefit Reporting for DOD Parts Control Programs.

It has been this exchange of information between Government and Industry that benefits both of us and strengthens the Technical Documentation Division.

I am, however, concerned over the near future. I fear that Industry's renewed emphasis on productivity will accelerate automation to a degree that our customers, The Services, may not accommodate our needs, our methods, and our informational products.

If you look at the program for this meeting, you will see such terms as "Optical Disc Storage for Technical Record Control", "Managing Computerized Documentation", "Total Technical Documentation Automation". These along with "CAD/CAM Application in Microelectronics", CAD/CAM and Parts Listing", "Digital Drawing Management System", "Database Management", "Interactive Graphics and Lazer Disk Storage" verify that what we have said is coming is now a full reality.

My concern--the Governments Informational Collecting Systems, Specifications, and Standards are lagging. Personnel are not prepared to substitute or tailor these requirements to what is available at minimum cost. If we do not take immediate action to modernize our requirements, we will continue to run high cost dual systems for many years to come.

A simple ROM (Read Only Memory) is a good example. When we were using 2K, 4K and 8K ROMS, Truth Tables may have been of some value to our customers. Now we have 48K, 64K, and Larger ROMS--Truth Tables are worthless.

Industry must provide and Government must accept new media of data transfer to permit low cost reprocurement.

It will be objective of the Technical Documentation Division to assist in this transition in each of our chartered areas: Drawings, Configuration Management, Software, Technical Manuals, etc.

The tide has turned and we must lead the way to new and low-cost management systems.

Thank you.

FUTURE TRENDS IN GOVERNMENT

DOCUMENTATION

Mr. BERNARD G. LAZORCHAK
Professional Staff Member
Joint Committee on Printing
Congress of the United States

Mr. Lazorchak spoke on future trends of the Federal Printing Program which the Joint Committee on Printing (JCP) administers.

The overall goal of the JCP is to identify and eliminate delays, duplication, and waste in government printing. ("Printing" is used in a very broad sense; covering a totally integrated system including development, editing, preparation of final copy, printing, and distrbution.)

Specific areas of JCP responsibility include:

- Automation and standardization of congressional publications.
- Interagency electronic and microforms.
- Technical liason to DoD in specifications and standards, technical information manuals, and all aspects of printing.
- Approval of all equipment requests relative to printing, binding, etc.
- Automation and application of new technologies including generic coding techniques, and merging of text and graphics.

Mr. Lazorchak described the need for uniform application of advancing technology in both technical documentation and configuration management to support a fully integrated system.

WELCOME

LIEUTENANT GENERAL JULIUS W. BECTON, JR.
Deputy Commanding General, Training
Inspector of Training
U.S. Army Training and Doctrine Command
Fort Monroe, Virginia

Note: The following is an edited transcription of General Becton's remarks.

On behalf of General Richardson, I'd like to welcome the ADPA Technical Documentation Division to Fort Monroe.

I'd also like to take this opportunity to focus your attention on the challenge of training.

I am convinced that today's technology and its applications provide a way for us to do more with less. The most challenging goal of the next decade is to increase troop readiness while at the same time reducing training resources. For example, use:

- Substitute, less powerful ammunition in training excerises.
- Electronic simulators for low cost combate training of man/vehicle operation.
- Computer based tactical simulation systems followed by field exercises to minimize the enormous cost of real field exercises.

Given that we all agree upon the use of such things, there may still be a more fundamental issue facing the Army:

> How do we train today's soldier to operate today's weapons to maximum effectiveness?

Modern technology is surely changing our world--in the office, in the factory, and on the battlefield. The myriad of new weapon systems, both fielded and in the future, appear logical on the engineering drawing table, but they must ultimately be operated by soldiers who have been properly trained.

"Hi-tech" is the buzz word, not only in the services, but in industry and in education.

Assuming you agree with me, that we are in an era of hi-tech weapons, what is the problem of hi-tech training?

The Defense Science Board has just released its findings from the study they conducted last summer on Training and Training Technology. Their conclusions may serve as a spring board for any follow-on discussions you may have at this meeting. They concluded:

> "We must take advantage of current technology and press for the release of emerging technologies to develop ways to make training more efficient and effective."

In the remainder of the report, the Board stressed the need for strong organizational cohesion in consolidating technological gains and training technology in applying hi-tech innovations to training.

While it might appear that this is only motherhood, apple pie, and Sunday baseball, I'd like to offer some comments to those on the hi-tech road.

Before we go too far, let's ask ourselves some basic questions about training and our intensifying technology.

- First, do we really know how deficient we are?
- What training is deficient?
- Which areas are most in need of updating or improvement?
- Which areas are in less need of hi-tech assistance?

We must concentrate hi-tech resources in areas where hi-tech will most likely pay off. We must remember, hi-tech provides only the tools for training; not the training itself. A computer simulator, if not properly programmed can deliver bad training just as easily as the good training that was expected.

Another challenge which is equally important:

Training is a continuing process--like cleaning house. When you think you've finished, its time to start over. It's a matter of hurry up to wait. A lot of soldiers spend a lot of time waiting to do their thing. That time could be filled with technology so that they could better do their thing, when it comes time.

The trainer, and the trainer's trainer, and so on up the chain of command are increasingly busy because they have so much more to do. In this field (that is high technology), there is much talk about making the systems friendly from the users' viewpoint. I suggest that friendly to a user is one thing, but friendly to a trainer may be quite another. There must be a better way to document the kinds of things that we need.

Well, I was given ten minutes, so I better stop here. I was only asked to welcome you, not to sermonize you. But I couldn't pass up the opportunity to suggest to you some ways in which you might help us. The Army is in good shape, but we can do better. We must do better.

Again, welcome to TRADOC and Fort Monroe. Good luck with your Twenty-Fifth Annual Meeting. .... God bless.

TRADOC SPECIAL ARMY BRIEFING

MAJOR GENERAL DONALD R. MORELLI
Deputy Chief of Staff for Doctrine
U.S. Army Training and Doctrine Command
Fort Monroe, Virginia

General Morelli presented a very informative slide briefing, summarizing the techniques and philosophy used in developing doctrine for future weapons systems. He described: (1) U.S. Battlefield Development Plan; an umbrella concept supported by a series of functional concepts and (2) Air-Land Battle 2000 covering the time period of 1995-2015.

The fundamental approach considers:

- How do we want to fight in the future?
- How did we solve this problem in the past?
- What is the worldwide threat potential?
- What are the technological trends for the future?

He pointed out that the emphasis is on identifying how we want to fight, based on the threat; then determining how emerging technologies can be applied to eliminate deficiencies which have been identified and prioritized. This is in contrast to the past; when available equipment tended to dictate the ways in which we planned to fight.

General Morelli identified, as a key problem, the disclosure of our nation's technology. Russia readily admits that they cannot modernize their armies without the use of Western technology. Other areas of concern are the Soviet Power Projection and potential deficiencies in strategic materials.

He also highlighted the need systems designers to understand how people learn. "Young people today learn from interacting with the game; (not by reading instructions)." He predicted that in the future, the mandate of leadership will be pushed to lower levels than ever before. We can't forget the soldier.

PROCUREMENT PRACTICES STUDY

by

Matthew E. Brislawn
Boeing Aerospace Company

SUMMARY

A study was conducted on the E3 (AWACS) program to determine if it is feasible, without increasing program risk, to reduce program cost by simplifying Government procurement practices. A review was made of contract terms, specifications, and data items; comparisons were made with comparable commercial activities. The conclusion was that substantial savings could be achieved if the Government would change, modify or waive certain standard procurement practices or regulations.

INTRODUCTION

In mid 1981, as a result of the decline in the commercial airplane market, Boeing conducted a series of reviews called organizational depth studies. These reviews were conducted by a small group of corporate executives. There were over 30 reviews conducted throughout the company on both commercial and military programs. The purpose of these reviews was to assure that overhead and management costs would be reduced consistent with declining direct manufacturing and engineering effort. At various times in our history when we have had cut-backs, direct costs would decline at a much faster rate than overhead and management costs; the depth studies were intended to assure that, this time, indirect cost would be reduced with direct.

On several occasions, when the reviewers asked that a particular activity be discontinued, they were told that it was a Government contract requirement and therefore could not be stopped. After hearing this same explanation a number of times, they decided that the Government was no more interested in perpetuating uneconomic management practices than Boeing was. Based on requests received from Air Force Systems Command, they directed that a study be conducted to advise the Air Force of current procurement practices which were causing the cost of the final product to be unnecessarily increased.

The procurement practices study was initiated in September of 1981 and was completed in February of 1982. The results of this study were presented in March to the Air Force Electronics Systems Division (ESD). A commitment was made at that time that, if the Air Force would implement the procurement practices changes recommended, Boeing would not only reduce the prices of future contract work but would pass on savings by reducing the price of existing contracts. ESD supported the majority of our recommendations and requested that we proceed to prepare firm contract proposals.

The objective of the procurement practices study was quite specific; we were to reduce product cost, that is the cost of developing and manufacturing the hardware, by recommending changes to or simplifications of government procurement practices in those areas where this could be done without adverse impact on product performance, quality, or operating costs. In other words, eliminate those practices which, from an economic point of view, did not, improve the end item product. The study was to be conducted using a single program as a test case. The Airborne Warning and Controls System (AWACS), or E3, program was selected for the study. AWACS was selected for several reasons, perhaps the most important of which was that it was the largest current military program in The Boeing Company. AWACS is a long, stable program; development began in 1970, production started in 1975, and we expect the program to be in production at least through the end of this decade.

The selection of the AWACS program dictated one of the early findings. As in many studies of similar nature, the first thing that the study team looked at was engineering and manufacturing specifications, to see if there wasn't a more simple cost effective way to build the product. On a product that began design 12 years earlier and had been in production for seven years, it

quickly became apparent that the cost of implementing significant design or manufacturing changes would more than offset any savings. Therefore, one of the first conclusions of the study team was that there would be little economic justification for changing the engineering or manufacturing specifications in mid production.

An initial task of the study team was to identify procurment practices imposed on us by contract. Contract requirements come from a variety of sources; the team identified and screened 217 separate terms and conditions, 318 military specifications and standards that are referenced in the contracts, 566 contract specifications, and over 375 different contract data items. In addition, a large amount of effort was spent comparing military program practices with commercial programs, where we're basically spending our own money. Many of our recommendations resulted from differences between the way we do things for the military and the way we do them on commercial programs.

AWACS has had a good history of cost consciousness. When the program was started, many specifications were specifically tailored in recognition of the fact that a commercial 707-320 airplane was being used to help reduce program costs. When the NATO and US standard program was implemented in 1980, they were effectively procured as a single package of 27 systems (18 NATO and 9 US), in effect providing the USAF whith the advantage of a multi-year buy with NATO. We have had numerous cost reduction suggestions implemented on the program (some $59M in 1981 alone), but we still felt that there was room for further improvement. We are continuing our internal cost reduction programs and, with the recommendations in this study, sought Air Force and DOD support to implement more cost reductions.

The conclusions of the study were reflected in 11 separate recommendations. The best way to summarize these recommendations is that the Air Force should be much more selective and discriminating in the application of procurement regulations and practices to an individual program. The program started in the development phase with a number of requirements. As the program moved through time with changing requirements, additional procurement regulations and practices were imposed; virtually none were dropped. There was no real attempt through the 12 year life of the AWACS program, by either Boeing or the Air Force, to recognize that risks had changed, the program had changed, and practices that may have been fully justified ten years ago in the middle of full scale development or at the start of production are simply not cost effective today.

RECOMMENDATIONS

1. Tailor Management Reporting

The first of the 11 recommendations was to tailor management reporting. The reporting requirements on contract are not associated with risk. At the time of the study there were no contracts on the AWACS Program in an overrun situation and yet we still sub-

mitted routine monthly cost reports on over 1,000 cost accounts for each of the contracts. We still provide a variance analysis on variances that occurred two or three years ago on contracts that have another year or more to complete. There is a great deal of repetitive reporting at a level of detail not consistent with the risks of the program. We are recommending that there be an expanded use of exception reporting rather than detail reporting; that the frequency of cost and schedule reporting be extended, for instance that most reports be provided quarterly instead of monthly; and that the level of reporting be raised, that is, report them at WBS level 2 instead of level 3 or 4, as currently reported.

2. Simplify Follow-on Procurements

On a multi-year production program such as AWACS, we have follow-on production proposals nearly every year. On the integrated US NATO Program, there were over 40,000 pages of proposal documentation plus 15,000 pages of specifications. On the Saudi Program, which was proposed in mid-1982, we again exceeded 40,000 pages of proposal documentation. It is our belief that a large amount of this proposal documentation is unnecessary, that a large number of program plan type documents are updated soley for the purpose of the proposal and that the need to do that has long since past. Therefore, we recommend that a concerted effort be made to reduce significantly the size and complexity of follow-on proposals, and a greater use be made of the exisiting established plans with minimum updates required only as required by major program changes.

3. Reduce Requirements for Subcontract Cost and Pricing Data

In many cases we are obligated to require subcontractors to submit detail cost data, and we must perform extensive cost analyses on follow-on procurements when we have extensive historical or parametric price data that is more than adequate to support the proposed subcontract price. For instance, in the case of the Saudi Tanker Program, the landing gear on the tanker aircraft is virtually identical to landing gears that we have been buying for 707 aircraft for over a quarter of a century. On the other hand, the aft fuselage section that contains the fueling system is a new design. But by regulation, since both subcontracts exceed the threshold for cost analysis, we are required to solicit from the suppliers a detailed cost proposal and go through an internal analysis of that cost. In our opinion, it would make much more sense to require the detail cost proposal and analysis on the new fuselage section, and to rely on a historical data and parametric comparisons for the landing gear. The effort should be put selectively in the risk areas, not in the areas where there is very little pay off; the effort should be applied where the risk and leverage are, not just applied to every subcontract that happens to exceed some arbitrary threshold.

4. Raise Threshold for Mandatory Contract Provisions

Many of the contract socio-economic flow down requirements have thresholds as low as $2,500; many have been unchanged for 20 years. Inflation alone has effectively lowered these thresholds to include a large number of subcontractors never intended to be included in these various government programs. Many companies, including some as large as International Harvester and Sears, have said they will no longer compete for government contracts because the cost of paperwork and administrative procedures far exceeds any earning capability. In the case of the Boeing Aerospace Company, we have to comply with reporting requirements in a number of areas on over 200 separate contracts. The study team has recommended that the thresholds should be raised to a more realistic level; that small business be excluded in total from flow down of many of the flow down provisions; that flow-down not be required for firms whose government business is less than 5% of their total; and that all reporting should be handled on a company wide or program basis rather than contract by contract. At one time on the AWACS Program, we had to submit small business plans on an ECP by ECP basis. We have gotten that changed so that now we are doing it on a contract basis. In fact, the only small business plan that makes much sense for a program the size of AWACS is a program wide plan.

5. Simplify Contract Specifications

On the AWACS Program, we are currently maintaining 566 separate specifications under Class 1 control containing over 85,000 pages. The Saudi Program will add an additional 100 plus specifications to this count. It is our belief that this could be reduced to approximately 87 specifications, containing less than 30,000 pages in a very cost effective fashion. Many of the specifications that are maintained are contract end item (CEI) specs which, in our opinion, should not be maintained after completion of functional configuration audit (FCA). After FCA, only the top level system specifications should be maintained. On a commercial airplane program during the development phase we do have the equivalent of the CEI spec; however, once the design has been qualified, we no longer maintain the specification. Configuration control is maintained by part number on what we refer to an an envelope drawing. CEI specs are kept for historical purposes and if there is ever a requirement to make a major change to a subsystem, the specification could be updated, but it is not maintained current once the detail design has been approved.

6. Simplify Change Procedures

We process over 150 changes a year on the AWACS Program; it takes in excess of one year to process the average change. About 1/3 of the administrative personnel on the program are in the business of pro-

cessing changes. We believe that this could be significantly reduced by combining individual changes into block changes. Further, we are recommending that many of the reviews conducted sequentially by the Air Force be conducted in parallel so that the time spent after a change is proposed until it is negotiated can be significantly reduced. A very large number of changes must be reproposed, either because of the passage of time and the new facts that are discovered, or the fact that the work statement changes.

7. Reduce Contract Data

The major contracts on the AWACS Program contain approximately 100 data items each. We have over twice this number on the Saudi contract because of the fact that we are providing both tanker/cargo aircraft and E-3 aircraft on the same contract. We have identified 167 different offices in the Air Force that receive AWACS data. Many data reduction exercises have rsulted in reducing the apparent number of data items, but in almost every case what these exercises have actually done is prevented the growth of additional data items, not reduced the number. We recommend significant reductions in the amount of data required, up to 50% on most contracts.

8. Streamline Spares Ordering

Under current practice, initial spares and production are bought by two different agencies of the Air Force at two different points in time. Our own experience indicates that, if we can buy spares concurrently with the order of production hardware, we can realize savings on the order of 20% to 50%. We have many examples that support these kinds of savings. We believe these savings could be achieved by the Air Force if a prime contractor could be authorized concurrently to order production hardware and initial spares. In addition, the paperworked process to put spares order on contract takes upwards of 250 days. In many cases, it takes longer to process the procurement paper than it does to build hardware; it is not unusual that hardware is actually ready for delivery before the spares order has been proposed, negotiated, and definitized. We also believe that greater use should be made of catalog pricing; the Air Force and the prime contractor or the prime contractor and the subcontractor should negotiate baseline values, subject to quantity and annual inflation adjustments, for items that are identified as potential spares items. This is a much shorter process than the current system of individually pricing and negotiating every single spares order.

9. Simplify Contract Property Procedures

Under a fixed price type of contract, a contractor is obligated to notify the government of intention to buy special test equipment (STE) so that the government can determine if that special test

equipment can be provided from surplus stock. On the AWACS program, we have provided over 500 such notifications in the past 2 1/2 years; we have never, in the history of the program, received a single piece of special test equipment from the government. Aerospace Industry Association (AIA) ran a survey recently. They checked 14 companies, over a period of five years, and identified 22,000 STE notification requests, only 29 items were actually received as GFP, worth $150,000. It is clear that the STE notification process has no economic justification, and should be eliminated.

We also believe that the GFE repair process can be significantly reduced in complexity. Under our current contract with the government, we have processed over 335 work requests to repair defective GFP; over 50% of these requests have been under $5,000. We believe that most of these repairs can be priced on a concept similar to inscope changes. For years, we have had clauses in our contracts that state that any change that can be accomplished for less than $100,000 is to be accomplished at no change in price; we can certainly implement a similar procedure for repair of government property.

10. Make Greater Use of Contractor Engineering and Inspection Personnel

The tenth recommendation is that the Air Force use designated engineering representatives (DER's) and designated manufacturing inspection representatives (DMIR's) in a fashion similar to that used on commercial aircraft programs. The Federal Aviation Administration has established procedures whereby contractor employees can be designated to do many in-process reviews and approvals required in the commercial airplane certification process. The commander of AFSC, recently announced a shortage of over 700 engineers in the Air Force Systems Command. We believe that many of those shortages could be eliminated by a system similar to that used by the FAA. We proposed using the Saudi tanker/cargo program as a test case to use contractor personnel for interim inspections and interim approvals in lieu of Air Force engineering or inspection personnel.

11. Use Contractor Maintenance in Lieu of Organic Depot Repair Capability

The final recommendation is to expand the use of contractor maintenance in lieu of organic depot repair capability, especially in those cases involving the use of commercial hardware, on programs that are small in quantity, or on programs that use complex technology hardware that is likely to change or become obsolete in a short time period. The investment that has been made in developing organic depot repair capability often is one of the major constraints against changing hardware that has become obsolete or

that presents serious operations and maintenance problems. On the AWACS Program, we have been able to identify an investment in excess of $300 million that has been made to handle annual repair costs of about $16 million. We believe that this investment is excessive and that substantial savings could be made by selective use of contractor maintenance in many areas.

CONCLUSION

All of the areas covered by these eleven recommendations have been mentioned in other studies in the past. The Defense Science Board has a series of studies going back some ten years dealing with most of these subjects. There have been recommendations by the Aerospace Industry Association to the Defense Department covering many of these subjects. The Air Force Systems Command conducted an extensive study at Boeing in 1981 comparing commercial and military procurement practices; it also covered many of these same areas. While none of the ideas may be new, we believe that there is merit in pursuing them and in making changes to the contract to effect significant cost savings.

We believe strongly that these changes can result in significant savings and that the added risks are small and certainly cost effective. However, in order to implement these changes, it will be necessary to receive top level support from the Defense Department and the Air Force. None of these recommendations can be implemented at the working level. They require waivers to directives and policies; they will require waivers to the Defense Acquisition Regulations (DAR) and, in some cases, waivers or changes to statutory requirements. There will be a tremendous amount of bureaucratic pressure against implementing the recommended changes.

Management decisions can and should be made by the Air Force to implement these cost effective recommendations. This is directly responsive to President Reagan's recent executive order directing that all Federal departments implement procedural revisions to reduce government administrative costs and the AFSC "War on Costs". We have suggested use of the AWACS program as a test case and have made a commitment to the Air Force that we will submit proposals reflecting these savings and that we will pass on savings that we can negotiate with our subcontractors. It is our intention to pursue this as long as the Air Force indicates an interest in implementing cost effective changes to government procurement practices.

Procurement Practices Study

BOEING

M. E. Brislawn
May 24, 1983

BACKGROUND

Organizational depth studies - mid 1981

- Company wide
- Reduce overhead and management costs

Carlucci request - Oct 1981

- "Eliminate costly and unnecessary practices"

Procurement Practices Study

- Final report - Feb 1982
- Reviewed with ESD, AFSC
- Contract Proposals - starting June 1982
- Will reduce contract price

THE BOEING COMPANY

SEATTLE WASHINGTON 98124

T. A. WILSON
Chairman of the Board

November 24, 1981

Dear Mr Secretary:

Your recent letter enclosing a copy of your April 30, 1981 decision package requested our assistance and an exchange of ideas on a common problem of eliminating costly and unnecessary practices. I believe you are already familiar with the strong support which Boeing people provided to the effort that preceded the formulation of these recommendations. We are enthusiastic about the initiatives, and also about the packaging of the recommendations which emphasizes that each is related to and dependent on the others.

The management principles which tie these decisions together are sound and we endorse wholeheartedly the concept that we share responsibility for their implementation. The success of this effort will contribute very positively to the defense of the Nation.

We understand your concern about the need to control rising costs. The actions begun by the Administration to reduce and eliminate rules and regulations which are unnecessary or which do not meet a cost benefit test have reduced cost pressure in some areas of overhead which we cannot fully control. We are hopeful that those efforts will continue because they are needed and very productive. In this connection, you and your staff may be interested in specific examples of excessive and costly documentation requirements imposed by government contracts as perceived by our Boeing Aerospace Company. These examples, which have also been brought to the attention of the Department of Defense and the Armed Services at various times, are contained in a letter (enclosed) to Congressman Dave McCurdy, Chairman, Special Panel for Defense Procurement. Congressman McCurdy recently headed a group of junior congressmen who visited the Boeing Aerospace Company and solicited our comments as to how the Government and defense contractors can cooperate to reduce the cost of doing government business.

At Boeing we have mounted a vigorous campaign to reduce costs and eliminate sources of unproductive effort. It has already produced significant results and its momentum is increasing in every part of the Company. Just in the last six months over 30 organization reviews, which we call depth studies, were aimed at reducing overhead and management costs. We have also initiated an in-depth examination of the effort required in performing a major weapons system contract. The E-3A (AWACS)

program is being used as a test case. The objective is to develop a model program to show how we might eliminate unnecessary industry and government effort which adds cost without commensurate results in risk reduction or in product quality or performance. To achieve the savings that we believe to be possible in this area, we will need coordination and support from DoD components and probably also from the upper level government rule makers.

We welcome your continuing interest in our efforts to improve cost performance and look forward to opportunities to get together in the Pentagon to review our progress and exchange ideas on further improvements. In closing, I wish to repeat our endorsement of the concept that we share responsibility for the success or failure of our defense efforts.

Sincerely,

T. A. Wilson

The Honorable Frank C. Carlucci
Deputy Secretary of Defense
Washington, D.C. 20301

OBJECTIVE AND APPROACH

Objective

- Reduce product costs by simplifying procurement practices without deterioration of product performance, quality or operating costs

Approach

- Selected E-3A Program as test case
- Conducted detailed evaluation of
  - 217 terms & conditions
  - 318 mil-specs & standards
  - 566 specifications
  - 375 contract data items
- Compared commercial and military practices

E-3A PROGRAM BACKGROUND

Long, stable program:

- Development began in 1970
- Production authorized in 1975
- Production expected until early 1990's

Good history of cost consciousness:

- Specifications tailored to take advantage of commercial 707-320 production base
- Multi-year approach used on U.S. FY '80 - 83 and NATO
- Numerous cost reduction suggestions implemented

Still room for improvement

- Continue internal cost reduction program
- Seek USAF/DOD support

FINDINGS

1) Management reporting:
   - Requirements not associated with risks
   - Monthly cost reporting on 1,000 cost accounts per contract
   - Performance on 10-20,000 events, some as low as $5,000
   - Variance analysis on no longer correctable events

2) Follow-on procurement requirements:
   - 40,000 pages for U.S./NATO integrated program - plus 15,000 pages of specs
   - 5 C/SCSC reviews since 1980

3) Cost and pricing evaluation of subcontractors:
   - Cost versus price analysis
   - Approximately 200 a year required for subsystem suppliers
   - Imposed on airframe suppliers with 25 years of history

RECOMMENDATIONS

1) Tailor management reporting
   - Exception reporting
   - Frequency of reporting
   - Level of reporting

2) Simplify follow-on procurement requirements
   - Cost proposals
   - Other proposal documentation
   - Implementation reviews

3) Concentrate cost and pricing evaluation on high risk subcontractors

FINDINGS

4) Mandatory contract provisions:

- Thresholds as low as $2,500; many unchanged for 20 years
- Many companies dropping out of defense work
- BAC reporting on 200 separate contracts

5) Specifications:

- 566 specs under Class I control (85,000 pages)
- 180 more specs added for Saudi

6) Change processing:

- 150 changes a year
- 300 - 380 days to process
- One-third of administrative personnel work changes

RECOMMENDATIONS

4) Raise thresholds for mandatory contract provisions

- Not applicable to small or commercial firms
- Company wide rather than individual contract

5) Simplify specifications

- Eliminate CEI's after FCA
- Maintain top level specifications

6) Simplify change processing

- Block changes
- Parallel reviews

FINDINGS

7) Contract data:

- Each contract has approximately 100 data items; (220 for Saudi)
- 167 different offices receiving data
- Little success in removing data items

8) Spares ordering:

- Concurrent releases have saved 20 - 50%
- Contracting takes 210 - 240 days - longer than to build hardware
- Westinghouse spares pricing agreement

9) Government Property Procedures:

- E-3A has never received GFE from STE notifications
- AIA survey - 14 companies over 5 years; 22,000 requests, 29 items received of GFP ($150K)
- E-3A has processed 335 work requests - 50% under $5,000

RECOMMENDATIONS

7) Reduce contract data

8) Streamline spares ordering

- Concurrent ordering
- Catalog pricing

9) Simplify Government Property Procedures

- STE notifications
- GFE work requests

FINDINGS

10) Designated engineering/manufacturing representatives:

- General Marsh announced a shortage of 700 engineers in AFSC
- FAA full time support for 727/737/747 production and 757/767 development

  40 FAA engineers/215 DER's
  9 FAA inspectors/41 DMIR's

11) Organic maintenance:

- $300M investment for E-3A for annual repair costs of $16M
- 4200 reparables on AWACS Program

  2300 never repaired

  1300 - < 1 repair per year

  60 - > 1 repair per month

  4% of parts account for 45% of field repair cost and 70% of depot repair cost

RECOMMENDATIONS

10) Use designated engineering representatives and designated manufacturing inspection representatives

11) Use contractor maintenance in lieu of organic depot capability for:

- Commercial hardware
- Small quantity programs
- Complex technology areas

OTHER STUDIES

	DSB 1973	DSB 1977	DSB 1979	DSB 1980	AIA LETTERS 1980 81	CPP STUDY 1981
Tailor Mgmt Reporting	X	—	X	—	X	—
Simplify Follow-on Procurements	—	X	—	—	—	—
Limit Subcontractor Evaluations	—	—	—	—	X	—
Raise Thresholds for Suppliers	—	—	—	X	X	—
Minimize Spec Maint	X	X	X	X	X	X
Simplify Change Processing	—	—	—	—	—	X
Reduce Contract Data Lists	X	—	X	X	X	—
Streamline Spares	X	—	—	X	—	—
Simplify ST/STE & GFE	—	—	—	—	X	—
Use Designated Representatives	X	—	—	—	—	X
Use Contractor Maint	X	—	X	—	—	—

CONCLUSIONS

Recommended changes can result in significant savings

Changes are cost effective - little added risk

Top level support is required

- Directives and Air Force policies and regulations
- Defense acquisition regulations
- Pressure from "cultists"

Secure waivers pending regulation changes

Proposal commitment

- Boeing has submitted eight (8) proposals reflecting savings
- Will pass on any savings negotiated with suppliers

Industry support required

SPACE TELESCOPE SCIENCE INSTITUTE

DEVELOPMENT

OF

CONFIGURATION MANAGEMENT

AT THE

SPACE TELESCOPE INSTITUTE

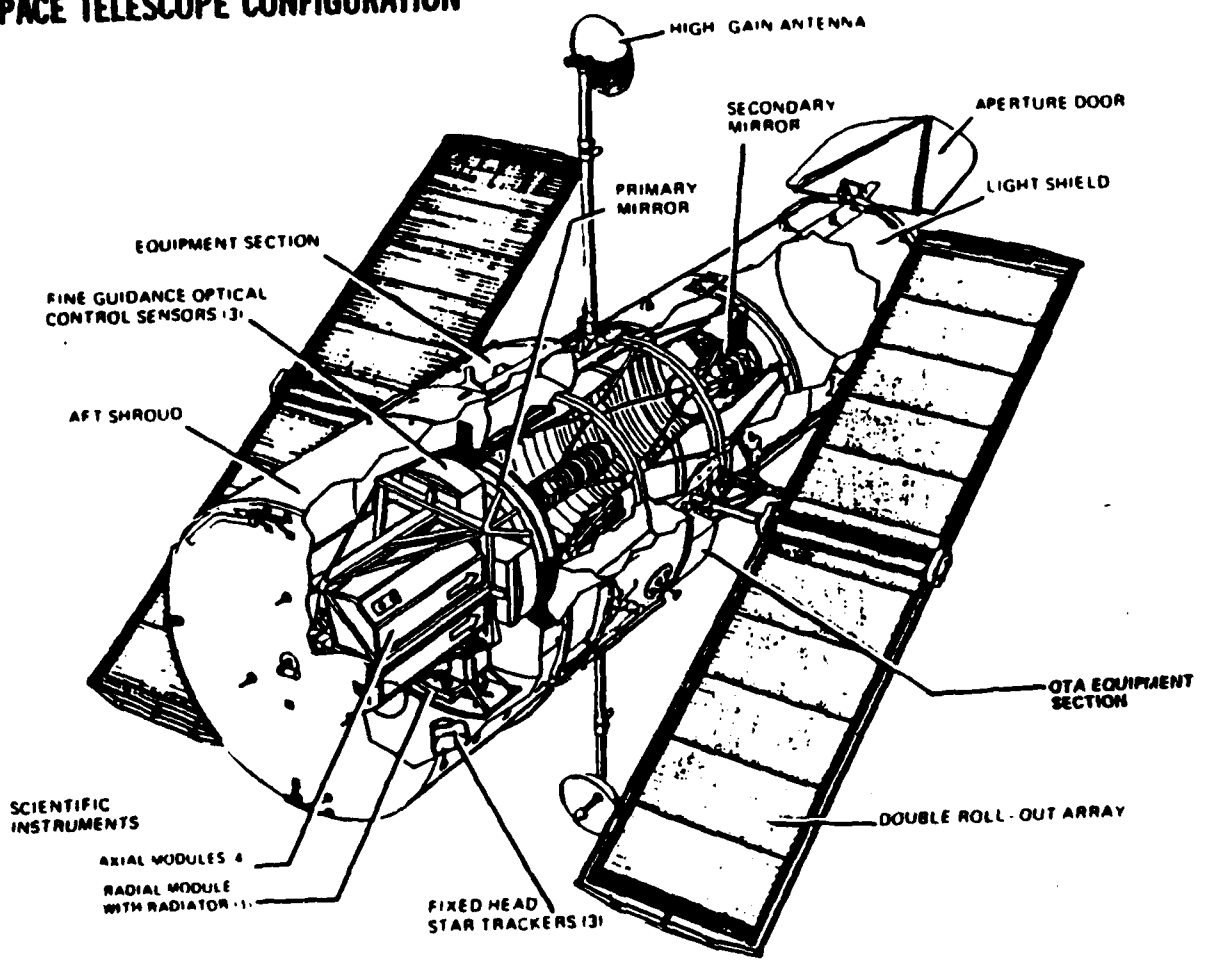
25TH ANNUAL ADPA-TDC

Date: 24 - 26 MAY 1983

Presenter: M. A. DANIELS

E

SPACE TELESCOPE CONFIGURATION



THE SPACE TELESCOPE SYSTEM

CONTROL ORGANIZATION

NASA HQ	o THE ST SYSTEM
NASA - MARSHALL (MSFC)	o THE TELESCOPE o INSTRUMENTS
NASA - GODDARD (GSFC)	o DATA CAPTURE o DATA PROCESSING o TRACKING/COMMAND
SPACE TELESCOPE INSTITUTE (ST ScI)	o GROUND DATA PROCESSING o ASTRONOMICAL OBSERVATORY o SCIENCE

THE ST ScI

- o INDEPENDENT ORGANIZATION OF AMERICAN UNIVERSITIES FOR RESEARCH IN ASTRONOMY (AURA)
- o RESPONSIBLE TO MAXIMIZE SCIENTIFIC RETURNS FROM THIS PROGRAM
  - PROVIDE REQUIREMENTS AND LEASE FACILITY
  - DEVELOP A GUIDE STARS SELECTION SYSTEM (GSSS)
  - DEVELOP A SCIENCE DATA ANALYSIS SYSTEM (SDAS)
  - OPERATE A SEPARATELY DEVELOPED SCIENCE OPERATIONS GROUND SYSTEM (SOGS)
- o SCIENCE OPERATIONS FOR SPACE TELESCOPE

CM REQUIREMENTS

SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC
Date: 24 - 26 MAY 1983
Presenter: M. A. DANIELS

ST ScI CM REQUIREMENTS

NASA CONTRACT REQUIRES ST ScI TO IMPLEMENT

o CM SYSTEM FOR

- PRODUCTS (GSSS, SDAS, BUSINESS SYSTEM)
- GFM ITEMS (SOGS)
- "PRIVATELY" DEVELOPED ITEMS (FACILITY, HARDWARE)

o DATA REQUIREMENTS DOCUMENT (DRD) SYSTEM

o COMPLY WITH CM STANDARDS

- DOD-STD-480A
- MIL-STD-490
- MIL-STD-1300
- DOD-D-1000B
- NASA GSFC GMI 8040.1A
- GSFC SPACE TELESCOPE PROJECT CM PLAN

ST ScI CM CONTROLS

o GSSS (HW AND SW - INTEGRATED)	~45,000 LINES OF CODE 2 MICRODENSIOMETERS
o SDAS (SW)	~50,000 LINES OF CODE
o SOGS (SW)	~60,000 LINES OF CODE
o FACILITY	LEASED BUILDING CONSTRUCTED AND MAINTAINED TO SPECS
o BUSINESS SYSTEM (HW & SW)	PRIME 550-II COMPUTER FINANCIAL PACKAGE VISION (DECISION SUPPORT SYSTEM) INFO (DATA BASE MANAGEMENT)
o COMPUTERS (HARDWARE)	2 VAX 11/750 2 VAX 11/780
o DRD	43 FORMAL DOCUMENTS

CM IMPLEMENTATION PROBLEMS

- o GROWING PROJECT
  - ALL REQUIREMENTS NOT KNOWN
  - SOME REQUIREMENTS NOT PRECISE
  - STAFFING FUNDED INCREMENTALLY (LATE)
  - MUST LIVE BY SOME "UNEDUCATED" EARLY CM PROCEDURES
- o STAFF CM ORIENTATION INADEQUATE
  - MAJOR PORTION FROM ACADEMIA
  - PROGRAMMER COMPLEMENT
- o OTHER
  - EQUIPMENT NOT IN PLACE
  - NON-CENTRALIZATION IN SOFTWARE DEVELOPMENT
  - COMPLEX INTERFACES

CONTROL AND ORGANIZATION

SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC
Date: 24 - 26 MAY 1983
Presenter: M. A. DANIELS

LEVELS OF CM CONTROL

NASA HQ	LEVEL I
MSFC	LEVEL II
GSFC	LEVEL III
ST ScI	LEVEL IV
PRODUCT TEAMS	LEVEL IVA
SUBCONTRACTORS	LEVEL V

CM/QA ORGANIZATION

- o CM OFFICER (FUNDED AFTER 1 YEAR)
- o QA OFFICER (FUNDED AFTER 2 YEARS)
- o SECRETARY (SHARED WITH PROGRAM MANAGEMENT)
- o PRODUCT LEVEL CM/QA (LEVEL IVA ASSIGNEES)

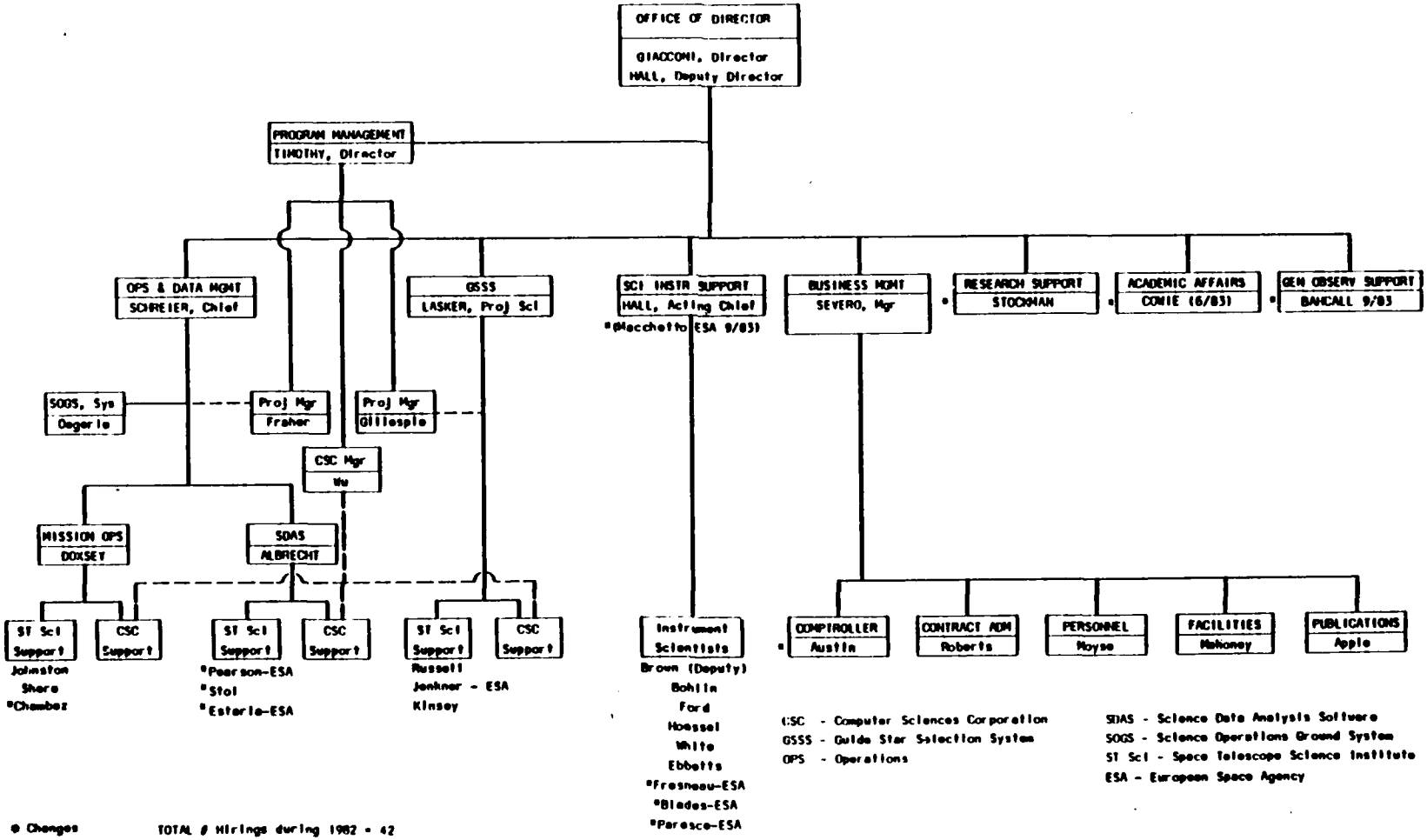
SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC

Date: 24 - 26 MAY 1983

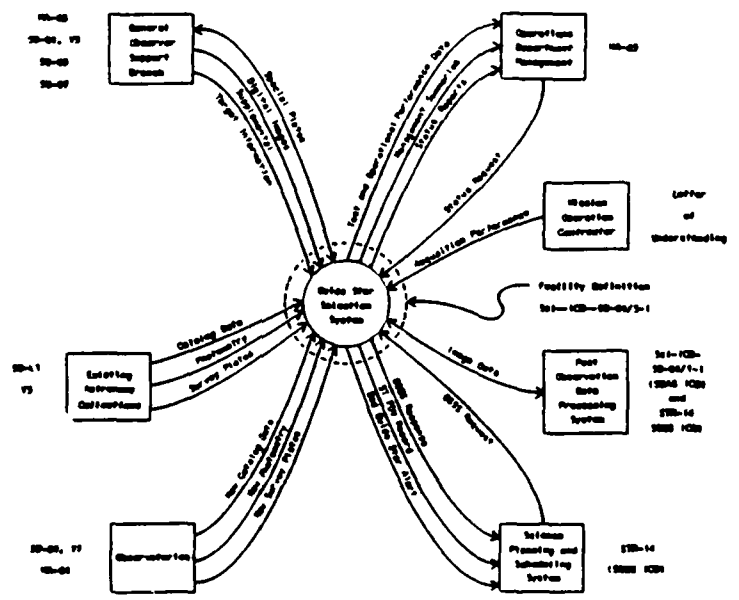
Presenter: M. A. DANIELS

ST SCI ORGANIZATION AS OF 12 MAY 1983
DEVELOPMENT PHASE

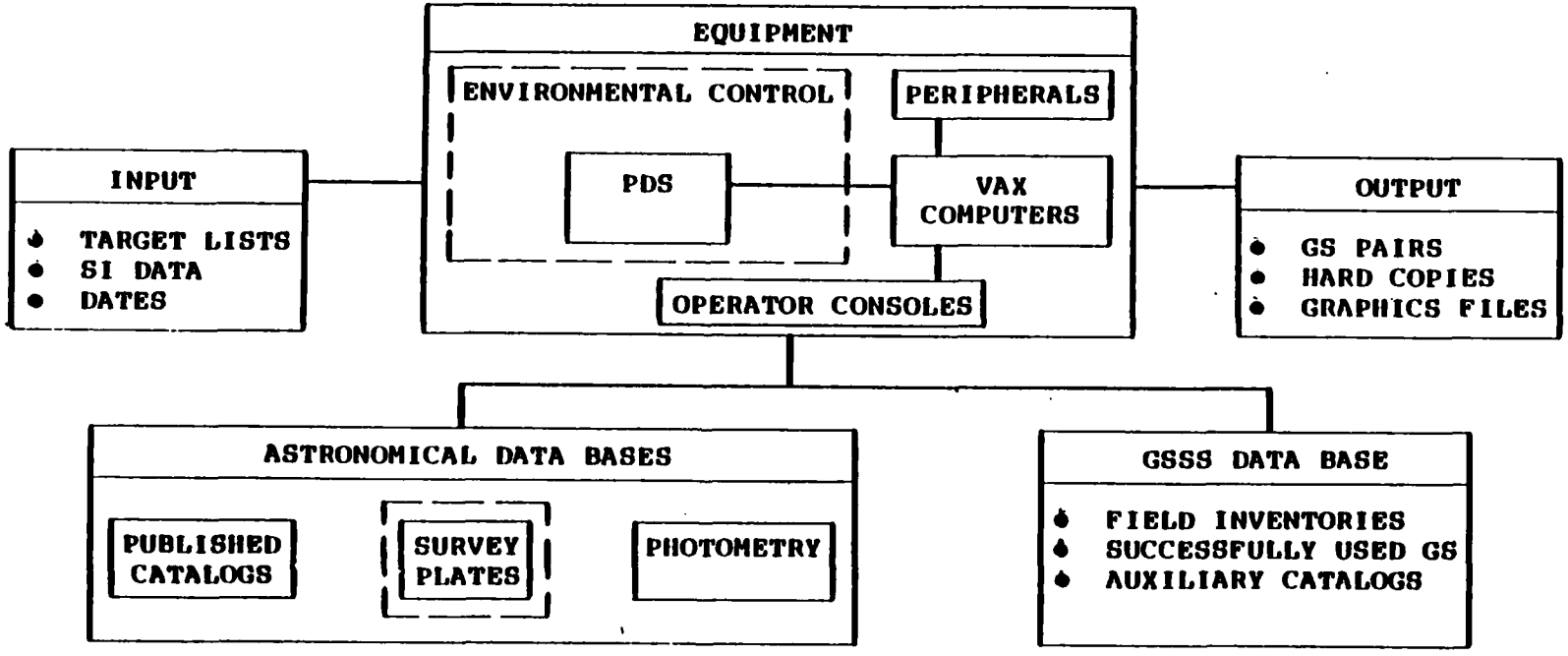


CM CONTROL ACTIVITIES

- CONFIGURATION MANAGEMENT PLAN
- CONFIGURATION CHANGE REQUEST (CCR)
- CONFIGURATION CONTROL BOARD (CCB)
  - CLASS I, CLASS II CCR
  - CCB DIRECTIVES
  - CCB RECORDS
- ASSIST LEVEL IVA BASELINING AND IDENTIFICATION
- STATUS ACCOUNTING (DATA BASE SYSTEM)
- AUDITS (INTERNAL, BY GSFC)
- DRD CONTROL AND RELEASE
- INTERFACE DOCUMENTS COORDINATION



GSSS DESIGN OVERVIEW



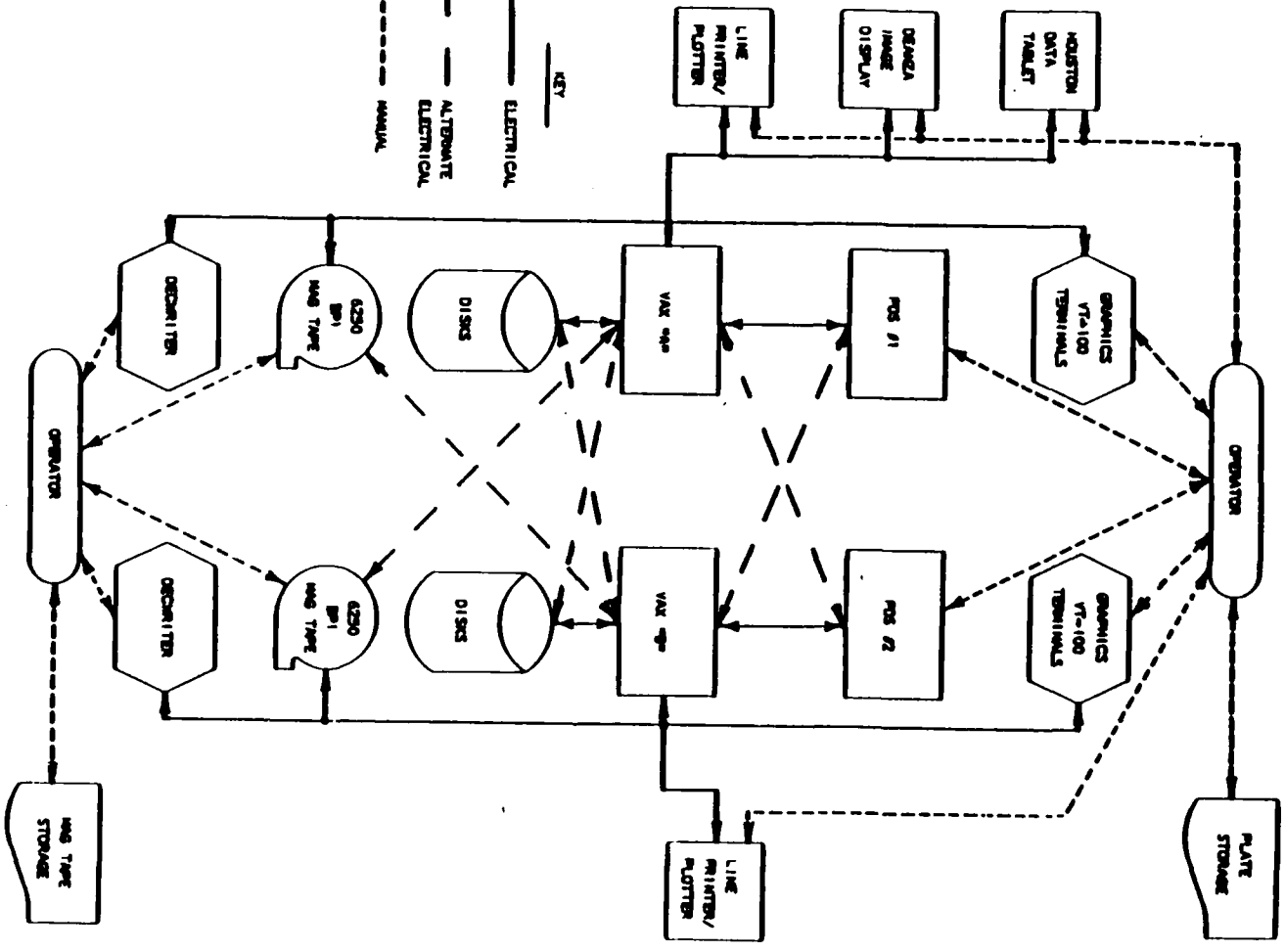
SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC

Date: 24 - 26 MAY 1983

Presenter: M. A. DANIELS

GSSS HARDWARE



SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC

Date: 24 - 26 MAY 1983

Presenter: M. A. DANIELS

Figure B-1a. Class I Configuration Change Request

CCR NO. _____
DATE INITIALED _____
CCB MEETING NO. _____
CCB MEETING DATE _____
MRB NO. _____

TITLE

ORIGINATOR _____ CODE _____ EXT. _____

APPLICABILITY

FOC ☐
FOS ☐ MISS. OPS. ☐
HRS ☐ OTHER ☐
HFPC ☐ _____
HSP ☐
SI CLSN ☐

CHANGE CLASS

I ☐ II ☐

TYPE OF CHANGE

POWER ☐ COST ☐ OTHER ☐
WEIGHT ☐ SCHEDULE ☐ _____

PRIORITY

DOCUMENTS AFFECTED

PROBLEM

PROPOSED SOLUTION

Figure B-1b. Class I Configuration Change Request (Continued)

CCR NO. _____
PCN NO. _____

ALL ITEMS MUST BE CHECKED. IF "YES" — A COMMENT IS REQUIRED. (REFERENCE ITEM TO IMPACT COMMENT(S) AND FOLLOW-UP RESPONSIBILITY).

ITEM	IMPACT YES	IMPACT NO	COMMENT	FOLLOW-UP
1. SCIENTIFIC INST.	☐	☐		
2. RE-QUALIFICATION TEST	☐	☐		
3. RE-ACCEPTANCE TEST	☐	☐		
4. MATERIALS	☐	☐		
5. RELIABILITY	☐	☐		
6. WEIGHT	☐	☐		
7. POWER	☐	☐		
8. STRUCTURE	☐	☐		
9 TELEMETRY AND DATA PROCESSING	☐	☐		
10. COMMAND	☐	☐		
11. OPTICAL	☐	☐		
12. THERMAL	☐	☐		
13. ELECTRICAL	☐	☐		
14. INTERFACE DOCUMNTN.	☐	☐		
15. TEST PROCEDURES	☐	☐		
16. TEST SOFTWARE	☐	☐		
17. SOFTWARE RQMTS.	☐	☐		
18. AGE (GSE)	☐	☐		
19. STOCC	☐	☐		
20. MISSION OPERATIONS	☐	☐		
21. SHUTTLE	☐	☐		
22. SCHEDULE	☐	☐		
23. ENGINEERING HOURS	☐	☐		
24. MANUFACTURING HOURS	☐	☐		
25. MATERIAL COST	☐	☐		
26. OTHER	☐	☐		

BOARD ACTION

APPROVE ☐
REJECT ☐
DEFER ☐
NOT REQ'D ☐

APPROVAL LEVEL REQUIRED

LEVEL I ☐
LEVEL II ☐
LEVEL III ☐

DIRECTION/ACTION REQUIRED

ECN ☐
ECP ☐
WAIVER ☐
DEVIATION ☐
TECH. DIRECTION ☐
CONTRACT MOD. ☐
OTHER (DEFINE) ☐

COMMENTS

SIGNOFF
CCB DATE _____ PROJECT MANAGER _____
CHD _____

CLOSEOUT ACTIVITY

ACTION DATE SIGNOFF

SPACE TELESCOPE SCIENCE INSTITUTE

Figure B-2a. Class II Configuration Change Request

CCR NO. _____
DATE INITIATED _____
CCB MEETING NO. _____
WBS NO. _____

TITLE

ORIGINATOR DEPT/BRANCH EXT.

APPLICABILITY
WBS 110 SCIENCE MST ☐
130 SYSTEM OPERATIONS ☐
140 OBSERVATION IMPLEM ☐
150 POST OBS. OPS. ☐
170 BUSINESS MST. ☐
180 FACILITIES ☐
190 PRELAUNCH PREP. ☐
195 GSSS ☐
196 SDAS ☐
OTHER ☐

CLASS
II

TYPE OF CHANGE
H/W ☐
S/W ☐
OPERATIONS ☐

PRIORITY
ST SCI PROCEDURES ☐
COST* ☐
SCHEDULE* ☐
OTHER ☐

DOCUMENTATION AFFECTED

PROBLEM

PROPOSED SOLUTION

* Changes impacting GSFC CI cost schedules are Class I. See MA-06 for instructions.

Figure B-2b. Class II Configuration Change Request (Continued)

CCR NO. _____
PCN NO. _____

IMPACT
PLEASE EXPAND ANY "YES" IMPACT BY A COMMENT.

ITEM	IMPACT YES	IMPACT NO	COMMENT	FOLLOW-UP
1. STAFFING	☐	☐		
2. ORGANIZATION	☐	☐		
3. SCHEDULE	☐	☐		
4. FACILITY SPECIFICATIONS	☐	☐		
5. MANHOURS	☐	☐		
6. H/W SYSTEM RQMTS.	☐	☐		
7. S/W SYSTEM RQMTS.	☐	☐		
8. OPERATIONS RQMTS.	☐	☐		
9 H/W SYSTEM SPECIFICATIONS	☐	☐		
10. S/W SYSTEM SPECIFICATIONS	☐	☐		
11. H/W TEST PROCEDURES	☐	☐		
12. S/W TEST PROCEDURES	☐	☐		
13. SYSTEM TEST PROCEDURES	☐	☐		
14. INTERFACE DOCUMENTATION	☐	☐		
15. Q.A.	☐	☐		
16. C.M.	☐	☐		
17. S.I. PROCEDURES	☐	☐		
18. G.O. PROCEDURES	☐	☐		

BOARD ACTION
APPROVE ☐
REJECT ☐
DEFER ☐
NOT REQ'D ☐

APPROVAL LEVEL REQUIRED
LEVEL III ☐
LEVEL IV ☐

DIRECTION/ACTION REQUIRED
WAIVER ☐
DEVIATION ☐
TECH. DIRECTION ☐
CONTRACT MOD. ☐
DOCUMENT CHANGE ☐
OTHER ☐

COMMENTS

SIGNOFF
CCB DATE _____ ST SCI DIRECTOR _____
CMO _____

CLEAROUT ACTIVITY

ACTION	DATE	SIGNOFF

SPACE TELESCOPE SCIENCE INSTITUTE

TO: _____ DATE: _____

FROM: Adrienne Timothy, Director Program Management

SUBJECT: CCB Directive No.

The following CCR, having been approved, is authorized for implementation:

CCR No.	Subject	To be Implemented

Special Instructions:

Upon completion of implementation, this form (with below listed information) is to be returned to the ST ScI CMO office. All resulting documentation is to be attached to this reponse.

/vs

Encl.: CCR Package

cc: Mike Daniels
Riccardo Giacconi
Everett Roberts

To: CMO From: Date:

Implementation of this directive was completed on _____. All resulting documentation is enclosed.

Encl. _____ (signature, date)

SCCM 12
(12/16/82)

DRD CONTROLS

- PRELIMINARY AND FINAL VERSIONS
- SEVERAL LEVELS OF CCB/CM CONTROLS
- ALL REQUIREMENTS TREATED AS SPECS (MIL-STD-490)

Table 6-1. FORMAL DOCUMENT—CONFIGURATION CONTROL

ST SoI Deliverable	T.O. APPROVAL AND LEVEL III CCB Control	T.O. APPROVAL AND LEVEL IV CCB Control	LEVEL IV CCB Only	LEVEL IVA
MA-01 MONTHLY PROGRESS REPORT				X
MA-02 REVIEW DATA PACKAGE				X
MA-03 TECHNICAL MANAGEMENT PLAN		X		
MA-04 CONFIGURATION MANAGEMENT PLAN		X		
MA-05 BUSINESS MANAGEMENT PLAN		X		
MA-06 ANNUAL BUDGET AND FIVE-YEAR PROJECTION	X			
MA-07 CONFIGURATION DEFINITION	X			
MA-08 FACILITIES DEFINITION			X	
SO-01 GENERAL OBSERVER/ARCHIVAL RESEARCH USER MANUALS			X	
SO-02 TRAINING REQUIREMENTS AND IMPLEMENTATION PLAN		X		
SO-03 SCIENCE DATA ANALYSIS IMPLEMENTATION PLAN				
VOLUME 1 - MANAGEMENT PLAN		X		
VOLUME 2 - REQUIREMENTS	F*	P		
VOLUME 3 - DESIGN	AT S/W DELIVERY	P,F		

NOTES: X - All Deliveries
F - Final
P - Preliminary
U - Update

Figure C-1. Specification Change Notice (SCN)

1. ORIGINATOR NAME AND ADDRESS	2. ☐ PROPOSED ☐ APPROVED	3. CODE IDENT	4. SPEC. NO.	
		5. CODE IDENT	4a. SPEC DATE	6. SCN NO.
7. SYSTEM DESIGNATION	8. RELATED LOP NO.	9. CONTRACT NO.	10. CONTRACTUAL AUTHORITY	
11. CONFIGURATION ITEM NOMENCLATURE		12. EFFECTIVITY		

THIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS SCN. THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES, COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4, CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

13. SCN NO.	14. PAGES CHANGED (INDICATE DELETIONS)	*S	*A	15. DATE
	PAGES CHANGED AND TRANSMITTED HEREWITH			
SCN NO.	CCR NO. / SUMMARY OF PREVIOUSLY CHANGED PAGES			
16. TECHNICAL CONCURRENCE		DATE		

Figure D-1. Document Change Record

Release
Date:

DOCUMENT CHANGE RECORD

Sheet:

CHANGE DOCUMENT

COPY NO.

Numbered | Revision | Dated

Change (Date)	To Incorporate the Change into the Document: 1. ADD PAGES:	2. REMOVE PAGES:	Other Comments Regarding This Change (Auth., Instruct., Etc.)

Note: After reviewing the document, file this sheet in document preceding Table of Contents.

SOFTWARE CONTROL

- PROGRAM DESIGN LANGUAGE (PDL)
- CODE MANAGEMENT SYSTEM (CMS)
- REVISION CONTROL SYSTEM (RCS)

SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-IDC
Date: 24 - 26 MAY 1983
Presenter: M. A. DANIELS

THE SDAS CODE MANAGEMENT SYSTEM

- o FACILITATES DOCUMENTATION, STANDARDIZATION, QUALITY ASSURANCE, AND CONFIGURATION CONTROL FOR SDAS DESIGN, CODING, AND TESTING
- o UTILIZES PDL AS BASIC UNIT OF DESIGN CONTROL
- o PROVIDES EASE OF DOCUMENT PRODUCTION VIA A COMMERCIAL PDL PROCESSOR
- o CONTAINS FOUR MAJOR SEGMENTS
  - PROLOG GENERATION (FOR EACH MODULE)
    - -- UNIQUE NAMING AND HIERARCHICAL NUMERICAL IDENTIFICATION
    - -- KEYPHRASE DESCRIPTION (TO AID IN CROSS-REFERENCING)
    - -- DETAILED DESCRIPTION (REQUIREMENTS FROM SO-03, VOLUME 2; CALLS TO COMMERCIAL LIBRARY SUBROUTINES; AND FOR EACH MAIN, ASSUMED HLCL LINKS TO OTHER MAINS)
    - -- CALLING SEQUENCE
    - -- DEVELOPMENT HISTORY (QUALITY ASSURANCE AID)
  - CONFIGURATION CONTROL LIBRARY
    - -- USES VMS UTILITIES AND HIERARCHICAL DIRECTORY STRUCTURE
    - -- PROVIDES ARCHIVING MECHANSIM FOR OLD FILE VERSIONS

SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC

Date: 24 - 26 MAY 1983

Presenter: M. A. DANIELS

```
2908    #  1
2909    #  2     Module Number: 6.1.6.2
2910    #  3
2911    #  4     Module Name: G Two-Dimensional Merged Array Parameters
2912    #  5
2913    #  6     Keyphrase:
2914    #  7     ----------
2915    #  8     Compute starting science coordinates and dimensions of merged array
2916    #  9
2917    # 10     Description:
2918    # 11     ------------
2919    # 12     This routine accepts an array containing the limiting coordinates of the
2920    # 13     input data windows of the two-dimensional science data arrays to be
2921    # 14     merged, and the x- and y-coordinate intervals in scientific units (e.g.
2922    # 15     right ascension and declination).  It returns the starting coordinates
2923    # 16     and the required dimensions of the merged science data array.
2924    # 17
2925    # 18     FORTRAN Name: MMRGPR
2926    # 19     -------------
2927    # 20
2928    # 21
2929    # 22     Inputs:
2930    # 23     -------
2931    # 24     COORDINATE_LIMITS_ARRAY
2932    # 25     NUMBER_SCIENCE_FILES_TO_MERGE
2933    # 26     SCIENCE_DATA_ARRAY_INTERVALS
2934    # 27
2935    # 28     Outputs:
2936    # 29     --------
2937    # 30     MERGED_ARRAY_STARTING_COORDINATES
2938    # 31     MERGED_ARRAY_DIMENSIONS
2939    # 32     STATUS
2940    # 33
2941    # 34        Version    Date         Author      Description
2942    # 35            2    15-FEB-1983  J.R. SEWALL  INSERT PDL
2943    # 36            1    15-FEB-1983  J.R. SEWALL  Prolog Generation
2944    # 37
2945    # 38
2946    # 39        MERGED_SCIENCE_DATA_ARRAY
```

BASELINING AND IDENTIFICATION

REQUIREMENTS

- SYSTEM SPECS GIVEN BY
  - NASA CONTRACT
  - *INTERFACE CONTROL DOCUMENTS*
- SYSTEM AND DETAILED REQUIREMENTS DOCUMENTS RESPONSE BY ST Scl
- REQUIREMENTS BASELINED
- REQUIREMENTS CHANGE CONTROL
- PDL BASELINED AT EACH DESIGN REVIEW

IDENTIFICATION

HARDWARE

- VENDOR NUMBER SYSTEM
- FACILITY DRAWINGS (CONTRACTOR SYSTEM)

SOFTWARE

- PDL MODULE NUMBERING SYSTEM
- *"AS BUILT" SW (VENDOR SYSTEM)*

SPACE TELESCOPE SCIENCE INSTITUTE

25TH ANNUAL ADPA-TDC
Date: 24 - 26 MAY 1983
Presenter: M. A. DANIELS

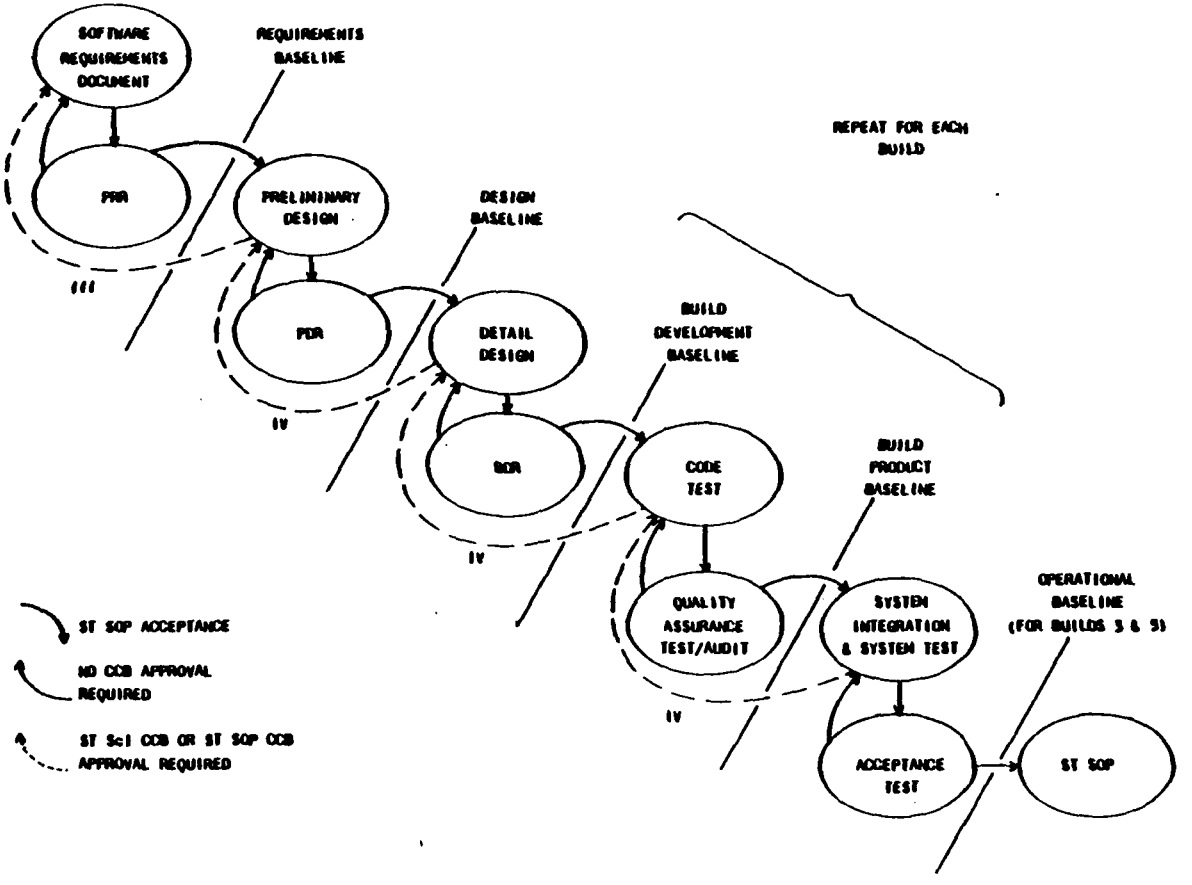


Figure 6-3. Change Control Across Baseline Boundaries

STATUS ACCOUNTING

APPROACH

- o STAFF SMALL - TYPING WORKLOAD
- o AUTOMATED SYSTEM - BEST SOLUTION
  - DEVELOP DATA BASE
  - INTERACTIVE TERMINAL
  - VIRTUALLY UNLIMITED REPORT CAPABILITY
- o STATUS ACCOUNTING SYSTEM DEVELOPED AND IMPLEMENTED
  - VISUAL 50 TERMINAL
  - DATA BASE (INFO ON PRIME 550 COMPUTER)
  - INTERFACE WITH NBI SYSTEM 64 (CHOICE OF FONT)
  - INTERFACE WITH VAX PROGRAM DEVELOPMENT COMPUTERS (ACCESS RCS, CMS)

Report SCI - CMC1

Effective Date: 04/30/83

ST ScI CCR STATUS

CCR No. / Title	Class	CCB Level	CCB No/Date	Disposition / Remarks/Status	CCBD No/Date	Implem. Date
001 SO-03 SDAS, Vol 2 Requirements	1	3	82-01 11/01/82	Approved Awaiting Implementation	302 03/14/83	
002 SO-04 GSSS Documentation, Vol. 2	2	4	82-02 11/18/82	Approved Implemented	201 12/21/82	02/15/83
002R1 Revision of CCR 002	2	4	82-03 11/24/82	Approved Implemented	201 12/21/82	02/15/83
003 Proposed Chg. to Funct. Spec. NAS5-26555	1	3	82-04 12/20/82	Rejected		
004 Changes to SO-03, Vol 2 SDAS Req.	1	3	82-04 12/20/82	Rejected		
005 SO-04, Vol. 2 Revision	2	4	83-01 02/10/83	Approved Implemented	301 02/10/83	02/15/83
006 SO-03 SDAS, Vol. 3 Design	2	4	83-02 03/07/83	Approved Implemented - Continuous Implementation	304 03/31/83	02/22/83
007 Prop. Changes to SO-03, Vol. 2, Requirements	1	3	83-02 03/07/83	Approved by Level 4 CCB Forwarded to Level III CCB		

Report SCI - CMD2

Effective Date: 04/30/83

ST ScI DRD STATUS

DRD NO. / CHANGE SET	CURRENT DRD ID / ID	DATE / DATE	CONTROL / RELEASED/DATE	TITLE / STATUS/REMARKS
MA-03 ---	82004C ---	03/24/82 ---	Level 4/TO ---	Technical Management Plan Revision in progress - not yet baselined
MA-04 ---	82005D ---	03/07/83 ---	Level 4/TO ---	Configuration Management Plan Baselined
MA-05 --	82001D ---	01/07/83 ---	Level 4/TO ---	Business Management Plan Baselined
MA-06 ---	82033A ---	09/14/82 ---	Level 3 ---	Annual Budget and Five-year Proj. -----
MA-08 ---	82010B ---	12/07/82 ---	Level 4 ---	Facilities Definition Baselined - New format document definition in progress.
SO-03,V1 ---	82011C ---	06/14/82 ---	Level 4/TO ---	SDAS - Management Plan Baselined
SO-03,V2 ---	82015C ---	08/13/82 ---	Level 3 ---	SDAS -Requirements Baselined

Notes:

1. This report does not include recurring items, such as the MA-01, MA-02, CO-01, nor special studies, analyses and ICD inputs.
2. All baselined DRDs are under strict CM control for changes, revision and release.

CM AUDITS

TYPES OF AUDITS

TYPE	INTEREST
INFORMAL	PREPARATORY FOR LEVEL IVA o KNOW CM RESPONSIBILITY o SYSTEM IN PLACE o PROCEDURES
FORMAL	FUNCTIONAL PHYSICAL
NASA GSFC	FUNCTIONAL OR PHYSICAL

WHAT IS AUDITED

- o GSSS HARDWARE AND SOFTWARE
- o SDAS SOFTWARE AND COMPUTERS
- o SOGS SOFTWARE CHANGES
- o BUSINESS SYSTEM HARDWARE AND SOFTWARE CHANGES
- o FACILITY CHANGES (DRAWINGS, PHYSICAL AUDIT)
- o DOCUMENT CONTROL (PUBLICATIONS MASTERS)

SESSION 2

Workshop Coordinator

MRS. LORNA BURNS
Hughes Aircraft Company

See sections R, S, and T for Session 2 workshop summaries.

SESSION 3

Chairman: MR. RICHARD R. BARTA
IBM Corporation

Secretary: MR. JOHN R. SUTTON
General Electric Company
Ordnance Systems

USS NEW JERSEY REACTIVATION AND MODERNIZATION

by

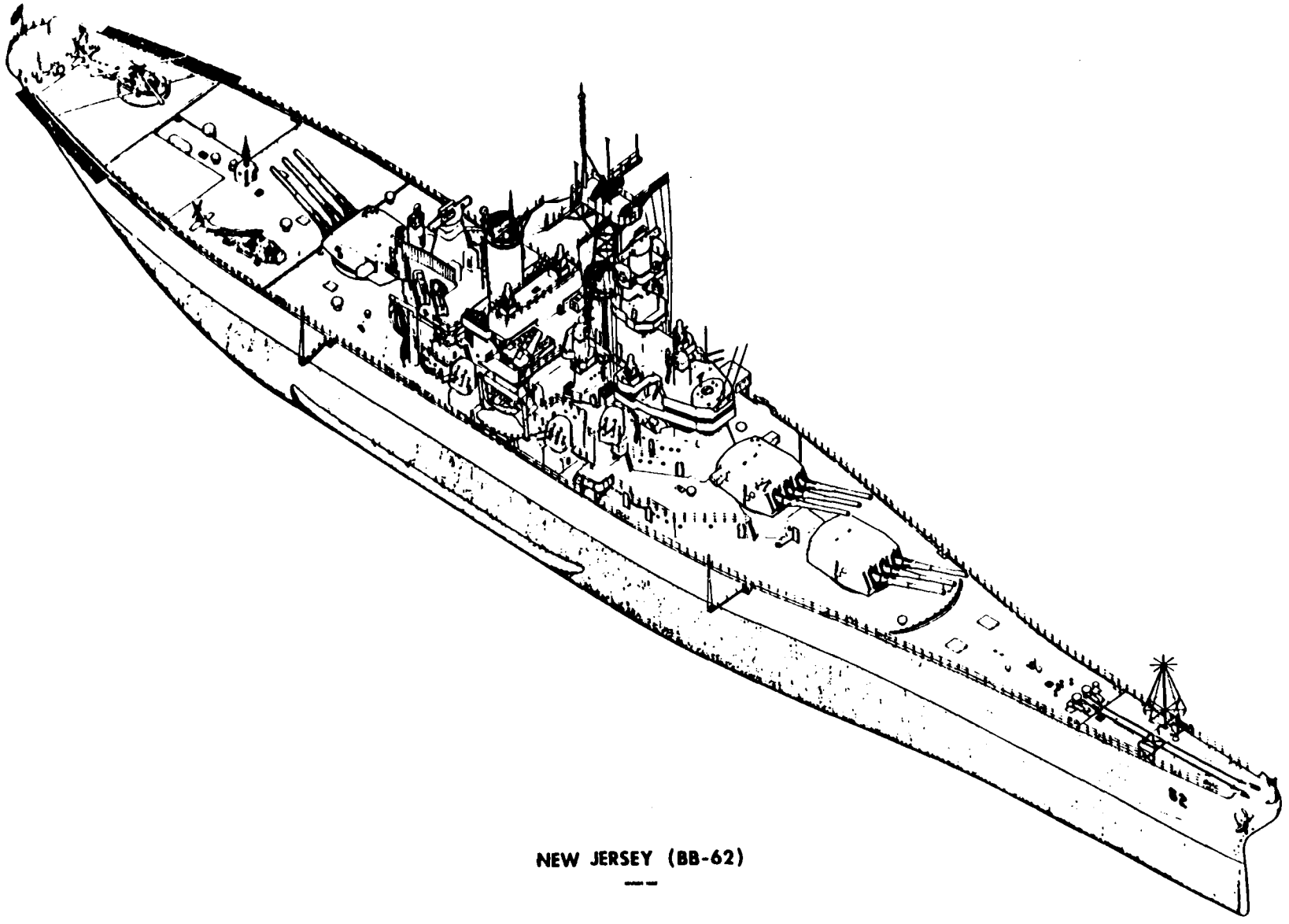
James R. McGregor

and

Allan D. Signore

NAVAL SHIP WEAPON SYSTEMS ENGINEERING STATION

Port Hueneme, California



NEW JERSEY (BB-62)

INTRODUCTION - The NEW JERSEY is one of the four IOWA Class battleships. She displaces 58 thousand tons, is 887.6 feet long, 108.2 feet wide at the beam and has a 38 foot draught fully loaded. With the exception of the two Japanese YAMATO Class battleships, they are the largest ever built. (Figure 1)

NEW JERSEY is powered by four Westinghouse geared turbines which develop 212 thousand horsepower, the steam being supplied to these turbines is from eight Babcock and Wilcox boilers. The ship can make in excess of 36 knots, she is the fastest non-nucellar powered major combatant in the world. The NEW JERSEY carries 9 thousand tons of fuel which relates to a cruising range of 5,000 miles at 30 knots or 15,000 miles at 17 knots. She is manned by 80 officers, 1600 enlisted men, 2 marine officers and 42 enlisted marines.

The armor of the NEW JERSEY is unsurpassed in any ship ever built. The main armor belt is 12.1 inches thick and encircles the entire ship, this belt is increased to 13.5 inches in the area of the screws to protect them from torpedo hits. The turret faces are 17 inches thick, the top of the turret is 7.25 inches, the sides and backs, 12 inches, and the entire barbette is 11.6 inches thick. The main armor deck is 6 inches thick and extends throughtout the ship, it is located one deck below the main deck. The conning tower, both the fore and aft fire control towers are 17.3 inches thick.

The ship carries three 3 Gun 16"/50 Turrets. Each turrets weigh over 5,000 tons. The 16"/50 gun fires a projectile which has an average weight of 2,000 lbs. The heavest being the armor piercing at 2,700 lbs. and the lightest, the high capacity at 1,875 lbs. In addition to these standard projectiles the gun is capable of firing the new MK 19 anti-personnel projectile, this projectile contains 400 individual bomblets. Each round is propelled by a 660 lb. powder charge, made up of six 110 lb. powder bags, each wrapped in a wear reducing jacket (these jackets were developed during the Viet Nam Conflict and decreases gun wear by a factor of 10). The 16"/50 has a range of 23 miles and with the new rocket assist projectile, that is under development, 40 miles.

In addition to the 16"/50 battery, the ship has six 5"/38 Twin Gun Mounts. The projectiles for these guns come in a variety of configurations such as; White Phospherous, Armor Piercing, High Capacity, Illumination and the rocket assisted projectiles. Maximum range for normal projectiles is 9 miles and for the RAP, 15 miles. Fuzing for these projectiles is adapted for the mission to be fired, for example; infra-red and variable time fuze (radar) is for anti-air warfare; base detonating, point detonating and mechanical time fuzes for surface warfare and naval gun fire support missions.

Anti Ship Missile Defense (ASMD) is provided by four Phallanx, Close-In-Weapon-Systems (CIWS). These systems are of the latest technology, they have a firing rate of 6,000 rounds per minute, with a 2 second reaction time. ASMD is also provided to the ship by eight Super Rapid Blooming Outboard Chaff Rocket launchers for deception purposes and the latest in electronic counter measure equipments.

A new offensive punch has been added to the NEW JERSEY in the form of cruise missiles. She carries 32 TOMAHAWK missiles and 16 HARPOON missiles. The TOMAHAWK can be fired at-sea targets up to 400 miles in range and at over-land targets at 1500 miles. The HARPOON missiles will be employed against shipping targets out to 200 miles. Targeting information for these missile system is received aboard ship by a form of the Naval Tactical Data System from many remote sources.

During World War II NEW JERSEY fired 771 rounds of 16", during the Korean War she fired 6,671 rounds. By contrast during the short 120 day period when she was deployed to Viet-Nam 5,688 rounds were fired. During this same period she also fired 15,000 rounds of 5".

On 28 December this magnificant man-o-war was recommissioned for the fourth time by the President of the United States.

Mr. Al Signor also of NSWSES will now go into some of the problems and solutions we incountered in outfitting the NEW JERSEY with the documentation required for operation and maintenance of the ship and the installed equipments and systems. Upon completion of his presentation we will show a short film entitled "American Dreadnaught". It is the story of NEW JERSEY up to her entry into the Viet-Nam Conflict.

TECHNICAL DOCUMENTATION - The Naval Ship Weapon Systems Engineering Station was tasked by the Naval Sea Systems Command to take control of and manage the data assets for the Weapons Department of the USS NEW JERSEY. (Figure 2)

All of the data assets were sealed in the Weapons Department technical library. That is, the hatchway entrance was welded shut. A crew of personnel from the shipyard (Bremerton) removed the data from the shelves and packed it into 72 boxes, the total weight being approximately 5 tons.

Much of the data contained historical as well as still classified documents. Because of this, Navy regulations required the data be accompanied by a guard who flew on the same commercial airplane and stayed with the material while it was transferred to a waiting Navy van at Los Angeles for transportation to Port Hueneme. He then accompanied the van to the Station where it was placed under guard until I took it over.

The first job was to inventory the data assets to determine what was available and to establish a data base for the 4 Battleships. Since the NEW JERSEY was the last ship of its Class to enter the mothball fleet (1969) after the vietnam war it was felt the data could be utilized for the other 3 Battleships (Iowa, Wisconsin, and Missouri). (Figure 3)

There were approximately 867 different publications ranging from an old MK 1A Gun Computer to the latest on the 16"/50 Caliber Guns in the three turrets. In some cases there were several copies of the same publication. These were removed and forwarded to the Naval Ordnance Station, Louisville for reprinting and further distribution to the various commands.

Approximately 1,042 drawings and lists of drawings were contained on 35mm microfilm aperture cards. These were sorted into drawing number sequence and a print-out made. A copy of this listing was also forwarded to the Naval Ordnance Station, Louisville for review and for establishing a new microfilm data package for the Battleships.

There were over 1,500 hard copy blueprints inventoried. Many of these had been revised to indicate changes to the equipments made by Shipyard and ship's personnel. A listing of all these was made and supplied to various users.

In addition, there were many files of correspondence which were not only of historical value but of importance concerning shipboard procedures for maintenance and operations of the gun systems.

Reprinting of many of the publications was necessary since several were "one-of-a-kind" and no other copies existed. The reprints were necessary in order to accomplish the necessary training and establishing of a publications library for the other Battleships. (Figure 4)

Several of the publications and hard copy drawings were used by the Long Beach Naval Shipyard to renovate, replace, and repair equipments during the renovation and installation of new equipment and weapon systems. These were marked up and returned to the ship after being microfilmed.

Also, some of the publications that were reprinted were used by contractors and navy personnel to train the crews on the various gun systems.

Not only did we furnish the technical publications, but in the case of the NEW JERSEY training at our Seal Beach facility, we provided the instructions as well. We taught 321 NEW JERSEYMEN over 2200 hours of classroom instructions in 13 courses.

The courses we developed for this effort has been provided to Naval Training Center, Great Lakes, as a basis for their course development for the IOWA crew. We also taught the marine detachment operations and maintenance of the 5"/38 twin mount.

The Naval Ordnance Station, Louisville is responsible for the publications and microfilm of the engineering drawings for all the gun systems and related equipments.

The USS IOWA is presently undergoing a 2 year renovation period by the Ingalls Shipyard at Pascagoula, Mississippi. The IOWA has a long way to go before it will be ready for re-commissioning. Much of the publications and microfilm of the engineering drawings is being supplied to the shipyard for the renovation.

Several contractors, J. J. McMullen, EG&G, etc. are all using the data from the NEW JERSEY in the performance of their studies and work efforts in the renovation program.

Training of ships' personnel has been accomplished in the use of the microfilm, publications, and drawing files. (Figure 5)

A new dry-copier reader printer was supplied to the ship for making instant prints from the microfilm. Also a new file was provided for the storage of the microfilm.

A listing of all the publications and microfilm was supplied to the ship from the inventory records.

PROBLEMS - There is a lack of illustrated parts breakdowns of much of the equipment. At present I am making a listing, by title, of all the parts lists (Lists of drawings and Sketch listings, LDs and SKs) and showing the related listing that can be consulted on an "as needed" basis. (Figure 6)

Some of the microfilm is keypunched on the aperture card different than what is actually on the document. Several are punched as "LD12345" when the document is "SK12345". It is intended to supply this listing to the ship for use until the Naval Ordnance Station is able to supply IPBs.

The Publications Allownce List is way out of date and efforts are underway to provide an updated PAL as soon as possible.

At this time we would like to present the film "American Dreadnaught".

PACKED 72 BOXES (WEIGHING APPROX 5 TONS) OF DATA WHICH WERE SEALED IN THE WEAPONS DEPARTMENT LIBRARY

- REMOVED FROM SHIP AND FLOWN UNDER GUARD TO LAX - LOADED INTO TRAILER VAN AND DELIVERED TO NSWSES.

INVENTORIED ALL PUBLICATIONS, MICROFILM AND HARD COPY DRAWINGS

- APPROX. 867 DIFFERENT PUBLICATIONS WITH MULTIPLE COPIES
- OVER 1,042 DRAWINGS LISTS ON MICROFILM
- OVER 1,500 HARD COPY DRAWINGS
- MANY LETTER FILES CONTAINING HISTORICAL DATA

PROVIDED PUBLICATIONS AND HARD COPY DRAWINGS FOR

- REPRINTING (FOR IOWA, WISCONSIN & MISSOURI)
- MODIFICATION/ REPAIR OF WEAPON EQUIPMENTS
- INSTALLATION OF NEW EQUIPMENT (ELECTRONICS, HARPOON, & TOMAHAWK)
- TRAINING AT SEAL BEACH, NSWSES, AND GREAT LAKES
- NAVAL ORDNANCE STATION, LOUISVILLE
- PASCAGOULA, MISSISSIPPI YARD FOR U.S.S. IOWA
- CONTRACTORS WORKING ON PROGRAMS FOR THE SHIP

PROVIDED

- TRAINING FOR SHIPS' PERSONNEL IN USE OF MICROFILM
- NEW READER/PRINTER AND MICROFILM STORAGE CABINET
- LISTINGS OF ALL THE PUBLICATIONS AND MICROFILM

PROBLEMS

- LACK OF ILLUSTRATED PARTS BREAKDOWNS OF OLD EQUIPMENTS
- DATA MOUNTED ON MICROFILM NOT IDENTIFIED BY CORRECT DOCUMENT NUMBER
  - NSWSES PRESENTLY REVIEWING AND WILL PROVIDE LISTING OF ALL EQUIPMENTS BY PARTS LIST NUMBER AND "WHERE TO FIND IT"
- PUBLICATIONS ALLOWANCE LIST NEEDS TO BE UPDATED

MANAGING CHANGE IMPLEMENTATION
(Control of problems after change release)

by

John Nast
NAST & Associates

SUMMARY

Implementing changes into production has its own characteristic problems. (They seem to be multipied by the rate at which changes are made.)

This paper presents the findings of a recent project to resolve change management problems for a manufacturer of magnetic computer storage equipment. Every activity in Manufacturing and Quality Assurance were affected by configuration control problems such as poor planning, not meeting schedule, surplus and shortages of material, implementing changes that don't work, support documents not available with first shipment, not knowing the correct change level, etc. The approach used in this paper may be tailored to resolve similar problems in other company environments.

Resolution of the problems requires:

- Motivated people.
- Fully coordinated planning.
- Tracking status of implementation.
- Effective reporting.
- Corrective action when needed.
- Clear delegation of responsibilities.
- Documented procedures.

INTRODUCTION

About ten years ago, I established an Engineering Change Control System for a major manufacturer of computer equipment. The scope of the project extended only to distribution of microfilm to Manufacturing. At that time, we obtained a commitment by Manufacturing that they would document their internal procedures for Change Review and Implementation.

Late in 1981 I returned to resolve some production problems, primarily associated with the implementation of changes. (They had not developed the promised procedures.) This paper is based on that assignment.

GENERAL BACKGROUND

Although this paper is based on a commercial application, the basic concepts of change control are quite similar to Government Contracts.

A comprehensive change review system had been established to determine the Design, Production, and Field impact of proposed changes. Schedule, cost, and technical data was obtained for authorization and was also used to establish an "Implementation Date".

After sale, the product is installed, maintained, and upgraded by the Manufacturer; therefore, the logistic aspects of their change control is quite similar to Government programs.

Production requirements were oriented to meeting a schedule and did not initially include the internal detail needed to accomplish it. Except for mature products that seldom change and small companies, procedures and tracking systems are needed.

CHARACTERISTICS OF CHANGE: SLIDE 1

Product Stability/Sensitivity influences change type, frequency, and the probability of introducing new problems when old ones are solved.

- Is the product Design Sensitive? How much testing is needed? Does it include subtle interrelationships among parts and functions? Is the design very complex?
- Is it Process Sensitive? Does the yield change significantly from small variations in process, environment, or material? Is imperical fine tuning of processes needed to make them work?
- Is it Application Sensitive? Do subtle differences in how it's used cause it to perform poorly? Are there subtle interrelationships among components of its using system?

An inherently Stable product has none of these Characteristics and does not tend to have many problems implementing changes.

Computer equipment however, is generally sensitive in all areas, a cost for complex systems using advanced state-of-the-art.

NEED AND URGENCY OF CHANGES

In the large frame computer business, changes are a fact of life. They are numerous and often needed yesterday. Changes are needed to:

- Avoid stopping production,
- Correct problems that seriously affects the customer.
- Improve performance or introduce new bells and whistles to satisfy competitive marketing requirements.
- Reduce cost and resolve availability problems.

The urgency and frequency of changes made it impractical to implement changes in blocks or at specified phase-in points. In this situation, each change has to be individually iplemented.

IMPLEMENTATION PROBLEMS SLIDE 2

This paper presents technicques used for managing implementation in this environment in a way that minimizes problems such as:

- Scheduling: Impossible dates, overlooked tasks, missed completion dates and a number of other problems can result from poor planning.

- Unexpected Delays: Procurement or engineering activity not meeting schedule may delay implementation.

- Overloaded Capacity: A frequent consideration when quantities of retrofit kits are involved. The resulting surge can tax capacity.

- Unanticipated Scrap/Surplus: Caused by a number of things, among them is not meeting a change implementation schedule.

- Unproven Changes: If changes don't work as intended, there is a risk of stopping production. Without adequate testing, a design or process change may introduce more problems than it solves.

- Production Schedule Problems: Implementation Plans based on stock usage must be revised if Production schedule changes or isn't met.

- Inadequate Process Controls: Changes to process must be controlled, The need for control is related to the sensitivity of the process.

- Sequence of Implementation: Related changes must be coordinated so that they are implemented in the correct sequence, especially in design or application sensitive products.

- Correct Production Change Level: Production and Quality personnel must know the correct change level. The difference between "latest change" and "currently in production" must be understood, the latest change may not be implemented for months.

- Unacceptable Field Deliveries: Retrofit kits and spares should be available when the first revised unit ships. Creative planning is often required to approach this goal.

SYMPTOMS vs PROBLEMS SLIDE 3

The list is long and varied, but the initial realization is that it is not a list of problems. It is a list of SYMPTOMS!!

SLIDE 3

Each item listed results from one or more deficiency shown here:

But again, this is a list of SYMPTOMS. By repeating this analysis we can move progressively closer to the root cause until responsibility for the appropriate corrective action becomes clear.

IT IS APPARENT THAT THE COMPANY DOES NOT ADEQUATELY MANAGE CHANGE.
!!! AND MOST DON'T!!!

REQUIREMENTS FOR MANAGING IMPLEMENTATION: SLIDE 4

The basic requirements for managing change implementation are:

- PEOPLE: Trained, qualified, understanding, motivated employees are a must. A prime responsibility of management.
- PLANNING: Fully coordinated planning provides a baseline to manage. Only in small companies can control be maintained without a plan. Responsibility is divided among the Systems Design, Participating Personnel, the Planner, and Management.
- STATUS TRACKING: Change associated activities must be monitored to assure that the plan is being met, or to identify any potential problems as early as possible. Tracking is the responsibility of the system design and the people that operate it.
- REPORTING: Personnel and management must be kept informed. Reports are needed that identify status, measure performance, show trends, identify problems, and notify personnel of changes. Effective reporting is a system design responsibility.
- MANAGEMENT: Informed Management must understand the system and their responsibility to assure that personnel do not drop the ball.

PEOPLE:

People are listed first because they are most important! Good people can make a poor system effective; the best system in the world is useless if the people operating it are not motivated or do not understand their jobs. Not only do people need to understand their job, they must also understand how their job contributes to the overall operation of the system and the Company. From this, they must have a strong sense that they are making a significant contribution. To accomplish this you need:

- Efficient, well documented procedures.
- Training, specifically directed at the needs of the personnel.
- Management that understands the system, and the ART of Motivation.

If management doesn't care, no one else will. Personnel get their priorities and attitudes either directly or indirectly from their managers. This includes maintaining the sensitive balance between involvement and delegation. Managers must also be trained in the system, with less operating detail but a more global understanding.

An often overlooked problem is the need of most employees to feel that they are working efficiently. When unnecessary or inefficient operations waste their time, they feel that since no one cares so why should they. There are several answers to this problem:

- Eliminate unnecessary steps from procedures or streamline inefficient activities. (This need even creeps into the best procedures after changes in the company eliminate or significantly change the original requirement. There is also a tendency to solve problems by adding steps instead of correcting the root cause.)

- Improve efficiency where it can be done. New technology may often provide an answer, but sometimes an old approach may be the best. Other times a few simple changes in how or when an operation is done will work wonders.

- Problems from a lack of understanding can usually be resolved by education. If employees are expected to do an unpopular operation, they will do it better if they understand why it must be done.

IMPLEMENTATION PLANNING

Change implementation involves parallel and unconnected activity by several functions. Without their close coordination:

- Materials may be scheduled into production long before the tooling is available.

- A new assembly may be scheduled into production months before a new hybrid component is available, or its test fixture and program are ready for use.

- Q A may inspect or test parts to the wrong change level.

- Materiel problems may arise, such as:

  + Simultaneous shortage and surplus, caused by no implementing the change on the date anticipated by requirements planning.

  + Missing the implementation date because changes to the production schedule were not reflected in the plan, or production is not on schedule.

In order to assure that all these activities occur as planned, changes must be managed as mini-projects!

ACCUMULATION OF DATA: SLIDE 5

During Review of a change, Customer Support, Manufacturing, and Quality Assurance review each change for technical content, and to identify its cost and schedule impact.

The procedure is fairly simple! Copies of the proposed change are sent to a Change Coordinator in Manufacturing and in Customer Support. They coordinate the proposal throughout their respective organizations in order to:

- Identify and Resolve any potential technical problems.
- Obtain technical concurrence.
- Obtain cost and schedule schedule data.
- Prepare a plan for implementation.

In Manufacturing the coordination includes Process, Test, and Quality Engineers, Production Control Analysts, Planner/Buyers, and OEM Customer Coordinators. The Manufacturing Change Coordinator also negotiates with Customer Support to establish a schedule for delivery of spare parts and retrofit kits.

This review is done by individuals who know most about what is required to implement the change, the problem is to be sure that they provide all of the data that is needed.

FORMS USED

Materials Data: SLIDE 6

The Production Control Analysts and Planner/Buyers use a sheet of the Parts Affected Formset to accumulate the information that they must provide.

Stock status, usage rate, projected depletion of stock, standard cost, lead time, etc. is usually needed. Change data may also involve supplier costs, leadtime committments, and other related issues.

Technical Activities SLIDE 7

For Manufacturing, Test, and Quality Engineers the required data is obtained from a Worksheet that acts as a memory jogger to assure that everything is considered, and as a place to make notes as the change is reviewed.

The top is filled in by the Change Coordinator and used to distribute the form with a copy of the change package. It is sent to the engineers associated with parts or processes included in the proposed change.

The next area on the form is used by the Reviewer to indicate technical concurrence or to note any exceptions.

The EC Planning and Cost Data blocks provide a place to list any Process Instructions or Programs to be changed or created, time to rework parts, and time needed to revise instructions and programs. Note there are two kinds of estimates, time in hours to do the job, and schedule time to process the documents or media and have them available to the floor.

The next area is for cost & schedule data related to revision or acquisition of equipment or tools; including design, procurement, building, and validation.

At the bottom are blocks to define the effect of the change on product cost, and a block for notes on testing or validation requirements.

Each Manufacturing, Test, and Quality Engineer fills in this data during review and turns it in at a technical review meeting.

After the schedule is completed, the Change Coordinator adds the due dates to the form and returns a copy to the initiators department.

Supplier Data SLIDE 8

Supplier coordination can be another source of problems. On ocasion it is necessary to coordinate a proposed change with a supplier. It may be for technical review, a revised price, a schedule committment, identify one time costs, or any of several other reasons.

The main difficulties are, assuring that the supplier understands that he is reviewing a PROPOSED change, and asking him the right questions.

This form is designed to ask most of the necessary questions for up to four revised parts. It provides space to disposition up to three POs per part, to cover times when more than one PO has been issued.

A real danger with involving the supplier at this time is his misunderstanding your intent. He must clearly understand that the change is NOT to be implemented until authorized by PO. A note on the face of the form states:

> "This is a proposed change. Take no action to implement this change until it is covered by P.O.".

Form instructions on the back, and a cover letter include the statement:

> "This is a proposed change package that is being reviewed, the change may or may not be authorized. If authorized it may or may not be the same as documented in this package."

However, more than once, a vendor has implemented the change too soon.

One major supplier explained to me with pride how he delivered revised parts a month before the commit date on the P.O.. It took me a half hour to convince him that he was not doing us a favor. He had no idea that the change he was making had to be implemented concurrently with other changes. You can imagine the problems that that caused.

GOOD COMMUNICATION WITH SUPPLIERS IS NECESSARY TO MINIMIZE PROBLEMS

CHANGE IMPLEMENTATION SCHEDULE SLIDE 9

Here is a typical implementation plan for a fairly simple change.

Engineering frequently asks why it takes so long to implement a change. Many don't realize that there can be a complete design, procurement, fabrication, and test cycle between release of a change and implementation into production. This slide represents the implementation schedule for the release of a new circuit board. It includes only the activities associated with the procurement of a new fabricated board and its subsequent assembly.

- There are Inspection Instructions for receiving inspection of the fabricated board and for acceptance of the finished assembly.
- Manufacturing Instructions and programming for auto-insertion are needed to assemble it.
- A new Test Procedure and Program are needed to test the assembly.
- Changes are also required to Process Documents for the next higher assembly.

CHANGE IMPLEMENTATION PLANNING SLIDE 10

Once the data is accumulated, the planner must review a a number of subjects before he can prepare an effective plan. These issues, and their significance, differ widely from one change to the next. Consolidation of the data into the most effective plan requires experience and an ability to "sense" a potential problem or omission. Typical of these issues are:

- Finalizing dispositions. Dispositions are considered to be recommendations by Engineering until after technical review, when stock level and cost considerations are evaluated!
    + Some changes must be implemented as soon as possible. But does that mean accepting cancellation charges ? Paying a premium for short lead time? If it does the decision must be passed on to the Buyer. A number of conditions influence how fast is possible.
    + When there is no specific need for urgency, implementation should be based on cost effectiveness. At times this may require changing dispositions. For example: Engineering recommended a disposition of "EXHAUST STOCK" on a $25.00 circuit board. The change that they were making eliminated $75.00 of rework on the existing assembly. In review, the disposition of the PCB was changed to "SCRAP". Engineering objected because they were responsible for the scrap budget, but reason prevailed and the cost effective solution was used.

- Scheduling testing and validation. We assume that Engineering has modeled sensitive changes and tested them sufficiently to assure that they work adequately. But have they? Will Manufacturing need to validate changes to the process or to new or revised equipment? These questions must be considered and, when necessary, provision for test or validation must be included in the plan.

- The potential impact of changes in part usage must be considered.

  + When requirements for a part are suddenly doubled or tripled, inventory that was planned for three months will be exhausted in a month or six weeks. If this is less than the procurement lead time, a shortage may result if implemented too soon.

  + When requirements for a part are reduced to one half or one third, inventory for three months will extend to six or nine months. When the price of money is high, this represents an expense. Not usually a serious problem, but in the extreme it can represent a major avoidable expense.

  + When a part is needed to update units in the field it can cause a significant surge in production. For example:
    If the new part replaces one that was built at the rate of 100 a month, and 10,000 units in the field need retrofitting, and 10,000 units in the field need retrofitting within the next year, requirements suddenly jump from 100 to 1100 per month. By itself, this may not be a serious problem, but 10 or 15 changes in process at one time with this impact can overload the plant capacity.

- Compatibility of changes. Engineering usually bases changes on the assumption that the previous changes have been implemented. Often the functional ties between a new change and earlier ones is not known. This is not a problem if changes are implemented in the same sequence, but this cannot always be done. While one change may take months to implement, the next one may be implemented immediatly.

  + If the changes are unrelated there is no problem.

  + When they are functionally related, but it is not realized, implementation of the new change may stop production or cause any number of problems.

  + If their technical relationship is known, an answer can usually be worked out. Even when the relationship is known, the answer may be difficult. For example,

    Implementing a new circuit board including a custom IC took 11 months because of IC lead time. About a month after the new design was released, a major functional problem was traced to the old design. Its resolution could not wait.

    Correcting the old design required a revision to change the new board back to the old one, and then correct the old board. A subsequent change was then needed to reinstate the new design.

- Standard Cost is the normal basis for cost comparisons. This is usually fine, but it can be misleading. When standard costs are not up-to-date, the cost of a new design can be higher than standard when, in fact, the new part cost less than the current price of the old design. This makes a cost reduction look like an increase.

- The change implementation is usually based on one of three events:
  + Leadtime to buy parts, or time required to change the process.
  + The time it takes to use up existing stock.
  + Implementation of a constraining change.

- When the production schedule changes, the rate at which parts are used also changes; if implementation timing is based on using or reworking all existing stock, the implementation schedule changes. It also changes if production does not meet the schedule.

To effectively resolve these issues, a planner must have:

- A general understanding of the organization, equipment, processes, and documents associated with Production, Test and Inspection.

- The ability to sense when planning data is missing, incomplete or erroneous, be able to correct it, or obtain what is needed.

- The background or intuition needed to know when and where to apply special analysis, and an understanding of when it is NOT needed.

- Background in the principles and applications of production control

TRACKING SYSTEMS

REQUIREMENTS TO MANAGE THE PLAN: SLIDE 11

With a plan you have a baseline, but monitoring is needed to manage it. The better the planning and the more stable the environment, the fewer exceptions. But no mater what, problems arise and changes are required. The key is to identify problems as soon as possible!

Actual performance must be tracked in order to confirm whether or not it is on schedule.

Personnel must be kept informed of any change to their schedule commitments! In order to manage, each supervising manager must know what commitments his people have to meet. Higher levels of management must have the information needed to measure the performance of their subordinates. They must also have exception data that identifies problems that may require action.

Many of these problems are like cancer. They can easily be cured if they are found early enough, but the longer the delay, the more difficult and less likely is a successful cure. We cannot afford to wait until the day before implementation to discover that a holding fixture has not been delivered, or the Process Instructions arn't ready.

TRACKING AND REPORTING SYSTEM SLIDE 12

Keeping track of between 8 and 100 events for each of 40 to 100 Changes Requires a of these requirements is accomplished with a tracking system that can prepare relevant reports for each participant and his manager.

The system should include comparitively minor events. A Milestone such as TOOLING AVAILABLE is not good enough. If the tool is not available when needed, it is usualy too late to do anything about it. Inch Pebbles such as "Tooling Data to Designer", "Design Complete", "Procurement Complete" "Parts Received", and "Tool Validated" are needed.

Until the last decade, gathering all of this data has usually been too difficult to be beneficial. However, by gathering data and capturing transactions from other computer systems, and providing data to those systems, most of the data are nearly free.

If the system is on-line it can also provide the service of informing individuals of due dates for their change related activities, and the status of other activity that constrains them.

By linking the Tracking system to status systems for Manufacturing and Quality Control stations, tools and equipment, and Process Documents it is possible to identify the complete impact of a Proposed Change.

CHARACTERISTICS OF A CHANGE TRACKING SYSTEM: SLIDE 13

To accomplish this, a system would have to be able to handle a large number of small unrelated and related projects, with durations ranging between one week and perhaps a year. It would require a significant number of flags and specialized data in each record for the purpose of preparing reports and selecting specific records on request. It should use well formatted screens for inputting data and requesting data, preferably menu driven. Ordering of routine reports should require simple commands and special reports must be easily formatted and ordered.

Management reports should be effectively formatted, more on that later.

DATA REQUIREMENTS: SLIDE 14

Each change record should include:

- A Change Header with the change number, a basic description of the change, and the flags and coding needed for inquiry and reporting.
- A schedule of events that relate to the change as a whole.
- A part/docuent record for each part or document included within the change. This record would identify all that was needed about each part, and its individual implementation schedule.
- A tool/equipment record for each unit of equipment affected. This record would identify all that was needed about each piece of tooling or equipment required or revised to support the change including its individual schedule.

OTHER SYSTEMS RELATED TO CHANGE TRACKING SYSTEM: SLIDE 15

A Change Tracking and Reporting System interrelates a broad range of otherwise independant activities with little cross coordination. The data needed usually exists in a number of different systems, some may be computerized and some not. If a lot of the data has to be manually gathered and posted, much of the benefit is lost; even more is lost if reports have to be manually prepared.

By interrelating with other systems most of the actual tracking can be done automatically, reducing the coordination and legwork needed to maintain status. Conceptually the system ties to the Requirements Plan ning System, the Purchase Order Control System, Floor Control System, and any Status Systems for control of Process Documentation, Equipment, Media, and Stations.

CHANGE DEFINITION AND IDENTIFICATION DATA: SLIDE 16

The Change Header record should tell you all you need to know about the Change. Besides number, description, and product, perhaps you need contract number, customer, Change class, initiator. Another item is identification of related changes, and possibly a constraint code.

CHANGE LEVEL STATUS, SORT, AND SELECT DATA SLIDE 17

Mixed in with the descriptive data in the header are codes and flags to select records for various reports. Fields to identify reason code, logistic impact, sensitivity to the production schedule, functional change, manuals affected, etc.

These records can also be used to summarize cost data like the estimated effect of changes on product cost, or an estimate of trackable one time costs to-date, or the estimated untrackable cost.

Included also are Schedule Dates that apply to the change as a whole. When was it received for review? When Approved and released? When is first system test of the changed configuration ? When does the first one ship? This does not include dates associated with part or tool changes.

If the change is rescheduled there should also be an indication of when and why, perhaps coded for future sorting and analysis.

PART IDENTIFICATION AND IMPLEMENTATION DATA: SLIDE 18

Each part or document in the change will have its own record, similar in concept to the Change Header except it contains part related data. Such as, Part or Document number, Description, Disposition, Cross reference between superseded superseding part numbers, make or buy code, etc.

This record will identify the ME, TE, QE, etc. involved with the changes to the part. This identification can be used to summarize listings for each department manager. If the record also includes manhour estimates they can summarize the Change action workload for each department.

Schedule data for parts include such events as PO Issued, Parts on Dock, Kits Issued to Assembly, Inspection Instructions Available, Process Instructions Available, Parts into Stores, etc.

If the use of a part is sufficiently increased by a change to make it the pacing item for implementation or to require expedited procurement, a tracking record is required even though the part was not revised.

EQUIPMENT IDENTIFICATION AND IMPLEMENTATION DATA: SLIDE 19

Although most changes do not involve revision or acquisition of tools, when they are involved they are often on the critical path. One record is required for each unit of equipment affected by a proposed change. The data required is conceptually like that needed for parts.

MANUAL TEST SYSTEM: SLIDE 20

In order to prove the concept of a Change Tracking System that goes to the detail I am describing, I established a manual system. This system works fairly well for tracking and proved the validity of the concept. It improves coordination between Production Control, the manufacturing floor, Manufacturing Engineering, and Quality Assurance. However this system does not lend itself to efficient preparation of some of the neeeded management reports.

A while ago I mentioned not forgetting old technology, here is an example. There is a week ending calander on the top edge of the cards. Colored clips identify weeks that have a tracking event, colors identified material events, production control/purchasing events, and engineering events. By looking down on a file of these cards, a status clerk could identify what is scheduled for this week, and what is past due.

TRACKING REPORTS: SLIDE 21

A computerized tracking system can provide the following reports:
To keep personnel informed of change status, a report is sent to each department involved with Change Implementation. This report identifies the status of constraining activities and activities within the department. The report provides status of Changes in Change number sequence, it also has cross reference lists in start data and due date sequence. These lists are summarized for each Engineer and for the Department.

The supervisory manager of each department gets a list of changes involving the department in due date sequence, worst past due first. There is also a statistical report of the activity and performance of the department.

Higher level managers get a statistical summary of their organization's activity and performance, a list of activities that are more than a specified number of days past due, and a copy of the report for each subordinate. Where there are several levels of higher management, the threshold for listing past due activities is progressively higher.

PHILOSOPHY OF MANAGEMENT REPORTING: SLIDE 22

At times it seems that data managers pride themselves with printing paper,-- in vast quantities. More often than not I have run into so called reports that are little more than a file dump. I have often been given a three, -- four, -- five inch thick printout to analyze and use to make some conclusions. Most managers, most employees do not have time. It is surprising how often the ability of a computer to select, sort and analyze data is overlooked. Half of the value of the system I've been discussing is in maintaining status, THE OTHER HALF IS PROVIDING DATA TO MANAGEMENT. Good reports have the following characteristics.

- The first sheet must inform the manager of activity and potential problems. --ON ONE SHEET! If possible, it should also list the most significant problems or activities that are most past due.

- Behind the first sheet is backup data such as the summary reports for subordinates, and more detailed listings of SELECTED data.

- Limit listings to relevant data AVOID USING FILE DUMPS AS REPORTS UNLESS SPECIFICALLY REQUIRED.

SUMMARY

Assuming that you had been experiencing these problems in a similar environment, and you have accepted and implemented my suggestions:

- Your personnel are trained, qualified, and motivated to make the system work.

- Your procedures are well documented, clearly written, & understood by everyone involved.

- Your planning is based on coordination with all potentially affected activities, and sound business judgement.

- Your operating systems provide all of the information needed to
  + Plan implementation of changes
  + Inform all participants of their obligations
  + Track the Status of all related activities
  + Identify slipping schedules
  + Reschedule, redirect resources, or initiate other form of corrective action
  + Keep management informed

- Your management is informed and making sound decisions.

- Your computer systems effectively exchange data, maintain status and generate effective reports.

- Most of your changes are smoothly implemented, when problems are discovered they are eficiently resolved.

Will you have cured all of the problems? Not quite, the problems will still arise (but not as often as before). But now, you will identify them early and resolve them efficiently.

MANAGING CHANGE IMPLEMENTATION
(Control of problems after change release)

by
John Nast
NAST & Associates

CATEGORIES OF STABILITY

- *Inherently* Stable
- Design Sensitive
- Process Sensitive
- Installation/Application Sensitive
- Operation/Maintenance Sensitive

SYMPTOMS

SYMPTOM/DEFICIENCY	CAUSE
Poor schedule coordination (if any)	SYSTEM*
Poor material/production control	TRG & MGMT
Inability to identify problems until too late	SYSTEM*
Poor coordination during implementation	SYSTEM*
Insufficient testing of changes (Procedures were in place but not followed)	PEOPLE & MGMT
Lack of information available to Planner	SYSTEM*
Lack of system knowledge by personnel	TRAINING
Lack of motivation of personnel	TRG & MGMT
Ineffective allocation of resources	SYST & MGMT*
Undefined responsibilities (and objectives)	SYST & MGMT*

IMPLEMENTATION PROBLEMS

The following problems were addressed:

- **Scheduling**
- **Unexpected Delays**
- **Requirements Exceed Capacity**
- **Unanticipated Scrap/Surplus**
- **Unproven Design Changes**
- **Implementation Plans vs. Production Schedule**
- **Inadequate Process Controls**
- **Related Changes Not In Phase**
- **Correct Change Level Not Known**
- **Unacceptable Spares and Retrofit Deliveries**

REQUIREMENTS FOR MANAGING IMPLEMENTATION

- **People**
- **Planning**
- **Status Tracking**
- **Reporting**
- **Management**

PLANNING CONSIDERATIONS

- **EFFECTIVE DISPOSITION FROM CORPORATE & CUSTOMER PERSPECTIVE**
  - Implement as quickly as possible
  - Implement with most cost effective schedule
- **DESIGN TESTING AND PROCESS VALIDATION**
- **POTENTIAL IMPACT OF CHANGES IN PART USAGE**
  - Increased usage = Potential shortage
  - Reduced usage = Potential surplus
  - Surges from field requirements
- **COMPATABILITY OF CHANGE SEQUENCE**
  - Problems with extended implementation
- **STANDARD COSTS VS. COST AFFECT OF CHANGE**
- **CHANGES IN PRODUCTION SCHEDULE**
  - Implementation based on production rate
  - Implementation based on activities
- **CONFIRM SCHEDULE WHEN CHANGE IS RELEASED**
  - Inform personnel of confirmed and revised schedules

REQUIREMENTS TO MANAGE THE PLAN

- **PERSONNEL MUST BE INFORMED OF COMMITTMENTS AND SCHEDULE**
- **MANAGERS OF THESE PERSONNEL MUST BE INFORMED OF COMMITTMENTS AND SCHEDULE**
- **PERFORMANCE TO PLAN MUST BE VERIFIED**
- **PROBLEMS MUST BE IDENTIFIED AS EARLY AS POSSIBLE**
- **CORRECTIVE ACTION SHOULD BE INITIATED WHEN PROBLEMS ARE IDENTIFIED**
- **PERSONNEL AND MANAGERS MUST BE INFORMED OF CHANGES TO PLANS**
- **HIGHER LEVEL MANAGERS MUST BE PROVIDED WITH**
  - PERFORMANCE STATISTICS OF SUBORDINATE GROUPS
  - EXCEPTION REPORTS OF MAJOR PROBLEMS
  - TREND DATA

TRACKING SYSTEM

- DETAILED TO LEVEL OF "INCH PEBBLES"
- CAPTURE DATA FROM OTHER SYSTEMS
- IDENTIFY WHAT EVENTS SHOULD TAKE PLACE
- IDENTIFY PROBLEMS AS EARLY AS POSSIBLE
- PROVIDE MANAGEMENT REPORTS
- IDENTIFY THE FULL POTENTIAL SCOPE OF A PROPOSED CHANGE

CHARACTERISTICS OF A CHANGE TRACKING SYSTEM

- TRACK A LARGE NUMBER OF INDEPENDENT PROJECTS
- DURATION OF A WEEK TO A YEAR
- HAVE FLAGS TO SELECT RECORDS FOR SPECIAL REPORTS
- FORMATTED FOR THE CONVENIENCE OF THE STATUS CLERK
- REPORTS FORMATTED FOR EFFECTIVE USE BY MANAGERS
- TIE INTO RELATED SYSTEMS TO OBTAIN DATA AND CAPTURE TRANSACTIONS
- PROVIDE STATUS ON AN INQUIRY BASIS

DATA REQUIREMENTS

- CHANGE ACTION DEFINITION AND IMPLEMENTATION DATA
- SORT AND SELECT CRITERIA FOR REPORTS
- PART IDENTIFICATION AND IMPLEMENTATION DATA
- EQUIPMENT IDENTIFICATION AND IMPLEMENTATION DATA

OTHER SYSTEMS RELATED TO CHANGE TRACKING SYSTEM

- **PART MASTER FILE**
  - — *Obtain part related data. Update part status in PMF.*
- **P.O. CONTROL SYSTEM**
  - — Obtain P.O. number. Confirm that procurement activities and supplier committments conform to the plan.
- **FLOOR CONTROL AND REQUIRMENTS PLANNING SYSTEM**
  - — Track material movement and confirm that it meets the plan.
- **STATION STATUS SYSTEM**
  - — Obtain status of Equipment, identify when change is implemented.
- **INSTRUCTION/PROCEDURE STATUS SYSTEM**
  - — Track preparation of Process Documents and Media

CHANGE DEFINITION AND IDENTIFICATION DATA

- **CHANGE IDENTIFICATION:**
  - — Change Number, Description, Product
- **ENGRG. REPSONSIBILITY:**
  - — Name of Engineer, Change Analyst, etc.
- **INITIATION:**
  - — ECR Numbver, Prepared by, etc.
- **RELATED CHANGES:**
  - — Change Number, Compatibility code, status, etc.

SORT AND SELECT CRITERIA FOR REPORTS, CHANGE LEVEL

- **AREAS AFFECTED,**
  - — Spares, Retrofit kits, CEM Customers, etc.
  - — System test, Final Assembly, Shipping, etc.
- **COST DATA:**
  - — Change in unit cost, one time cost, etc.
- **PLANNING DATA:**
  - — RPS Run, Schedule sensitivity, etc.
- **SCHEDULE DATA:**
  - — List of Change events with SCHEDULE, RESCHEDULE, and ACTUAL dates for each.
- **RESCHEDULE DATA:**
  - — Date, RPS Run, Reason Code, and Remarks to explain why plan was rescheduled.

PART IDENTIFICATION AND IMPLEMENTATION DATA

Multiple records per Change, one for each part affected.

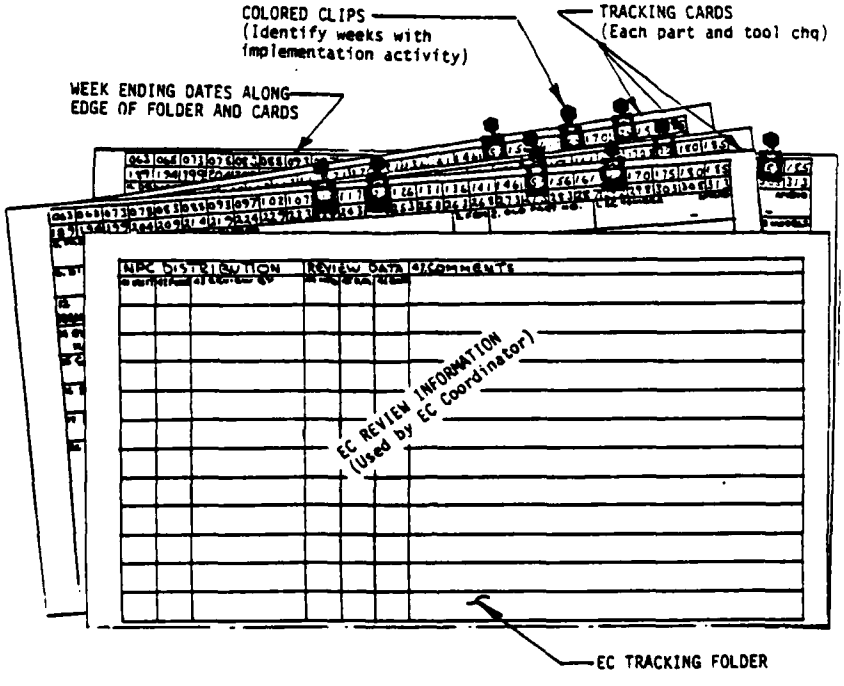
- **PART DEFINITION**
  - — P/N, Description, Superseded P/N, Disposition, Type Code
- **SPECIAL FLAGS**
  - — Spare part/Retrofit Code, Mfg. Dept/Make/Buy Code
- **IDENTIFICATION**
  - — ME, QE, Buyer, PCA, etc.
- **SCHEDULE DATA**
  - — Part events, with SCHEDULE, RESCHEDULE, and ACTUAL dates for each.
- **MANHOUR ESTIMATES**
  - — Estimates for ME, QE, TE labor and estimated rework per part.
- **DATA AFFECTED**
  - — List of Instructions, Procedures, Programs, and Equipment to be revised to implement the change to the part.

EQUIPMENT IDENTIFICATION AND IMPLEMENTATION DATA

Multiple records per Change, one for each unit of equipment affected.

- **DEFINITION**
  - — Equipment ID, Description, Action, Type Code
- **SPECIAL FLAGS**
  - — Using Dept, Operation, Make/Buy Code
- **IDENTIFICATION**
  - — Requestor, Designer, Buyer, PCA
- **SCHEDULE DATA**
  - — Events, with SCHEDULE, RESCHEDULE, and ACTUAL dates for each.
- **DATA AFFECTED**
  - — List of Docments to be revised to implement the change to the part.

MANUAL TEST SYSTEM



ELEMENTS OF MANUAL EC TRACKING SYSTEM

TRACKING REPORTS

- **List the Change related committments for each participating function so that they can maintain their status.**

- **Summary report to each supervisory manager of a participating function.**
  - Statistical summary of activity/performance
  - Trend analysis
  - List of late activities in order of amount past due

- **Summary reports to higher level management**
  - Statistical summary of activity/performance, backed up with copies of same report summarized for each subordinated.
  - Trend analysis
  - List activities over XX days past due

PHILOSOPHY OF MANAGEMENT REPORTING

- **FIRST PAGE MUST TELL THE STORY**
- **BACKUP SUMMARIES SHOULD FOLLOW**
- **EXCEPTION REPORTING OF MOST SIGNIFICANT ITEMS (In order of significance, days past due, etc.)**
- **LIMIT REFERENCE LISTINGS TO RELEVANT RECORDS**

AVOID USING FILE DUMPS AS REPORTS UNLESS SPECIFICALLY REQUIRED.

IN CONCLUSION

I HAVE PROBABLY NOT ANSWERED ALL OF YOUR QUESTIONS

THOSE I HAVE ANSWERED PROBABLY HAVE ONLY INTRODUCED NEW QUESTIONS

YOU ARE PROBABLY LEAVING THIS SESSION AS CONFUSED AS YOU WERE WHEN YOU ARRIVED

I DO HOPE THAT YOU ARE CONFUSED AT A HIGHER LEVEL ABOUT MORE IMPORTANT THINGS.

COMPUTERIZED MANAGEMENT
OF
ENGINEERING DOCUMENTATION

Presented by
Thomas Henderson
Business Systems Specialist
Technical Affairs Office
Ford Aerospace & Communications Corporation
Palo Alto, CA

Ford Aerospace & Communications Corporation

OR
WHAT HAPPENS TO DESIGN AFTER RELEASE FOR PRODUCTION

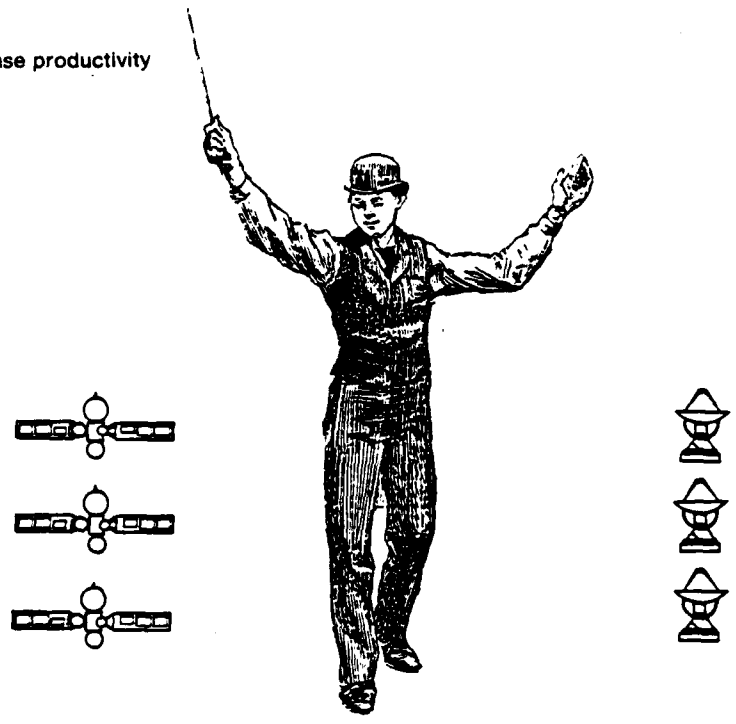
Management of engineering documentation does not stop when engineering, drafting, and configuration control board are done.

We still have to build the product and manage changes. This presentation shows the computerized approach developed by Ford Aerospace & Communications Corporation, WDL Division, to help manage these processes.

The computer tools used are called Product Support Systems. They apply irrespective of project orientation.

The systems are a way to

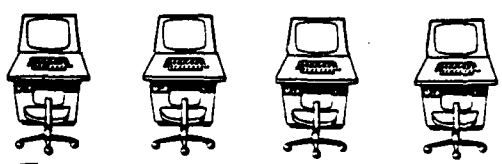
increase productivity

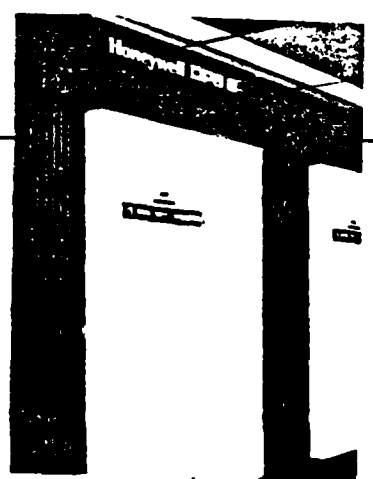


and cut operating costs...

we want you to hear about it!

The Product Support Systems serve three major functions: engineering information, material planning, and production control.





MATERIAL PLANNING

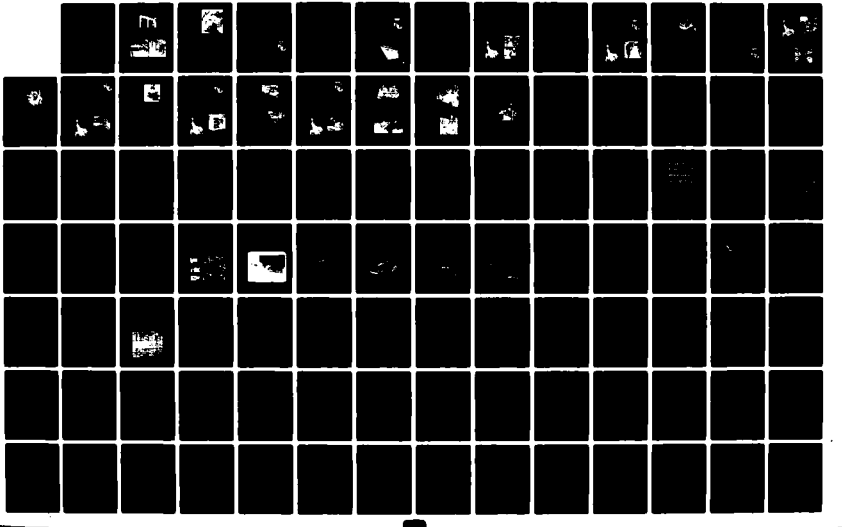
PRODUCTION CONTROL

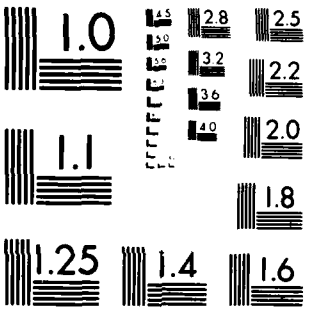
ENGINEERING INFORMATION

AD-A136 271 PROCEEDINGS OF THE MEETING OF THE TECHNICAL DOCUMENTATION DIVISION OF THE..(U) AMERICAN DEFENSE PREPAREDNESS ASSOCIATION ARLINGTON VA 27 MAY 83

23

UNCLASSIFIED F/G 5/2 NL

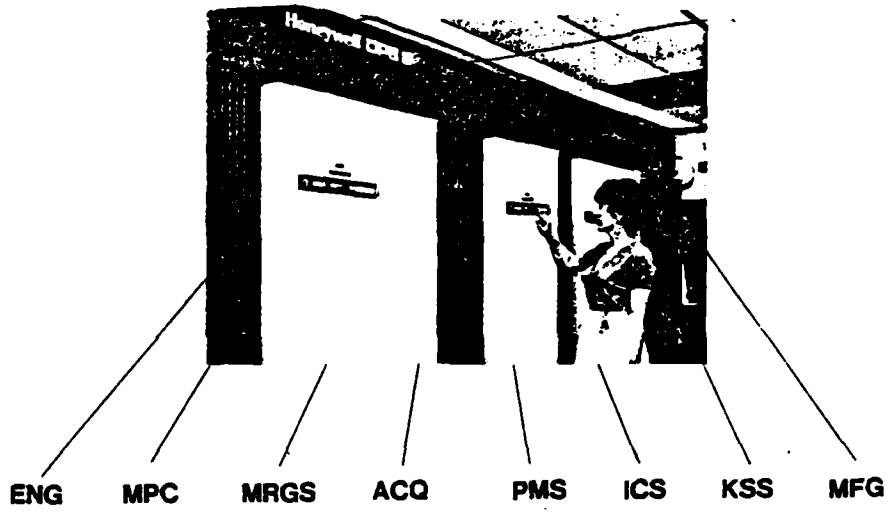




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

The FACC WDL Product Support Systems are a modular network of eight standalone systems integrated into a common network.

Some people interface with just one of the modules and some use many. As we will see though, the separate elements support one another so that even those who interface with only one element are utilizing data provided by two or more of the elements. The systems share data and this sometimes is not obvious to the user.



This network uses **proven** tools with hardware presently available or obtainable.

Let's go over the eight elements and see what they do to aid in our success.

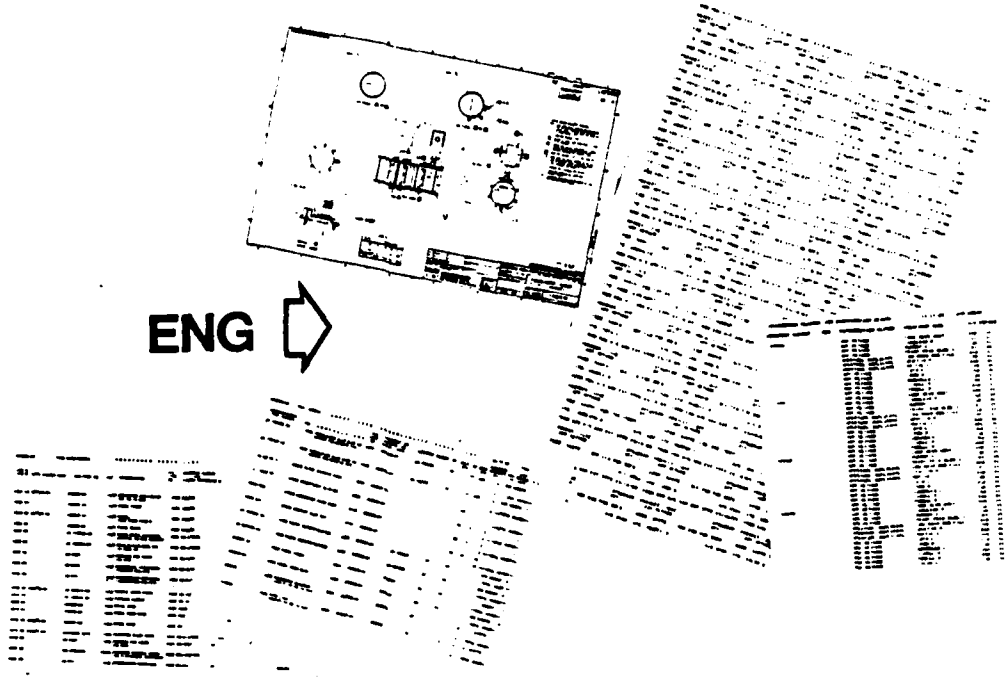
It all begins with the design - manually-created or CAD designs are generated. FACC WDL currently uses three CAD systems. Plans are underway to tie the CAD part libraries to the engineering information systems. Meanwhile, however, the Master Part Catalog module is used in both the manual and computerized drafting systems to obtain standardized part numbers and data - currently over a quarter million part records are on file.

MPC

```
MPC-SCAN  MASTER PART CATALOG SCAN                                  TIME: 031083 1124

                                                                    CL P M     M O
PART                      DOCUMENT                                  CD T C UM L B
NUMBER          FSCM      NUMBER      DESCRIPTION                   20 F U EA 2
S48429-11       11530     S48429      BASE,                         20 F U EA 2
S48429-12       11530     S48429      CLAMP,                        20 F U EA 2
S48429-13       11530     S48429      HOLDER,ADAPTER,               20 F U EA 2
S48429-14       11530     S48429      SUPPORT,WG,                   20 F U EA 2
S48429-15       11530     S48429      MOUNT,HOLDER,                 20 F U EA 2
S48429-16       11530     S48429      BRACE,MOUNT,                  20 F U EA 2
S48430-01       11530     S48430      FIXTURE ASSY,                 30 F U EA 2
S48430-11       11530     S48430      BASE,                         20 F U EA 2
S48430-12       11530     S48430      CLAMP,                        20 F U EA 2
S48430-13       11530     S48430      HOLDER,ADAPTER,               20 F U EA 2
S48430-14       11530     S48430      SUPPORT,WG,                   20 F U EA 2
S48430-15       11530     S48430      LOCATER,MTG EYE,              20 F U EA 2
S48431-01       11530     S48431      EQUALIZER ASSY,               47 F U EA 2
S48432-01       11530     S48448      EQUALIZER ASSY,               47 F U EA 2
S48433-01       11530     S48433      EQUALIZER ASSY,               47 F U EA 2
S48434-01       11530     S48434      EQUALIZER ASSY,               47 F U EA 2
S48435-01       11530     S48435      EQUALIZER ASSY,               47 F U EA 2
S48436-01       11530     S48448      EQUALIZER ASSY,               47 F U EA 2
S48437-01       11530     S48448      EQUALIZER ASSY,               47 F U EA 2
S48438-01       11530     S48438      EQUALIZER ASSY,               47 F U EA 2
S48439-01       11530     S48448      EQUALIZER ASSY,               47 F U EA 2
PRESS F1 TO CONTINUE OR ENTER NEW PART NUMBER AND PRESS F5
```

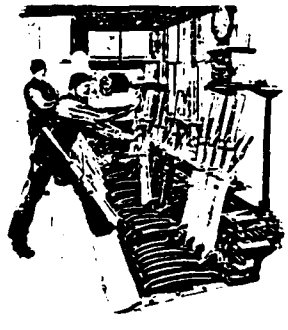
Once the CAD plot or manual design drawing and parts lists are ready for release, they are entered into the engineering information system (ENG). The engineering information system consists of three files - Product Structure, Document Status, and Document Distribution.



In the product structure

- *Parts List Worksheet input by the Engineering Release Unit.*
- Treeing is performed by the system
- Over 25,000 assemblies on file with 1 million line items
- Eventually will be replaced by CAE inputs
- On-line inquiries show: single-level part lists, where-used information

ENGINEERING SERVICE CENTER

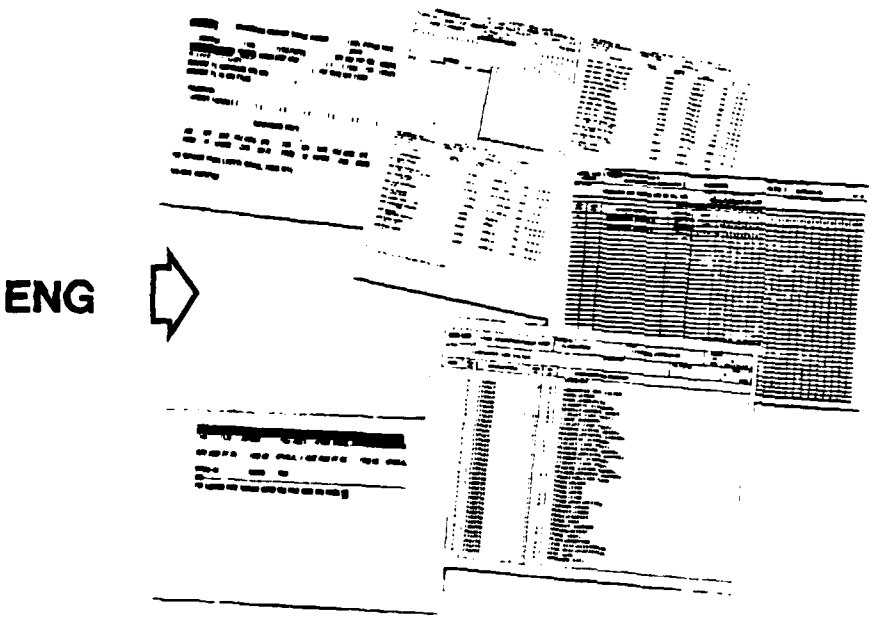


Document Status

- On-line status of over 100,000 released documents (includes specifications, statements of work, drawings, parts lists, and engineering change orders).
- Tracking through release and repro cycle
- Assures latest status, including all outstanding ECOs

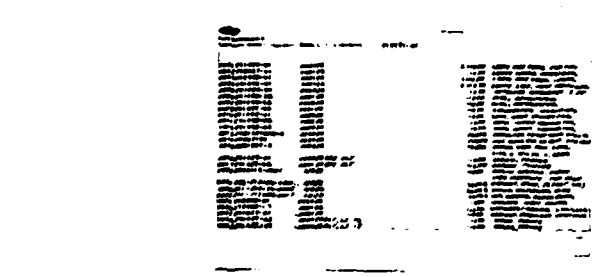
Document Distribution

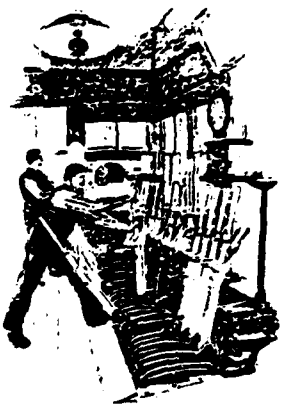
- On-line record of all names, phone extensions, and mail stops of everyone who needs copies of released documents
  - Document Distribution 96 people, average 300 documents each
  - Project Distribution 326 project codes, average 10 people each



Let's return for a few moments to the Master Part Catalog - in addition to helping the designer/draftsman, the catalog provides for consistent identification of parts across all systems, thus improving the integrity and competency of system interfaces.

ENGINEERING SERVICE CENTER





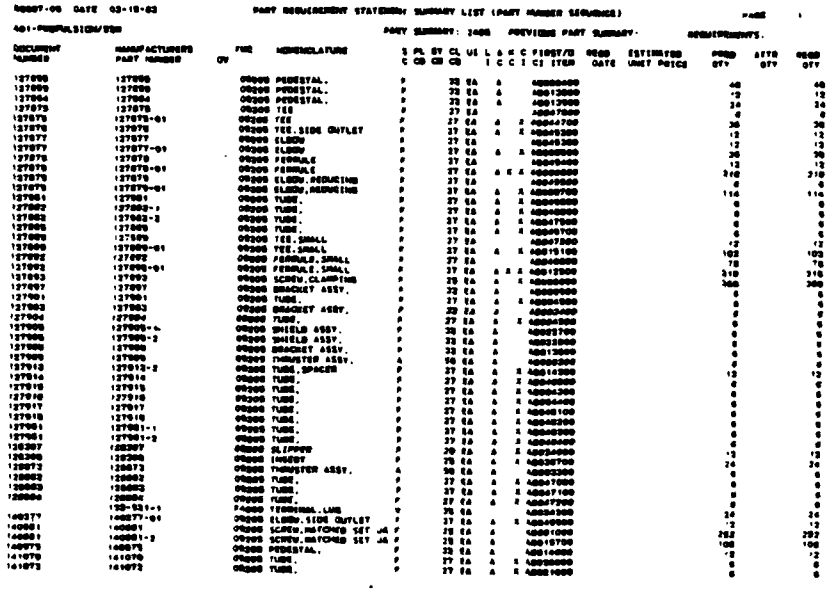
MPC

Parts and Materials that require special handling due to their hazardousness or electrostatic sensitivity are identified on all working documents to assure proper handling.

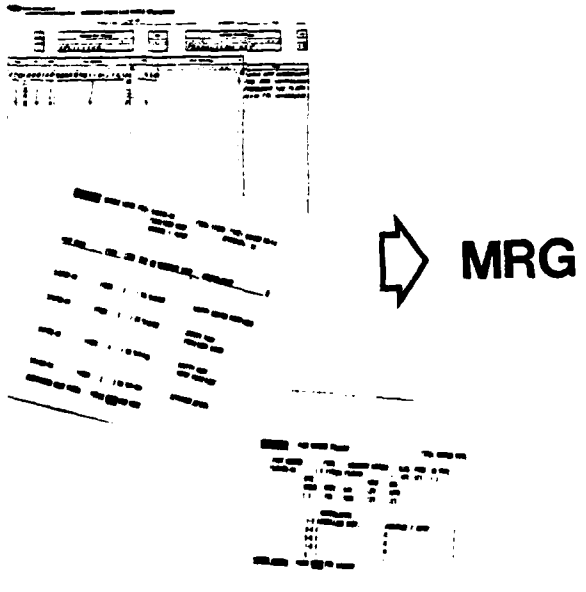
MPC

We've released the design (or advanced parts lists). Now what happens? The next module, Material Requirements Generation (MRG), tracks detail hardware requirements by program and summarizes parts and materials requirements by program.

MRG

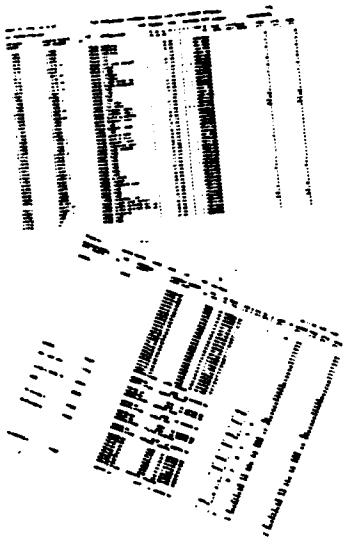


Its inputs consist of new designs from advanced parts lists, released designs merged from ENG and standard part data merged from MPC.



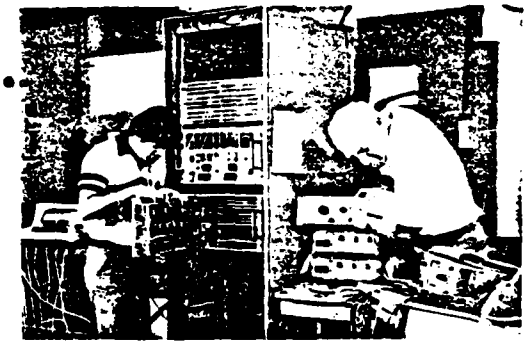
Key outputs include:

- Indentured parts lists
- Consolidated where-used reports
- Program part summary lists
- Delta part requirement lists



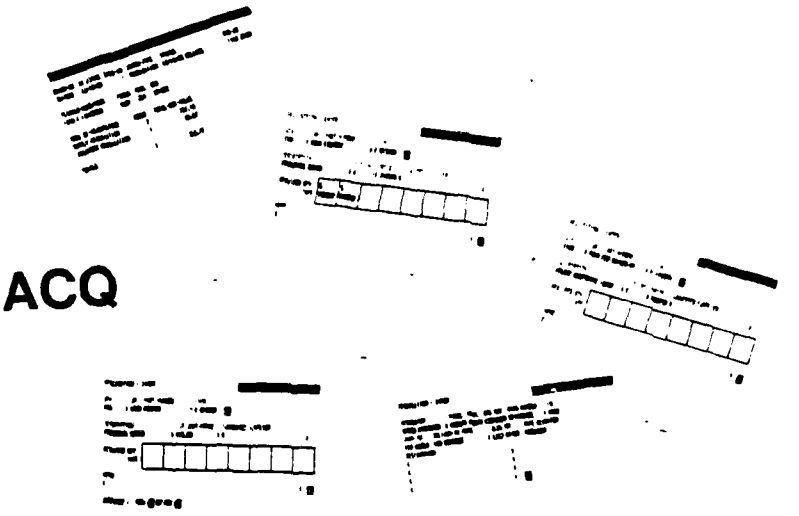
MRG

MRG - This system is now being modified to not only keep track of all program hardware requirements but also to track those requirements by performing organization.



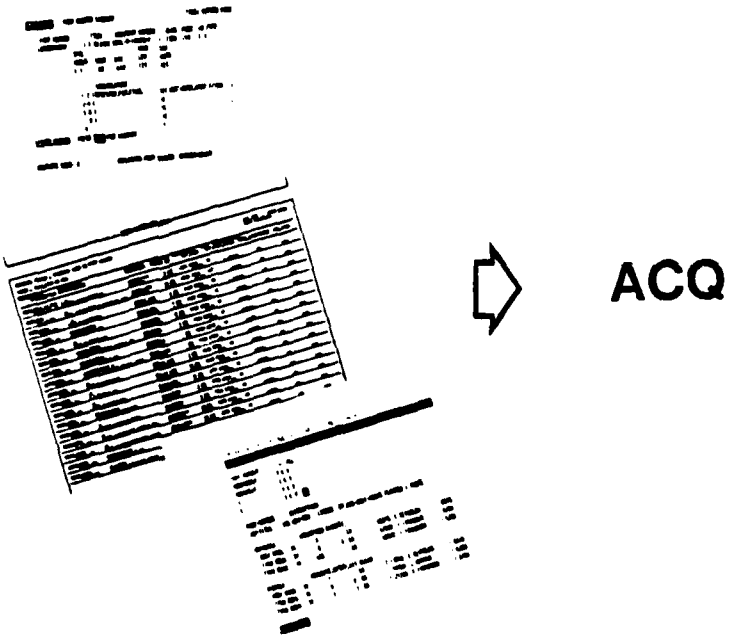
We've identified the material requirements ... now what, coach?

The Acquisition System is an efficient tool used to record material needs, and see if those needs can be met from existing stocks and generate the appropriate paperwork to acquire the needed material.



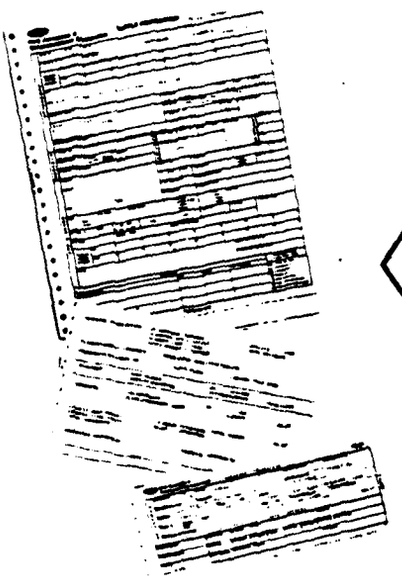
Inputs Entered

- En masse from MRG or
- Individually via on-line transactions



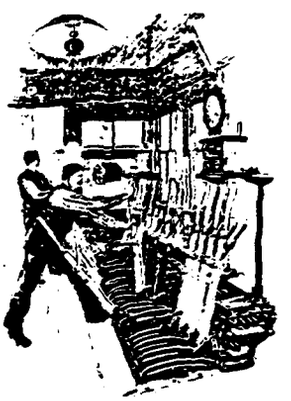
Outputs include

- *On-line status of all inventories*
- A HI-Rel option to help locate parts needed regardless of screening level
- SRs and other acquisition documents



ACQ

USER DEPARTMENT



Once the ACQ System knows what you want, it takes action to acquire those materials in the fastest possible way; paperwork produced by ACQ does not have to be re-entered in Purchasing but is sped to the buyer.

We've generated the acquisition documents. Now additional acquisition data is loaded to the Purchased Material Status System (PMS).

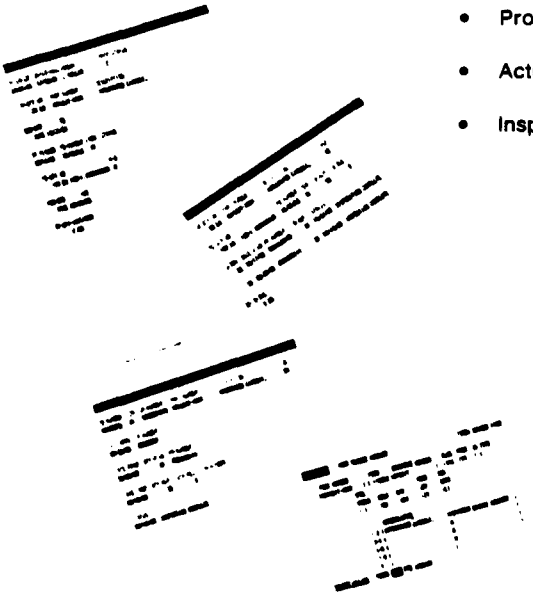
PMS tracks and provides full status of goods and services

- When the Supply Requisition hit Purchasing
- Assignment of Buyer
- Placement of order
- Receipt of material
- Inspection of material
- Delivery of material

PMS

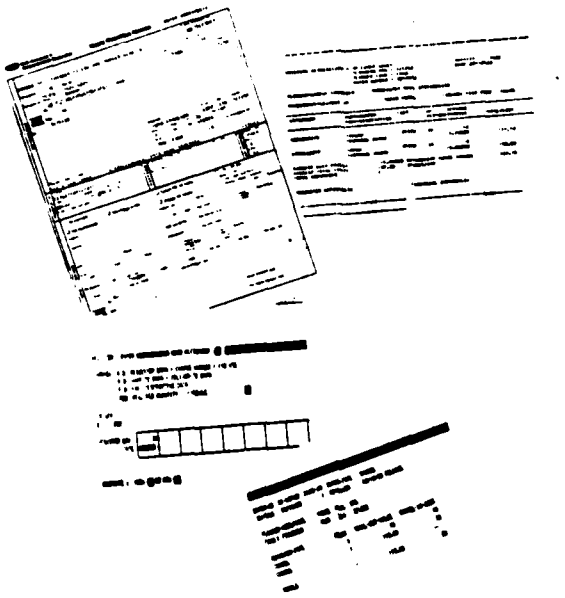
Inputs

- Automatically from ACQ or,
- Each manual SR submitted is entered on-line
- Promised delivery dates (from Buyer)
- Actual receipt dates (from Receiving)
- Inspection results (from Receiving Inspection)



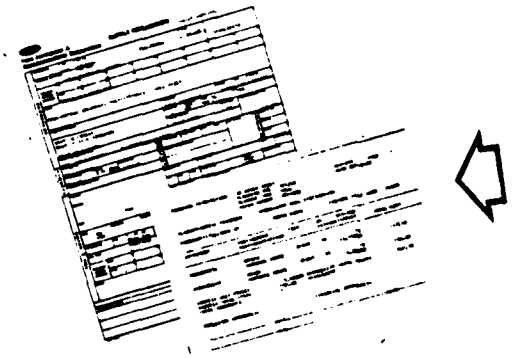
PMS

Automatic inputs include document revision status from ENG, SR details from ACQ and delivery information from the Inventory Control System.



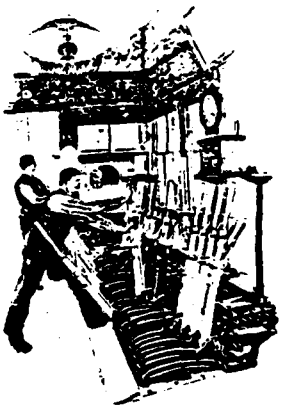
PMS

PMS is controlled by the Materiel Office and provides the critical part delivery data necessary for production control.

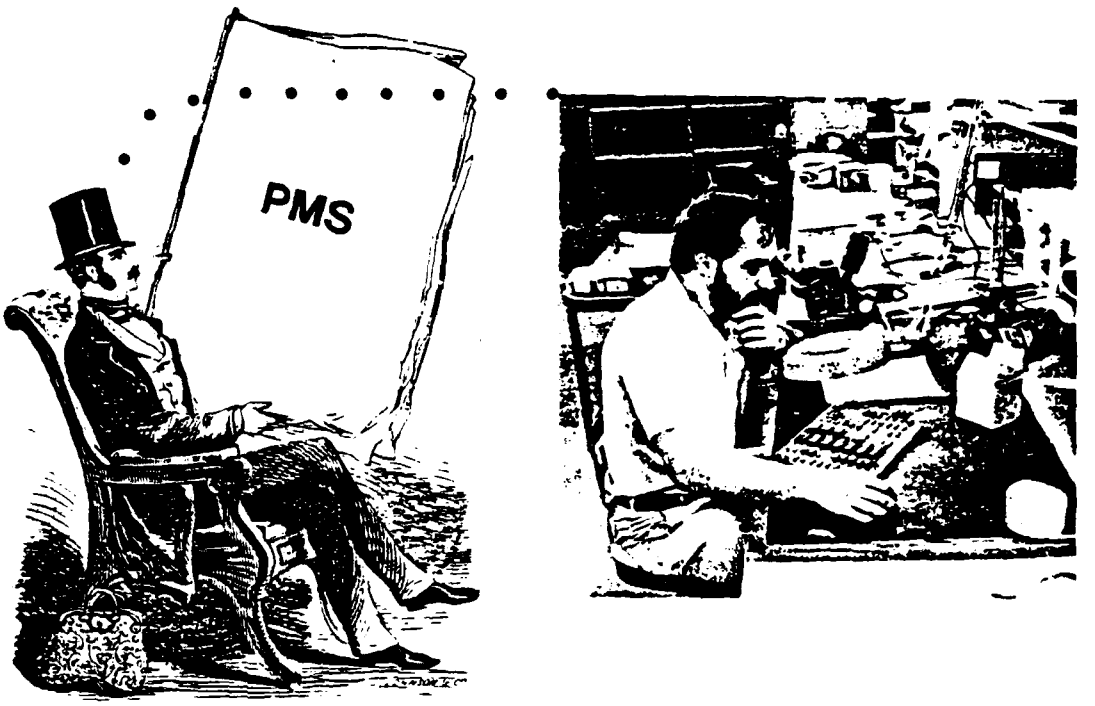


PMS

MATERIEL OFFICE



PMS provides visibility of purchased parts from the time an SR is received in purchasing until the item is received and inspected.



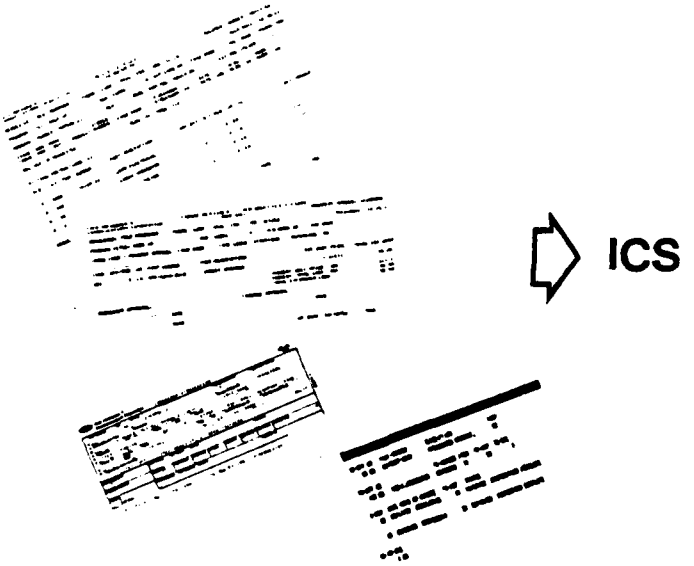
And now the material has arrived and has been put in stores

The Inventory Control Systems (ICS) maintains on-hand balances in stores.

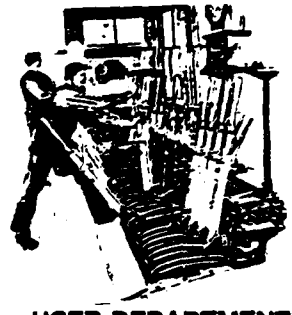
ICS

The system that manages and reports the stockroom transactions is the Inventory Control System or ICS.

ICS provides for on-line update of stockroom transactions and full on-line inquiry by inventory part number, and document number.

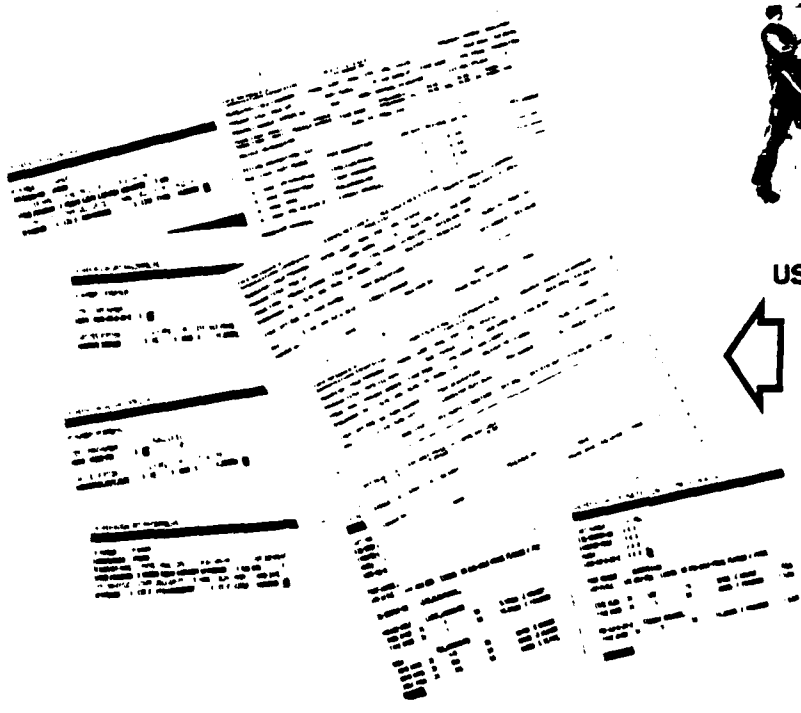


ICS provides the critical on-hand balances needed for production planning and a number of reports necessary to successful material control, including age-sensitive material reports.



USER DEPARTMENT

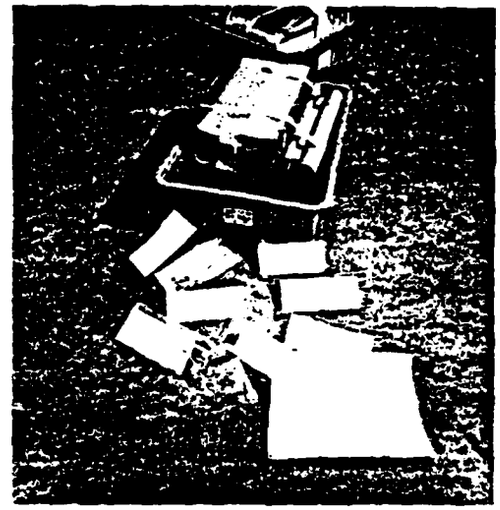
ICS



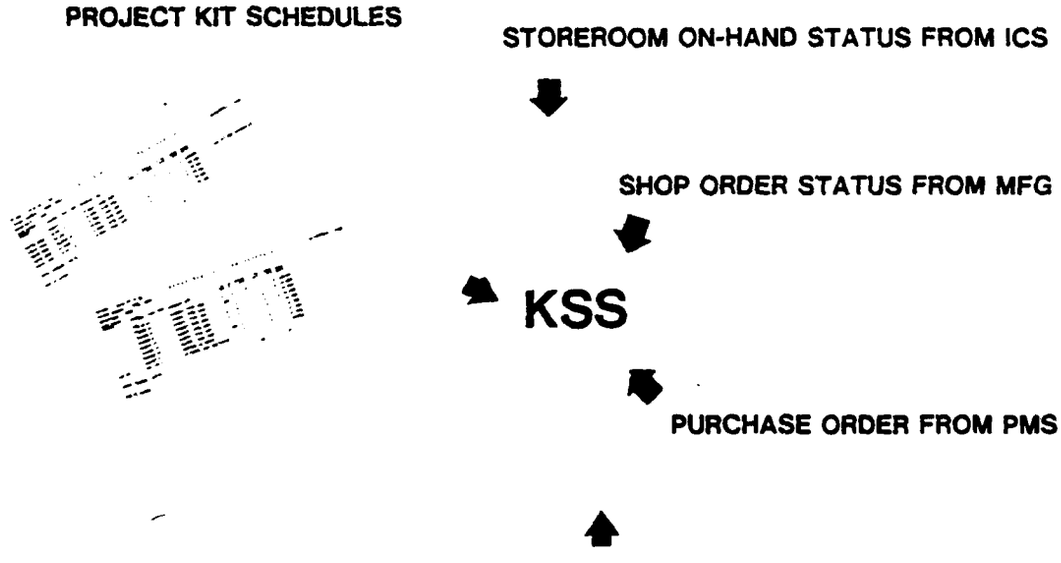
To summarize, ICS provides visibility for all receipts and issues of parts, and maintains on-line status of parts on hand in the storeroom. It also provides status by part number or by complete assembly, and kit number.

Kit Status System (KSS) simulates actual kitting to determine parts availability by kit.

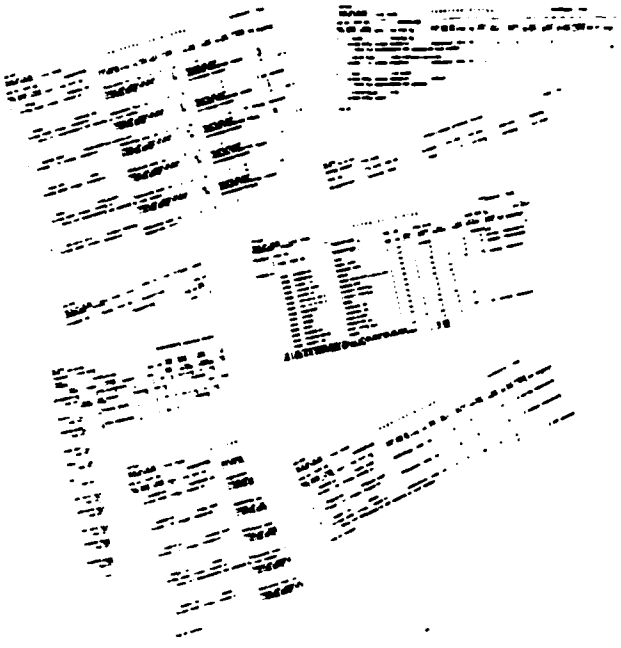
KSS

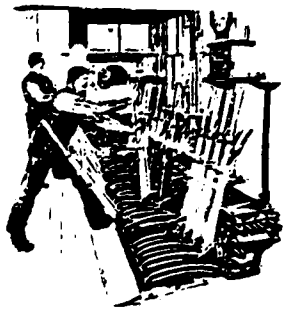


The inputs are project kit schedules, and automatically, single level kit structure from MRG, and Purchase Order Status from PMS. Other inputs are Shop Order Status from MFG and Storeroom on-hand status from ICS.



KSS is controlled by the using department. Its key outputs are paper kit status that simulates actual kitting, shortage reports used for expediting, and kit lists.

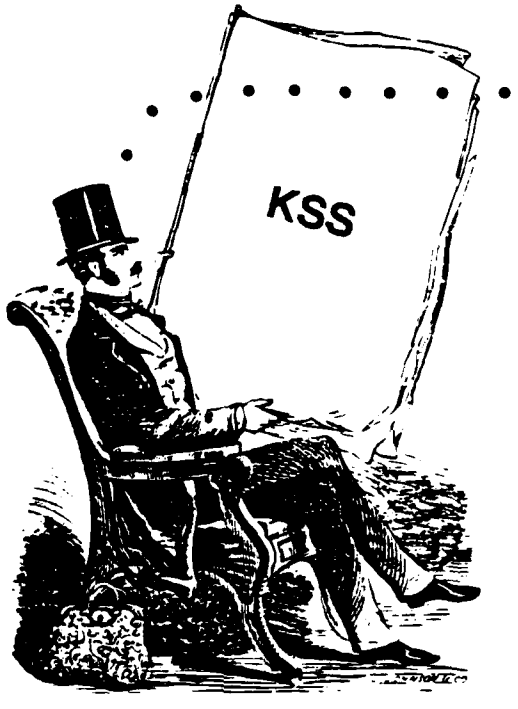




USER DEPARTMENT

KSS

KSS takes the requirements from MRG and simulates filling these requirements. It obtains purchased part status from PMS and on-hand inventory from ICS and WIP from MFG. This simulation enables managers to ascertain when parts are needed - without physically "kitting" the material.

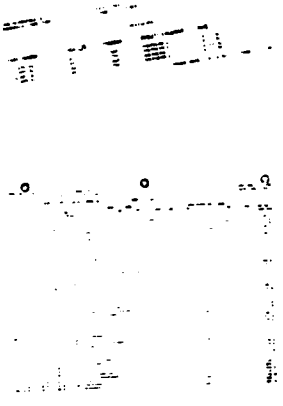


The eighth and final module, Manufacturing Scheduling/Planning (MFG), helps schedule the Shop Floor, tracks work in process, prepares routings and shop orders and plans capacity.

MFG

Inputs

- RFGs - Same RFG can be used for many builds
- Capacities
- Required completion dates
- Touch labor completed
- Part data from MPC
- Delivery information from PMS (for Vendor items)



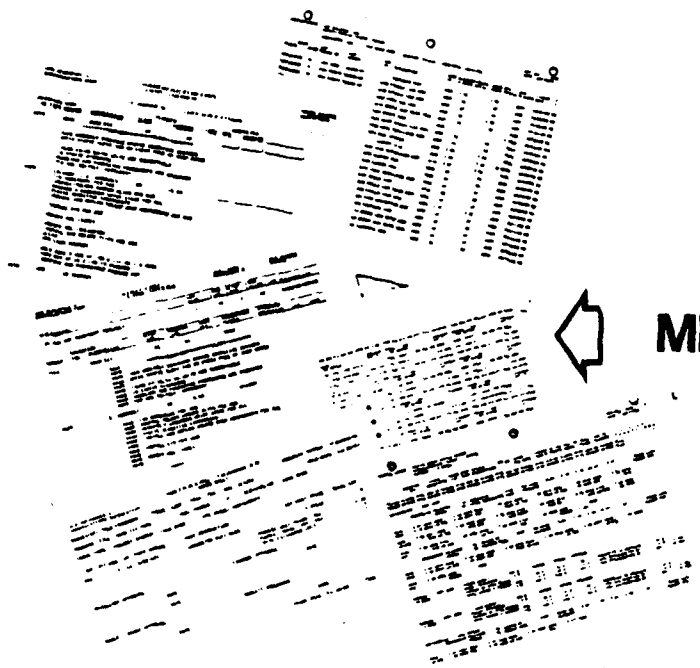
MFG

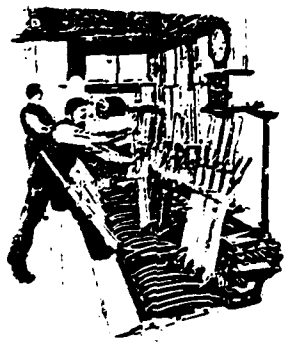
PART DESCRIPTION DATA

SUPPLIER DELIVERY INFORMATION

Outputs

- Schedules (Backwards, Forwards, Learning curve)
- Shop Orders and Traveler Cards
- Job sequence lists that prioritize work

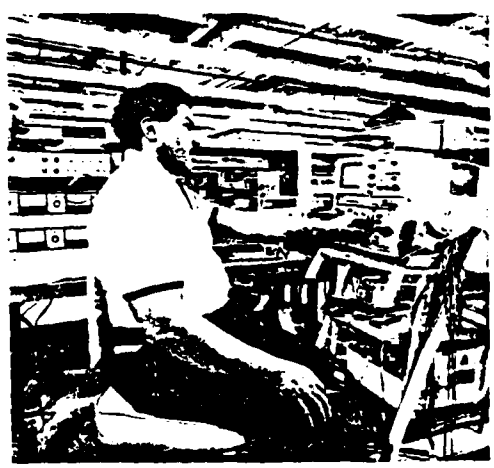




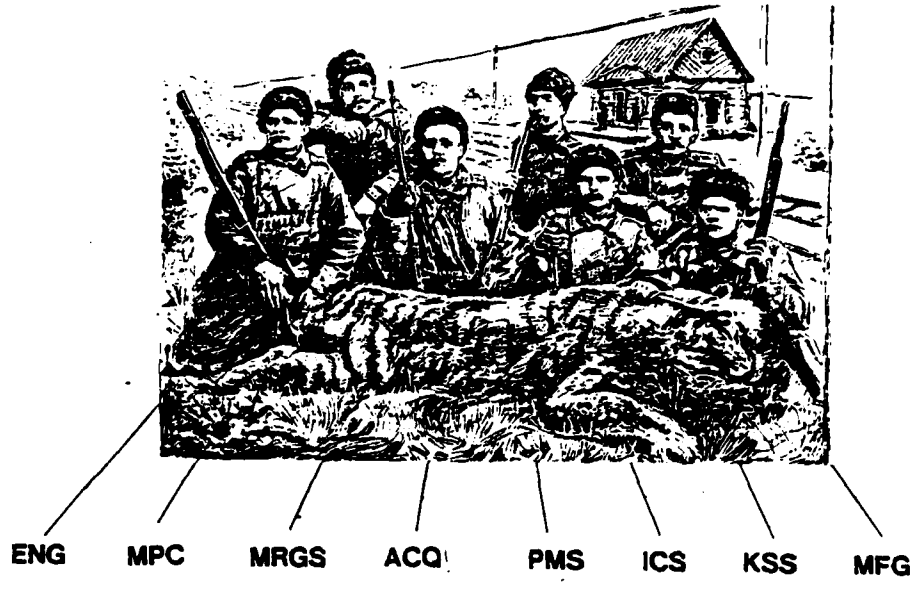
USER DEPARTMENT

MFG

MFG provides on-line visibility of all work-in-process by shop order or assembly number.



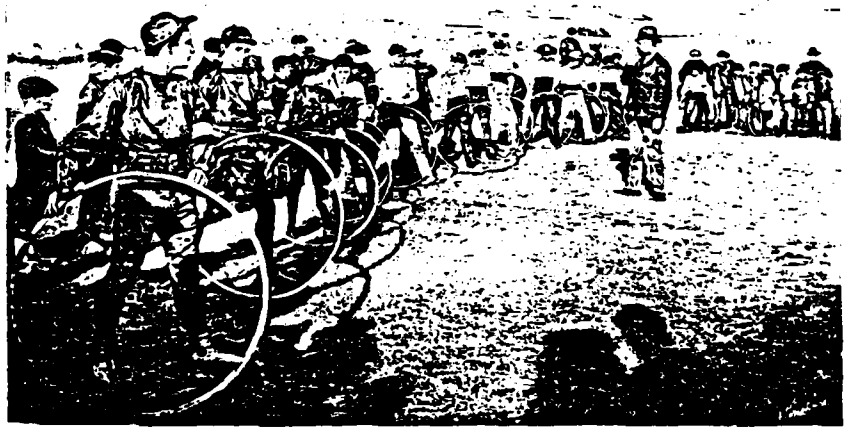
These are the eight elements of the WDL Product Support Systems that make our production more efficient. There are four keys to the successful use of these automated material/production control tools.



What did we do to implement these systems?

First, identified what business practices had to change and changed them before implementation.

Second, train those who will be inputting data.



Third, train those who will be utilizing data provided including management. It is important that they go through the system and not around it.

Fourth, make it a department goal to successfully implement.

Remember that these tools are working here now at WDL with a proven training program.

Each module provides valuable data but used together they form a powerful tool for managing program schedules.

Through all steps from design to shipment, computer tools are used to manage the engineering documentation and changes to assure that material is not bought nor parts built to obsolete designs.

Ford Aerospace & Communications Corporation

OSD DATA INITIATIVES

by

Col. Walker A. Larimer, USAF

Director, Defense Material

Specifications and Standards Office

Falls Church, Virginia

OSD DATA INITIATIVES

- REDUCE DATA REQUIREMENTS AND COSTS
  - IDENTIFY COST DRIVERS
  - SCRUB DOWN REQUIREMENTS
  - IMPLEMENT RECOMMENDATIONS
- OSD PERSPECTIVE OF THE DOD/JCP TECHNICAL INFORMATION COMMITTEE
  - DoD TEAMWORK & COOPERATION CRITICAL TO SUCCESS.
  - TRI-SERVICE REVIEW OF PLANS PROGRESS. AND FUTURE SYSTEMS
  - SINGLE INTEGRATED PLAN
  - SINGLE INTERFACE WITH JCP

REQUIREMENTS AND DATA DRIVERS

	REGULATORY PROVISIONS	FINANCIAL & ADMINISTRATIVE	ENGINEERING & PRODUCTION TASKS	O&M TASKS
REQUIREMENTS & DATA SOURCE	• STATUTES • DAR	• DAR	• MISSION PERF. • OPERATIONAL NEED • TECHNOLOGY BASE	O&M ENVIRONMENT O&M CHARACTERISTICS
CONTRIBUTION TO SYSTEM PERFORMANCE EFFECTIVENESS	NONE	MINIMAL - EARLY WARNING RE COST/SCHEDULE	DEFINES/ESTABLISHES/DETERMINES SYSTEM PERFORMANCE, OPERATIONAL AND SUPPORT REQUIREMENTS	
RELATIONSHIP TO WEAPON SYSTEM ACQUISITION PROGRAM	INDEPENDENT	DEPENDENT ON ACQUISITION STRATEGY	UNIQUELY TAILORED TO EACH SYSTEM DATA IS BY PRODUCT OF TASK	TRADE OFF BETWEEN SYSTEM REQUIREMENTS AND O&M DOCTRINE DATA IS BY PRODUCT
DATA UTILIZATION	COMPLIANCE WITH REGULATORY PROVISIONS	TRACK COST & SCHEDULE	VERIFICATION OF COMPLIANCE "REPROCUREMENT"	BASIS FOR OPERATION, MAINTENANCE AND SUPPORT
PERCEIVED COST IMPACT OF DATA	HIGH	MED	LOW	LOW-MED
REMARKS	SOCIO-ECONOMIC INITIATIVES - NON DOD	CAN DRIVE COMPLIANCE RATHER THAN TOOL FOR CONTROL	TASKS/REQUIREMENTS DRIVE COSTS DATA IS "FALL-OUT"	
RECOMMENDATION	PERIODIC COMPL. VS CONTRACT DRIVEN	ELIMINATE EXCESS DETAIL	TAILOR TASKS AND REQUIREMENTS TAILOR DATA REQUIREMENTS TO CORRELATE WITH TASKS/REQUIREMENTS	

ACTION PLAN FOR DATA REQUIREMENTS SCRUB DOWN

- LARGE PRIME CONTRACTOR IDENTIFIES AND DOCUMENTS NONESSENTIAL REQUIREMENTS (COMPLETED APRIL 1983).
  - SECOND PRIME CONTRACTOR REVIEWS AND COMMENTS ON RESULTS.
- JOINT LOGISTICS COMMANDERS (JLCs) REVIEW REPRESENTATIVE DOD CONTRACTS AND PROVIDE RECOMMENDATIONS (IN WORK).
- DEFENSE SYSTEMS MANAGEMENT COLLEGE (DSMC) CONSOLIDATES INPUTS FROM CONTRACTORS AND JLCs (IN WORK). PROVIDES RECOMMENDATIONS TO OUDSRE (30 JUNE 1983) FOR AIP #14 CONSIDERATION.
- PILOT TEST IMPLEMENTATION OF DSMC's RECOMMENDATIONS BY ALL SERVICES.
  - IMPLEMENT THE BEST IDEAS (6 TO 12).
  - INCENTIVES FOR THE CONTRACTOR AND GOVT PROGRAM MANAGER.
  - NEGOTIATED IN THE CONTRACT.
  - CONTRACT TAILORED FOR THE ENVIRONMENT.
  - DO-ABLE IN THE NEAR-TERM.
  - MORE HARDWARE FOR LESS PAPER

PRIME CONTRACTOR'S REVIEW

- CONTRACTUAL OBJECTIVES HAVING HIGH COST IMPACT ON MANAGING AEROSPACE BUSINESS (15 RECS)
  - SOCIO-ECONOMIC.
  - EVALUATION OF SUBCONTRACT PROPOSALS.
  - INADEQUATE EARLY SPACES SUPPORT.
  - CONTRACTOR MAINTENANCE VS ORGANIC DEPOT.
  - CHANGE PROCESSING.
  - GOVERNMENT PROPERTY PROCEDURES.
  - DESIGNATED ENGINEERING & MANUFACTURING INSPECTION REPS.
- AREAS WHERE DOD CONTRACT DOCUMENT REQMTS COMPEL CONTRACTORS TO MANAGE AT A LEVEL OF DETAIL THAT IS UNPRODUCTIVE. (6 RECS.)
  - COST MANAGEMENT REPORTING.
  - SCHEDULE REPORTING.
  - PROGRAM MANAGEMENT REVIEWS AND NARRATIVE REPORTS.
  - LIFE CYCLE COST/DESIGN TO COST.

- AREAS WHERE THE DOD IS REQUIRING EXCESSIVE OR UNNECESSARY DATA, INCLUDING INCLUDING SOLICITATIONS. (11 RECS.)
  - Source Selection.
  - Follow-on Procurement.
  - Proposal Complexity and Revisions.
  - Data Requirements (Before and After Contract Award).
  - System Enhancement and Upgrade Programs.

- DOD REQUIREMENTS/DOCUMENTS RESULTING IN OVER SPECIFICATION. (6 RECS.)
  - Managing Development and Allocation of Systems Requirements.
    - System Specification requirements.
    - Verification Requirements.
    - Technological Currency and Tailoring.
    - Trend Toward "How To."
    - Specification Trees.
  - Growth of Management, Functional and Speciality Tasks.

DEFENSE SYSTEMS MANAGEMENT COLLEGE REVIEW

- ESTABLISHED WORKING GROUP - 7 PROFESSIONALS.
  - Continued Support from Military Departments.
- NOW REVIEWING PRIME CONTRACTOR'S RECOMMENDATIONS.
- NOW REVIEWING DRAFT REPORTS OF ARMY AND NAVY.
  - All Military Department Reports Due JLCs 16 May 1983.
- DETERMINE CAUSES FOR PROBLEMS.
- REPORT RECOMMENDATIONS TO OUSDRE.

THE BOTTOM LINE IS IN THE DAR

9-502 ACQUISITION OF TECHNICAL DATA AND COMPUTER SOFTWARE

(A) TECHNICAL DATA AND COMPUTER SOFTWARE IS EXPENSIVE TO PREPARE IN THE REQUIRED FORM AND TO MAINTAIN AND UPDATE. EVERY EFFORT, THEREFORE, SHOULD BE MADE TO AVOID PLACING A REQUIREMENT UPON A CONTRACTOR TO PREPARE AND DELIVER DATA OR SOFTWARE UNLESS THE NEED IS POSITIVELY DETERMINED.

OSD PERSPECTIVE OF THE DOD/JCP TECHNICAL INFORMATION COMMITTEE

- DOD/JCP CO-CHAIRMEN PROVIDE CO-SIGNED RECOMMENDATIONS ON SYSTEM ACQUISITIONS TO JCP.
  - LAZORCHEK (JCP) - JCP CO-CHAIRMAN
  - RICHARDSON (DMSSO) - DOD CO-CHAIRMAN
- DOD POSITION FORMULATED WITHIN TRI-SERVICE WORKING GROUP ENVIRONMENT AND COORDINATED WITH ADUSD(PS) PRIOR TRANSMITTAL TO JCP.
- ALL MILITARY DEPARTMENT PRINCIPALS MUST COORDINATE AND AGREE ON INDIVIDUAL SERVICE REQUESTS TO JCP
  - DOES IT CONFORM WITH ESTABLISHED TRI-SERVICE PROGRAM?
  - DOES IT SATISFY SERVICE REQUIREMENT?
  - DOES IT MAKE SENSE?
  - DO CHANGES MAKE SENSE?
- ALL MILITARY DEPARTMENT PRINCIPALS MUST PARTICIPATE IN JCP-DIRECTED TRI-SERVICE EVALUATIONS OF EQUIPMENT
  - EVALUATIONS SCHEDULED AND TRI-SERVICE PRINCIPALS NOTIFIED BY SERVICE HOST.
- DMSSO PROVIDES SINGLE INTERFACE FOR DOD WITH JCP. POLICY DOCUMENTS WILL SOON REFLECT THIS CHANGE. JCP WILL BE FORMALLY ADVISED.

9-201 DEFINITIONS. FOR THE PURPOSE OF THIS PART, THE FOLLOWING TERMS HAVE THE MEANINGS SET FORTH BELOW:

(A) DATA MEANS RECORDED INFORMATION, REGARDLESS OF FORM OR CHARACTERISTIC.

(B) TECHNICAL DATA MEANS RECORDED INFORMATION, REGARDLESS OF FORM OR CHARACTERISTIC, OF A SCIENTIFIC OR TECHNICAL NATURE. IT MAY, FOR EXAMPLE, DOCUMENT RESEARCH, EXPERIMENTAL, DEVELOPMENTAL OR ENGINEERING WORK; OR BE USABLE OR USED TO DEFINE A DESIGN OR PROCESS OR TO PROCURE, PRODUCE, SUPPORT, MAINTAIN, OR OPERATE MATERIEL. THE DATA MAY BE GRAPHIC OR PICTORIAL DELINEATIONS IN MEDIA SUCH AS DRAWINGS OR PHOTOGRAPHS; TEXT IN SPECIFICATIONS OR RELATED PERFORMANCE OR DESIGN TYPE DOCUMENTS; OR COMPUTER PRINTOUTS. EXAMPLES OF TECHNICAL DATA INCLUDE RESEARCH AND ENGINEERING DATA, ENGINEERING DRAWINGS AND ASSOCIATED LISTS, SPECIFICATIONS, STANDARDS, PROCESS SHEETS, MANUALS, TECHNICAL REPORTS, CATALOG ITEM IDENTIFICATIONS AND RELATED INFORMATION, AND DOCUMENTATION RELATED TO COMPUTER SOFTWARE. TECHNICAL DATA DOES NOT INCLUDE COMPUTER SOFTWARE OR FINANCIAL, ADMINISTRATIVE, COST AND PRICING, AND MANAGEMENT DATA OR OTHER INFORMATION INCIDENTAL TO CONTRACT ADMINISTRATION.

COMPETITION

AND

COOPERATION

CAPTAIN THOMAS J. BURKE, USN

COMMANDING OFFICER, NAVAL SEA SYSTEMS
COMMAND LOGISTICS SUPPORT
ENGINEERING ACTIVITY

OFFICER IN CHARGE, NAVAL ELECTRONIC
SYSTEMS COMMAND DETACHMENT
MECHANICSBURG

ENGINEERING/TECHNICAL ASSISTANT TO
COMMANDING OFFICER, SPCC

P. O. Box 2020
MECHANICSBURG, PA 17055
717-790-2711

GOOD MORNING LADIES AND GENTLEMEN. IT IS A DISTINCT PLEASURE FOR ME TO BE HERE AT THE 25TH ANNUAL MEETING OF THE TECHNICAL DOCUMENTATION DIVISION OF THE AMERICAN DEFENSE PREPAREDNESS ASSOCIATION, AND TO REPRESENT NAVY ON THE MILITARY PANEL. I MUST ADD THAT I ALSO REPRESENT THE CENTRAL PENNSYLVANIA MANAGEMENT CHAPTER OF ADPA LOCATED IN MECHANICSBURG, PENNSYLVANIA, WHERE I AM A MEMBER IN GOOD STANDING.

TO SET THE STAGE FOR MY REMARKS AND SO THAT YOU WILL PLACE THEM IN PROPER PERSPECTIVE, I NEED TO TELL YOU A FEW THINGS ABOUT MYSELF AND THE ACTIVITIES I REPRESENT. ALTHOUGH I AM THE "NAVY" REPRESENTATIVE, IT IS OBVIOUS THAT SOME OF MY REMARKS WILL BE SLANTED TO AND BIASED BY MY PRESENT POSITIONS. FIRST, I AM A SURFACE WARFARE OFFICER -- A SHIP DRIVER. I AM NOT AN ENGINEER BY EDUCATION; HOWEVER, I HAVE A STRONG TECHNICAL BACKGROUND BOTH BY TRAINING AND SHIPBOARD EXPERIENCE. I CURRENTLY HAVE ASSIGNMENTS WITH THREE SEPARATE ACTIVITIES IN THE MECHANICSBURG, PENNSYLVANIA, AREA. MY PRIMARY DUTY IS AS COMMANDING OFFICER OF THE NAVSEA LOGISTICS SUPPORT ENGINEERING ACTIVITY, A NAVAL SEA SYSTEMS COMMAND FIELD ACTIVITY. I HAVE AN ADDITIONAL DUTY ASSIGNMENT AS OFFICER IN CHARGE, NAVELEX DETACHMENT IN MECHANICSBURG, A NAVAL ELECTRONICS SYSTEMS COMMAND FIELD ACTIVITY. THESE ACTIVITIES ARE DEEPLY INVOLVED IN THE PROVISIONING PROCESS FOR HULL, MECHANICAL AND ELECTRICAL EQUIPMENTS, AS WELL AS SEARCH RADARS, SONARS AND TACTICAL COMPUTERS FOR NAVSEA, AND FOR ALL NAVELEX EQUIPMENTS.

IN ADDITION, BOTH ACTIVITIES PROVIDE ENGINEERING SERVICES TO NAVY SHIPS PARTS CONTROL CENTER (SPCC) FOR RESOLUTION OF TECHNICAL PROBLEMS RELATED TO SPARE PARTS REPROCUREMENT. I LIKE TO REFER TO MY PEOPLE, MOST OF WHOM ARE ENGINEERS, AS INTERPRETERS BETWEEN THE ACQUISITION MANAGERS IN NAVSEA AND NAVELEX AND THE SUPPLY SYSTEM, PRINCIPALLY SPCC AS THE PRIMARY INVENTORY CONTROL POINT FOR SHIPS. INTERPRETERS OBVIOUSLY SPEAK AT LEAST TWO LANGUAGES; THUS, MY ENGINEERS, IN ADDITION TO BEING QUALIFIED IN THEIR OWN LANGUAGE, ALSO SPEAK "SUPPLY", A LANGUAGE WHICH IS FOREIGN TO MOST OF THOSE IN THE ACQUISITION BUSINESS.

MY THIRD POSITION, ANOTHER ADDITIONAL DUTY ASSIGNMENT, IS AS ENGINEERING/TECHNICAL ASSISTANT TO THE COMMANDING OFFICER OF SPCC, COMMODORE ROBERT B. ABELE, SC, USN.

MY APPEARANCE HERE TODAY IS SOMEWHAT OF A FOLLOW ON TO YOUR EXECUTIVE BOARD MEETING HOSTED BY THE CENTRAL PENNSYLVANIA MANAGEMENT CHAPTER OF ADPA IN MECHANICSBURG FROM 27-29 SEPTEMBER 1932. AT THAT TIME, MR. DICK McFARLAND, THE EXECUTIVE DIRECTOR OF SPCC, AND I HAD THE PRIVELEGE OF PARTICIPATING IN DISCUSSIONS WITH MEMBERS OF THE EXECUTIVE BOARD. DURING THOSE DISCUSSIONS, WE OPENED THE DOOR TO SOME OF THE POINTS I WISH TO LEAVE WITH YOU.

IN THE SHIPS' WORLD WE HAVE TWO GENERAL CATEGORIES OF EQUIPMENTS -- GOVERNMENT FURNISHED AND CONTRACTOR FURNISHED. MOST OF YOU ARE MORE CLOSELY ASSOCIATED WITH THE GOVERNMENT FURNISHED EQUIPMENTS WHICH ARE MOST OFTEN INTRODUCED TO THE FLEET THROUGH THE R&D CYCLE WITH THE NAVY FREQUENTLY PARTICIPATING IN OR PROVIDING FUNDING FOR THE DESIGN PROCESS. IN MANY OF THESE CASES, THE NAVY ACTUALLY ACQUIRES A MAJORITY OF THE TECHNICAL DATA OR THE RIGHTS TO THAT DATA. MOST OF THESE EQUIPMENTS FALL INTO THE ELECTRONIC OR ORDNANCE CATEGORIES. HOWEVER, THERE ARE SOME HULL, MECHANICAL AND ELECTRICAL (HM&E) EQUIPMENTS SUCH AS PROPULSION GAS TURBINES, WHICH ALSO FALL INTO THIS GOVERNMENT FURNISHED CATEGORY. CONTRACTOR FURNISHED EQUIPMENT IS SUPPLIED BY THE SHIPBUILDER TO MEET PERFORMANCE SPECIFICATIONS CALLED OUT IN THE SHIPBUILDING CONTRACT. THESE ARE USUALLY OFF-THE-SHELF, COMMERCIAL, MARINE APPLICABLE HM&E EQUIPMENTS; BUT NOT ALWAYS. IN RECENT YEARS, WE HAVE SEEN MORE SMALL ELECTRONIC ITEMS, INTERCONNECTING DEVICES, REMOTE CONTROL UNITS AND OTHER PERFORMANCE SPECIFICATION ITEMS BEING PROVIDED BY THE SHIPBUILDER. THE MAIN POINT HERE IS THAT ALMOST ALL CONTRACTOR FURNISHED EQUIPMENT IS PROCURED TO PERFORMANCE SPECIFICATIONS WITH LITTLE TO NO STANDARDIZATION. SINCE NAVY GENERALLY HAD NO PART IN THE DEVELOPMENT OF THESE EQUIPMENTS, AND DOES NOT NORMALLY CONTROL THE EQUIPMENT DESIGN, THE GOVERNMENT HAS NO RIGHTS TO TECHNICAL DATA AND VERY FREQUENTLY THE EQUIPMENT MANUFACTURER REFUSES TO SELL SUCH DATA TO NAVY.

ALL THIS PREAMBLE WAS MEANT TO LEAD INTO MY TWO PRINCIPAL THEMES -- COMPETITION AND COOPERATION.

ALL OF YOU ARE AWARE OF THE PRESSURES CURRENTLY BEING PLACED ON THE DEPARTMENT OF DEFENSE BY THE CONGRESS TO INCREASE COMPETITION FOR SPARE PARTS. I AM SURE YOU HAVE BEEN EXPOSED TO AT LEAST SOME OF THE TELEVISION AND PRINT MEDIA EXPOSÉS ON OUR FAILURES TO COMPETE SPARE PARTS BUYS AND THE EXAMPLES GIVEN WHICH WERE INTENDED TO SHOW MILITARY WASTE AND EXCESSIVE EXPENDITURES. PERHAPS YOUR COMPANY HAS BEEN ONE OF THOSE ACCUSED OF PRICE GOUGING AND EXCESSIVE PROFITEERING ON THE SALE OF SPARE PARTS TO THE MILITARY. IN MANY OF THE EXAMPLES, THE EXPOSÉ IS CORRECT. COMPETING THE ITEM WOULD HAVE RESULTED IN A LOWER PRICE. THEN, WHY DIDN'T WE COMPETE THE ITEM? I AM NOT GOING TO ATTEMPT TO ANSWER THAT FOR ALL CASES, BUT I DO WANT TO DISCUSS ONE MAJOR REASON. THE OBSTACLE TO COMPETITION OF WHICH I AM SPEAKING IS THE LACK OF ADEQUATE TECHNICAL DOCUMENTATION.

ALL TOO OFTEN, THE TECHNICAL DATA DELIVERED TO THE NAVY DOES NOT DISCLOSE SUFFICIENT DETAIL TO SUPPORT REPROCUREMENT OF IDENTICAL SPARE AND REPAIR PARTS FROM OTHER THAN THE ORIGINAL EQUIPMENT MANUFACTURER (OEM). THIS IS ALMOST THE WAY OF LIFE FOR US WITH REGARD TO CONTRACTOR FURNISHED EQUIPMENT WHERE THE DATA OFTEN DOES NOT EXIST TO THAT LEVEL OF DETAIL, BUT IT IS ALSO FREQUENTLY THE CASE WITH GOVERNMENT FURNISHED EQUIPMENT EVEN THOUGH THE NAVY SUPPOSEDLY BOUGHT THE

REQUIRED DATA. IN MANY CASES, WE HAVE FOUND THAT LEVEL III DRAWINGS, WHERE AND WHEN BOUGHT, ARE NOT COMPLETELY SUITABLE FOR COMPETITIVE REPROCUREMENT.

LET'S FACE FACTS. THE PRESSURES TO BREAK OUT SPARE PARTS FOR COMPETITION ARE NOT GOING TO LESSEN. ON THE CONTRARY, I EXPECT THAT THE SCREWS WILL BE TIGHTENED EVEN MORE BY CONGRESS AND THE HEAT WILL FURTHER INCREASE. EACH OF THE SERVICES, AS WELL AS DLA, HAS BEEN GIVEN GOALS FOR COMPETITION WHICH SIGNIFICANTLY EXCEED THE DOLLAR VALUE OF THEIR REPORTED COMPETITIVE SPARE PROCUREMENTS OF PRIOR YEARS.

HOW IS THE NAVY LOOKING TO MEET THOSE GOALS FOR COMPETITIVE PROCUREMENT OF SPARE PARTS FOR SHIPS' EQUIPMENT? ONE LONG-TERM OBJECTIVE IS TO "ENCOURAGE" ACQUISITION MANAGERS TO BUY MORE DETAILED TECHNICAL DATA WITH THE EQUIPMENT PROCUREMENT. ANOTHER OBJECTIVE, ALSO LONG-TERM, BEING PURSUED BY NAVSEA IS TO DEVELOP STANDARDIZED, NAVY OWNED DESIGNS FOR CERTAIN COMMON, HIGH POPULATION, HM&E EQUIPMENTS. A THIRD ACTION, WHICH MY ACTIVITIES ARE BEING LOOKED TO FOR GREATER INVOLVEMENT, IS THE IN-DEPTH TECHNICAL REVIEW OF EXISTING DOCUMENTATION TO DETERMINE ADEQUACY FOR COMPETITION OR TO DEVELOP ADDITIONAL TECHNICAL DATA SO THAT THE PACKAGE IS ADEQUATE TO COMPETE.

ANOTHER ACTION, AND ONE WHICH IS ACTIVELY BEING PURSUED BY SPCC, IS THE DEVELOPMENT OF INCREASED COOPERATION WITH EQUIPMENT MANUFACTURERS.

THIS LEADS ME INTO MY SECOND THEME --INCREASED COOPERATION BETWEEN THE MILITARY AND INDUSTRY.

WHAT DO I MEAN BY INCREASED COOPERATION?

BEFORE ANSWERING THAT QUESTION, LET ME ASK YOU A FEW QUESTIONS. OBVIOUSLY, I DON'T EXPECT ANSWERS.

- HOW MANY OF YOUR COMPANIES ASSIGN YOUR OWN PART NUMBER TO ALL PARTS IN EQUIPMENT YOU PRODUCE EVEN THOUGH YOU DO NOT MAKE ALL THE PARTS YOURSELF BUT PURCHASE THEM FROM SOME VENDOR OR VENDORS?

- HOW MANY OF YOUR COMPANIES PURPOSELY LEAVE SOME OF THE DETAILS OF A MANUFACTURING PROCESS, QA REQUIREMENT, TEST PROCEDURE OR MATERIALS REQUIREMENT OFF A PART DRAWING SO WE WILL HAVE TO COME BACK TO YOU TO BUY THE PART?

- HOW MANY OF YOUR COMPANIES CONSCIOUSLY STRIVE TO GET YOURSELF INTO THE POSITION OF BEING THE SOLE SOURCE FOR SPARE PARTS AND THEN CHARGE EXCESSIVELY HIGH PRICES FOR THOSE PARTS?

- HOW MANY OF YOUR COMPANIES PROFIT MORE ON GOVERNMENT SALES THAN COMMERCIAL SALES?

- WHY SHOULD THE MILITARY BE PLACED IN THE POSITION OF

BUYING SPARE PARTS ONLY FROM YOUR COMPANY UNLESS YOU BRING SOME SPECIAL "MAGIC" TO THAT PART?

- WHY SHOULD THE MILITARY PAY YOUR COMPANY SIMPLY TO PASS AN ORDER FOR SPARE PARTS THROUGH TO ONE OF YOUR VENDORS?

- WHY SHOULD YOUR COMPANY MAKE A GREATER PROFIT OFF OF MILITARY SALES THAN COMMERCIAL SALES?

AS I SAID, THE PRESSURES TO COMPETE SPARE PARTS ARE NOT GOING TO GO AWAY; SO WE, THE MILITARY AND INDUSTRY, MUST WORK TOGETHER IN WAYS WHICH ARE MUTUALLY BENEFICIAL WHICH WILL HELP US TO MEET OUR GOALS FOR COMPETITION, AND WHICH WILL REDUCE THE COSTS FOR SPARE PARTS.

MR. DICK McFARLAND, THE EXECUTIVE DIRECTOR AT SPCC, IS CURRENTLY CONTACTING SENIOR EXECUTIVES AT MAJOR COMPANIES AND PROPOSING THAT THEY RELEASE TO NAVY THE DATA ON VENDOR ITEMS FOR WHICH THE EQUIPMENT MANUFACTURER ADDS NO MAGIC" OR "VALUE," TECHNICAL DATA PACKAGES, SOURCES AND PRICING STRUCTURE ON AN ITEM BY ITEM BASIS. WHERE HE HAS ALREADY GOTTEN SUCH AGREEMENTS, SPCC HAS BEEN ABLE TO REDUCE LEAD TIMES AS WELL AS REDUCE COSTS TO NAVY.

WHAT DOES THE COMPANY GET IN EXCHANGE FOR THIS INCREASED COOPERATION OTHER THAN SIMPLY SEEING A DECREASE IN TAX DOLLARS

BEING SPENT FOR SPARE PARTS? MR. McFARLAND IS PROVIDING TO THOSE COMPANIES WITH WHICH HE HAS NEGOTIATED AGREEMENTS PROJECTED ANNUAL BUY DATA FOR THOSE LEGITIMATE SOLE SOURCE ITEMS SO THAT THE COMPANY MAY BETTER PLAN FOR AND PRODUCE TO THOSE LARGER ANNUAL BUYS. FURTHER, HE IS WORKING ON A PROGRAM TO TRANSLATE PRODUCTION PLANNING FORECASTS INTO ONE TIME PRODUCTION CONTRACTS. IN ADDITION, PROGRAMS ARE NOW GETTING UNDERWAY UNDER NAVMAT'S SPONSORSHIP WHICH WILL IDENTIFY PARTS WHICH ARE "CRITICAL" TO THE OPERATION OF THAT EQUIPMENT AND THEN LIMIT THE PROCUREMENT OF THOSE PARTS RATHER THAN BREAKING THEM OUT FOR COMPETITION. FUTURE EQUIPMENT CONTRACTS WILL INCLUDE THE REQUIREMENT FOR THE EQUIPMENT MANUFACTURER TO RECOMMEND SPECIFIC PROCUREMENT METHOD CODES (PMC) FOR EACH PART IN ACCORDANCE WITH MILITARY STANDARD 789. NAVELEX IS STARTING TO INCLUDE THIS REQUIREMENT IN THEIR CONTRACTS AND I EXPECT NAVSEA TO ALSO DO SO IN THE NOT TOODISTANT FUTURE.

THIS MAY NOT BE WHAT YOU EXPECTED TO HEAR FROM THE NAVY REPRESENTATIVE TODAY. BUT, WHEN YOU GET A SIMPLE "SHIP DRIVER" TALKING ABOUT SUCH THINGS AS COMPETITION, PROCUREMENT, REPROCUREMENT, FIRST TIER BREAKOUT, AND TECHNICAL DOCUMENTATION, WHAT CAN YOU EXPECT? MY BOTTOM LINE ALWAYS IS IMPROVED SUPPORT FOR THE FLEET.

WE HAVE BOTH, MILITARY AND INDUSTRY, TAKEN ENOUGH HITS AND BEEN GIVEN ENOUGH BLACK EYES BY THE MEDIA ON LACK OF COMPETITION FOR SPARE PARTS. THE DRIVE FOR INCREASED COMPETITION IS HERE TO STAY. WE NEED TO GET ON WITH IMPROVING THE COOPERATION BETWEEN THE MILITARY AND INDUSTRY SO THAT MY BOTTOM LINE OF IMPROVED SUPPORT TO THE FLEET CAN BE ACHIEVED.

THANK YOU

A CONCEPT FOR TECHNICAL DATA MANAGEMENT AUTOMATION

LTC STEPHEN TRACY

DIRECTORATE FOR READINESS

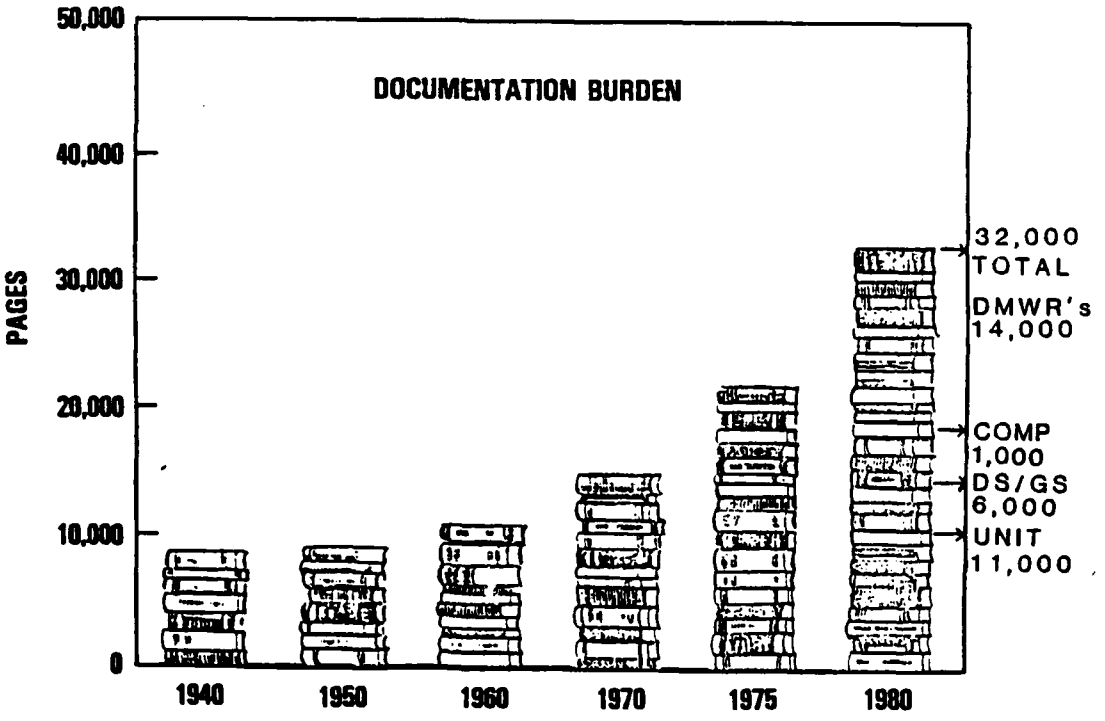
HEADQUARTERS, DARCOM

K

GOOD MORNING, LADIES AND GENTLEMEN. I AM LTC STEPHEN TRACY, FROM THE DIRECTORATE FOR READINESS, HEADQUARTERS, DARCOM, AND I WILL BE BRIEFING YOU TODAY ON AN EVOLUTIONARY CONCEPT BEING DEVELOPED BY DARCOM WHICH WILL AUTOMATE TECHNICAL DATA FROM THE WEAPONS SYSTEM DESIGNER TO THE SOLDIER IN THE FIELD. THIS NEW CONCEPT FOR MANAGEMENT OF TECHNICAL DATA WILL UTILIZE THE TREMENDOUS POTENTIAL OF RECENT COMPUTER TECHNOLOGICAL ADVANCES IN BOTH HARDWARE AND SOFTWARE IN THE COMMERCIAL SECTOR. THE DEVELOPMENT OF THIS CONCEPT IS CONSIDERED BY DARCOM TO BE A MAJOR INITIATIVE UNDER THE LOGISTICS RESEARCH AND DEVELOPMENT PROGRAM.

TECHNICAL DATA MANAGEMENT

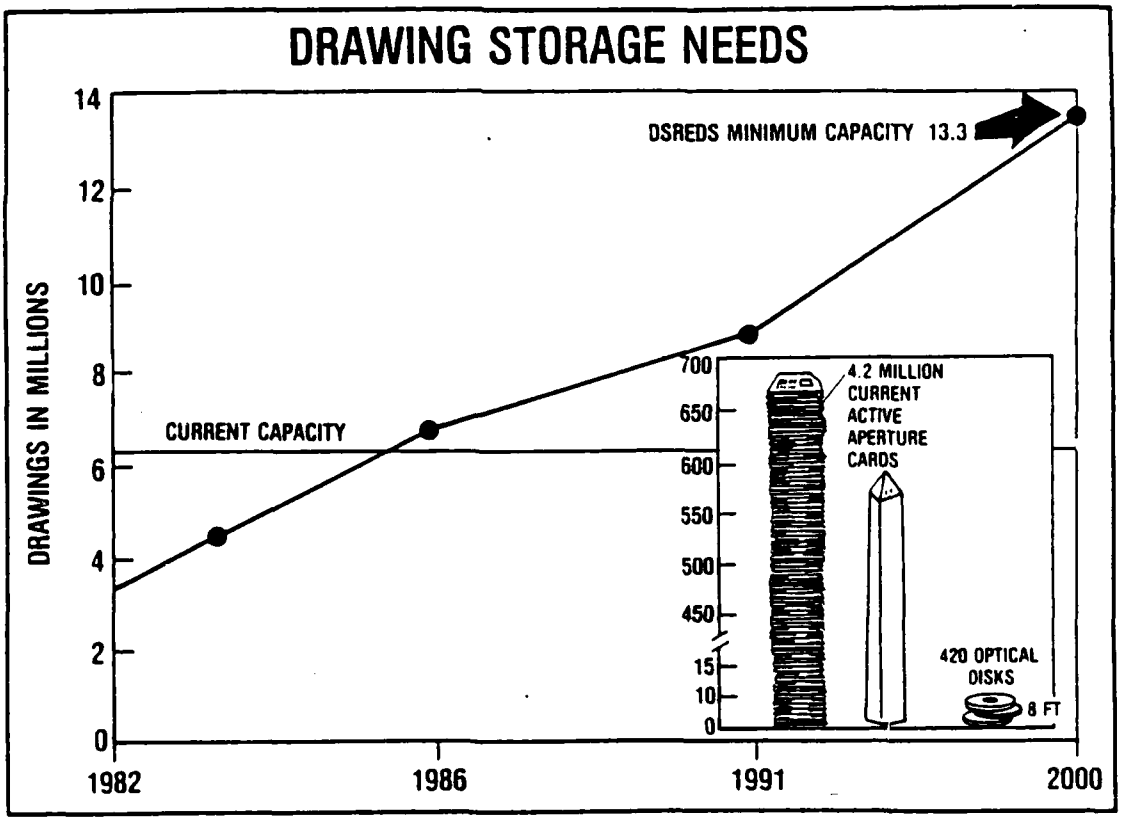
TYPICAL WEAPON SYSTEM



THE NEED FOR AUTOMATED TECHNICAL DATA IS OBVIOUS.

TECHNICAL DATA IS EXPLODING IN VOLUME.

FOR EXAMPLE, TECHNICAL DOCUMENTATION HAS EXPLODED FROM 8000 PAGES FOR THE M24 TANK IN 1940, TO 15,000 PAGES FOR THE M60 TANK IN THE 70'S, TO ABOUT 32,000 PAGES IN THE 80'S FOR THE M1 TANK. THE PATRIOT MISSILE USERS LIKEWISE ARE CONFRONTED WITH 21,000 PAGES OF MANUALS FOR THEIR WEAPON SYSTEM. BUT THESE ARE ONLY TWO EXAMPLES OF THE TOTAL PROBLEM CONFRONTING THE ARMY. ADD TO THIS, TECHNICAL MANUALS FOR OTHER NEW SYSTEMS BEING FIELDED OVER THE NEXT SEVERAL YEARS, AND WE FIND THE SOLDIER IS GOING TO NEED TO CARRY AROUND AN EVER-INCREASING REFERENCE LIBRARY TO KEEP EQUIPMENT SHOOTING, MOVING, AND COMMUNICATING.



IF WE LOOK AT TECHNICAL DATA FROM A TOTAL ARMY VIEWPOINT, THE STORY IS EQUALLY UNNERVING. LOOKING ONLY AT THE TOTAL NUMBER OF ENGINEER DRAWINGS ON APERATURE CARDS WITHIN THE ARMY TODAY, THE PICTURE IS ALL BUT MIND BUGGLING. IF THESE CARDS WERE PLACED IN A SINGLE STACK, THE PILE WOULD TOWER OVER THE WASHINGTON MONUMENT BY SOME 100 FEET. IF THESE DRAWINGS WERE TO BE PLACED ON VIDEO DISKS, THE 700 FEET OF APERATURE CARDS WOULD BE REDUCED TO 420 OPTICAL DISKS, WHICH WOULD BE ROUGHLY 8 FEET HIGH, IF STACKED ONE ON TOP OF EACH OTHER.

IF WE CONTINUE WITH OUR PRESENT SYSTEM, BY THE YEAR 2000, ENGINEER DRAWINGS WILL INCREASE FROM THE CURRENT 4.3 MILLION APERATURE CARDS TO 13.3 MILLION - A 3 FOLD INCREASE IN LESS THAN 20 YEARS. BY THE YEAR 2000, THE STACK OF APERATURE CARDS WOULD APPROACH 2100 FEET IN HEIGHT - THE APPROXIMATE COMBINED HEIGHT OF BOTH THE UPPER AND LOWER FALLS AT YOSEMITE NATIONAL PARK!! AND THIS WOULD ONLY BE A SMALL PORTION OF THE OVERALL TECHNICAL DATA VOLUME WITHIN THE ARMY!!!

FOR YOUR INFORMATION, DSREDS NOTED ON THE UPPER RIGHT HAND PORTION OF THIS SLIDE IS AN ACRONYM FOR DIGITAL STORAGE AND RETRIEVAL ENGINEER DATA SYSTEM, WHICH IS A PROPOSED SYSTEM WE ARE EXAMINING WHICH PROMISES TO REDUCE THE VOLUME OF PAPERWORK FOR ENGINEERING DRAWINGS.

TECHNICAL DATA MANAGEMENT
REQUIREMENTS

SYSTEM SHOULD INCLUDE:

- **TECH DATA PACKAGE**
- **LOGISTICS SUPPORT ANALYSIS**
- **TECHNICAL MANUALS**
- **REPAIR PARTS AND SPECIAL TOOLS LIST**
- **TRAINING MATERIALS**
- **TRAINING DEVICES**
- **PROCESS SHEETS**
- **DEPOT MAINTENANCE WORK REQUIREMENTS**
- **DIAGNOSTICS/ATE**
- **PARTS REQUISITIONING CAPABILITY**
- **MAINTENANCE DATA COLLECTION**
- **ADAPTABILITY FOR FOLLOW-ON TRAINING/TESTING**

APERATURE CARDS AND HARD COPY TECHNICAL MANUALS ARE ONLY PART OF THE PROBLEM TODAY IN FIELDING AND SUPPORTING NEW WEAPONS SYSTEMS. THE FACT IS THAT THE WHOLE TECHNICAL DATA SYSTEM IS OUTMODED AND MUST BE FIXED; INCLUDING THE TECHNICAL DATA PACKAGE, REPAIR PARTS LISTING AND REQUISITIONING, TRAINING PUBLICATIONS, DEPOT MAINTENANCE WORK DOCUMENTS, DIAGNOSTIC FAULT ISOLATION, AND EVEN FEEDBACK OF FIELD MAINTENANCE DATA TO THE SUPPLIER AND DESIGNER.

CURRENT TECHNOLOGY IS NOW AVAILABLE TO STREAMLINE THE ENTIRE PROCESS; AND WHAT WE NEED IS A CONCEPT THAT TIES ALL THE PIECES TOGETHER.

THE COMMANDER OF DARCOM, GENERAL KEITH, HAS DIRECTED THAT ACTION BEGIN IMMEDIATELY TO EXPEDITE DEVELOPMENT OF A MODERNIZED TECHNICAL DATA MANAGEMENT SYSTEM. THAT EFFORT IS UNDERWAY NOW, AND INVOLVES BOTH DARCOM AND TRADOC. IN THE REMAINDER OF THE BRIEFING, I WILL IDENTIFY INITIATIVES ALREADY UNDERWAY TODAY, AND WILL SHOW YOU WHAT NEEDS TO BE DONE.

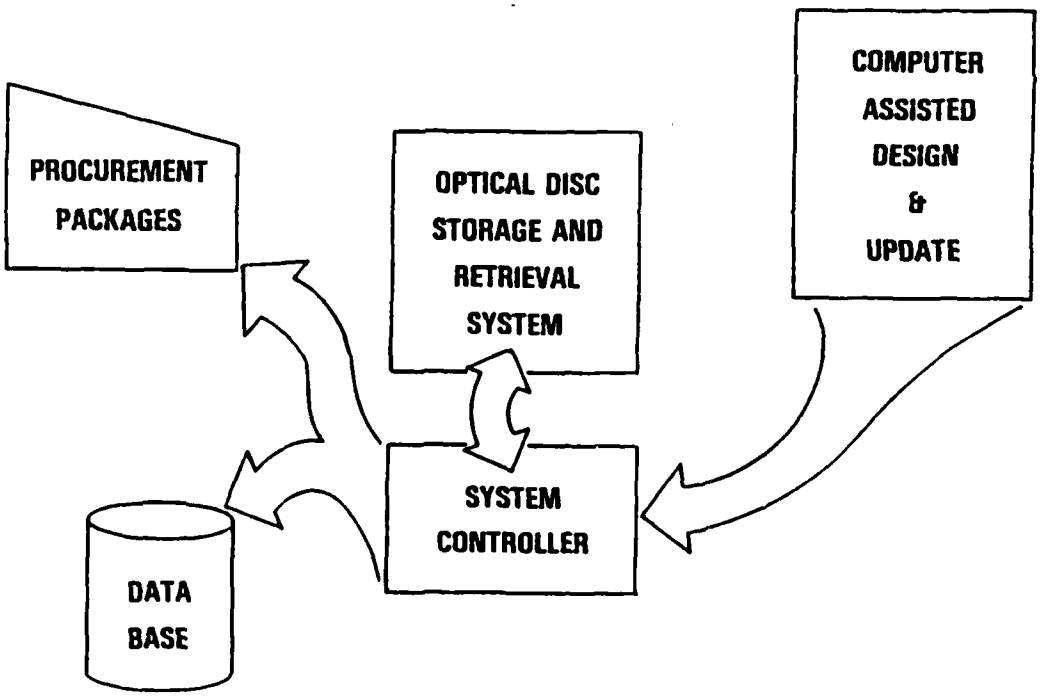
TECHNICAL DATA MANAGEMENT
KNOWN ARMY INITIATIVES

- **COMPUTER-ASSISTED DESIGN/COMPUTER-ASSISTED MANUFACTURING**
- **CONFIGURATION TECHNICAL DATA**
- **STORAGE OF DIGITIZED ENGINEERING DRAWINGS**
- **LOGISTICS SUPPORT DATA**
- **PROVISIONING DATA – REDESIGN OF CURRENT SYSTEM**
- **MAINTENANCE DATA FEEDBACK**
- **EQUIPMENT PUBLICATIONS PRODUCTION SYSTEM**
- **USER ELECTRONIC DISPLAYS – PARTS AND MAINTENANCE DATA**

THESE ARE ON-GOING INITIATIVES IN THE ARMY THAT RELATE DIRECTLY TO THE PROBLEM OF TECHNICAL DATA. THESE ARE ALREADY EXISTING PROJECTS THAT MUST BE LINKED TOGETHER. IN SOME INSTANCES THEY REQUIRE NEW STATE-OF-THE-ART HARDWARE, WHILE OTHERS REQUIRE SOFTWARE DESIGN. THEY ARE MAJOR EFFORTS THAT WILL BE CRITICAL TO SOLVING THE ENTIRE TECHNICAL DOCUMENTATION PROBLEM. I'D LIKE TO DISCUSS SOME OF THEM WITH YOU NOW, IN THE CONTEXT OF THE MANNER IN WHICH THE TECHNICAL DATA MUST FLOW IN DARCOM.

TECHNICAL DATA MANAGEMENT

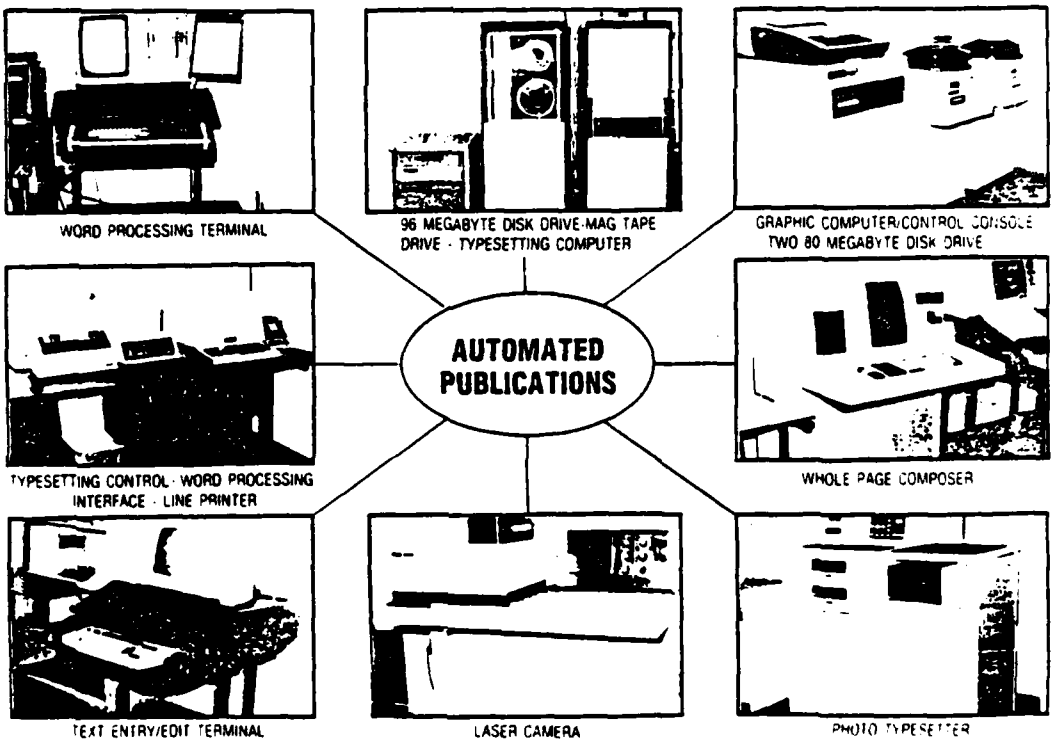
TECHNICAL DATA STORAGE SYSTEM



FOR INSTANCE, DARCOM HAS A PROJECT UNDERWAY NOW TO PROVIDE A NEW STORAGE MEDIUM FOR THE MILLIONS OF ENGINEERING DRAWINGS OUR SUBORDINATE COMMANDS MUST STORE ON OUTDATED 35 MM APERATURE CARDS. THE STATE-OF-THE-ART IS HERE FOR A SYSTEM USING OPTICAL VIDEODISCS AS THE STORAGE MEDIUM. THE PROPOSED SYSTEM, CALLED THE DIGITAL STORAGE AND RETRIEVAL ENGINEERING DATA SYSTEM - DSREDS - COULD AUTOMATICALLY ASSEMBLE ALL APPLICABLE DRAWINGS FOR EACH TECHNICAL DATA PACKAGE IDENTIFIED FOR PROCUREMENT, AS WELL AS BE THE TECHNICAL BASE FOR INSTRUCTIONAL MANUALS.

COMPUTER ASSISTED THREE DIMENSIONAL DESIGN TECHNIQUES, IN USE BY SOME MAJOR INDUSTRIAL CONCERNS, COULD THEN BE LINKED TO THIS SYSTEM; AND THROUGH THE ABILITY OF INTERACTIVE GRAPHICS, WOULD ALLOW THE DESIGN ENGINEER TO "TALK" TO HIS DRAWINGS AND KEEP THEM CURRENT.

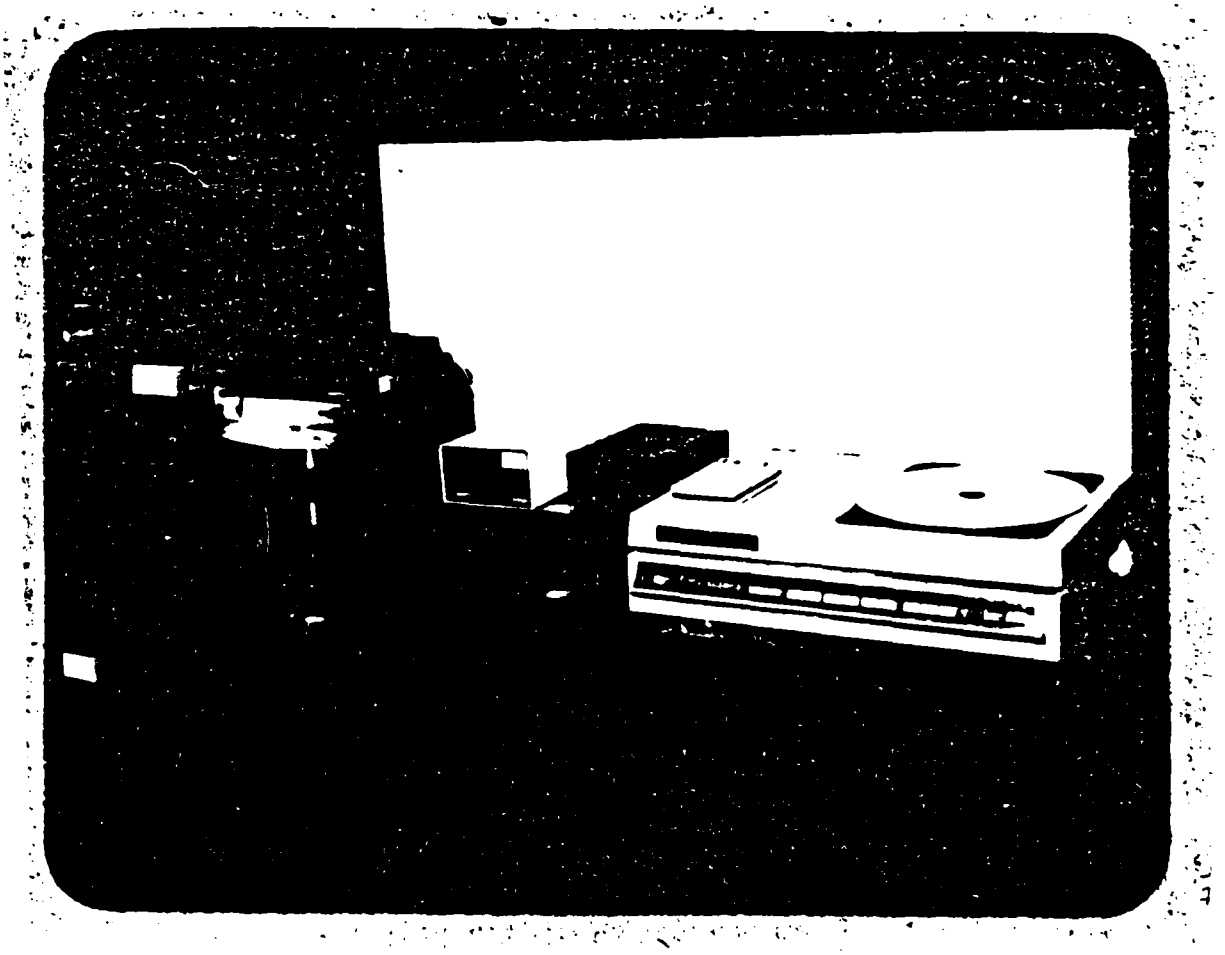
AUTOMATED PRINTING AND PUBLISHING SYSTEM (APPS)



ANOTHER PROJECT INVOLVES AUTOMATING THE PRINTING OF TECHNICAL PUBLICATIONS.

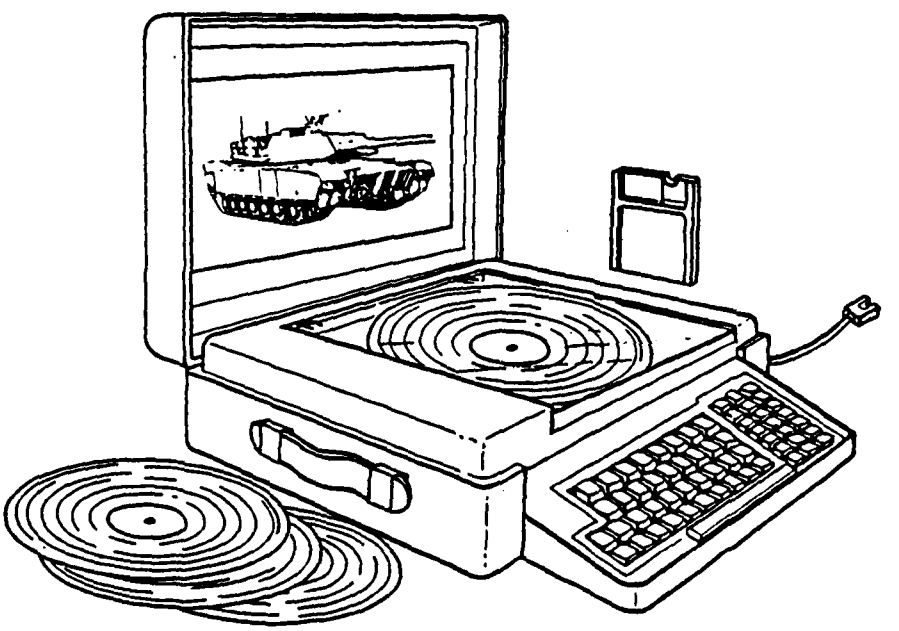
IN JANUARY, DARCOM'S MISSILE COMMAND (MICOM) TURNED ON A PILOT SYSTEM WHICH WILL HELP SOLVE THE PROBLEM WITH TECHNICAL PUBLICATIONS, INSOFAR AS THE BACKLOG IN PRINTING IS CONCERNED. IT IS A SOPHISTICATED WORD PROCESSING SYSTEM WHICH STORES WORDS AND PICTURES ON TAPES AND ALLOWS THE MAINTENANCE ENGINEER TO DISPLAY THEM FOR EDITING AND THEN PROVIDES AN OUTPUT FOR PRINTING. SHOWN HERE ARE THE OFF-THE-SHELF PRODUCTS WHICH MAKE UP THE PROTOTYPE AUTOMATED PRINTING AND PUBLICATIONS SYSTEM.

THE SYSTEM WILL HAVE OUTPUT CAPABILITY INITIALLY ONLY TO PRINT HARD COPY. AN EARLY SYSTEM ENHANCEMENT WILL ADD THE ABILITY TO OUTPUT ELECTRONICALLY. HOWEVER, THIS METHOD WILL NOT PROVIDE THE SOLDIER WITH AUTOMATED PUBS. IN ORDER TO REPLACE THE WRITTEN WORD, WE MUST HAVE DISPLAY TERMINALS IN THE FIELD.



THE FIRST STEP WILL BE TO PROVIDE AN INTERIM SOLUTION UNTIL MORE REFINED VERSIONS CAN BE FIELDED. WE ARE THINKING OF SOMETHING, PERHAPS RACK-SIZE, WITH TAPE OR EVEN DISC STORAGE, LIKE WHAT IS SHOWN ON THIS VUGRAPH. IT COULD BE UTILIZED FOR BOTH SMALL DENSITY SYSTEMS, LIKE THE PATRIOT, AND ALSO FOR APPLICATION WITH LARGER DENSITY SYSTEMS.

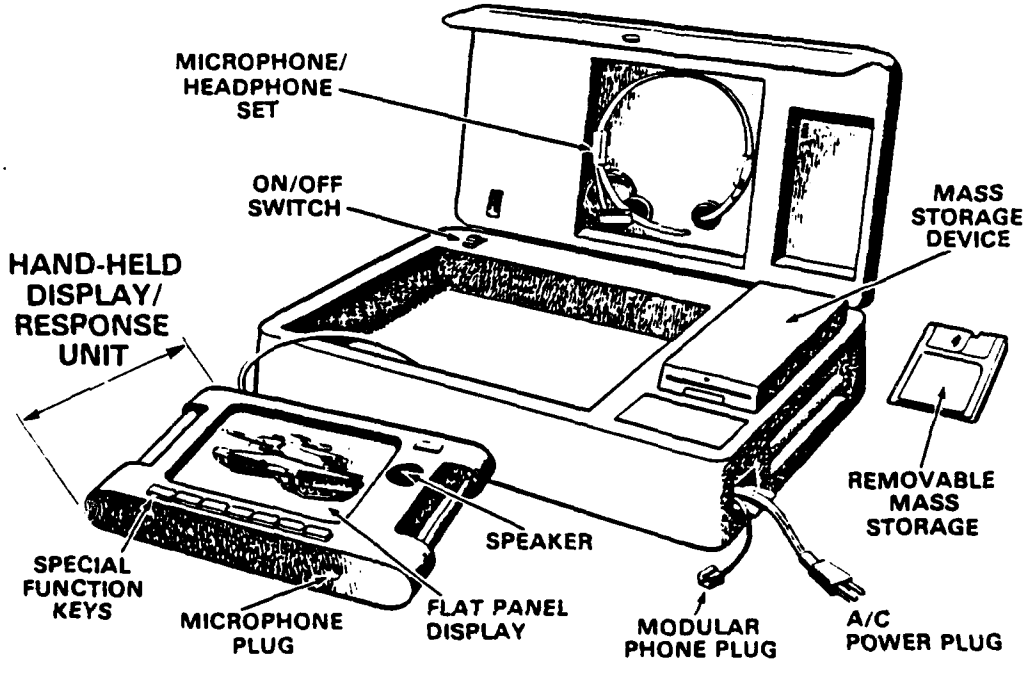
IT IS THE USE OF SUCH A DEVICE THAT WE ARE WORKING CLOSELY WITH TRADOC AND THE LOGISTICS CENTER.



LOOKING OUT BEYOND THE INTERIM SOLUTION, WE ARE DEVELOPING, WITH TRADOC, MORE PORTABLE SYSTEMS FOR FIELD USE. I WILL BRIEFLY MENTION TWO. FIRST, THE ELECTRONIC INFORMATION DELIVERY SYSTEM, WHICH IS A PORTABLE VIDEO DISC SYSTEM UNDER DEVELOPMENT BY DARCOM WITH FULL SCALE PRODUCTION POSSIBLE IN 1987.

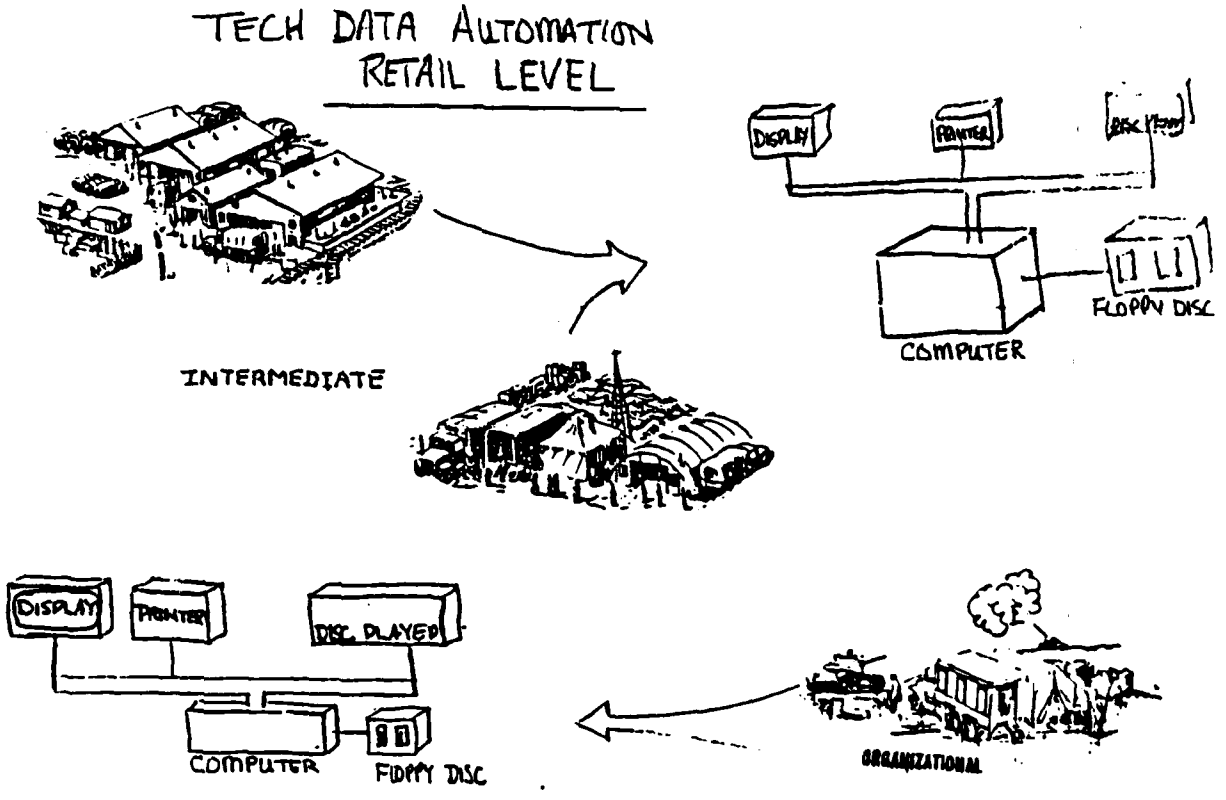
TECHNICAL DATA MANAGEMENT

INFORMATION DELIVERY CONCEPT



ANOTHER SYSTEM, UNDER DEVELOPMENT BY ARMY RESEARCH INSTITUTE (ARI), IS A PORTABLE VIDEO CASSETTE SYSTEM CALLED PEAM (PERSONAL ELECTRONIC AID FOR MAINTENANCE). THIS IS A JOINT-SERVICE PROGRAM WITH ARI AS THE PROGRAM MANAGER. TEXAS INSTRUMENT WAS AWARDED A CONTRACT TO PROVIDE FOUR PROTOTYPES, (THREE FOR ARMY, AND ONE FOR NAVY) IN 1984 WITH PRODUCTION POSSIBLE IN 1987.

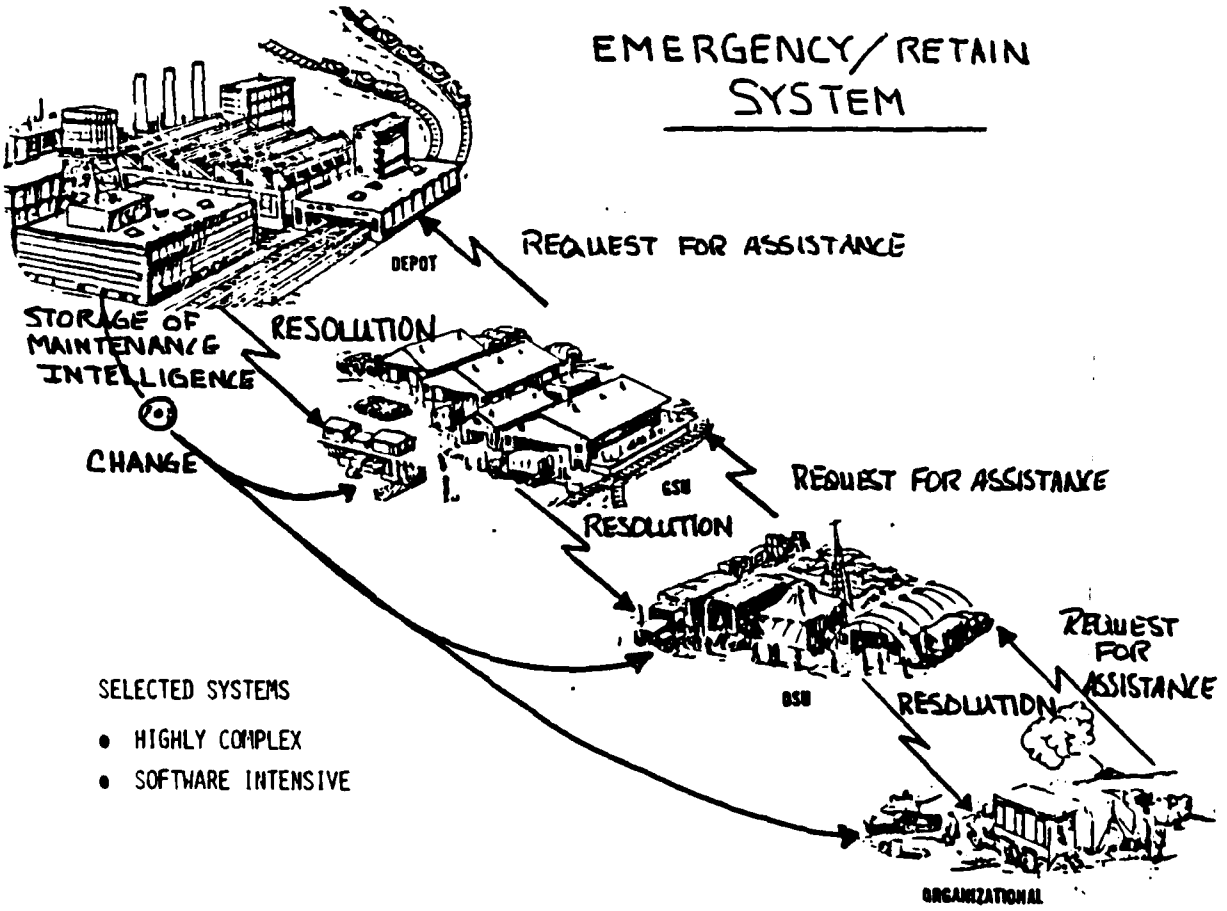
BEYOND THESE ON-GOING EFFORTS, DARCOM HAS ASSEMBLED A TECHNICAL DATA MANAGEMENT TASK GROUP THAT HAS DESIGNED A NEW TECHNICAL DATA MANAGEMENT SYSTEM CONCEPT. THESE ON-GOING EFFORTS FIT INTO THIS CONCEPT. I'D LIKE TO BRIEFLY SHOW YOU WHAT THE CONCEPT ENTAILS, BEGINNING AT THE ORGANIZATIONAL LEVEL OF THE ARMY.



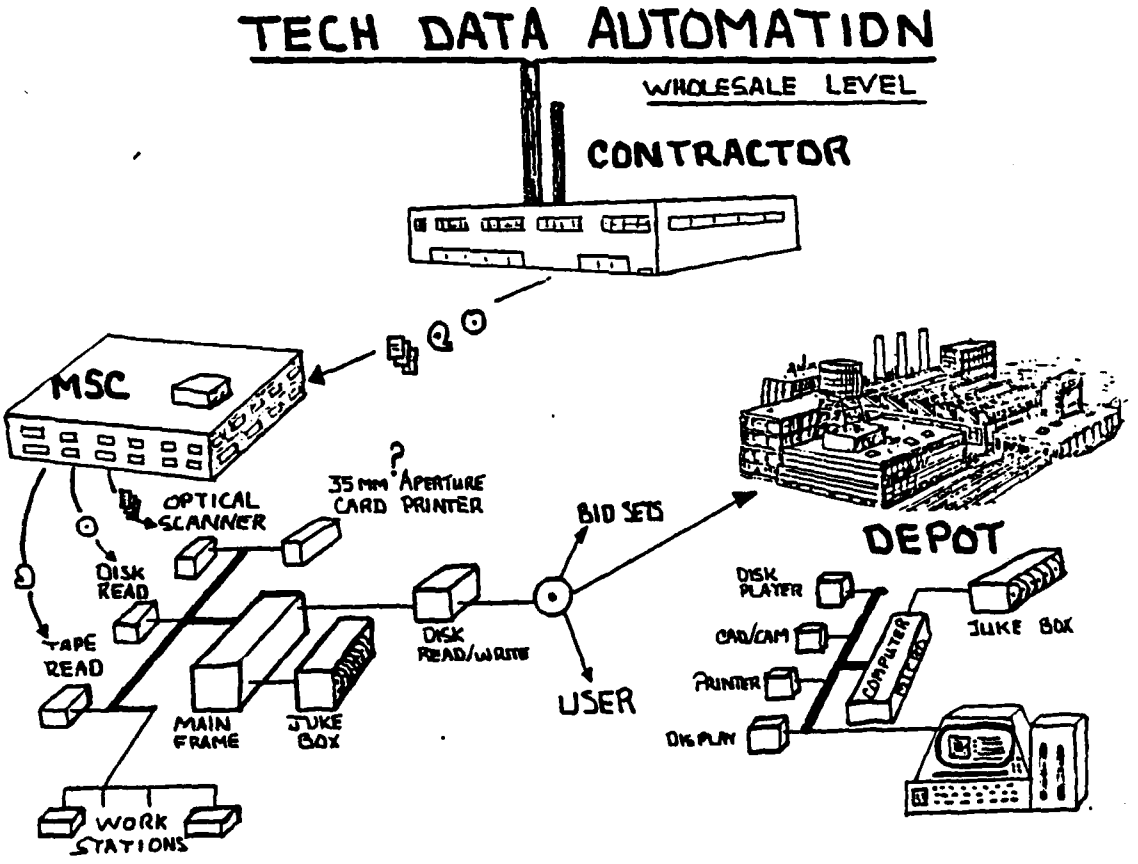
LET US BEGIN THE DISCRIPTION OF THIS CONCEPT AT THE ORGANIZATION LEVEL. THE BASIC MEDIA WHICH WOULD BE USED TO DISTRIBUTE THE MAINTENANCE AND SUPPLY INFORMATION WOULD BE A VIDEO DISC. TO ACCESS THIS INFORMATION, A SYSTEM WOULD BE RACK MOUNTED IN EACH MAINTENANCE VAN: 1) A MICRO COMPUTER, 2) A VIDEO DISC PLAYER, 3) A VIDEO DISPLAY, 4) AN IMPACT PRINTER, AND 5) A FLOPPY DISC DRIVE. TO ACCESS THE NEEDED INFORMATION, THE TECHNICIAN WOULD PULL THE APPROPRIATE DISC FROM THE STORED LIBRARY AND DISPLAY THE NEEDED INFORMATION FOR REVIEW AND STUDY. THAT INFORMATION WHICH IS NEEDED TO BE TAKEN BACK TO THE JOB (I.E., SCHEMATICS, TEST CONDITIONS, ETC...) CAN BE PRINTED OUT AND REMOVED FOR HIS PERSONAL USE.

AT THE INTERMEDIATE LEVEL, WE ENVISION THE SAME SYSTEM BEING USED. THE ONLY DIFFERENCE WOULD BE MORE UNITS AND A LARGER LIBRARY. THE INFORMATION CONTAINED ON THE DISC WOULD HAVE ALL LEVELS OF MAINTENANCE, THUS, THE DISCS USED AT ALL LEVELS WOULD BE THE SAME.

IT IS AT THE ORGANIZATIONAL AND INTERMEDIATE LEVELS THAT WE SEE THIS SYSTEM PROVIDING INPUT TO THE SUPPLY SYSTEM.



THE SYSTEM CONCEPT ALSO INCLUDES A CAPBILITY TO RESPOND TO MEET UNFORESEEN PROBLEMS. THAT IS, THE PROBLEMS THAT CANNOT BE DIAGNOSED AND FIXED, USING THE INFORMATION IN THE MAINTENANCE DISC. WE FORESEE THE USE OF NEAR REAL TIME COMMUNICATIONS TO RELAY THE PROBLEM TO THE RESPONSIBLE MSC. AT THE RECEIPT OF THE PROBLEM, THE SYSTEMS ENGINEERING STAFF WILL ADDRESS THE PROBLEM AND DEFINE A "FIX". THIS "FIX" WILL BE RETURNED TO THE FIELD USING NEAR REAL TIME COMMUNICATIONS. THE SYSTEM WILL RETAIN BOTH THE PROBLEM AND FIX FOR FURTHER REFERENCE AND INCLUSION IN THE CHANGES THAT WOULD BE MADE IN THE NEXT VERSION OF THE MAINTENANCE DISC TO GO TO THE FIELD.



HERE WE DEPICT THE FRONT-END OF THE SYSTEM WHERE THE VIDEO DISCS ARE CREATED AND CONTROLLED. LET US IMAGINE THAT, WHEN WE CONTRACT FOR THE DEVELOPMENT OF A SYSTEM, WE ASK FOR DIGITAL DATA DELIVERED IN THE FORM OF A MAGNETIC TAPE OR VIDEO DISC - NO PAPER; THAT IS, ALL OF THE TECHNICAL DATA DRAWINGS, SPECIFICATIONS, DESCRIPTIVE AND TRAINING INFORMATION IS IN DIGITAL FORMAT. MOREOVER, LET US FURTHER ASSUME THAT WE CAN DEFINE A HIGHER ARCHIVAL SET OF DATA FROM WHICH ALL REQUIRED INFORMATION CAN BE DERIVED. THE SYSTEM AT THE MSC WILL CONSIST OF THE FOLLOWING SUB-ELEMENTS: 1) A MAIN FRAME COMPUTER, 2) A VIDEO DISC JUKE BOX, 3) AN OPTICAL DISC READ/WRITE UNIT, 4) WORK STATIONS, AND 5) INPUT UNITS FOR MAGNETIC TAPE, OPTICAL DISC OR PAPER (THE OPTICAL SCANNER). THIS SYSTEM WOULD ENABLE THE MSC TO INPUT THE INFORMATION INTO AN ARCHIVAL MEDIA VIDEO DISC, AND RECALL THAT INFORMATION (TEXT AND DRAWINGS) AT THE WORK STATIONS AND CHANGE IT ON A ROUTINE BASIS. THEN, PERIODICALLY, PRODUCE A NEW DISC FOR DISTRIBUTION TO THE USER ORGANIZATIONS, THE DEPOTS AND OTHER DARCOM ORGANIZATIONS. THE KEY TO THE ABOVE CONCEPT IS THE NEED TO DEFINE THE HIGHER ARCHIVAL DATA BASE, ITS FORMAT AND INTERFACE.

THE SYSTEM AT THE DEPOT LEVEL IS ENVISIONED TO BE DIFFERENT THAN AT THE MSC BECAUSE OF THE DIFFERENCES IN NEEDS. THE DISC LIBRARY WILL AGAIN BE ACCESSED BY THE JUKE BOX, BUT THE SYSTEM WILL BE CONTROLLED THROUGH A MINI-COMPUTER. THE SYSTEM WILL ALLOW DESIGN CHANGES BE MADE ON A CAD/CAM SYSTEM AND THEN BE INTRODUCED TO THE SYSTEM AND FINALLY ENTERED ON AN OPTICAL DISC FOR STORAGE AND RETRIEVAL. SHOP TECHNICIANS WOULD HAVE ACCESS TO THE STORED INFORMATION THROUGH REMOTE TERMINALS TIED TO THE SYSTEM.

SUCH IS OUR TDM SYSTEM AS WE ENVISION IT TODAY. WE HAVE A GREAT DISTANCE TO TRAVEL BEFORE WE REACH OUR GOAL - AN AUTOMATED TECHNICAL DATA MANAGEMENT SYSTEM. WE HAVE A BEGINNING. WHAT WILL WE BE DOING NEXT?

TECHNICAL DATA MANAGEMENT
WHAT NEEDS TO BE DONE

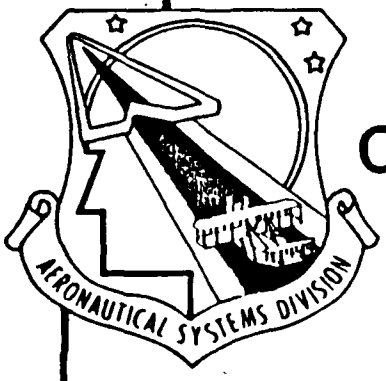
TRADOC AND DARCOM WILL:

- DEFINE APPROACH
- IDENTIFY RESOURCES REQUIRED
- ESTABLISH SCHEDULE
- FORMULATE DESIGN CRITERIA
- FORMULATE PROGRAM PARAMETERS
- SELECT NEAR TERM INITIATIVES

GENERAL KEITH GAVE APPROVAL TO THE TECHNICAL DATA CONCEPT ON 12 JANUARY AND DIRECTED THAT THIS EFFORT BECOME ONE OF DARCOM'S MAJOR THRUSTS TO BE INCLUDED AS PART OF THE ARMY'S NEW LOGISTICS RESEARCH AND DEVELOPMENT INITIATIVES. DETAILS ARE BEING WORKED OUT, BUT THINGS ARE ALREADY MOVING FAST.

DARCOM AND TRADOC ARE NOW WORKING TOGETHER ON THE NEWLY CHARTERED TECHNICAL DATA MANAGEMENT TASK GROUP TO FURTHER REFINE THE CONCEPT AND TO MANAGE THE ACTIONS THAT ARE EITHER UNDERWAY OR THAT WILL BEGIN IN THE FUTURE. WE WILL PROBABLY HIRE A CONTRACTOR TO DO THE DETAILED WORK OF DEFINING INTERFACES, FLESHING OUT THE DETAILED PLAN, AND PERFORMING A COST BENEFIT ANALYSIS. WHILE THESE ACTIONS ARE UNDERWAY, THE PM, PATRIOT IS FUNDING AN EFFORT TO USE VIDEO DISC TECHNOLOGY TO PROTOTYPE A TECHNICAL DATA DELIVERY SYSTEM FOR THE FIRST BATTALION THAT RECEIVES THE PATRIOT. WE WILL BE EVALUATING THAT EFFORT CLOSELY TO SEE HOW IT WORKS OUT.

THAT CONCLUDES MY BRIEFING. ARE THERE ANY QUESTIONS?



COMPUTER AUTOMATION OF DESIGN DATA AND TECHNICAL SUPPORT DATA

PRESENTED BY: COLONEL RALPH L. KUSTER, JR.
AFSC ASD / AFWAL

AUTOMATION OF DESIGN AND TECHNICAL DATA

PURPOSE

TO PRESENT THE RESULTS OF A PRELIMINARY REVIEW OF AF EFFORTS WHICH ARE UNDERWAY AND PLANNED TO DIGITIZE AND UTILIZE AUTOMATED TECHNICAL DATA THROUGHOUT THE WEAPON SYSTEM LIFE CYCLE

SAF/AL LTR, 3 SEP 82

OUTLINE

- BACKGROUND
- ASSESSMENT - SAF/AL CONCERNS
- PRELIMINARY FINDINGS
- KEY PROGRAMS SYNOPSIS
- SUMMARY

AUTOMATION OF DESIGN AND TECHNICAL DATA
BACKGROUND

- BRIEFING TO SAF/ALG 31 AUG 82

  INTEGRATED DESIGN SUPPORT SYSTEM (IDSS)

  A DIGITAL SOFTWARE DEVELOPMENT PROGRAM TO COLLECT, MANAGE, AND CONTROL FUTURE WEAPON SYSTEM DESIGN AND MANUFACTURING DATA FOR LOGISTIC SUPPORT

- SAF/AL LETTER TO AF/CV - 3 SEP 82

- BRIEFING TO SAF/AL - 28 JAN 83

OUTLINE

- BACKGROUND
- ASSESSMENT - SAF/AL CONCERNS
- PRELIMINARY FINDINGS
- KEY PROGRAMS SYNOPSIS
- SUMMARY

AUTOMATION OF DESIGN AND TECHNICAL DATA

SAF/AL CONCERNS

MASSIVE TECHNICAL DATA REQUIRED FOR LOGISTIC SUPPORT

- MICROFILM AND PAPER MEDIA
- DIFFICULT TO TRANSMIT / READ / USE
- COSTLY TO MAINTAIN AND KEEP CURRENT

INDUSTRY MOVING TO KEEP UP WITH GROWING DIGITAL TECHNOLOGY

- DIGITAL WORD PROCESSING IS ROUTINE
- CAD/CAM IMBEDDED IN INDUSTRY

DOES AIR FORCE HAVE A PLAN TO EXPLOIT THIS TECHNOLOGY ?

ASSESSMENT – MASSIVE DATA FILES

MASSIVE MICROFILM AND PAPER

- MICROFILM DRAWINGS - 25,000,000 BEING MAINTAINED TO DEPICT CONFIGURATION OF CURRENT AIR FORCE SYSTEMS
- TECHNICAL ORDERS - 13,000,000 PAGES TO CONTROL OPERATION AND MAINTENANCE OF AIR FORCE SYSTEMS

TYPICAL EXAMPLES:

WEAPON SYSTEM	MICROFILM DRAWINGS	TECH ORDER PAGES
F-16	555,000	660,000
F-111	520,000	624,000
A-10	110,000	132,000
F-4	218,000	500,000
C-5	150,000	180,000

SOURCE: AFLC/LOL

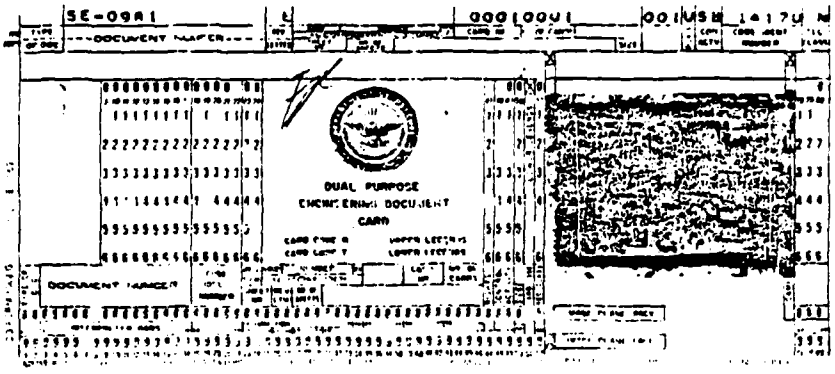
AUTOMATION OF DESIGN AND TECHNICAL DATA

ASSESSMENT – MASSIVE DATA FILES

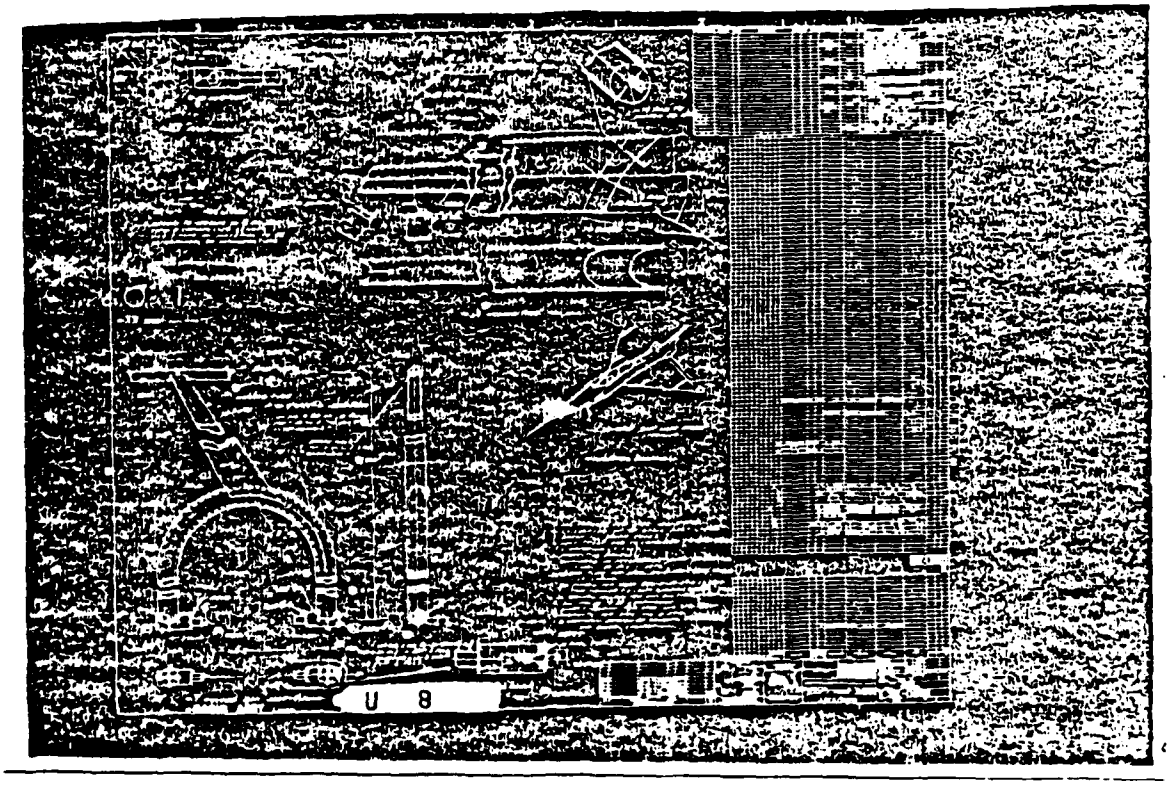
MICROFILM

DIFFICULT TO TRANSMIT / READ / USE -

- 60 DAYS TO LOCATE, REPRO AND MAIL
- PAPER REPRODUCTION POOR
- CANNOT COMPUTER SORT INFORMATION ON FILM



ASSESSMENT – MICROFILM DATA



AUTOMATION OF DESIGN AND TECHNICAL DATA

ASSESSMENT – MASSIVE DATA FILES

COSTLY TO MAINTAIN CURRENCY

- AFLC FY83 BUDGET FOR MAINTENANCE OF TECH ORDERS - $20,000,000
- TECH ORDERS CONVERTING TO TASK ORIENTED FORMAT
  (PAYOFF TO F-4E / RF-4C FLEET IS 54 FLIGHT READY AIRCRAFT)
- $80,000,000 FOR CHANGES TO MINUTEMAN ICBM TECH ORDERS (1966 - 1982)
- AVERAGE COST TO PREPARE A TECH ORDER CHANGE FOR PRINTING
  - $3,000 PER PAGE IF ENGINEERING IS REQUIRED
  - $160 - 400 PER PAGE - DEPENDING ON CONTRACTOR

SOURCE: AFLC/LOL

ASSESSMENT-WORD PROCESSING IN INDUSTRY

WORD PROCESSING IS STATE-OF-ART

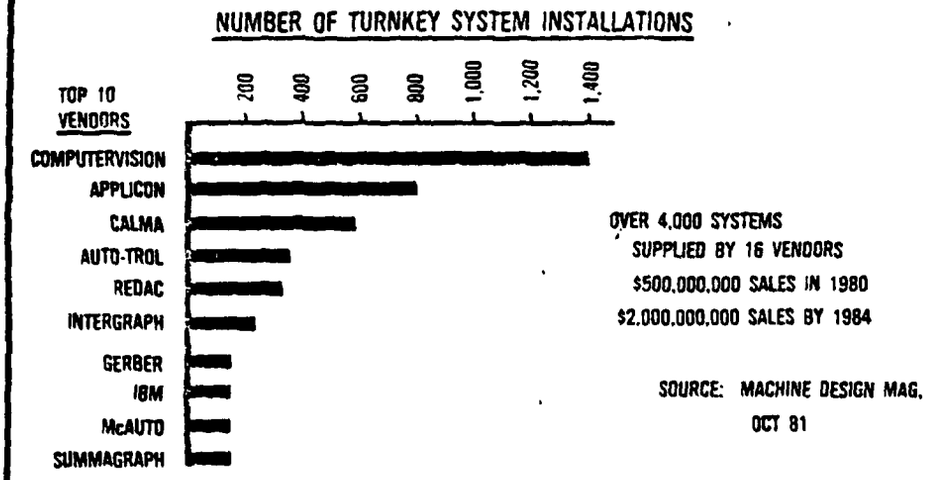
WIDE SPREAD UTILIZATION IN INDUSTRY

F-16, B-1B, MX UTILIZING TECHNOLOGY

- DEVELOPING TECH ORDERS ON DIGITAL SYSTEM
- CURRENTLY TRANSMITTED VIA PAPER / MICROFILM

AUTOMATION OF DESIGN AND TECHNICAL DATA

ASSESSMENT - CAD/CAM IN INDUSTRY



ASSESSMENT - NAVY DIRECTION

- 295 COMPUTERVISION CAD / CAM SYSTEMS - FY83

NAVY AUTOMATED VIDEO INFORMATION SYSTEM (NAVIS)

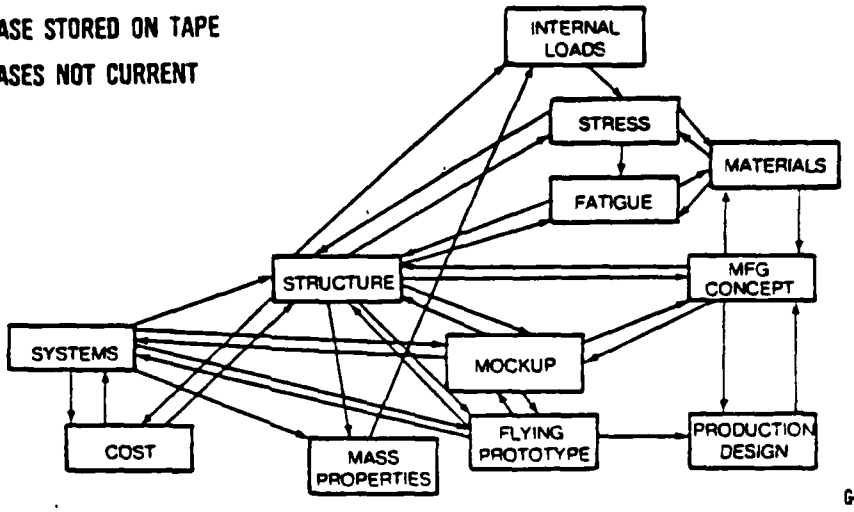
- CAD PROCESS FOR EN ROUTE A/C REPAIR
- INSTALLED ON BOARD CARRIER SHIP
- AUGMENTED BY SATELLITE TRANSMISSION
- EXPANSION OF AUTOMATED VIDEO MAINTENANCE INFORMATION (AVMI) SYSTEM

AUTOMATION OF DESIGN AND TECHNICAL DATA

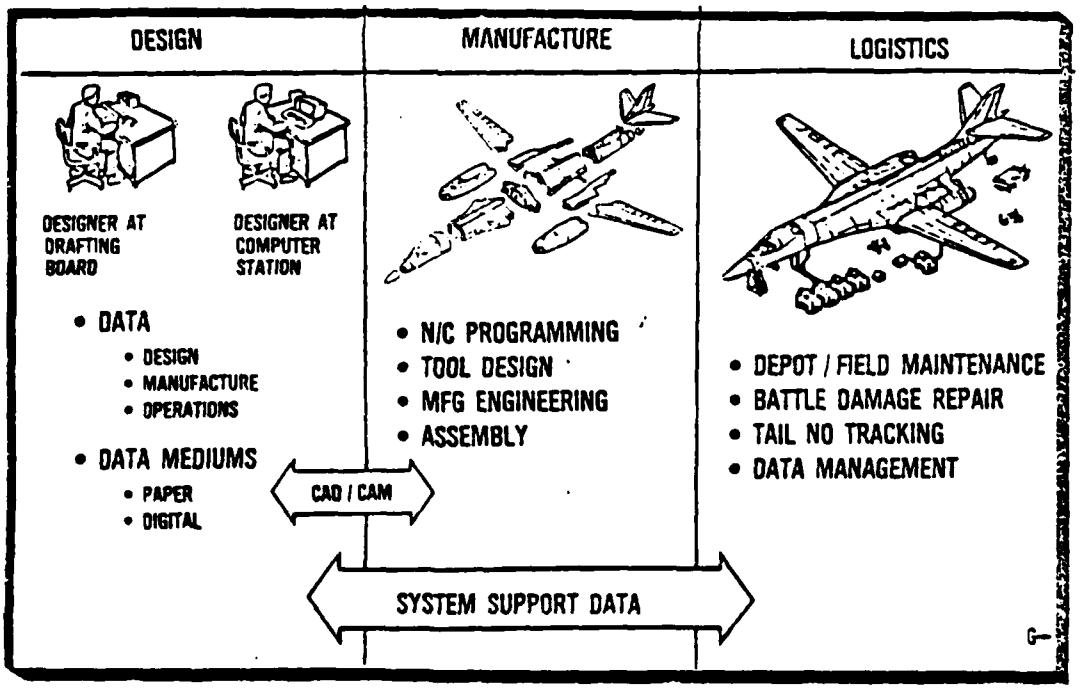
ASSESSMENT - CAD/CAM IN INDUSTRY

TODAY'S DESIGN / MANUFACTURING COMPUTER NETWORK

- INDIVIDUAL ORGANIZATION DATA BASES
- DATA BASE STORED ON TAPE
- DATA BASES NOT CURRENT



ASSESSMENT – CAD/CAM DATA FLOW



AUTOMATION OF DESIGN AND TECHNICAL DATA

ASSESSMENT - ISSUE ? ? ?

WHILE DIGITAL DESIGN ANALYSIS AND GRAPHICS USE IS EXPLODING IN INDUSTRY, THERE IS NO CAPABILITY TO CAPTURE THIS DATA FOR FUTURE WEAPON SYSTEM LIFE CYCLE MODIFICATIONS AND MAINTENANCE !!!

CAN THE AIR FORCE AFFORD TO LOSE THIS DATA ?

OUTLINE

- BACKGROUND
- ASSESSMENT - SAF/AL CONCERNS
- PRELIMINARY FINDINGS
- KEY PROGRAMS SYNOPSIS
- SUMMARY

AUTOMATION OF DESIGN AND TECHNICAL DATA

PRELIMINARY FINDINGS

- AF SPONSORING MANY PROGRAMS
  - 22 PROGRAMS REVIEWED
    - SOME CONTROL AND MANIPULATE DATA
    - SOME PRODUCE DATA AS BY-PRODUCT
- AF DOES NOT HAVE A FOCUSED PLAN LEADING TO EXPLOITATION OF GROWING DIGITAL TECHNOLOGY IN DESIGN, MANUFACTURE, AND LOGISTICS SUPPORT
- VALUABLE DATA FOR WEAPON SYSTEM MODIFICATION AND MAINTENANCE IS NOT CAPTURED IN TODAY'S MICROFILM / PAPER ENVIRONMENT

OUTLINE

- BACKGROUND
- ASSESSMENT - SAF/AL CONCERNS
- PRELIMINARY FINDINGS
- KEY PROGRAMS SYNOPSIS
- SUMMARY

AUTOMATION OF DESIGN & TECHNIAL DATA

KEY PROGRAM SYNOPSIS

- 7 KEY PROGRAMS THAT CONTROL & MANIPULATE DATA
  - AUTONOMOUS PROGRAMS
  - NOT COORDINATED
- THERE IS MINIMAL DUPLICATION OF EFFORT
- HOWEVER, THESE PROGRAMS ARE NOT A TOTAL SOLUTION FOR AUTOMATED DESIGN AND TECHNICAL DATA
- THEY DO ADDRESS THE KEY AREAS OF CONCERN

KEY RELATED DATA MANAGEMENT PROGRAMS

ORGANIZATION	PROGRAM	DEMONSTRATION
AFLC	ENGINEERING DATA COMPUTER AIDED RETRIEVAL SYSTEM	1985
AFHRL	UNIFIED DATA BASE	1983
AFLC	AUTOMATED TECH ORDER SYSTEM	1984
AFHRL	COMPUTER BASED MAINTENANCE AIDS	1984
AFHRL	MAINTENANCE & LOGISTICS COMPUTER AIDED DESIGN	1987
AFWAL	INTEGRATED DESIGN SUPPORT SYSTEM	1985
USAF/LEY	LOGISTIC INFORMATION MANAGEMENT SUPPORT SYSTEM	1984

AUTOMATION OF DESIGN & TECHNICAL DATA

KEY RELATED DATA MANAGEMENT PROGRAMS

(AFLC)

ENGINEERING DATA COMPUTER AIDED RETRIEVAL SYSTEM

PHASE I: CONVERT EXISTING 35MM APERTURE DRAWINGS

- DIGITIZE EXISTING DRAWINGS FOR LIBRARY
- COMPATIBLE WITH EXISTING TRANSMISSION SYSTEMS
- INSTALL AT DEPOT LEVEL

PHASE II:

- DESIGN TO ACCEPT ANY DATA FORM (PAPER, DIGITAL)
- DISTRIBUTE IN ANY DATA FORM
- INSTALL AT BASE LEVEL

KEY RELATED DATA MANAGEMENT PROGRAMS

UNIFIED DATA BASE

(AFHRL)

- ANALYZE LOGISTICS SUPPORT ANALYSIS RECORD
- ANALYZE HISTORICAL AND PERFORMANCE RECORDS
- PROVIDE COMPENDIUM / TECHNOLOGY BASE FOR:
  - MODIFICATIONS
  - LESSONS LEARNED

AUTOMATION OF DESIGN & TECHNICAL DATA

KEY RELATED DATA MANAGEMENT PROGRAMS

(AFLC)

AUTOMATED TECH ORDER SYSTEM

PHASE I:

- DEVELOP TECH ORDERS IN DIGITAL FORMAT
- WORK FROM PAPER TECH ORDERS
- DEMONSTRATIONS WITH F-16, B-1B, & MX

PHASE II:

- WORK FROM DIGITIZED TECH ORDERS
- DEPOT MAINTENANCE FIRST-FIELD LATER

KEY RELATED DATA MANAGEMENT PROGRAMS

(AFHRL)

COMPUTER BASED MAINTENANCE AIDS

- DEVELOP SKILL ADJUSTED COMPUTER DISPLAYS FOR MAINTENANCE TECH ORDERS
- PROVIDES DATA POOLS AND TRACKS FOR COLLATION
- B-1B INTERMEDIATE LEVEL DEMONSTRATION - 1984

AUTOMATION OF DESIGN AND TECHNICAL DATA

KEY RELATED DATA MANAGEMENT PROGRAMS

MAINTENANCE & LOGISTICS COMPUTER AIDED DESIGN

(AFHRL)

- DEVELOP METHODS TO PUT RELIABILITY & MAINTAINABILITY INTO DESIGN VIA LESSONS LEARNED
- EMPHASIS ON:
  - FAULT ISOLATION DURING EARLY DESIGN
  - REDUCE MAINTENANCE REMOVE / REPLACE TIME
- USE COMPUTERIZED BIOMECHANICAL MAN

(AFAMRL)

KEY RELATED DATA MANAGEMENT PROGRAMS

(AFSC / ASD)

INTEGRATED DESIGN SUPPORT SYSTEM

AN EXECUTIVE SOFTWARE PROGRAM TO:

- CAPTURE AND STORE SELECTIVE CAD / CAM DATA
- PROVIDE LOGISTICS FEEDBACK TO DESIGNER - "LESSONS LEARNED"
- CONTROL CONFIGURATION DATA BASE
- MANAGE DATA BASE INFORMATION IN A CENTRALLY CONTROLLED FILE
- TRANSFER TO AFLC WITH WEAPON SYSTEM

AUTOMATION OF DESIGN & TECHNICAL DATA

KEY RELATED DATA MANAGEMENT PROGRAMS

(AFSC/ESD)

LOGISTICS INFORMATION MANAGEMENT SUPPORT SYSTEM

- KEY TO DIGITAL LOGISTICS MANAGEMENT
- INTEGRATE EXISTING AND PLANNED DIGITAL LOGISTICS SYSTEMS
- DEVELOP COMMUNICATION NETWORK FOR LOGISTIC INFORMATION
- LOG C^3 CONCEPT
- TO BE OPERATIONAL PRIOR TO 1990

OUTLINE

- BACKGROUND
- ASSESSMENT - SAF/AL CONCERNS
- PRELIMINARY FINDINGS
- KEY PROGRAMS SYNOPSIS
- SUMMARY

AUTOMATION OF DESIGN AND TECHNICAL DATA

SUMMARY

- AGREE WITH SAF/AL - AF NEEDS TO THINK ABOUT HOW TO EXPLOIT TECHNOLOGY THROUGHOUT LIFE CYCLE
- PROGRAM CONTENT AND SCOPE PROBABLY NOT ADEQUATE TO EXPLOIT TECHNOLOGY
- PROGRAMS NOT TIED TOGETHER:
  - SHOULD BE
  - NOT SURE HOW FAR TO GO
- NON-TRIVIAL QUESTIONS

SUMMARY - ACTION PLAN

ESTABLISH AFSC / AFLC EXECUTIVE STEERING GROUP

- INPUTS FROM USING COMMANDS
- CLOSE ALIGNMENT WITH LIMSS
- O - 6 LEVEL WORKING GROUP
- STATUS REPORT ON ROADMAP - 180 DAYS

AUTOMATION OF DESIGN & TECHNICAL DATA

SUMMARY - CONSIDERATIONS

CONSIDERATIONS FOR STEERING GROUP

- CONDUCT A GOVERNMENT - INDUSTRY WORKSHOP
- REVIEW AND CATALOG RELATED PROGRAMS
- FOCUS OBJECTIVES WITH SCHEDULES AND FUNDING
- ARMY / NAVY THRU JOINT LOGISTICS COMMANDERS
- CULTURAL CHANGE FROM PAPER TO VIDEO

SESSION 4

Workshop Coordinator

MRS. LORNA BURNS
Hughes Aircraft Company

See sections U, V, and W for Session 4 workshop summaries.

SESSION 5

Chairman: MR. SAMUEL ALVINE
Singer Company
Kearfott Division

Secretary: MR. BURTON G. SCHAEFER
Pitney Bowes

TECHNOLOGY TRANSFER TO A DUAL SOURCE

by

James L. Remiker
Chief, Configuration Management
General Dynamics Convair Division
San Diego, California

"SUMMARY"

Technology transfer is a new approach to second source procurements. It requires not only the transfer of the design activity's engineering data to the new source but also the information on why the design turned out the way it did.

This paper describes the challenges to the configuration and data managers in establishing baselines, processing of changes, and identifying the documentation that defines the "why" behind the design. It identifies the approaches used, the lessons learned, and the remaining problem to be solved.

Technology Transfer to a Dual Source

Technology transfer may be the ultimate in alternate source procurement action. It provides for the simultaneous procurement of identical items from dual sources. It provides new challenges to the configuration and data managers of the original design activity, the second source, and the procuring activity.

Many of you in the audience who have been attending these ADPA sessions for a while are already thinking "Here we go again with another sermon on making drawings for reprocurement. This is just going to be another re-hash of the MIL-D-1000 Category E, DOD-D-1000 level 3 discussion all over again." If you ever get involved in a technology transfer program you'll find, like I did, that this type of program involves more than the transfer of engineering drawings. Your attendance at this type of meeting indicates to me that you are interested in producing quality documentation and there probably would not be any problems with another source using your drawings.

Going into this program, I had no concerns either. My company had always prided itself on the quality of its drawings and the delineation they provided. I was convinced that nobody made better drawings than we did and anybody could produce identical products from our drawings. I still believe this but I now have a better appreciation of the problems that the Government faces when it attempts to second source identical item. I found out that technology transfer is more than a drawing transfer.

The feature that makes a technology transfer program different from other second source activity is that in addition to providing the design definition of how the item is to be made, you must provide the information on why it's designed the way it is. In other words, what was the technology that made the item what it is and how it is. It's why the lines and notes on the drawings and the requirements in the specifications are what they are. Technology transfer is the transfusion of this knowledge from the original design activity to the second source.

You can begin to see the challenges taking form but let me add two other dimensions to them. First, there was the challenge that keeps all of our companies in business - profit. The financial implications of the technology transfer I was involved in were significant. Secondly, our program was a two way transfer. We were transferring structural technology to a source that was transferring electronics technology to us.

The financial implications were significant not only because they involved big dollar amounts but because the company's opportunity to compete for these dollars was directly linked to its ability to successfully transfer its technology to the other source. If you were unable to accomplish the transfer for some reason within your control, the portion of the second source pie you could compete for was severely reduced.

The fact that it was a two-way transfer helped to break down some of the natural barriers that seem to arise in a second source procurement. I think there is a natural resentment when your product is selected for second sourcing. You perceive it as a threat and perhaps you are reluctant to go the extra mile it takes to dig out an answer to a question raised by the second source. With the two way transfer you react to a question or request from the second source just like it was coming from your own company because you know you're going to be making your own request of the other contractor and you're going to expect service in kind.

The challenges to the configuration manager start with the need to identify and establish a product baseline as a departure point for future decisions on changes. We recognized that this would probably have to be an iterative process in order to capture in-process approved changes as a part of the baseline. This turned out to be true with one important exception. We didn't have any control over our customer's approval of Class I changes that had been pending in his house for approval. Even today, we have to re-evaluate baselines because the customer has approved a Class I change. Because the new source has not gotten far enough into their implementation to cause an impact, there has not been a need for a related change as yet but I've learned a lesson. The next time I'll require a review of all pending Class I changes and the submission of related changes by the second source. This would provide the customer an identification of the total impact of a change and also provide a firm effectivity. It would also make the second source aware of pending changes that could influence some of his decisions in setting up his production facility.

Having established a baseline, the next consideration becomes one of a joint evaluation of future changes for impact, desirability and effectivity. Our decisions on how to best obtain the required information from the second source was a direct approach. We simply set another place at the table. We made the second source's representative a member of the family and included him as a member of our change evaluation and approval boards. At the beginning, there was a reluctance to continue the honest dialogue necessary for a good change evaluation. Having the competition in attendance tended to stifle the open discussions that had previously occurred. Gradually, however, the realization sunk in that we couldn't make a decision on our own change implementation without this open discussion.

Our biggest problem with changes, however, is the Class II change. This problem occurs in two forms. One is the problem of a change that is Class II to us, and Class I to the second source. Since we want to maintain the identicality of the product, we always have to evaluate the problem of our implementation versus the possiblity that the procuring activity will disapprove the Class I change from the second source. This type of change must be evaluated on a case-by-case basis weighing the merits and risks associated with each proposed change.

At our stage of manufacture, the most prevalent case is the situation where manufacturing requests a Class II change that will make their job easier or cheaper. From an engineering viewpoint, this type of change does not make any technical difference so the effectivity of the change is established to be at the convenience of manufacturing. Since we're well into production, our supply lines are well stocked and change implementation may not be convenient or

economical until some number of downstream manufacturing lots. With the second source just getting ready to cut chips, he may want to plan his implementation of the change to be effective in his first lot. Although we can all agree that it would be foolish for him to plan his fabrication for a few vehicles to match our configuration and then make the change, we're faced with the dilemma that technically the change doesn't make any difference while still recognizing our requirement to have both manufacturers produce identical configurations. A further complication is the fact that we have the DD250 responsiblity for the vehicles produced by the other source and must account for every change implementation. Any of you who have ever tried to track the actual factory implementation of Class II changes know that at best its a very difficult task. When you're dealing with another manufacturing source the difficulty is compounded. In general, we have agreed with the second source to have him implement the change on his first vehicle while holding our own most convenient cut-in. The responsiblity for identifying the differences between our configuration and that of the second source has been placed on the second source. As we prepare for a selloff, we come armed with the list of changes that we had cut-in for the specific manufacturing lot of which his vehicle is a part. Any differences from this list must be justified by the second source. The accepted justification for the differences is an engineering change which allows a cut-in at manufacturing's convenience. Since the change doesn't make any difference technically we feel we have fulfilled our commitment to produce identical configurations. Identifying the differences in configuration provides us the backup necessary to support the delivered vehicles during depot maintenance.

All of the preceeding discussion viewed the configuration management problems from the design activity's perspective. When you're on the receiving end of the transfer, the problems become procedural ones. You're dealing with someone elses drawings and change paper. You find that information your people are accustomed to receiving is not provided by the other source in the same manner and they have to get their information from two or more sources. Your company's standard parts and processes have to be evaluated against the parts and processes specified by the other design activity. Is what is specified the same as yours with a different identification or is it truly different? How do you minimize the turmoil in the factory and procurement departments that would be caused by performing the same process or stocking the same part or material under different part numbers? All of these become the problems the configuration manager has to face and solve in a technology transfer program.

The challenges facing the data manager in this type of program are formidable. By having to transfer the "why" behind the product, the data manager must identify and track down a veritable mountain of paper. Compiling the formal documentation that was previously prepared and submitted due to CDRL requirements is a comparatively simple procedure when you maintain a contract data depository such as we do. Providing this data becomes a matter of extracting the proper data from the file and having it reproduced for shipment to the second source. The informal data presented another set of problems. The most difficult of these is to identify what data exists. How many of the data managers in the audience know when one of the engineers makes a stress calculation, runs a development test or conducts a tradeoff of design alternatives? It is this type of study, analysis and test that represents the technology that made your product what it is. It is why your design turned out the way it did. Much of this information is not available. It existed in

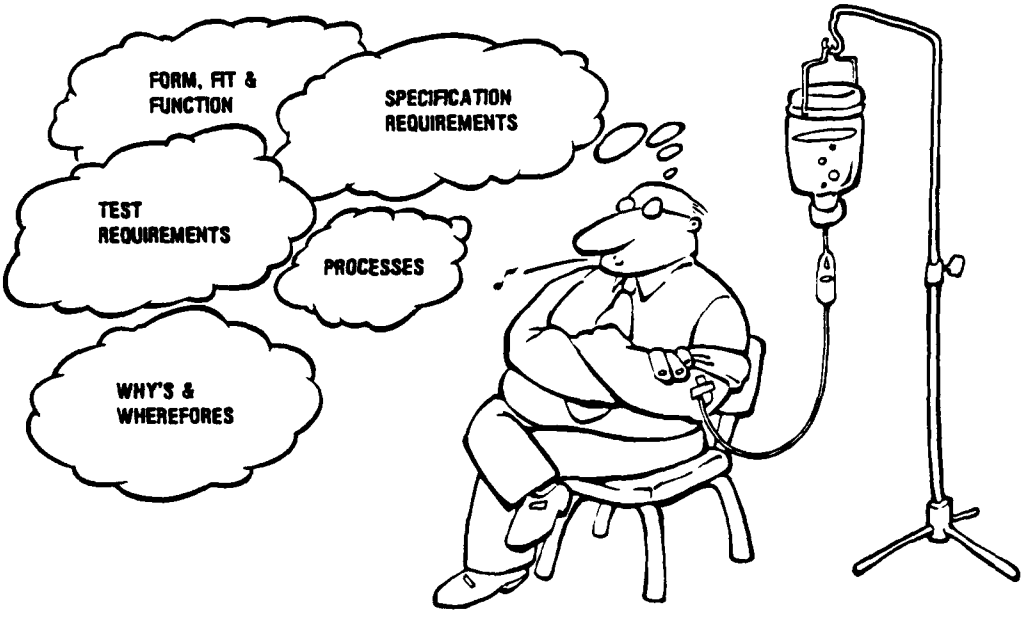
someone's head at the moment of decision. It existed on the desk pad until the janitors came by and emptied the trash. But much of it was written down; in memos to the boss or to the designer; in the engineer's notebook; in forms too numerous to mention. The real job in technology transfer is to identify how much of this type of data exists and locate it. Since we can't clone the engineer and send him to the second source, the best we can hope for is to take his documented knowledge and transfer it. The essence of technology transfer is to provide the second source the information he needs to make the same informed, intelligent decision that the original design activity would make. The data doesn't have to be pretty; it just has to be usable. And to be usable it must be available!

This same problem exists without a technology transfer program. Our engineers are a mobile population. How much technology can be or will be transferred to his replacement from the time he gives his two week notice? The challenge to the data manager is what kind of a low cost program can be implemented to capture and catalogue this information? How can you let your company take advantage of the work they all ready paid for and not reinvent the wheel as personnel transfer to other programs, retire, or take jobs with other companies?

Maybe the personal computer in the office will make the solution to this problem easier; or it could make it worse. I haven't found the solution to this problem but I hope one of us here today will. When you do, I hope you'll share it with us at an ADPA meeting.

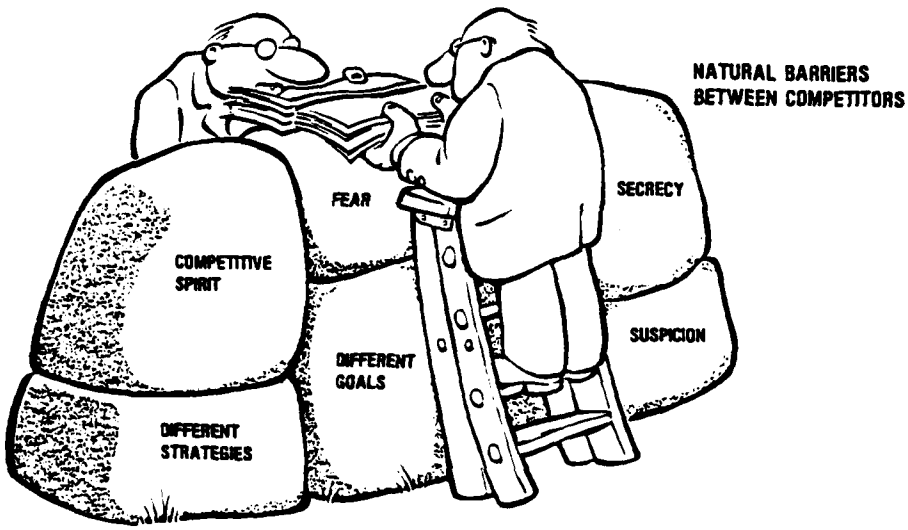
GENERAL DYNAMICS
Convair Division

TECHNOLOGY TRANSFER IS A TRANSFUSION OF INFORMATION TO A SECOND SOURCE



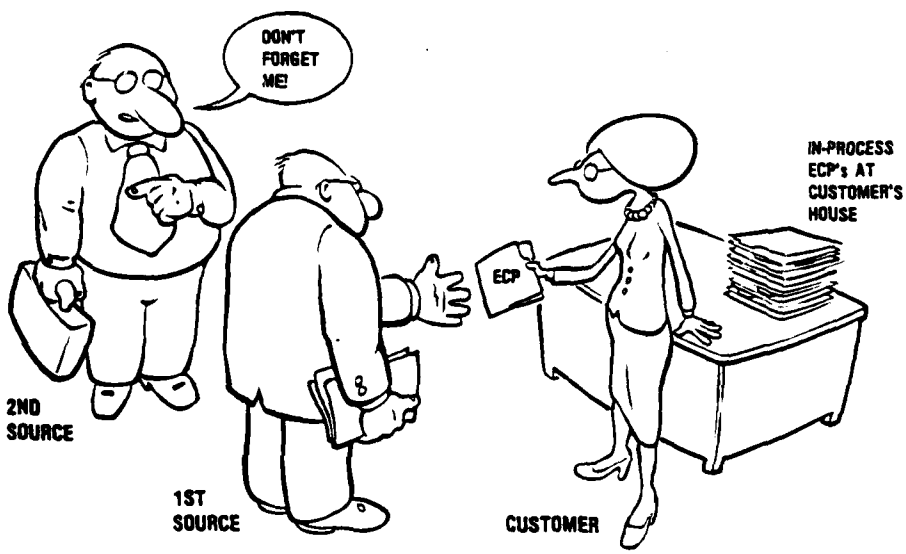
GENERAL DYNAMICS
Convair Division

TECHNOLOGY TRANSFER WORKS ONLY WHEN NATURAL BARRIERS ARE OVERCOME



GENERAL DYNAMICS
Convair Division

BEFORE BASELINE ESTABLISHMENT — REVIEW COPIES *OF IN-PROCESS CLASS I CHANGES*



VIDEO PAPER

Robert D. Rhodes
Lockheed Missiles and Space Company
Sunnyvale, California

Abstract

Tradition within the design documentation groups has played a very important role in the structure of checking, authorization and release of engineering drawings. This tradition has evolved from the need to communicate design authorization from engineering to the various service groups such as manufacturing and materiel. The computer, with its impact on design and manufacturing, has necessitated a new approach to prevent unauthorized access to the design information on the files. At the same time the new method must communicate the design authenticity to all affected agencies.

1. INTRODUCTION

The engineering process has always relied upon signatures of persons in the design drawing approval cycle to indicate design acceptance. Drawings and other engineering information are new being created and stored in computer files. These files can be accidentally or intentionally altered if adequate safeguards and procedures have not been developed. The purpose of password security, combined with programmer coding, can effectively provide the controls desired. In addition, this method will permit controlled access to interim design data on a company wide basis.

2. AUTHORIZATION METHODOLOGY

2.1 ENGINEERING RELEASE

Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) has certain characteristics which inhibit the traditional authorizing approach using signatures. Two factors determine that a need to change this method is required when using

CAD/CAM. First, video generated drawings do not accept a true signature readily. In essence this can be done but it is unwarranted because of the cost and the elaborate hardware systems that would be required. Second, communication of CAD/CAM drawings on video is now instantaneous and these can be made available throughout the facility in any state of completion or authorization. Therefore file protection is the ultimate goal of such a control system and we must capitalize on the positive attributes of CAD/CAM to implement a satisfactory protection scheme.

When we speak of file protection in this paper we are strictly referring to limiting the access of individuals to the design documentation residing on computer accessable magnetic files. Inherently we must tie file protection to signature authority in order to assure that the drawing review process has taken place. In turn this means that file protection and authorization are synnonomous.

Figure 1 pictorially describes a simplified drawing generation and review process. Normally an engineer prepares a drawing(s) which he signs and gives to his supervisor for review and approval. Once completed the engineer obtains several "not released" reproductions (prints). He now delivers the original drawing and two prints to the design checker. He also gives one copy to each organizational entity who has been designated to review the drawing(s). Each suggested or dictated revision is cycled back to the originating engineer for possible change. This action continues until all of the discrepancies have been resolved. In the manual system this means that all of the review organizations have "signed" the drawing(s) indicating their approval. The package is now ready for release.

The above process with or without individual company modifications to this scheme has been quite successful. The authorizing method that will now be described below attempts to adopt new computer based technology with an old proven method of doing business.

2.2 PASSWORD CONTROL

The basic premise we are establishing is the privacy of a password as used to access a computer system. This password is treated as you would treat the key to your desk or the combination to a three tumbler lock. The ultimate responsibility for the security of a password must reside with the individual himself. A "key to the computer must be also treated as a revokable privilege. To illustrate the use of a password in a CAD/CAM system, it would be advantageous

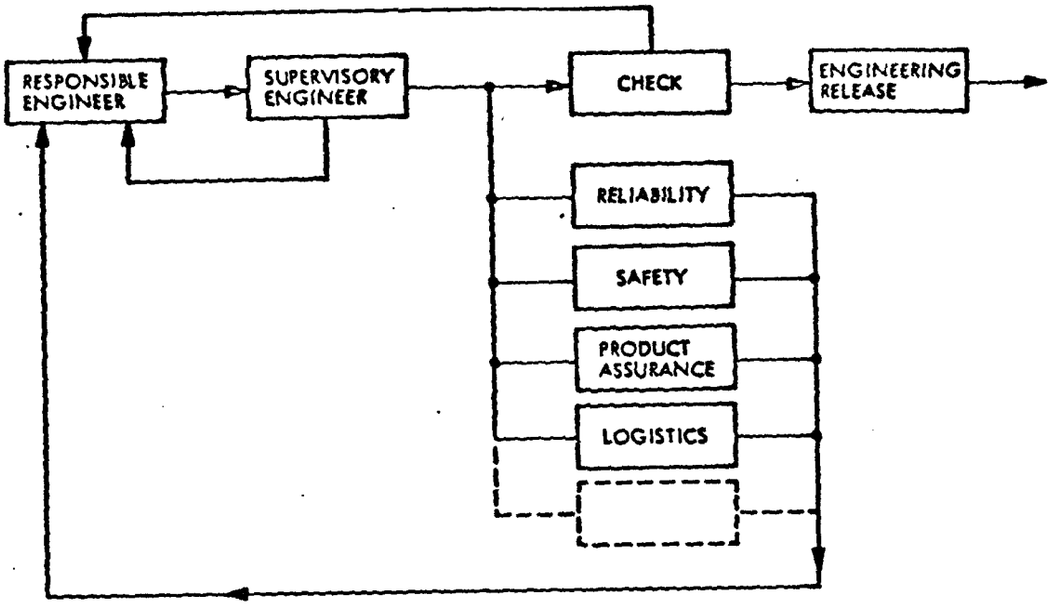


Figure 1 ENGINEERING RELEASE FLOW

to use the checker and engineering functions as an example.

Assume that an engineer and a checker is assigned to a new design program. At this time they are given passwords known only to themselves and the issuing agency. An organization which is interested in cost collection by computer costs will also issue a list of cost account numbers. These numbers, applied to a specific task, will permit the required analyses described above.

The list below shows a typical list of account numbers and passwords. Such numbers, or combination of numbers and letters, are determined to be valid by the computer program and programmed for the statistical tasks to be performed.

PASSWORDS

12A94Z

STARWARS

GEMINI

ALPHA6

ACCOUNT NUMBERS

A9-1092-6100	WING
42-6A91-4132	FUSELAGE
L8-123A-4667	TANK
BC-H672-19	ACTUATOR

Now back to the engineer and the checker.

The engineer wishes to begin a design. He logs onto the CAD/CAM system in a prescribed manner and includes an account number associated with his task and a password which opens the system to him. Next he performs his design effort and routinely files the drawing away in the magnetic medium used on his system. Each design session is treated in this manner so that the drawing is available for viewing by anyone so authorized--but, that person can only read--not write on that drawing. His password will not permit design access to another person's drawing.

When the design engineer has finished his task, he types onto the drawing his name in the space reserved for the designer. Next he notifies his supervisor the drawing is ready for review. The design supervisor logs onto the CAD/CAM system (with his account number and password) and types his name into the appropriate authorization block. Both pieces of signature data are dutifully recorded on a log tape for possible audit. We must remember only <u>that</u> particular password will permit typing <u>that</u> particular "signature" name.

At this point in time the drawing is passed to the checker for review and check. He will log onto the system in precisely the same manner as above but the checker's password and account number is different. For approval indication, the checker will type his name into the system. Now the drawing is sent to data control for release. The typical log-on screen described above is shown on Figure 2.

Obviously all review and approval agencies such as reliability, maintainability, etc., use the same method as that described above. If circumstances occur that require expediting when someone (eg. checker) is not available the CCB Chairman or Program Manager (or whoever) can be given a universal password for authorization to release (his name) in lieu of any others. These actions are also generated on the log tape for recordation and audit.

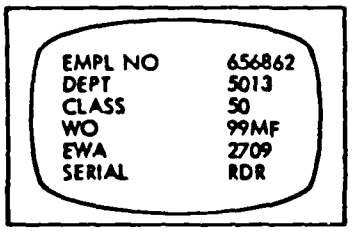


Figure 2 CADAM SCREEN

3. ECONOMICS

The information flow previously described has obvious cost savings. Most of these are "soft" savings which revolve around better communication, increased accuracy, shorter turn-around times and integration with other automated systems. One very large "hard" savings which is usually overlooked or ignored is white print reproduction and microfilming costs. Normally an industry is extremely sensitive to record retention and distribution of information. If an organization has completed a design, that organization will send that design to the various support groups (including check) for evaluation, confirmation of design accuracy and information. For "arguments sake" lets assume the following support groups are involved in the design process. These include, at a minimum, manufacturing, materiel, tooling, safety, reliability, check, producability and various history files. This distribution list could be about 10 prints. Typically a distribution list is about 20 prints on a major project. At 50¢ (an arbibrary value) for an "E" size drawing we would expend $10.00 for the initial "waterfall" process.

Of course it is a rare occasion that this is a final distribution. By the time an approved release of that drawing has been made we have expended about $25.00 for one original drawing. Next comes the inevitable microfilming process and the attendant aperture cards. Generally you can add another $15.00 to the original costs. Basically from our investigations on average situations, we have found that the reproduction costs (including microfilming) for an "E" size drawing range between $25.00 and $75.00 depending upon the number of iterations and the length of the distribution list. Obviously the end of this cost is still not in sight. Next comes the inevitable change process which adds to the reproduction costs; more microfilming; delivery of microfilm to the customer and the ultimate archive storage. Much of these reproduction costs can be avoided using the video terminal as the "paper" for the approval cycle and change process. Complete elimination of all paper is an impossibility but an 80% reduction is a feasible goal. Certainly this discussion is over simplified but it does point to a direction we can take in the future to solve many age-old problems known to all of us.

4. SUMMARY

The system described is basic and effective. Greater sophistication can be developed if required. For example, the checker has an organizational number.

During the log-on process this number can be compared with his password employee number. If everything matches, his department or work group can be the only persons able to access the specific checker's signature area. Certainly even more complex schemes can be envisioned.

The advantages of CAD/CAM and signature authorization are multi-fold. First and foremost is the instant communication of a design throughout the product system. The drawing can be offered during the course of design and status of that drawing is immediately obtained.

Additionally, "soft" savings are going to be part of system especially when turn-around times are considered. Reproduction costs will drop dramatically and the associated savings will effectively bring the total release system costs down. Not all problems can be resolved using this systems approach, but where used, design communications will be vastly improved.

5. BIOGRAPHY

Robert Rhodes has been in the computer hardware/software field since the early 1950's at the National Bureau of Standards. Most recently his responsibilities have been in the assessment, procurement and implementation of CAD/CAM systems for Lockheed Missiles and Space Company, Sunnyvale, California. His configuration management and data control background augments his computer experience in a unique way to help understand the system flow aspects of the design graphics field. He has three patents to his credit and published several papers and articles. His interest in computers began during his academic pursuits at Bucknell and George Washington Universities.

PROBLEMS IN UNDERSTANDING

PRINTED WIRING REQUIREMENTS

by

MR. RICHARD R. BARTA

IBM CORPORATION

(Paper not available)

A

TAXONOMY FOR SOFTWARE

AT

HUGHES

AUTHOR: R. L. Van Tilburg

April 19, 1983

PRESENTED BY: Jack Cooper

May 26, 1983

P

CONTENTS

A TAXONOMY FOR SOFTWARE

1. INTRODUCTION

Software at Hughes is used in many ways: as a part of the products we sell; as aids in engineering and management of product development; in manufacturing and test of products; and as part of the broad-based automated management and information systems used to run the enterprise. The use is diverse and pervasive. The software is not all the same nor are the requirements for the management of the software the same.

This paper defines five broad uses of software along with some important management considerations. It is written to clarify some of the confusion created by indiscriminate use of the term software when the speaker is refering to one use and the listener is thinking about another use. It also points out some management considerations that are appropriate to some kinds of software but not to all. It also comments on the different views of software quality appropriate to the various kinds of applications. The five uses of software are described in terms of:

Mission critical programs
Direct support software
Engineering software
Administrative software
Personal software

2. MISSION CRITICAL PROGRAMS

These programs are used to provide the essential functional capability used in the digital processors in the systems delivered to the customer. Sometimes they are delivered as operational programs in the form of software and sometimes they are embedded in the form of firmware as part of the hardware. Typical terms used to describe these programs are "Operational software", "Built-In Test" programs, "Firmware", "Embedded Computer Software", "Tactical Logic", "Control Programs", "Application Programs", etc. Examples of application programs developed by Hughes include tracking programs, guidance programs, navigation programs, display programs, detection programs. Applications to missile systems and autonomous vehicle operations are another example of special interest as the software operates autonomously and can be lethal.

2.1 Definition

Mission critical programs are essential for the system to perform correctly. Without them one or more of the essential functions of the system would be inoperative.

2.2 Usage

Mission critical programs are dedicated to the operation of the system product that is acquired by a customer. They provide the broad functional capability of the product. The functional requirements of these programs are tied ultimately to the system performance requirements, either as a software requirement placed on the data processing elements or indirectly as a "black box" performance requirement to be implemented as programmed digital logic. The engineering of these programs is a part of the overall engineering of the Hughes deliverable product, closely tied to the mission of the embedded computer system and/or the functional performance of the product.

Computer programs may be delivered as software (executed out of RAMs) or firmware (executed out of ROMs). Engineering of the programs is the same - using the same forms of documentation and reviews. Configuration management practices are the same for the engineering phase, differing only in that the ROMs are treated as hardware items after they are baselined by burn-in or other technique applicable to the particular type of ROM.

2.3 Management Concerns

Software intensive firmware should be engineered and managed as software but often it engineered and documented as hardware. Software engineering techniques are used for software intensive firmware applications where sequences of instructions execute in a processor and the logic is not apparent from an examination of a memory map. Hardware intensive firmware (small, non-complex forms of digital logic) and data forms (for example, programmed logic arrays) are engineered and documented as hardware.

Mission critical software engineering standards are often isolated from the general engineering standards and procedures. For example, a system preliminary design review often isolates the software review from the systems and hardware design review even though the software provides the functional capability of the system. The general Company engineering directives should be applicable to software but often are not applied. There is a tendency to write a separate but parallel set of software standards (sometimes to meet the implied desires of the customer). The policy is to write separate standards only where needed. Where differences occur, software engineering practices are defined to cover the differences, such as in configuration

management, quality reviews, etc.

There is a growing pressure in the customer community to define software development processes independently from the general system engineering process. This leads to isolation of the software generation process from the general engineering of the systems product. This is undesirable because the programs are a part of the product and the engineering process cannot be arbitrarily split.

All software embedded in Hughes products must be subject to the same minimum acquisition standards, documentation standards and review standards. Customer standards are inadequate for tailoring to the different project levels of complexity. A management concern is that there is no well defined minimum acceptable standard that can be tailored and applied to all acquisitions. Mission critical programs that are subcontracted are subject to the same quality, configuration management and testing standards as are internally developed programs. Vendor proprietary programs and GFI embedded in products are subject to acceptance test and configuration management as part of the product.

2.4 Quality Issues

The customer's definition of quality focuses on conformance to contractual requirements for the management of the software engineering process. Issues such as reviews of design at designated milestones, plans for testing and management of the configuration, conformance to predefined documentation standards, and adherence to programming standards and procedures are major concerns.

Engineering quality is concerned with the identification and incorporation of those performance attributes that best represent the customer's interest. Since software provides much of the functional capability of the system that the customer sees, software quality attributes need to be defined as requirements to be incorporated in the software design. Customer definitions of reliability, maintainability, transportability, etc., need to be defined as part of requirements for incorporation in the design.

3. DIRECT SUPPORT SOFTWARE

This software is used directly in the development and test of the company products. This type of software also includes software used in maintenance of the product (both hardware and software). Typical software considered here is compilers, testware, acceptance test programs, hardware test programs,

utility programs, test generator programs, loaders, automatic test equipment (ATE) software, site registration programs, link editors, fault location programs, and system calibration programs. Off-line exercise evaluation programs, recording programs, and training programs are other examples of direct support software. The computer aided test (CAT) software used in acceptance of hardware is an example of direct support software used for hardware. The software used in operation of production hardware in the factory (the computer aided manufacturing or CAM) also falls into this use category. An example program here is the APT software.

3.1 Definition

Direct support software is software necessary for the development and maintenance of hardware and other software. There is a direct relationship to the product such that an error in the support program can cause or allow an error or fault to enter into or to continue to exist in the deliverable product.

3.2 Usage

Direct support software is needed in the development and maintenance of a system but not essential for performance of critical mission functions. It is used in implementation and test of hardware as well as software and quite often is delivered to the customer as a part of the system. Direct support software includes firmware generation systems as well as software development environments.

Direct support software is increasingly used in the manufacture and test of hardware as automation, including CAM and CAT, is applied to increase factory productivity.

It should be noted that there is a difference between data and programs with respect to how they are managed even though software is often defined to include both programs and data. For example, the tape containing a numerical control program for an automated machine on the factory floor is "data" and is managed in the same manner as any drawing. The program used to generate the numerical control tape is managed as software. A data tape is changed by an engineering activity defining new hardware parameters or test points. A program is changed by software engineers modifying the logic of the program.

3.3 Management Concerns

Direct support software that is not made deliverable by contract is often given less management attention. The importance of this type of software to the quality of the products makes it

necessary for management to pay attention to all of the direct support software used by projects, particularly if the software is to be used on more than one project.

Change control in direct support software should be tied to changes in the product it supports. A change in the hardware of the system product must consider its impact on the supporting software as well as potential impact on mission critical programs. Likewise, a change in the programs used in direct support must consider impact on product hardware, both current production and past configurations for which maintenance responsibility still exists.

There also is a strong feeling in the customer community that all software used in the development of computer programs be made available as a part of the contract, whether specifically developed on contractual funds or otherwise. The engineering software used in the design of products is not all direct support, and not necessary in a turnkey system. Proprietary tooling should not be treated as direct support software. This is a contractual issue that management must be aware of during negotiation of the statement of work.

Sometimes direct support software is made GFI (as in the case of the MTASS or the CMS 2 compiler) and the requirement is to maintain the configuration without making unapproved changes.

Much of the software used in manufacturing and tools used in software development are acquired by purchase from vendors. Since the engineering of this software is not open to inspection, then the acceptability of the software tool is by verification/validation of the resulting product. In such case, the management requirement is to maintain configuration of the software tools as certified by testing of the product. Changes made to the software must be demonstrated to have no negative impact on the product.

3.4 Quality Issues

In general, the engineering quality attributes of efficiency of performance, robustness, and usability are not as important as transportability and maintainability for this class of software. The management aspects of software engineering process is not monitored as closely as the management of the mission critical software. In testing, more weight is allocated to certification of the software package by demonstrating that it produces the desired product than by in-process reviews and independent testing of the software package.

4. ENGINEERING SOFTWARE

An interesting set of software that is gaining importance within the company is the software used to support design activities. Collectively known as Computer Aided Design (CAD) systems and Computer Aided Engineering (CAE) systems, this software includes a host of different kinds of programs used in the engineering of a product. Most CAD tooling has been focused on hardware design and represents a very heavy investment in graphics capabilities, simulation capability, design data bases and special engineering programs. Examples of circuit analysis programs are TEGAS, DRC, SUPER COMPACT, and SPICE. Examples of simulation software are SIMSCRIPT, SLAM, MIMIC, AISIM, DAS/DDPM. Software tooling for aid in systems engineering and design such as SYSREM, HERCULES, SREM, CADSAT, AIDES, ISDOS, AISIM, and RXVP are examples of these applications. All are sophisticated software programs designed to aid the engineer in his tasks.

4.1 Definition

Engineering software is a set of programs used to improv the productivity of the engineering process or quality of th product.

4.2 Usage

Engineering software allows individuals to augment their work with the capabilities of the computer, either as simulation/modeling, using graphic design aides, building data bases that allow individuals to interact in a disciplined manner or as communication and documentation aides. These software packages are sometimes large, complex systems that require careful tuning for optimal usage and constant change as they adapt to different processing environments and undergo evolutionary growth.

The trend now is to combine them into a system with an engineering data base that allows an engineer to perform his work at an automated work station. The common characteristic of these programs is that they increase the productivity of the individuals using the system. Engineering software is used in the design of a product but not directly as a part of the implementation or manufacturing and maintenance process.

The general interest in this category of software by our customer community and industry in general is evidenced by the commitment of DoD to the the software initiatives as evidenced in the STARS program and the sustained efforts towards systematic introduction of Ada along with its programming support environment (APSE).

4.3 Management Concerns

There is a tendency to make the software tooling that is associated with a product deliverable to the customer in a turn-key system. This is acceptable for direct support software as that type is necessary for maintenance but not acceptable for engineering software which gives us a competitive edge. An example of this problem is faced in VHSIC which makes the DAST software accessible to other industries.

Of even greater concern is recent customer insistence that we can only use deliverable support software in the engineering design and development of operational software, meaning that we cannot use effective design tools unless we give them to the customer! The issue of proprietary support software arose in the review of the STARS and it is evident that there is general industry concern on this issue.

Engineering software, and to some extent direct support software, represents a very large investment in computer resources on the part of the company. There is a concern about the investment in the development of these programs and more concern about the added cost for maintenance.

4.4 Quality Issues

A basic quality issue is the assurance that engineering software is maintainable as it will be extended many times during its life cycle. It should have a user friendly interface to promote effective use by engineering personnel. Engineering software is maintained under Company configuration management in order to protect the high capital investment.

5. ADMINISTRATIVE SOFTWARE

These programs are used in the general management/administration activities associated with company operations, in the management of the engineering process, and in the management of the manufacturing process. They include the traditional automated data processing applications of payroll, inventory control systems, marketing, parts management systems, scheduling systems, manufacturing control systems, and pricing packages. They also include the growing number of applications found under the general name of Office Automation. Internal communication programs and other systems used in the general management of the company and the projects fall in this category.

5.1 Definition

Administrative software is software used in the control of company administrative operations and management of the engineering process and manufacturing operations.

5.2 Usage

The programs in this category are most often thought of as business programs or commercial programs. In reality, the distinguishing feature is the kind of information or data base that they process. The data base for administrative programs contains information relevant to the management of several or all projects and to the activities of the company in general. Engineering software, on the other hand, contains information relating to the technical process used in creating the products for customer use.

5.3 Management Concerns

The information in the administrative data base reflects the activities of the company over a period of years and is of great importance to the continued operation of the enterprise. As such, it is often sensitive and needs to be protected from accidental change or access by unauthorized personnel. Management of the data base requires the highest expertise.

There is some confusion in management between engineering software and the administrative software since they have traditionally been run on the same hardware - the maxi system or the large mainframes. With the growth of the micro-mini systems and the lowering cost of the hardware, basis for this confusion no longer exists. Engineering software, by its nature, is controlled by engineering management. Data processing management recognizes this difference in the definition of the two categories of administrative software:

- Production Software - that software used in production for specific application and is managed by a computing department or center.
- Open Shop Software - that software used for an application and is managed and run by the end user.

With the explosive growth in use of software by the many new and expanding applications, there is a constant demand for more computing resources. This continual growth in demand for services must be constantly reviewed.

5.4 Quality Issues

The development of new administrative applications is not as frequent as new applications are created for engineering software or mission critical programs embedded in new products. The primary quality attribute is maintainability, to meet changing demands of the users and new hardware additions. There is a need for assurance of internal configuration control.

6. PERSONAL SOFTWARE

These programs are used to solve the unique problems that occur in everyday work. The problems that they solve are related to the needs of the individual using the software and not incorporated into deliverable products or used repeatedly by many other users. An example is an analytic program prepared by an engineer in identifying the side lobe patterns of a radar antenna. Another example is an information data base kept by a manager to review the salary scales of his people.

6.1 Definition

Personal software are application programs written to solve a specific problem and are not for general use by others.

6.2 Usage

This type of software is written by anyone and everyone. The standards applied to the development of software for mission critical programs, direct support software, engineering software, and administrative software are not necessarily applied to personal software. These programs are those typically written on personal computers.

The basic difference between personal software and the software found in other uses is that professional engineering techniques are applied in the specification of requirements (statement of user's needs) and in the testing, documentation and packaging of the software for prolonged and extensive use by other than the developers of the software. The process of detail design, coding and debugging are generally the same in personal software development as in professionally engineered software.

6.3 Management Concerns

Personal programming can be accomplished by using professional software engineering techniques as well as amateur

programming practices but administrative software, engineering software, mission critical programs and direct support software delivered to our customers require professional expertise.

This distinction is not well appreciated by non-professional software developers.

Hughes cannot allow software that is not developed to professional standards to be used directly in the generation of products or to be delivered to a customer. Hughes can ill afford the extra cost of software generated in an undisciplined manner to be mingled with engineering software or the administrative software.

The problem of product degradation by mingling of different categories of software is aggrevated by the advent of engineering workstations. The software used here will be thought of as "personal" by the user and thus under his control. The mingling of personal programs not developed to standard with engineering software and company products must be avoided

Personal programming is useful and can increase individual productivity. A basic issue is one of preventing the mixing of the personal We need to provide for its effective use and yet exercise restrains on the changes to controlled software.

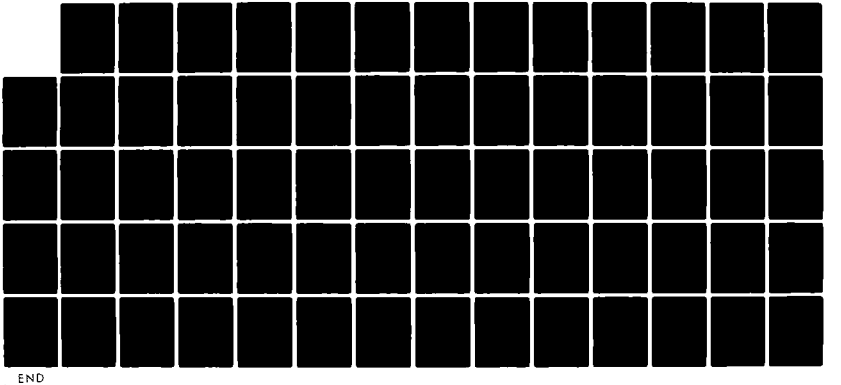
6.4 Quality Issues

A program that "works" is a "good" program for use as personal software. This criteria of acceptability is not sufficient for other kinds of software. Individual creativity used in a program is a highly praised quality attribute.

AD-A136 271 PROCEEDINGS OF THE MEETING OF THE TECHNICAL DOCUMENTATION DIVISION OF THE..(U) AMERICAN DEFENSE PREPAREDNESS ASSOCIATION ARLINGTON VA 27 MAY 83

3/3

UNCLASSIFIED F/G 5/2 NL

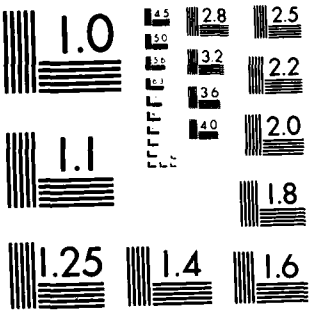


END

DATE FILMED

84

DTIC



TYPES OF SOFTWARE
A Taxonomy Based On Use

The following taxonomy of software is based several different factors but generally reflects the uses defined in this IDC.

1. MISSION CRITICAL PROGRAMS

    1. Operational programs - The application programs that provides the major functional capability of the system. Usually is delivered in the form of software but in more mature systems can easily migrate into firmware. Basic criteria is that the requirements for the programs decompose from system functional requirements. Customer has direct input into the statement of requirements and in the acceptance of the programs. An example is a command control communication program.

    2. Run-time Support Software - The programs needed to support hardware interfaces, handler routines and operating system functions. Requirements are derived from performance requirements placed on the total system, not necessarily the functional requirements of the system. The customer rarely specifies these functional requirements for these programs. Implementation can be in firmware or software. Examples are the on-line fault detection programs, operating systems or executive programs.

    3. Hardware Support Programs - These programs provide the digital logic that one would have found in analog circuitry a few years ago. The requirements stem from the design requirements allocated to the "black box", not from the system functional requirements. Implementation is most often in firmware but the logic is extensive enough that the technical disciplines of software engineering need to be applied for management of the engineering and the maintenance of the product. The programs can easily migrate into VLSI hardware. An example is a correlation program.

        NOTE

        Hardware intensive firmware is not considered a part of mission critical software.

2. DIRECT SUPPORT SOFTWARE

1. Programming Support Environment - The software used in the generation and maintenance of other software, such as compilers, utility software, loaders, configuration management software, editors, etc., used in the generation and maintenance of code. Programming systems used for firmware are a part of the support environment. Requirements are not derived from system functional requirements but from the need to generate and maintain software in a cost effective manner. Implemented in software and generally run in a host environment. Customer is primarily concerned with standardization of the tools, their efficiency, and correctness and the maintenance of configuration management.

2. Test Programs - The software used in the generation of test data, the running of test cases, and in test data reduction. Requirements stem from system and hardware test specifications. Customer interface is via the approval of test specifications. Examples are: testware; raid tape generators; card test programs; hardware acceptance test programs; and manufacturing test programs. The software used in automated test equipment fall in this category.

3. Maintenance Programs - The software used in fault detection and fault isolation. Differ from test programs in that they are more go-no go type programs than test of specific parameters. Requirements stem from system specifications for MTTR and system availability. Although the functions are more often found embedded in the application software, these programs have traditionally been off-line. Customer interface is in the specification of MTTR and availability goals. Examples are: performance monitoring/fault location programs; hardware diagnostics; and calibration programs.

4. Computer Aided Manufacturing Programs - This software is used to generate the programs used in (embedded in) production tools producing hardware. They are the logical equivalent to the programming support environment. Requirements stem from the need for lowered cost and improved accuracy and quality in the manufacturing process. Customer interest is in repeatability of the production process controlled by the programs generated in this environment. Examples are the ADAM II programs and the HERCULES software.

3. ENGINEERING SOFTWARE

1. Computer Aided Design Software - This software is used to improve the productivity of the hardware engineer in the design process. It tends to be graphic oriented and makes heavy use of simulation to verify designs. Requirements stem from need to improve productivity and quality of the engineering process. Most often is in form of software running on main frames but is now being adapted to design work stations running on mini computers. Examples are the TEGAS software, SPICE, and Simscript programs. The customer interest seems to be a desire to standardize and make available to all of industry the productivity gains from use of such software.

2. Computer Aided Engineering Software - The software used to increase the productivity of systems and software engineering process. The software in this category is just beginning to appear and project use of such systems is limited. The category is one of the next areas of emphasis for productivity improvement. Requirements stem from need to improve the individual productivity of engineers doing requirements analysis, specifications, top level design and systems architecture. Software generally runs on mini computers and there is a drive towards use of work stations. The customer tends to lump this software with the programming environment.

4. ADMINISTRATIVE SOFTWARE

Administrative software supports the administrative or management areas of the company. This software is not directly connected with the development of a product but is used by the functional areas as described below.

1. Financial Software - The software used to manage the company's financial books, distribute cash and funds, plan the company's and organizations' financial position, collect and price cost input data. This software is normally under the direct or indirect control of the company's financial organizations who are responsible for the integrity of the financial data.

2. Project Management Software - The software used to manage and administer projects, (both contracts, bids, and IR&D). These applications are used to report the project cost - plans and actuals - schedules, and management work breakdown. These reports are used by

project offices, the assist organizations and the customers for management purposes rather than engineering or manufacturing processes.

3. Employee Services Software - The software used to manage the company's employee status, compensation and benefit data. This software is used and managed by the company Human Resource, Payroll and Employee benefit organizations. REports generated by these systems are mainly used by the above organizations for their own personnel management and to the government for required Human Resource reporting.

4. Engineering Configuration Data Software - The software used to manage the configuration of the parts in a product during the engineering development of that product but not the final repository of the configuration of the product. This software may also include parts procurement, provisioning and inventory software. These applications are managed by an engineering support organization such as a Data Management department but reports are used by many engineering and manufacturing organizations.

5. Manufacturing Data Software - The software used to manage the manufacturing tasks and their associated use of parts. This manufacturing or production control software is managed by the manufacturing organizations who are responsible for the integrity of the data.

6. Communications Systems - The software used only in voice and data communications for the company's internal communications network and not involved in any products.

5. PERSONAL SOFTWARE

Since, by definition, it is desired to maintain a category of software that is not constrained in any way, it is inappropriate to include subcategories in this use-field.

THIRTEEN DOCUMENTATION PROBLEMS

THAT DON'T SEEM TO GO AWAY

by

W. W. Thomas

RCA CORPORATION

INTRODUCTION - Twenty-five years of documentation management reflected by the history of this division allow us to look at some of the issues with an eye toward sorting out the crises and deciding which are fires and which may be just smoke. The points I hope to make summarize some of these problems. They are personal views offered within the true intent of our charter to stimulate discussion that will influence our government toward maximum defense for our tax dollar.

DRAWING COSTING - How do we know the cost of drawings is too high? Since the formation of this division, DOD leaders have expressed the opinion that if we could get a fix on the cost of data, we would have a start on where to reduce these costs. Every new generation of the government people in charge starts the effort again.

D

This may be fine for some forms of documentation where, if the customer doesn't buy the data, no effort gets spent. But drawings are different. For many disciplines, drawings start at the origin of the engineering process, and their development is a part of that process. Multiple iterations generate drawings that never get released. The revisions inherent in the engineering process add redraw costs that are certainly not separable from the cost of the engineering itself.

Some choose the route of costing drawings as the cost of printing of a set. This is mostly a pull-and-reproduce cost, and in no way reflects the cost of drafting practices. There is nothing there that needs to be measured, and thereby reduce drawing costs.

It is unfortunate that even now a new group of specialists has under discussion a new way of costing the 1423 form. I would like to suggest we forget any summation of these costs and get on with the process of eliminating those features of our specifications and standards that contribute unnecessary constraints wherever they are and regardless of how little they save. This is an excellent example of where, if we watch the pennies, the dollars will take care of themselves.

ON TO COMPUTERS - The challenge of computer aided interactive graphics first hit this division in 1964. By 1965, our discussion had spawned a series of national magazine articles on the computer replacing the drawing board. Thurber Moffat published a prediction of interactive graphics that rereads so accurately it could have been written by CALMA or Applicon for today's brochures.

O

Thurber was absolutely right. His prediction of five years till all engineers would have a terminal is possibly still five years away, but it is coming, and with it the five-alarm fire of documentation problems ranging from configuration control of the data base to delivery of data that never becomes hard copy.

CEO OR BUST - Are data managers and configuration management specialists a disadvantaged sect because of the level to which they report? Probably not, but the person involved in the diplomatic squeeze inherent in these jobs often believes his problems are unique. C

For example, how about the unfinished drawing your group is working on which is pulled out for a print "right now" because "we need it now; clean it up later"? How about being told to make the change effective "all" with the first product on the shipping dock?

How about being made organizationally responsible to one of many middle engineering managers and told to just serve the whole engineering department as you can find the time and manpower? How about finding out about the tech manual requirements when the assembly line needs to insert the manual in the shipping container?

At the risk of disillusioning some, we need to remind ourselves that these are the awful frustrations of almost any service job. They are also challenges to good middle managers. We all hear complaints about documentation management reporting levels being too low. Surprisingly, reliability managers feel the same way. So do managers of test groups, factory production departments, and accountants.

If you are a good manager, it probably doesn't mean much that you don't report directly to the president. If you have missed my point, the problem I would like to articulate here is that I think we are wasting too much of our professional effort discussing the profession of data management. Let's stop studying the organizational status of the data manager and get to work efficiently managing data.

UNIFORM TECHNOLOGY TRANSFUSION - Transmission of technology by data without personal interface, especially for competitive reprocurement, is one of our more subtle problems. U

Of all the problems faced by the documentation specialist, possibly the most intellectually frustrating one involves the embedded belief on the part of the world that everything there is to be known about a product can be communicated in a competitive reprocurement data package. This just isn't so, as proven by the many cases where competitive acquisitions have proceeded for years, and suddenly a new low bidder's product starts to perform erratically.

The drawings and specifications in the reprocurement data package are only the beginning. Knowledge of the business, the processes and the technology are equally important and, in many cases, probably not reducible to documentation.

Part of the problem here is that none of us fully understands just how much we take for granted as part of the processing. Another part of the problem is that our competitors also know as much as we do about many of these same things. Thus, a data package is often presumed to be suitable for competitive reprocurement only because all competitors who build to it know about the things the designer inadvertently left out. The crisis comes when the inexperienced supplier bids the job, wins it, and finds out he doesn't know enough about the business to be able to follow the totally complete and spec-compliant data package he has been given.

Where is the problem? I think it rests with those who fail to understand that the technical data package is a fragile and incomplete communication device at best. They are the ones who insist that it be perfect regardless of cost, and they are incorrect in doing so—at significant cost to our military defense budget.

MANUFACTURING PROCESSES - Probably one of the reasons why the issue of whether the drawing package ever communicates all about a design to a second competitive source has to do with a basic axiom of drawing practices. This is, "never do your processing in the drawing package unless there is no other way to describe what you want but to describe how to get it." The old rule, "Show what—not how," applies here every bit as much as it does to mil specs, standards and contracts. It should be obvious that how you make a part or assembly or a weapons system will vary with technologies available, factory tooling, production rates, machine loading, and labor skills available. Even a robot may come on the scene. Locking the process into the competitive reprocurement package tends to negate that essential manufacturing flexibility.

M

ESCAPED PROPRIETARY INFORMATION - Many of you may never have heard of Denham Scott and his "swiss cheese drawings," but Denham was a real person who for years delivered to the services drawings with big holes in them where proprietary information had been cut out. You probably understand that his may have been the only company that truly protected its proprietary information.

E

In my opinion, the government policy on proprietary protection has elements of being unfair to the point that the defense industrial base is reduced by this unfairness. Companies usually prefer to get the job, rather than lose it through refusal to give up proprietary information. So, the companies stand their ground only in major cases and, even then, reluctantly disclose only when the issue is, "Give in and win, or refuse and lose." The frightening aspect of this situation is that probably some companies are just staying out of the game.

Is this problem smoke or fire? It is probably smoke for fast paced technologies or very complex businesses. It is probably fire for highly competitive companies in stable technology areas.

We have worked this problem for a long time with the military and had almost no change in its posture. The thing we who live by our defense business can never know is how much of the industrial base is just not participating in defense work because of these policies. How to find this out, and to correct the causes are two projects that have been within the charter of both the ADPA and this division for years without satisfactory resolution.

I think we need one guiding rule here at the present time, until we get the situation changed: If you have a true secret and need to protect it for your business, don't disclose it to the government.

NON-MILITARY, WHERE PRACTICAL - The issue of mil spec or commercial is the scene of some of ADPA's greatest successes. Surely, ADPA, with help from Bob Franciose, Maurie Taylor and Chet Nazian, broke extremely successful ground when ANSI Standards became defense standards and reduced to a whisper the roar of protest over the 40% delta dollar differential quoted so widely when 70327 was first issued. N

I hope in opening this beautifully successful case we didn't open Pandora's box. There is a place for military versions of commercial products, but to mislead the government into buying commercial when it falls apart the first time a depth bomb goes off under the keel is no contribution to the defense effort. Do we have a problem here? I feel there is probably more smoke than fire, but the situation bears close watching.

DAR DATA REQUIREMENTS ON THE CDRL - The exemption from listing of DAR required items on the CDRL is one of the least understood of DOD's positions. It represents a 'heads we win, tails you lose' attitude on the part of the government. The CDRL was possibly the best idea ADPA ever convinced the government to adopt. The slight exception for DAR data requirements makes the CDRL "complete, all but," and this becomes one of life's little documentation management crosses to bear. T

Fortunately, along with CDRLs came a maturity in data managers that partially compensates for this unfairness, so this problem is probably more smoke than fire. It is a situation that, in fairness, should be corrected just the same.

ALL THOSE MONO-DETAILED SYSTEMS - Unique military practices, such as the mono-detailed drawing system and, for that matter, assignment of military part numbers to contractors' drawings, are still a problem. This problem has been around for over twenty-five years. I would like to think that either industry could be made to understand why these practices are necessary or that the practices be eliminated. They do cost the taxpayer a good bit of money. A

Are there enough of these cases to call it a fire? No. I would rate this as a smokey fire, but one well worth calling one alarm.

THEN INSPECT IT - As many of you know, I have for years been opposed to the idea that statistical quality control or after-the-fact inspection of drawings when applied to the drawing package under a MIL-Q-9858 type approach is the wrong way to get quality in documentation. Every so often, product assurance types explain how they will inspect quality into the drawings, and we see unnecessary costs emerge again. As in a great number of related issues, sometimes we lose sight of the fact that a good set of drawings has its quality built in, not laid on during a post-completion review, and certainly not achieved by a count of defects.

T

INTRODUCING SPECIFICATION AND SOURCE CONTROL DRAWINGS - We have an awful dilemma where we have allowed a specification control drawing to be defined as a document which is seldom a specification, seldom controlling, and sometimes not even a drawing. I know Ted Golmis and your subcommittees are working on the redefinition of the specification and source control drawing. I happen to feel the terms, however incorrect they are, are so embedded in the culture that we would cause more trouble correcting them than living with what we have. But this educational problem will continue to plague us for quite a while. I question whether minor cosmetic treatment can solve it, and I doubt if major surgery is justified. This appears to be a dilemma we'll just have to live with.

I

O STANDS FOR ZERO SIGNIFICANCE IN DRAWING NUMBERS - Another smokey area where I suspect there to be fire involves recurring pressure for significant numbering systems. Flat out, I would like to recommend a policy of non-significant drawing and part numbering systems, and have the ANSI or mil specs implement this policy. There are some who see merit somewhere in the idea of special significance to part numbering and drawing numbering prefix letters and symbology ad nauseum. There seems to be a lot of smoke here, even though the military specs are currently quite good. It is the special implementation that causes much of this problem.

O

Of course, when pressing for significance, one has to oppose the 15 character limit in part numbers, which just adds to the reasons for opposing significance. Charlie Fisher has asked, "Has anyone ever suggested using National Stock Numbers (NSNs) and letting individual contractors go their own way as to part numbers?" This would require some far better transmission of National Catalog listings to the industry, but could be a solution to the duplicate part number problems that abound. These duplicate part number problems could grow exponentially if significant numbering systems were to be encouraged, and the 15 digit lid were to be removed.

The real fire, however, is breaking out in the identification and configuration management practices for deliverable software, where a new generation of specialists with no documentation background think they have invented a new wheel. In this area, the problem is definitely two alarm, headed possible for three.

NEW ENGINEERS NEED TEACHING - More and more engineers are graduating semi-literate in one of their basic languages. This is a real fire, and it's in our own backyard, not the government's. When one writes poorly, with improper grammar, spelling and sentence structure, one is called semi-literate because one has failed to master the language. Why shouldn't we consider the engineer who can neither draw nor read drawings equally illiterate? Yet a great many colleges are dropping all drafting courses from their curriculum. N

DOCUMENTATION - There they are. Thirteen problems that don't seem to go away. Thirteen issues that nag away at effective documentation practices while adding costs to our defense product. Is it possible that this division in its next twenty-five years can resolve or reduce to insignificance a good number of these? To do so would be a magnificent way to offer our contribution to a more effective industry/defense team. LAST

WORKSHOP PANEL SUMMARY REPORTS

ADPA
25th ANNUAL MEETING
TECHNICAL DOCUMENTATION DIVISION

Workshop #1 - Data Management

I. Attendance- Industry 42 (62%)
Government 26 (38%)

(See Attachment)

II. Approach - The format of this half-day workshop included three separate parts; a question-answer session where the customary questions/comments on the available question cards were discussed; a discussion period dealing with the two prior-identified topics; and a period devoted to responding to any topics generated at the workshop.

III. Question - Answer Period

Messrs. Jim Richardson, OUSD-RE(DMSSO) and Vince Mayolo, EG&G, constituted a panel which fielded the question cards which were turned in. These topics are summarized below, as interpreted by the workshop chair.

Q-1 "We've heard rumors of the demise of the MIAG. What is happening to the MIAG and will there be on-going action to eliminate DID redundancies?"

A-1 The MIAG has been abolished. It is being replaced by the Technical Data Management Advisory Group, with representatives from all the Services. Among the tasks to be handled will be a review of the current DID's, expected to take some 18 months.

Q-2 "Is there a MIL-SPEC which covers COM (Computer Originated Microfilm)? If not, are there any plans to prepare a new one or revise MIL-M-9868?"

A-2 There is no action on a MIL-SPEC now. With all of the film involved in 38 DOD repositories, there is some review going on (e.g., the Army's DESRED effort). There are discussions on tape/film scanability considerations and the make up of a data base. Initial systems dealing with this may be in operation in about 15 months at Huntsville, Philadelphia and Sacramento ALC.

Q-3 "How do you handle engineering (or other organization) approvals on drawings in a "paperless" system?"

A-3 From a national point of view, this is one of a number of problems identified for which a decision has not been made. A number of individual programs have reported satisfaction with handling this by means of systems varying from the use of organization approval codes to the use of no approvals (signature) at all.

Q-4 "We've heard that Public Law 96-511 affects Data Management. What is happening as a result of this law and what might we expect in the future?"

A-4 P.L. 96-511, Paperwork Reduction Act of 1980 removes those data previously exempt from OMB control (Technical Documentation) under the Federal Reports Act of 1942. This act provides that all data requirements must have prior OMB approval. Information collection requests must use the DID and DD 1423. The law impacts all Federal Agencies (not just DOD) and the following:

DODI 5010.12
DODD5000.19 Encl #5
DOD 5000.19L Vol. II (AMSOL)
DODD 4120.3
DOD 4120.3M
MIL-STD-961
MIL-STD-962
MIL-STD-963
New MIL-STD on hardware specs
FAR/DAR clauses
Collection of info in RFP's

A new implementation document will be necessary.

Approved (standard) documentation requirements can only be used as is or portions deleted; any additions require additonal OMB approval.

Q-5 (1) <u>QA Data Item Inspection Requirements</u>

- What are the guidelines?
- Who does it and when?

(2) <u>Data item Packing & Packaging Requirements</u>

- What are the guidelines?
- Aperture cards/original dwgs/tech manuals
- Who does it and when?"

A-5 About one quarter of the attendees indicated that they are subject to DCAS audit of Data Management Quality Assurance. It was reported that there is a heavier emphasis on data quality in the new rewrite of MIL-Q-9858. Further, there is now in limited coordination a NavAir Q.A. program for Tech Manuals. One company reported more than one Q.A. (drawings, T.O.'s, etc.) and many differing emphasis, depth of requirements and organization.

IV Prior Identified Topics

Two current topics were identified for workshop discussion; outline considerations were available to workshop participants at meeting registration as shown below.

TOPIC A

Changes in Data Management to Cope with the Paperless Office

- With CAD/CAM, Drawings on Tape vs Paper
  - Impact on Data Packages & Repositories?
  - Standard language/format for drawing/parts lists?
- As Government begins to Standardize
  - What penalties for wrong guess (e.g. DI-E-1104A)?
  - How much interactive access is acceptable?
  - Where is line drawn on third-party involvement?
- Utilization of technology without invasion of Contractor's rights
  - Does standardization of formats, graphics, languages, hardware, software out-prioritize contractor ingenuity, initiative, independence?

Much activity in data automation was reported by the participants. Reported results varied from "total disaster" to "quite satisfactory". A number of problems were identified:

lack of standardization-language, graphics

documents lost in word processor

difficulty in control-access problems

repagination constraints

handling classified information

indexing

need for paper products-dual systems

training requirements-old guard syndrome

Participants indicated varying degrees of progress-some have had gradual growth from dual products (paper and screen) to the point where all drawings now are digitized (after 7 years of development). DOD representatives reported efforts underway to automate repositories.

Discussions brought out a number of cautions:

It is too soon to standardize some things;

Internal computerization is big need;

Access controls = not minor, but workable;

Length of time tapes in storage & remain valid, unknown;

Need feasibility studies

cheaper engineering task may result in more expensive mfg task

new computer capacity fills up immediately

pay-off depends on effective integration

success requires:

customer confidence

innovative thinkers

supportive management

bottom line = trust, both ways

customer/contractor

employer/employee

TOPIC B

The Data Manager's role in contract negotiations

- Depth of Involvement
  - Actual
  - Desirable
- Focus of Involvement
  - Passive-as requested
  - Active-as perceived necessary
- Pre-RFP
  - SOW
  - MIL Spec/Stds
  - CDRL
  - Schedule/General & Special Provisions (incl DAR, Rights in Data, Software, etc.)
  - Cost-benefit Analysis
- RFP - Delta
- Post-RFP

Attendees:

Jerry Cichowicz - Chemical Systems, Aberdeen
Larry Dietz - Arradcom, Dover N.J.
Dan Gillian - Rockwell Int'l, Richardson TX
Carl Lewis - General Electric, Wilmington, MS
Ron VanBuskirk - Aerojet Electro Systems, CA

It was a consensus that there is a definite benefit in involving the data manager in pre-RFP, contract negotiations and post-RFP activities.

It was concluded, however:

A. Depth of involvement depends on organizational structure and therefore leads to three (3) levels of involvements:

   (1) Data management function in place with involvement throughout a program
   (2) During initial phase, on a consulting basis, but not thereafter
   (3) None - Decisions made by program office, contracts or other organizations

B. The contract data items list is established in one (1) of three (3) ways and is again organizational sensitive:

   (1) By comparison, analogy - past programs
   (2) "Pick List" by functional organization
   (3) Justified item by item

V. Workshop-Generated Topics

A. A question was raised relative to the length of data warranties and the applicability of the latent defects cause. Response indicated data warranties usually of three years and little application of the latent defects clause to data.

B. It was pointed out that with the coming broad application of the FAR, the DD Form 1423 has been nominated for use as a Fed Std. (Anticipation that FAR will be issued about April '84). Accordingly, it would appear timely to look at and recommend any improvements to the DD 1423. The workshop chair agreed to receive any current recommendations, combine with last year's recommendations and submit to DM SS0. (As a side comment, it would appear that the use of current AFSC forms 707, 708, 709 would have to be discontinued).

C. Reference was made to our earlier CDM Section meeting addressing the matter of DM certification. It was recognized that nothing further could be done without an agreed-to definition of the DM function. Wally Rook, Al Signor and Ed Avery agreed to convene subcommittee meetings this coming year to come up with a consensus definition. Others expressing an interest in working on this subcommittee include: Jim McGregor, Bob Lint, Fred Tessier, Ron Van Buskirk, C. Eschenback, Ron Schrage, Herb Atkins, Bill Thomas, Vic Fredette, Jr., and Dr. Ray Calhoun.

John R. Hart
Workshop #1 Data Management

NAME	ORGANIZATION/PHONE	MAILING ADDRESS
Atkins, Herb	EG&G	2150 Fields Road, Rockville, MD 20850
Averi, E. F.	GTE Sylvania	1 Research Drive Westborough, MA 01581
Bastek, Ed	Motorola (GEG) (602) 949-3357	8201 E. McDowell Road P.O. Box 1417 Scottsdale, AZ 85252
Blackstone, David G.	Ingersoll Rand Co. (607) 937-2960	100 Chemung Street Painted Post, NY 14807
Boozer, Elyse	Littons Systems, Inc. (213) 715-2772	G/CSD 5500 Canoga Avenue Woodland Hills, CA 91365
Brady, Denise	Naval Ordnance Station (301) 743-4217	CAD Dept 51211L Indianhead, MD 20640
Calhoun, Dr. Ray	Texas Instruments (214) 867-9647	13500 N. Central Expressway, Mail Sta. 333 Dallas, TX 75265
Cichowicz, Jerome J.	Chemical Systems Laboratory (301) 671-4102, 671-3868	DRDAR-CLT-I Aberdeen Proving Ground, MD 21010
Courtoglous, Paul	Hq ESD/ALEC (617) 861-4256	Hanscom AFB Bedford, MA 01731
Dalgety, Jim	Defense Logistics Agency (202) 274-7178 AV 284-7178	Attn: DLA-SCT Cameron Station Alexandria, VA 22314
Dietz, Larry	PM-CAWS (201) 724-4905	DRCPM-CWS Dover, NJ 07801
Drum, William M.	Applied Technology Lab, USARTL (AVRADCOM) Attn: DAVDL-ATL-QA AV 927-3300/2974	Fort Eustis, VA 23604
Edenfield, Phil	AD/YIP (904) 882-5201	Eglin AFB, FL 32580
Endicott, John E.	General Dynamics/Convair (619) 277 8900 Ext. 1782	P.O. Box 80847 San Diego, CA 92138
Fatig, Bernard W.	Westinghouse Electric Corp. Defense Electronics Center	520 Steward Avenue Glen Burnie, MD 21061
Fleig, Lt. Col. Norm	AFCOLR/MS Wright Patterson (513) 255-3001	AFCOLR/MS Wright Patterson AFB, OH 45433
Fredette, Vic, Jr.	U.S. NAVORDSTA 301-743-4536 4217	Code 51211C Indian Head, MD 20640
Furman, Nell	The BDM Corporation (703) 883-4526	7915 Jones Branch Drive McLean, VA 22102
Gilliam, D. L.	Rockwell Int.	

NAME	ORGANIZATION/PHONE	MAILING ADDRESS
Goy, Michael J.	HQ AFLC-CASO/LODS (616) 962-6511 Ext. 9351	HQ AFLC-CASO/LODS Federal Center Battle Creek, MI 49016
Halverson, Michael A.	Texas Instruments Incorporated (214) 995-6820	P.O. Box 226015, M/S 3194 Dallas, TX 75266
Harman, Jean L.	Naval Sea Systems Command (202) 692-0160	SEA 5523 Dept. of Navy Washington D.C. 20362
Hart, John R.	Boeing Aerospace Co. (206) 773-1935	P.O. Box 3999, M/S 8K-61 Seattle, WA 98124
Heggem, Dick	Westinghouse Marine Division (408) 735-2348	401-E Hendy Avenue EW-1 Sunnyvale, CA
Heim, William J.	COMMANDER (36501) 939-2191	Naval Weapons Center China Lake, CA 93555
Johnson, Isaac L.	GTE Systems (617) 449-2000 Ext. 3221	77 "A" Street Needham, MA 02194
Knight, William D.	Aerojet Electrosystems Co. (213) 812-1947	Dept. 4355, Bldg. 160 P.O. Box 296 Azusa, CA 91702
Kushner, William	McLaughlin Research Corp. (703) 370-8210	5200 Eisenhower Avenue Alexandria, VA 22304
Lazarchek, Bernard	U.S. Congress	
Lewis, C. X.	General Electric Co. (617) 657-4717	50 Fordham Road Wilmington, DL
Lewis, George L., Jr.	Northrop Corp.	15150 Magnolia #270 Westminster, CA 92683
Lint, R. D.	Honeywell, MSD (206) 789-2000	Seattle, WA
Magness, Reed	Chemical Systems Laborat ory (301) 671-3309	DRDAR-CLT-I Aberdeen Proving Ground, MD 21010
Marshall, Ben H., Jr.	Voight Corp.	P.O. Box 225907 Dallas, TX 75035 M/S 49-99
Marshall, Charles H.	USAF-HQUSAF/RDX	900 E. Church Street Xenia, OH 45385
Mayolo, Vince	EG&G	2150 Fields Road Rockville, MD 20850
McCregor, James R.	NAVSHIPWEPSYSENGSTA A/V 360 4839 (805) 982 4839	Port Hueneme, CA 93041 Code 4304C
Mersch, R.	USAMERADCOM (703) 664 5128	DRDME-DE Fort Belvoir, CA 22060

NAME	ORGANIZATION/PHONE	MAILING ADDRESS
Miller, James A	Lockheed Calif Co (213) 847 9301	P O Box 515 D/72-72 B/311 P/B6 Burbank, CA
Moore, Glen E	Aerojet Electrosystems Co (213) 812 2028	Dept 3221, Bldg 59 P O Box 296 Azusa, CA 91702
Moore, Jack Z	USE Corp (703) 960 4600 Ext 365	2550 Huntington Avenue Alexandria, VA 22303
Neary, Gordon	McDonnell Douglas (314) 232 3671	P O Box 516 St Louis, MO 63166
Ness, Vincent A		Vought Corp Dallas, TX
Perez, Andrew	Singer-Link Division Flight Simulation	Colesville Rd Binghamton, N Y Kirkwood Facility (G S S) 13902
Polland, Scott	GTE Systems	P O Box 7188 Mt View, CA 94039
Rice, Sam L	Hq US Army Arm't Cmd (309) 794 5305	Rock Island Arsenal Attn: DRSAR-LET-C Rock Island, IL 61299
Richardson, J D	DMSSO/USDRE	5203 Leesbury Pike, Suite 1403 Falls Church, VA 22041
Rinker, Lt Col B	ADS/B-1C Wright-Patterson AFB	686 Augusta Dr Fairborn, OH 453224
Rook, W E	Cerberonics, Inc (703) 379-4500	5600 Columbia Pike Bailey's Crossroads, VA 22041
Rowland, Hal	Sundstrand Aviation (815) 226-7445	4747 Harrison Avenue Rockford, Il 61101
Saul, Joe	Harris Corp (305) 729-7570	137 Terry Street IHB, FL 32937
Schrage, Ronald J	USAF ASD/XRJ Wright Patterson AFB OH (513) 255-5630	7252 Claybeck Drive Huberheights OH 4542
Shapiro, Isadore	Dept of Army Harry Diamond Laboratories (202) 394 2677 DELHD IT EA	2800 Powder Mill Road Adelphi, MD 20783
Signor, A D	U S Naval SEASYSCMD (805) 982-5281/4990 AV 360-5281/4990	NSWES Code 5121 P O Box 296 Port Hueneme, CA 93041
Stacey, Thomas	Massey Ferguson Perkins Inc (313) 595 9674	32500 Van Born Rd Box 811 Wayne, MI 48184

NAME	ORGANIZATION/PHONE	MAILING ADDRESS
Stasiowsk, Paula	Naval Air Systems Command (202) 692-2850	AIR 51122 Washington D C 20362
Tessier, Fred G	International Laser Systems (305)295-4010	3404 North Orange Blossom Trail Orlando, FL 32804
Thomas, W D	RCA	Camden, NJ
Travis, Bob	Martin Marietta Aerospace (303)977-4083	Box 179 Denver, Colo 80201 Mail No 0438
VanBuskirk, Ron	Aerojet Electrosystems (213) 812-2102	1100 W Hollyvale 57 P O Box 296 Azusa, CA 91702
Viars, Joy	Designers & Planners, Inc (703) 892-8200	1725 Jefferson Davis Hwy Suite 700 Arlington, VA 2202
Waddell, Cathleene	Naval Sea Systems Command (202) 6922776	Code 61Z4213 NC2/7E48 Washington D C 20362
Walch, Mark	Honeywell, Inc (612) 378-4250	2600 Avionics Blvd Minneapolis, MN
Weiss, H Peter	Joint Tactical Communications Office	197 Hance Avenue Tinton Falls, NJ 07724
Young, Frank K	TACOM Suboffice (408) 289-2295	1105 Coleman Avenue San Jose, CA 95108

WORKSHOP NO. 2

ENGINEERING DRAWINGS

Acting Chairman: Mrs. LORNA BURNS
Corporate Head, Engineering Design Standards
Hughes Aircraft Company
El Segundo, California

Panel Members: Mr. RICHARD R. BARTA
Manager, Engrg Standards and Product Safety
IBM Corporation
Owego, New York

Mr. MAURICE E. TAYLOR
Chief, Specifications and Standards Branch*
Army Armament R&D Command
Dover, New Jersey

Recorder: Mr. WALTER E. THIELE
General Motors Corporation
Delco Systems Operations
Goleta, California

*Preparing Activity for DOD-D-1000 and DOD-STD-100.

STATUS OF Y14 DRAFTING PRACTICES
(new/recently revised)

Y14.5 Dimensioning and Tolerancing (MR. Nicovich) - Revised 1982.

Y14.6 Screw Thread Representation (Mr. Meitz) - Supplement issued covering metric screw threads, 1981.

Y14.8 Casting (Mr. Pickard) - Revision in work.

Y14.9 Forgings - This subommittee is looking for experts to participate in updating this standard.*

Y14.13 Springs (Mr. Guetzlaff) - Revised 1981.

Y14.15 Electrical and Electronic Diagrams (Mr. Muller) - IEEE has assumed responsibility for this standard; a new number will be assigned at the next revision. Only Logic Diagram Preparation is currently in work.

Y14.18 Drawings for Optical Parts (Mr. Beavers) - New standard issued 1982.

Y14.24 Types and Application of Engineering Drawings (Mrs. Burns) - New standard in work.

Y14.26 Computer Aided Preparation of Product Definition Data (Mr. Jones) - New standard issued 1981.

Y14.34 Parts Lists, Data Lists and Index Lists (Mr. Dubocq) - New standard issued 1982.

Y14.35 Drawing Revisions (Mr. Derry) - New standard in work.

---

* Recommendations should be submitted to R.F. Franciose, (408) 925-6880.

WORKSHOP NO. 2
ENGINEERING DRAWINGS

The Engineering Drawing workshop was attended by approximately 64 people (see List of Attendees); approximately one third Government and two thirds Industry.

As the result of the general discussions and more than 30 questions, nine new action items for the Engineering Drawing Section were identified.

I. GENERAL DISCUSSIONS

A. Drawing Requirements for Paperless Data

> ACTION ITEM: An ad hoc committee was established to evaluate the standards needed for paperless data.

This ad hoc group faces a revolutionary challenge and much careful work. But inspite of this, six individuals responded to this challenge.

Since the advent of CAD generated data, the requirements of various drawing standards have been challenged as archaic. Some of these standards have been revised to facilitate CAD documentation preparation. (For example: ANSI Y14.2-1980 permits the use of a single line width on CAD prepared drawings. About half of those present use single line width plots.) But these kinds of changes only address elementary applications of automation.

> What is the Problem? As an alternative to hard copy or microfilm of drawings, new methods for developing, communicating, storing, retrieving, and using product definition data are rapidly gaining acceptance. (Gen. Morelli, Mr. Lazorchak, Col. Larimer, Col. Kuster, Col. Tracy, and almost every other speaker this year described this need.) The potential payoff for these new methods is dramatic increase in productivity. A wedge is being driven between the traditional engineering drawing community and this new, but real product definition data--the stakes are too high to let tradition get in the way. Precious dollars are being spent in meeting obsolete drawing requirements.

B. Changes to DOD-STD-100

Mr. Taylor summarized the changes to DOD-STD-100C that are contained in Notices 3 and 4. These notices are dated March and May 1983 respectively. Notice 3 incorporates numerous editorial changes which had been requested by the ADPA/TDD Engineering Drawing Section and invokes several new/revised standards. Notice 4 corrects ommissions that were introduced by Notice 3. No problems were presented by attendees.

C. Implementation of ANSI Y14.5M-1982

Notice that this revision of Y14.5 has been invoked by DOD-STD-100C, Notice 3 was received without much comment.

Concern was expressed that previous issues of this standard will not be available to support existing drawings for on-going programs. The attendees asked that ADPA urge ASME to make copies of ANSI Y14.5-1973 available to assist users in interpreting drawings prepared in accordance with that issue.

It was pointed out that Appendix D of ANSI Y14.5M-1982 contains a summary of former practices. In addition, VSMF maintains historical records on microfilm.

ACTION ITEM: Survey the continued need for the 1973 issue and submitt request to ASME as necessary.

D. Source Control Drawing Problems on the MX Program

Robert E. Hartman described problems (see Attachment B) experienced when prime contractors failed to support the data package with design disclosure package and provided only source control drawings. Items were new design and program funded.

ACTION ITEM: Review requirements for drawing types to plug loopholes.

II. QUESTIONS and ANSWERS

The questions generally fell into the following groups:

A. Format Problems

1Q Is a Revision Status of Sheets block required on Sheet 1 of ADPs prepared documents when all sheets carry the same revision letter?

1A No--it was suggested that a note be added stating "All sheets carry the same revision letter", but this is not required by DOD-STD-100.

2Q ANSI Y14.1 is not clear as to the requirement for the supplementary drawing number block on continuation sheets of "A" size multiple sheet drawings. Clarify.

2A Currently, the supplementary drawing number block is required on all continuation sheets. There are, however, some distinct

advantages to omitting it on continuation sheets of A size drawings.

ACTION ITEM: Develop proposal and request clarification.

3Q How are Roman numerals handled on machine prepared drawings and Parts Lists?

3A A type font should be used that has serifs on upper case I's. Alternatively, the Roman numeral may be converted to Arabic. Manual application of serifs is not advocated; can be missed on subsequent changes. Clarity and consistency in the application is the primary consideration.

B. Item Identification and Part Substitution

4Q Is it common to use a significant drawing numbering system based on part or drawing type?

4A A nonsignificant numbering system is strongly recommended. This avoids numerous system problems, including: (1) breakdown when exceptions become necessary, (2) need for part number changes because of drawing type change, and (3) numerous handling routines which users sometime apply thoughtlessly just because of the number.

5Q The method of building a part number for bulk items needs clarification. Suggest the use of methods similar to M39014/04-0101.

5A Agree.

ACTION ITEM: Will work with logistic activies to develope recommendations for MIL-STD-490 and -962.

NOTE: ADPA is on record with DMSSO that such identifiers should not exceed 15 digits; DMSSO has agreed.

6Q For part numbers such as M39003/01-XX-X, should the complete MIL spec number be entered in the Drawing or Document (Specification) column of Part Lists?

6A To ensure procurement of MIL-Spec qualified items, the complete specification numbers should be entered in either the Document Number column or the Description column.

7Q Substitute parts are increasing for specific items; especially microcircuits. Is there an effort to add a standard drawing example in DOD-STD-100?

7A No. Elements of this subject are covered by MIL-STD-480 and MIL-STD-454, Requirement 7.

NOTE: Part substitution is still a large problem for both Government and Industry which the TDD is continuing to work with several DoD agencies.

8Q How are Manufacturing options added/documented (eg, riveted assembly versus welded assembly)?

8A If the items are true fit and function equivalents, separate part numbers are recommended with an "or" condition called out in the Parts List. If one item is preferred over the other, the Parts List should call out the preferred item with a note that the other item(s) is an alternate.

9Q When accumulation of EOs against a drawing is permitted, how are the EOs identified; Method A or B?

Method A:

EO 1, 2, 3, etc; incorporate in A change
EO A1, A2, A3, etc; incorporate in B change

Method B:

EO A1, A2, A3, etc; incorporate in A change
EO B1, B2, B3, etc; incorporate in B change

9A The EO identification system is the contractor's option which must be documented by his proceedures. Incorporation of the EOs always advances the drawing revision letter. The majority of those present who use the EO identities described in this question, use Method A.

C. Identification Marking

ACTION ITEM - These questions identified the need to review the compatibility between MIL-STD-130 and DOD-STD-100.

10Q When is it mandatory to mark the MFR FSCM number on an item which design activity does not produce themself?

10A The MFR FSCM number is to be marked on all parts which could qualify for spares provisioning (eg; inseparable assemblies, matched assemblies, complete assemblies, and detail items).

11Q When contract requires use of customers format, is the contractor's FSCM number to be marked as MFR on the item(s)?

11A Yes, if the contractor does the manufacture. The customer's FSCM number prefixes the part number and the appropriate FSCM number of the manufacturer is marked in accordance with MIL-STD-130.

12Q MIL-STD-130 should clarify that vendors part number alone satisfies the marking requirements on specification control items.

12A This is stated in DOD-STD-100, paragraphs 201.4.2 and 402.10.d.

13Q If drawing revisions and Parts List revisions do not track, which revision letter is marked on the printed wiring board?

13A DOD-STD-100, paragraph 402.6C states that part numbers shall not include drawing revision letters. Revision letter marking is, therefore, not required except when MIL-STD-1389 is contractually invoked. In any case, the drawing (not the PL) is the controlling document which establishes the part identification.

D. Status of Applicable Standards

14Q How are companies implementing ANSI Y14.5M-1982?

14A Not many of the organizations represented at the Workshop are presently implementing this new standard. Some are training personnel in the differences from previous issue.

15Q Is DOD-STD-100 drawing types changing to ANSI?

15A Don't know as yet.

16Q What is the status of Y14.8 casting standard?

16A This is still under development in the ASME subcommittee.

17Q Will MIL-STD-34 "Preparation of Drawings for Optical Elements" be updated or replaced?

17A ANSI Y14.18 has been revised recently. It was reviewed by DoD activities and considered not a significant improvement over MIL-STD-34. DOD-STD-100 will continue to invoke MIL-STD-34.

18Q Does ANSI/IEEE Std 268-1982 replace ASTM E380-76?

18A No, not for DoD applications; see DOD-STD-100, Notice 3. However, both standards have DoD Acceptance Notices.

19Q What is the status of HDBK 2000 including all the dash numbers?

19A The (5 year plan) Standarization Program Analysis on Soldering (FSC: SOLD) explains what's going on. Copies may be obtained from:

Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

20Q What is the status of MIL-P-50884C and proposed standard MIL-STD-2118?

20A As of 83-08-19, these documents were still a "couple of months" away from publication.

E. Specification and Source Control Drawings

21Q Should all vendors and associated part numbers be added as required to specification control drawings in the suggested Sources of Supply list? If not, what type of "Audit Trail" is required to use parts in hardware?

21A Inculsion of more than two suggested sources is not required by DOD-STD-100. The panel recommended a controlled data base accessable to purchasing, receiving inspection, etc, with documented approval of equivalent's.

22Q Define "specialized segment of an industry" relative to specification control drawings.

22A "Specialized segment of an industry" is any supplier who has recognize expertise in producing a particular product line (eg; an electric motor manufacturer, hydraulic valve manufacturer, etc). These suppliers typically provide Applications Engineering services to tailor their product line to specific design requirements. Such tailoring is usually provided at significantly less cost than would be incurred for new design of an equivalent item.

23Q Will "vendor item drawing" become a type of control drawing like specification and source control drawings?

23A "Vendor item drawing" may replace "specification control drawing".

F. Data Automation

24Q We have much CAD output from Versatek printers on wood pulp paper. Most DoD services will not accept this. Why not?

24A Will not meet MIL-M-9868 microfilm requirements.

25Q DARCOM is procuring several DSREDS (pronounced "des-reds") systems. What is the status? Is the technology sufficiently advanced to procure such an integrated system?

25A Several systems are planned (if funded). First system will be at Redstone Arsenal. RFP to be issued soon.

G. Miscellaneous

26Q What is the difference between Level 2 and 3 drawings? Do contractors quote differently for Level 2 or 3?

26A Levels 1, 2, and, 3 allow for a progression of a program's data packages. Level 2 and 3 are per DOD-STD-100 with no lesser quality and depicts the engineering designed configuration. The difference is the content required to productionize the limited or pre-production data (eg; generate drawings of harnesses vs point-to-point wiring lists, castings vs hog-outs, etc). Production tooling is another consideration. The pre-production (Level 2) should be assessed for tailoring (ie, altering drawing requirements to accomodate a contractor's drawing practices for a limited build condition). A detailed explanation of Levels is contained in the Appendix of DOD-D-1000.

27Q What should we do about unrealistic requirements for test coupons in MIL-STD-275D? The .070 land defined by MIL-STD-275D for Coupon A is not realistic. Terminal lands for Coupon A, Layers 1 and 2 should use the smallest terminal land used on the associated board.

27A Fill out a Form DD1426 (included at the back of most specs) and send it to the custodian of the specification with a copy to the Chairman of the ADPA/TDD Engineering Drawing Section.

28Q In cable assembly drawings, dimensions of actual cut wire length are difficult to specify because connectors from various manufacturers may require different trim lengths prior to assembly. How can this be resolved?

28A DOD-STD-100 only requires end product dimensions; specific the overall dimensions (including the connectors) only. Manufacturing planning is then responsible for adjusting wire trim lengths to meet the end product dimensions regardless of the connector manufacturer.

29. The following questions were not answered at the workshop:

a. Q Should off-the-shelf material be documented using a specification control drawing per DOD-STD-100 or a material specification per MIL-STD-490?

Paragraph 402.16.4 of MIL-STD-100 says to not prepare drawings for bulk material and paragraphs 1.1 and 1.4.1 of MIL-STD-490 infer that off the shelf material is outside of the scope of -490 specifications.

ACTION ITEM: Develop proposed clarification.

NOTE: DOD-STD-100C, Notice 2 changed paragraph 402.16.4 to prohibit preparation of drawings for "specific quantities of bulk materials" only.

b. Q With the trend toward using computer aided design in the generations of drawing, is there a plan to update DOD-D-1000 and DOD-STD-100 to further define their use.

A Detailed specifications invoked by -100 are being revised to accommodate CAD prepared drawings (see section I, paragraph A of this report). There are no plans to specifically revise -100 and -1000 at this time.

c. Q On CAD developed drawings data, what procedure is used to maintain change control--hard copy or data-base maintenance? How?

ACTION ITEM: To be addressed by Ad Hoc Committee on Paperless Data Requirements.

d. Q How many organizations use hardware revision letter part marking--always, the assembly level only, or never?

ACTION ITEM: Survey Engineering Drawing Section members.

ENGINEERING DRAWINGS
WORKSHOP #2

ATTENDEES

Name	Address	Telephone
Albert T. Ackerman	Naval Weapons Support Center Crane, Indiana 47522	
Robert E. Ansley	Motorola, Inc, Gov Elec Gp 8201 E McDowell Scottsdale, AZ 85252	(602)990-5329
Herbert T. Ashley	NSWSES Code 5122 Port Hueneme, CA 93143	(805)982-5039
Arnold M. Batina	Ball Aerospace Systems Division P.O. Box 1062 Boulder, CO 80306	(303)441-4599
Raymond J. H. Beckingham	Hughes Helicopters Bldg 6 C/68 Culver City, CA 90230	(213)305-5241
Mike Bellia	Raytheon Company Andover, MA 01810	(617)475-5000 X2296
Charles H. Burk	Vought Corporation M/S 194-23 P.O. Box 225907 Dallas, Texas 75265	(214)266-5633
James H. Casey	Army Aviation Sys Cmd Attn: DRSTS-JP 4300 Goodfellow St. Louis, MO 63120	(314)263-3591
*Larry A. Ciskowski	The Boeing Company M/S 8C-53 P.O. Box 3999 Seattle, WA 98188	(206)773-1399
George M. Dallas	Martin Marietta Aerospace Mail 0438 P.O. Box 179 Denver, CO 80201	(303)97705329

* Will participate on Ad Hoc Committee for Paperless Data Requirements

Name	Address	Telephone
William R. DeWaal	Harry Diamond Labs 2800 Powder Mill Rd Adelphi, MD 20783	(202)290-2634
Frank E. Dougherty, Jr.	AAI Corporation P.O. Box 6767 Baltimore, MD 21204	(301)628-8433
R. V. Dronseiko	Raytheon Corporation Andover, MA 01810	(617)475-5000
John M. Ebersole	IBM Corporation, FSD 9500 Godwin Dr. Manassas, VA 22110	(703)367-4622
William B. Eggers	Naval Ordnance Stn Indian Head, MD 20640	(301)743-4389
Carl A. Eschenbach	Logicon, Inc P.O. Box 85158 San Diego, CA 92138-5158	(619)455-1330 X351
Lawrence S. Feldman	CG, MCLB Albany, GA 31704 Attn Code P844	(912)439-6466
Charles D. Fisher	RCA Govt Comm Systems Bldg 10-6-2 Camden, NJ 08102	(609)338-2008
Otto F. Garrett	Intl Laser Systems, Inc 3404 N. Orange Blossom Trail Orlando, FL 32804	(305)295-4010
Ed Gendron	Smith & Wesson 2100 Roosevelt Ave. Springfield, MA 01104	(413)781-8300 X259
Jerome W. Gray	Naval EOD Tech Ctr Code 451 Indian Head, MD 20640	(301)743-4419
Pat Greenwood	Hercules, Inc. Aerospace Division P.O. Box 98 Magna, UT 84044	(801)250-5911 X4218
Thomas Griffin	USAF ASD/XRN Wright Patterson AFB, OH 45433	(513)255-5632

Name	Address	Telephone
M.S. Hastings	Westinghouse P.O. Box 421 Annapolis, MD 21404	(301)260-5735
Robert E. Hartman	TRW/Defense System Group Mail Stn 1999 P.O. Box 1310 San Bernadino, CA 92402	(714)382-5941
Thomas Henderson	FACC 3939 Fabian Way Palo Alto, CA 94303	(415)852-4116
George Hromnak	ARRADCOM DRDAR-TST Dover, NJ 07801	(201)724-6528
Richard K. Johnson	Talley of Arizona 4551 E. McKellips Mesa, AZ 85203	(602)898-2510
Raymond L. Jones	Naval EOD Tech Ctr Code 451 Indian Head, MD 20640	(301)743-4419
Steven R. Kauffman	Naval Ordnance Stn. Indian Head, MD 20640	(301)743-4441
John Kicak	H.Q. DARCOM Attn: DRCMT-S 5001 Eisenhower Ave Alexandria, VA 22333	(202)274-9828
John A. Lasco	AFSC/SPACE DIV Los Angeles AFS P.O. Box 92960 Los Angeles, CA 90009	(213)643-1966
George Maeda	Aerojet Electrosystems Co 1100 W. Hollyvale Azusa, CA 91702	(213)812-2100
Bill Magnusson	Westinghouse Hendy Avenue Sunnyvale, CA 94088	(408)735-2348

Name	Address	Telephone
Richard Mersch	USA MERADCOM DRDME-DE Belvior, VA 22060	(703)664-5128
Jack Z. Moore	VSE Corp 2550 Huntington Avenue Alexandria, VA 22303	(703)960-4600
Vincent J. Moravek	Martin Marietta Aerospace P.O. Box 179 Denver, CO 80201	
Joe Motis	Lockheed D 50-13, Bldg 541 Sunnyvale, CA 94086	
*Richard A. Napier	Rockwell International Collins Comm Sys Div 1200 N Alma; 401-137 Richardson, TX 75081	(214)996-2030
M. E. Pietz	Rocketdyne 6633 Canoga Ave D/586-180 AB16 Canoga Park, CA 91304	(213)643-1966
Norman Raditz	Naval Air Engineering Center Code: 932 Lakehurst, NJ 08733	(201)323-7488
*Jim Remiker	General Dynamics Convair Division Mail Zone 34-6060 P.O. Box 80847 San Diego, CA 92138	(619)277-8900 X3782
Ellwood H. Richardson	Martin-Marietta Aerospace Mail 0438 P.O. Box 179 Denver, CO 80201	
Capt. Jack Sawdy	AFWAL/FIBR Wright-Patterson AFB OH 45433	(513)255-6992

Name	Address	Telephone
B. G. Schaefer	Pitney Bowes P.O. Box 6050 Norwalk, CT 06852	(203)853-7113
R. P. Smith	Honeywell, Inc. 13350 U.S. Hwy 19 So. Clearwater, FL 33546	(813)531-4611
R. L. Stephenson	Honeywell, Inc. 13350 U.S. Hwy So. Clearwater, FL 33546	(813)531-4611
Gerald D. Shock	Naval EOD Tech Ctr Code 451 Indian Head, MD 20640	(301)743-4419
Walt Thiele	Delco Electronics 6767 Hollister Ave. Goleta, CA 93117	(805)961-5059
*Alfred L. Turino	GTE Comm Products Corp. Sylvania Systems Gp P.O. Box 188 Mt View, CA 94042	(415)966-3227
Ron Van Buskirk	Aerojet Electro Systems P.O. Box 296 Azusa, CA 91702	(213)812-2102
Rick Wells	AFLC CASO/LODSHC Federal Center Battle Creek, MI 49016	(616)962-6511 X9350
Bucky Westerlund	FMC Incorporated Northern Ordnance Div 4800 East River Rd Minneapolis, MN 55421	(612)571-9201
*Frank K. Young	TACOM Suboffice FMC Corporation 1105 Coleman Ave. San Jose, CA 95108	(408)289-2295

NOTE: The attendance roster was not signed by all attendees; therefore some names are missing from this list.

Attachment B

SOURCE CONTROL DRAWING PROBLEM

Presented by Robert E. Hartman
For Engineering Drawing Section Consideration

- SOURCE CONTROL DRAWINGS ARE TO BE USED IN DOCUMENTING AN EXISTING OFF-THE-SHELF ITEM WHEN ADDITIONAL "QUALITY CONFORMANCE INSPECTION AND APPROVAL" MUST BE IMPOSED BY THE USER.

DOD-STD-100C

201.4.3 Source control drawing. A source control drawing depicts an existing commercial* or vendor* item which exclusively provides the performance, installation and interchangeable characteristics required for one or more specific critical applications. Quality conformance inspection and approval procedure shall be stated on the drawing or in a document referenced on the drawing.

- SOURCE CONTROL DRAWINGS ARE NOT TO BE USED WHEN DOCUMENTING A NEWLY DESIGNED ITEM.

RE-IDENTIFICATION OF SUBCONTRACTORS PART NO. BY USING A SOURCE CONTROL DRAWING CAUSES VIOLATION OF MIL-STD-130.

MIL-STD-130E

3.9 Identifying Number. The number used to identify an item. It is the number assigned by the design activity whose engineering drawings, specifications, standards, and inspection requirements control the design of the item. This number may be a specification, drawing, part, model, type, catalog, etc., number depending on the numbering system of the design activity. Whenever a part number is assigned to an item of production, the part number assigned shall be or include the design activity drawing number and shall be used as the identifying number. The identifying number shall contain the design activity identification code as a prefix.

- THE SUBCONTRACTORS SET OF DOD-D-1000, LEVEL 3, ENGINEERING DATA IS BEING PREPARED INCOMPLETE/DEFICIENT AS TO CONTAINING THE REQUIRED PERFORMANCE DATA.

DOD-STD-100C

Para 201.4.1

NOTE 1: The term "performance data" means a listing of those physical and functional characteristics under specified operating conditions (loads, speeds, etc.) and environmental conditions, as required to fully describe the essential operating characteristics under which the item must operate and perform. The characteristics so listed shall be defined to the degree that interchangeability of substitute items produced by any manufacturer is assured if the specified performance is possessed by these items.

- COMPETITIVE PROCUREMENT IS DIFFICULT, CONFUSING, AND COSTLY WHEN THE REQUIREMENTS CONTAINED IN TWO SETS MUST BE COMPARED.

- MAINTENANCE OF TWO SETS OF DATA BY THE AIR FORCE IS CONFUSING, NOT IAW THE CONTRACT, AND NOT COST EFFECTIVE.

- DOCUMENTATION OF A NEWLY DESIGNED/DEVELOPED ITEM IS TO BE DOCUMENTED BY A SET OF DOD-D-1000, LEVEL 3 ENGINEERING DATA PREPARED COMPLETE IAW DOD-STD-100 WHICH INCLUDES PERFORMANCE DATA.

ENGINEERING DATA DEFINITION

DOD-STD-100C
22 DECEMBER 1978

719 Engineering data. Engineering documents such as drawings, associated lists, accompanying documents, manufacturer specifications, and standards, or other information prepared by a design activity and relating to the design, manufacture, procurement, test, or inspection of items or services.

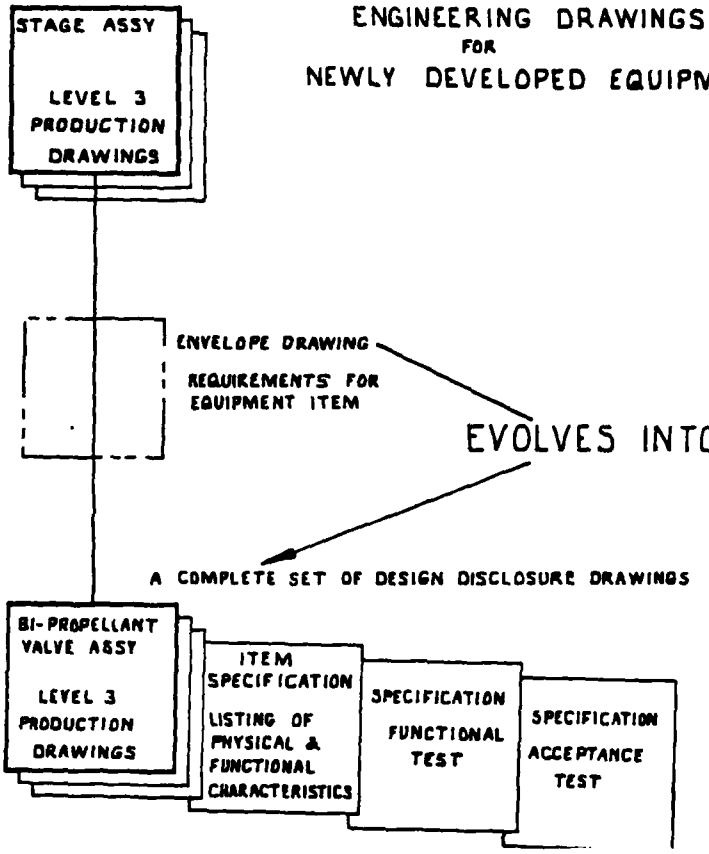
- BMO-AWC TAILORED THE LAST SENTENCE: ". . . PREPARED BY THE ASSOCIATE CONTRACTOR, HIS SUBCONTRACTORS AND VENDORS REQUIRED TO DEFINE OR CONTROL A SPECIFIC ENGINEERING DESIGN BASELINE."

THIS EFFORT IS AN ATTEMPT TO LIMIT THE AMOUNT OF DATA REQUIRED TO THE FOLLOWING:

- ENGINEERING DRAWINGS OF VARIOUS TYPES NECESSARY TO DEPICT THE PHYSICAL AND FUNCTIONAL END ITEM REQUIREMENTS.
- ONLY THOSE REFERENCED CONTRACTOR PECULIAR SPECIFICATIONS AND STANDARDS THAT HAVE NO EQUIVALENT GOVT/ANSI DOCUMENTS AND ARE UNIQUE/CRITICAL/ESENTIAL IN DEFINING THE ITEM.
- ONLY THOSE REFERENCED UNIQUE/CRITICAL/ESSENTIAL CONTRACTOR PECULIAR PROCESSES AND PROCEDURES THAT WOULD REQUIRE ADDITIONAL DESIGN EFFORT BY A SECOND SOURCE TO PRODUCE THE ITEM IF THEY WERE NOT PROVIDED.
- REFERENCED UNIQUE/CRITICAL/ESSENTIAL TOOLING DRAWINGS.
- VENDOR DATA OF EXISTING OFF-THE-SHELF REPARABLE COMMERICAL ITEMS DOWN TO THE LOWEST REPARABLE LEVEL.
- ENGINEERING CHANGE DOCUMENTS THAT HAVE NOT BEEN INCORPORATED INTO THE ENGINEERING DATA.

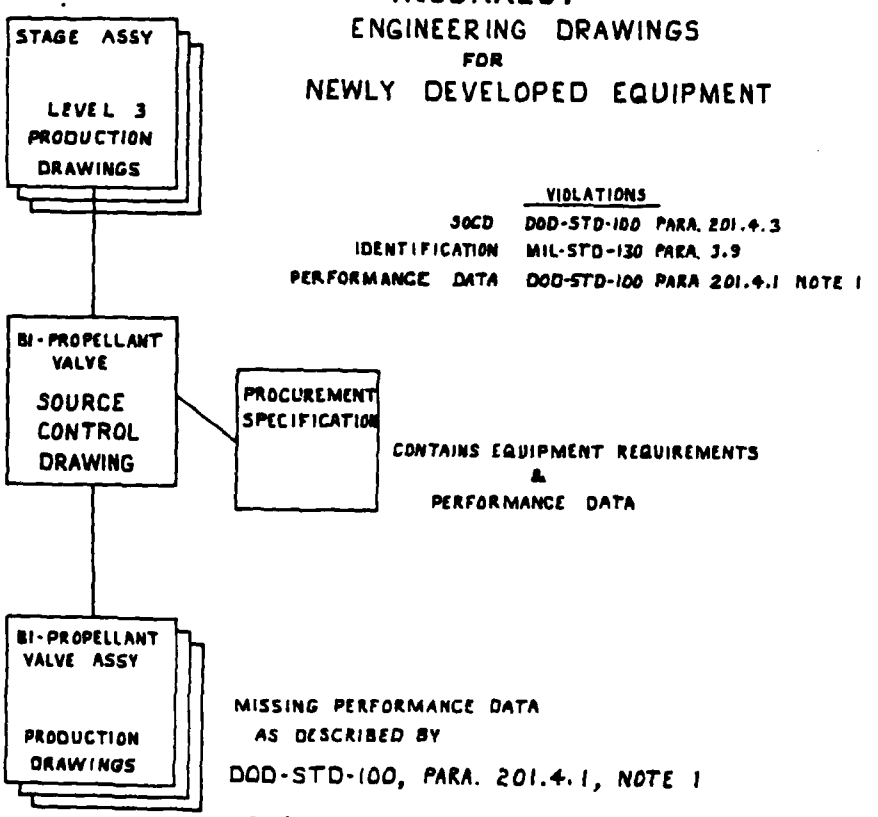
CORRECT

ENGINEERING DRAWINGS
FOR
NEWLY DEVELOPED EQUIPMENT



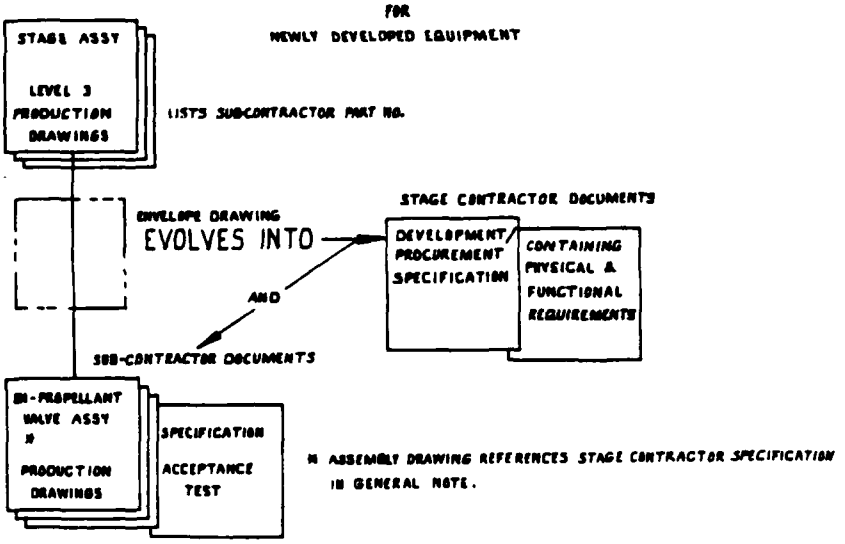
INCORRECT

ENGINEERING DRAWINGS
FOR
NEWLY DEVELOPED EQUIPMENT



REQUIREMENT COMPROMISE

ENGINEERING DRAWINGS
FOR
NEWLY DEVELOPED EQUIPMENT



REFERENCED CONTRACTOR HOW-TO-DO TYPE OF DOCUMENTS

- DOCUMENTS CONTAINING NO DESIGN OR END ITEM REQUIREMENTS SHALL NOT BE REFERENCED AS A DELIVERABLE DOCUMENT ON THE ENGINEERING DATA. (DOD-STD-100, PARA 201.1, 201.1.1, AND DOD-D-1000, PARA 3.3.3, 3.4)

    - Engineering Drawings are to be interpreted IAW DOD-STD-100 and its subtier documents. Contractor peculiar drafting room manuals, production/machining guides, interpretation of dimensioning, etc. are not to be referenced and submitted.

        Note: These documents may be placed in parenthesis and flagged to a general note stating "these documents are for the (specific contractors) use only".

    - A COMPETITIVE PROCUREMENT SET OF ENGINEERING DATA WILL NOT BE ACCEPTED IF OTHER CONTRACTORS MUST INTERPRET ANOTHER CONTRACTORS PECULIAR HOW-TO-DOCUMENTS

    - 57 COPIES OF EVERY DOCUMENT REFERENCED ARE PREPARED BY OO-ALC WHEN PROCUREMENT FOR REPLACEMENT ITEMS OCCURS. IT IS NOT COST EFFECTIVE FOR THE AIR FORCE TO ACCEPT AND MAINTAIN CONTRACTOR HOW-TO-DO DOCUMENTS

SELECTION OF REFERENCED DOCUMENTS IAW MIL-STD-143 (ORDER OF PRECEDENCE)

- CONTRACTOR PECULIAR SPECIFICATIONS/PROCESSES ARE NOT TO BE SPECIFIED INSTEAD OF THE GOVT/ANSI DOCUMENT UNLESS THE GOVT/ANSI DOCUMENT IS NOT SUFFICIENT TO DISCLOSE THE DESIGN REQUIREMENT. (DOD-STD-100 (TAILORED) PARA 402.18)

    - THE SELECTION MUST BE TECHNICALLY SUITABLE TO SATISFY THE DESIGN REQUIREMENTS IN EVERY RESPECT AND BE MOST ECONOMICAL TO THE GOVERNMENT.

    - THE PROVISION TO IDENTIFY THE CONTRACTORS DOCUMENTS THAT ARE EQUIVALENT TO THE GOVT/ANSI DOCUMENTS BY PLACING THEM IN PARENTHESIS IMMEDIATELY AFTER THE GOVT/ANSI NUMBER WAS SPECIFIED TO ALLOW THE CONTRACTOR NUMBER TO BE READILY IDENTIFIED FOR THEIR IN-HOUSE PRODUCTION.

    - ACCEPTING ESSENTIALLY DUPLICATE "LIBRARIES" OF CONTRACTOR DOCUMENTS FROM EVERY CONTRACTOR, PROLIFERATES THE AIR FORCE DATA DEPOSITORY AND IS NOT COST EFFECTIVE.

WORKSHOP #3

ILS/TECHNICAL PUBLICATIONS

MEETING REPORT

WORKSHOP PARAMETERS - The ILS/Technical Publications Workshop was conducted from 1315 to 1700 on May 24, 1983 in the Continental Room of the Chamberlin Hotel, Hampton, Virginia. This workshop was a part of the Twenty-Fifth Annual Meeting of the Technical Documentation Division, American Defense Preparedness Association.

Workshop #3 was attended by 24 participants (9 government and 15 industry representatives). The roster identifies each participant by name and affiliation.

OVERVIEW - The Workshop Chairman convened the session by presenting a brief report on the status of last years action items. Three areas of follow-up action were reported:

The first area involved assistance in the Technical Manuals Specifications and Standards (TMSS) program. The Program Plan for this effort was approved in January, 1980, and this plan was developed and coordinated with the DOD Components and Industry by the U.S. Army DARCOM Material Readiness Support Activity, Lexington, Ky., the Lead Service Activity. It was noted that the TMSS Chairman, Mr. Art Rulon of DARCOM, presented a TMSS status report at our 23rd Annual Meeting held at the U.S. Air Force Academy, Colorado Springs, Colorado in June, 1981. Mr. Jim Richardson of DMSSO provided current TMSS activity status during the workshop discussion. Further action on TMSS tasks is anticipated.

The second area involved follow-up to the NAVSEA Modular Specification System (M-SPECS). Mr. Jim Richardson of DMSSO provided current M-SPECS activity status during the workshop discussion. Further action on M-SPECS development is anticipated.

The third area involved a joint action with the Engineering Drawing Section of the Technical Documentation Division. The following recommendation was forwarded to DARCOM in April, 1981:

"The Engineering Drawing Section urges that for Engineering Drawings used in manuals, lettering heights be specified in dimensional form (inch or millimeter), rather than by point size. We recommend this be accomplished by incorporating the dimensional equivalent of point sizes shown in Figure 3 of MIL-M-46849 (either directly or by reference)."

We have been advised that this recommendation has been included in the latest revision to MIL-M-38784. This revision is dated 16 April 1983 and is now available for distribution at the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 (Telephone 215-697-3321). Further follow-up is planned until the revision is reviewed.

Following the action item coverage, the Workshop Chairman briefed the participants on the ILS/Technical Publications issues that surfaced during the two Executive Board Meetings (Sept. '82 Meeting at Defense Depot Mechanicsburg (DDMP), Mechanicsburgh, Pennsylvania and Jan.'83 Meeting at Air Force Systems Command (ASD), Wright Patterson Air Force Base, Dayton, Ohio). Minutes of these Executive Board Meetings contain the details of these issues.

After the introductory report, the purpose and operating procedures for the workshop session were given. At registration, "Question/Problem" forms were made available to all attendees, and during the General Membership Meeting (Session I on May 24, 1983), the six ADPA workshops and workshop chairmen were introduced. As a result of this solicitation, Workshop #3 received three "Question/Problem" forms that were used as workshop issues for discussion. Three key areas of concern (Maintenance Planning, Publications Change Control, and Analog and Digital Servicing Techniques) were also identified as discussion subjects. To prepare for the discussion, each participant in Workshop #3 was asked to identify individual background information such as name, affiliation, position, and brief sketch of applicable experience. The Workshop Chairman then stressed that each participant should contribute as an individual rather than as a representative of the affiliated company or military service. Using this approach, the workshop objective was established as the resolution of the "Question/Problem" issues and discussion of the key areas of concern that would best serve American Defense Preparedness.

WORKSHOP ISSUE 1 - APPLICABLE STANDARD FOR LSA/WSESA

QUESTION: What are we using for the government for Logistic Support Analysis/Weapon System Engineering Support Analysis, that is, MIL-STD-1388 or MIL-STD-1388A?

DISCUSSION HIGHLIGHTS: This question related to activities in support of Skill Performance Aids (SPA) technical manual preparation for an Army Weapon System. In the discussion, Army personnel noted that MIL-STD-1388A has not been released and is currently in review.

RESOLUTION: Continue to use MIL-STD-1388 and seek guidance on your program when MIL-STD-1388A is released.

WORKSHOP ISSUE 2 - CHANGE BAR AUTOMATION

QUESTION: Is there today a word processing system which will handle "change bar" designations?

DISCUSSION HIGHLIGHTS: Most word processing systems on the market today feature a "wraparound" feature. This does not allow change designators to remain in the page margin. It is frustrating to have the power of video editing techniques for text manipulation and then find it necessary to have an illustrator manually add the change bars.

RESOLUTION: Systems such as the Xerox Model 9700 Laser Printer provide for change bar annotation. Application to an existing word processing system must be evaluated as well as compliance with specification requirements. The AIA Automated Technical Publication Symposium to be held at the San Diego Hilton on Sept. 13-15, 1983 will provide an excellent opportunity to explore other possibilities.

WORKSHOP ISSUE 3 - IMPACT OF THREE-LEVEL MAINTENANCE CONCEPT

QUESTION: What will be the impact of the new three-level maintenance concept on maintenance planning, LSA/LSAR, and provisioning?

DISCUSSION HIGHLIGHTS: This question was related to Army consideration of change from five-level to three-level maintenance. Automated test equipment was identified as the prime motivating factor.

RESOLUTION: Converting from five-level to three-level maintenance would have major impact on fielded systems. This impact could be reduced significantly if the three-level maintenance concept were phased-in by limiting application to new systems. Considering the tie-in to the introduction of automated test equipment, the limited use of three-level maintenance appears to be the practical way to approach the problem.

KEY AREA OF CONCERN NO. 1 - MAINTENANCE PLANNING

During the last two decades emphasis on maintenance planning has been on the increase. Resources and effort have been applied to improve the Life Cycle Cost of DOD fielded systems and equipment. Provisioning, support equipment, training, and up-front analysis were the subjects discussed in the workshop with respect to their impact on technical manuals. It was agreed that technical manuals must provide the bridge between the operational maintenance personnel and the fielded systems and equipment. Use of the technical manuals in the training environment enhances their use in subsequent field assignments.

The discussion brought out the uniqueness of individual service missions and requirements, and emphasized the difficulty in applying maintenance planning across the board. Even the nomenclature developed by the different branches of Army, Navy, and Air Force tends to make transition difficult. Perhaps this explains the evasive goal of the TMSS effort. More must be done to improve and make easier the application of maintenance planning across service lines of interest.

In the provisioning area, timing and configuration are critical elements to consider to achieve good correlation of fielded equipment, illustrated parts breakdowns, and the supply system. Although much progress has been made to improve this correlation there is much room for further innovations.

By popular demand of the workshop participants, the impact of automation techniques on maintenance planning was discussed. Forward looking concepts envision the up-front maintenance planning documentation to be the formation of the technical manual data base. The thought here is to progress to the point where the initial keystrokes of maintenance planning can be captured and applied directly to technical manual preparation. This challenge is coming into focus now but will require much effort to implement.

KEY AREA OF CONCERN NO. 2 - PUBLICATIONS CHANGE CONTROL

Configuration Management of hardware and software has been addressed at great length and breadth in recent meetings. This workshop area was introduced to discuss the related concept of publications change control.

The true measure of effective control is made when the degree of correlation between the fielded systems and the technical manuals is determined by the user. Although validation and verification techniques at delivery time insure initial compatibility, field changes in equipment and procedures must receive the same emphasis to keep systems and technical manuals on track.

Block changes, sequentially dependent field changes, factory break-in versus field changes, and timing of changes were among the topics discussed. The relatively few horror stories brought out in the discussion indicated that the current control appears to be adequate. Impact of new automation trends must either maintain or improve the present tracking controls.

KEY AREA OF CONCERN NO. 3 - ANALOG AND DIGITAL SERVICING TECHNIQUES

Modern weapon systems and equipment have quickly capitalized on the advantages provided by digital circuitry. Although most sensors and many display devices continue to utilize analog devices, the processing, manipulation and control of signals have realized a dramatic shift from analog to digital

form. This workshop area was introduced to consider the impact of this basic change on the technical manual requirements.

Built in test equipment (BITE), preventive maintenance/fault localization (PM/FL), improved reliability/maintainability and reduced overhaul needs were among the prime topics discussed. One irony that was brought out was that technical manual size tended to increase to provide the coverage needed to include the self-test circuitry. Another concern was the emphasis on line drawings when digital circuitry parts location could be handled more easily by photographic renderings.

The discussion reached the point where great savings in Technical Manual effort would be realized if BITE, PM/FL, and other self test circuitry could be brought to the 100% capability in the area of servicing digital circuitry. Current practice falls short of the 100% capability and relies on Technical Manual coverage to complete the support. This practice results in increased Technical Manual size to cover the undisclosed capability delta.

RECOGNITION: Special thanks are in order for the excellent setting provided by both Fort Monroe and the Chamberlin Hotel.

Also, the attendance and active participation of Jim Richardson, Col. Joseph W. Lloyd, and Col. S.F. Putnam did much to achieve the communication level that was realized. Although not established as a formal panel, these participants formed the backbone of the workshop session.

WORKSHOP #3

ILS/TECHNICAL PUBLICATIONS

ROSTER

NAME	AFFILIATION
Richard E. Knob	Sperry Corporation
Joseph G. Polai	Honeywell
Robert J. Winklareth	XMCO, Inc.
Don Cleveland	TAURIO
Roger Frazier	NAVPRO Dallas
Denise Brady	Naval Ordnance
Col.S.F. Putnam	Hq. CECOM (DME)
R. Woznick	TPC, Corp.
Joe Hauck	Dayton T. Brown, Inc.
Ron Kiesnosh	Dayton T. Brown, Inc.
Barbara Vogel	Honeywell
Carl A. Eschenbach	LOGICON, Inc.
Bruce S. Malmont	Hq. DESCOM
Michael D. Marraffino	GTE Systems
Linus Glowienka	Ken Cook Co.
SM Sgt. Danny Lewis	AFCOLR
M.A. (Mike) Daniels	AACI
Col. Joseph W. Lloyd	DARCOM - AUTO Systems
Cathleene Waddell	Naval Sea Systems Command
Joy Viars	Designers & Planners, Inc.
Jean L. Harman	Naval Sea Systems Command
David G. Blackstone	Ingersoll- Rand Co.
Franklin Phillips	Sanders Assoc.
Jim Richardson	DMSSO

Workshop #4
Configuration Management
Wednesday, May 25, 1983 - 1315 Hours

CHAIRMAN: Mr. Charles J. Embrey
PACER Systems, Inc.
1755 Jefferson Davis Hwy
Arlington, VA 22202
Telephone: 703-920-8300

PANEL/
MEMBERS: Mr. M. Daniels
Manager, Configuration Management
Space Telescope Institute, John Hopkins University
Baltimore, MD 21218

Mr. J. Nast
NAST and Associates
15171 Lestics Lane
Los Gatos, California

Mr. J. Remiker
Chief, Configuration Management Rqmts & Identification
General Dynamics/Convair Division
P.O. Box 80847
San Diego, CA 92138

SUBJECTS: CM Requirements for Software Development (DOD-STD-1679A)

Questions and/or Problems Posed by the Workshop Attendees

Development of an Action Item List for Unanswered/Unresolved Items to be worked or during the coming year.

WORKSHOP PURPOSE:

The purpose of the Configuration Management Workshop was to utilize the knowledge gained by the government and industry participants who work with and apply this management discipline on a day-to-day bais, and also improve communications regarding CM matters between all of the attendees. The objective of the workshop was to identify and resolve problems which are currently being experienced by the attendees, through questions and answers posed by both the panel and the attendees. Those problems which required specification changes to resolve, or were otherwise too time-consuming or complex to resolve at the workshop, were recorded as action items and will be addressed by the CM committee during the coming year.

WORKSHOP SUMMARY:

Mr. Charles Embrey opened the workshop and introduced the panel members. The workshop attendees were provided with copies DOD-STD-1679A, Subject: Software Development. There were a number of questions concerning that proposed revision which were previously written and submitted to the Chairman. Those questions, plus comments & questions from the attendees during the course of the workshop on 1679A and related CM matters formed the basis of the workshops activities. Mr. Embrey also provided the workshop attendees with a brief overview of the current status of the rewrite of DOD-480B and the Joint DOD CM Regulation.

1. DOD-STD-1679A was discussed at some length by the workshop attendees, and the following significant points were made.

- o DOD-1679A was not fully coordinated with all of the DOD users, therefore it is questionable if it should have been released as a DoD Standard

- o DID number DI-E-2035E (Configuration Management Plan) included in Section 6 of 1679A. Current planning indicates that DOD will take corrective action. The attendees generally agreed the standard (1679A) as rewritten, satifies the CM direction required by a contractor, when providing software deliverables to a DOD component.

2. Configuration Management requirements imposed on subcontractors and vendors were discussed by the attendees, and the following points were made.

- o Most companies insert a standard CM clause in a sub-contract, which can be tailored to reflect any unique requirements necessitated by the specification on the prime contract.

- o Vendor CM requirements are not included for most "off-the-shelf" components.

- o CM compliance audits of sub-contractor and vendor facilities for the most part, are conducted on a random basis, with government participation only when required by the procuring activity.

3. Engineering Change Proposal (ECP) processing times were discussed, and it was determined that if processing times were to be shortened, it would require a concerted effort on the part of the contractor and the procuring activities. Some of the suggested methods for improving processing times were:

- o ECPs not be submitted by the contractor for approval, until all of the supporting and substantiating data is made available.
- o ECPs requested by the procurring activity have funding identified and committed, prior to final approval by the Government.
- o ECPs currently in process be reviewed, and a status report provided to program management at both the procurring activity and contractor, which highlights the cause for delay in the processing cycle.

4. Configuration Management used in conjunction with Computer Aided Manufacturing (CAM) systems, was the subject of discussion among the attendees. CM applied to CAM does not pose any unique problems, and it is currently being accomplished at a number facilities with varying degrees of success.

5. Mr. C.D. Fisher (RCA) Chairman of the DAR committee responded to a question on computer resources, "if they would be treated as CPCIs?" for CM purposes. Mr. Fisher provided the attendees with the following excerpt from a recent DAR circular which addressed that subject.

Under "System Design Principles"

14. Computer Resources. Acquisition of computer resources for application to, or critical to the direct fulfillment of, the military or intelligence missions of the Department of Defense (including command and control systems) will be conducted in accordance with DoD Directive 5000.29, and managed within the context of the total system.

a. Requirements for interfaces between computers, including data communications, must be identified early in the life cycle. Plans for software development, standardization, documentation, testing, and update during deployment and operation require special attention.

b. Initial computer resource planning must be accomplished before Milestone I and will be continued throughout the life cycle. Computer resources support elements will be considered in life cycle cost estimates.

c. Where software costs are significant, acquisition strategy will implement "software first" concepts, wherein software design is reasonably firm prior to the identification and selection of the supporting hardware. Program Managers will plan and budget as needed for continuing development and evolution of software throughout the acquisition and operational phases.

d. Computer hardware and software must be specified and treated as configuration items. Baseline implementation guidance is contained in DoD Instruction 5000.19.

CONTINUING ACTION ITEMS:

Mr. C. Embrey will supply updated and/or draft Joint DOD CM Documents for comment, as they become available.

ROSTER OF ATTENDEES

Raymond J.H. Beckingham
Hughes Helicopters Inc.
Building 6 C/68
Culver City, California 90230
213-305-5241

Ron Van Buskirk
Aerojet Electro Systems
Azusa, CA
213-812-2102

Delcrio Cameron
Litton Data Systems Dir.
Van Nors
213-902-4809

Joe Cencich
DETCOM DSL
AMC
313-464-5262

Lenny Ciskawski
The Boeing Company
M/S 8C-53 Box 3999
Seattle, WA 98188
206-392-2680

Paul Courtoglaus
HQ ESD/ALEC
Hanscom AFB
Bedford, MA 01730
617-861-4257

Bill DeWael
Harry Diamon Labs
202-394-2634

Larry Dietz
PM-CAWS
DRCPM-CWS
Dover, N.J. 07801
201-724-4905

D. Dmartman
Martin Marietta
805-735-5458

Frank E. Davanerty Jr.
AAI Corp.
Baltimore, MD 21204
301-628-8433

Clive P. Durase
Westinghouse Electric Co.
Defense Electronic Center
P.O. Box 746, M.S. T-380
Baltimore, MD 21203
301-767-8722

William B. Eggers
Naval ODD STA
Indian Hd, MD
301-743-4389

Bernard W. Fatig
Westinghouse Electric Co.
Defense Electronics Center
P.O. Box 746 MST 545
Baltimore, MD 21203
301-765-8605

Lawrence S. Feldman
Marine Corps,
Albany, GA
912-439-6466

C.D. Fisher
RCA Govt Comm Systems
609-338-2008

Pat Greenwood
Hercules Inc.
Acrospace Div.
P.O. Box 98
Magna, Utah 84044
801-250-5911

Tom Griffin
ASD/XRJ, W-PAFB, OH
513-255-5632

Jean L. Harman
Naval Sea Systems Command
DEA 55Z3, Dept of Navy
Washington, D.C. 20362
202-692-0160

Robert E. Hartman
TRW/BMO CM
714-382-5941

Dick Heggen
Westinghouse
Marine Div.
408-735-2348

Richard K. Johnson
Tallry Inc.
4551 McKellips
Mesa Az.
602-898-2510

Steven R. Kauffman
Naval Ordnance Station
Indian Head, MD
301-743-4441

Bob Keeler
NAVSEA Logistics Support Eng.
Activity Mech. PA.
717-790-3887

William D. Knight
Aerajet elector Systems Co.
Dept. 4355 Bldg 160
P.O. Box 296
Azusa, Calif. 91702
213-812-1947

William Kushner
McLaughlin Research Corp.
703-370-8210

Col. Walt Larimer
OVSPRE-DMSSO
Washington, D.C.
703-756-2337

George L. Lewis
Northrop Corporation
213-942-4118

Bob First
MSD, Honeywell Inc.
5303 Shishale Ave N.W.
Seattle, WA 98107
206-789-2000

Charles H. Marshall
HQ USAF/RDX
Pentagon
Washington, D.C.
202-679-3041

R. Mersch
USA MERADCOM
703-451-3452

Jim Miller
Lockhead Cal Co
213-847-9301

Bill Nagmussa
Westinghoiuse
Marine Div.
408-735-2348

Phil Packa
International Design
P.O. Box 820
Edgewater, FL 32032

Andrew Perez
Snger Link
Colesville Rd
Binghamton N.Y.
607-7724-324

S.F. Putman
H.Q. CECOM, DRSEL-ME
AV 992-1212

Norm Radltz
Naval Air Eng'g Center
201-323-7488

Oswald Rogers
ASO/YYCO
Wright Patterson AFB
513-255-3761

Hal Rowland
Sundstrand Aviation
815-226-7445

Joe Saal
Harris Corp.
137 Terry St.
IHB FLA 32937
305-729-7570

Ronald J. Schrage
ASD/XRJ
Wright-Patterson AFB OH
513-236-9738

Tom Stacey
Massey Ferguson Perkins
313-595-9674

Walt Thicle
Delco Electronics
805-261-5059
267-4632

Jay L. Viars
Designers & Planners, Inc.
1725 Jeff. Davis Hwy
Suite 700
Arlington, VA 22202
703-892-8200

Cathlene Waddell
Naval Sea Systems Command
Code 6114213 NC2/7E-48
Washington, D.C. 20362
202-692-2776

H. Peter Weiss
Joint Tactical Communications Office
201-523-8227

Rick Wells
CASO AFLC/LODSHE Logistics
Federal Center
Battle Creek, MI 48016
616-962-6511 ext 9350

WORKSHOP #5 - COMPUTER SOFTWARE

Chairman: Mr. Jack Cooper
C.A.C.I., Inc. - Federal

GENERAL. Workshop Session #5 addressed the question of "how do we get Government acceptance of automated computer program documentation?" The industry is increasingly utilizing their internal computer facilities and/or word processing systems for the development and storage of, not only computer program documentation, but all engineering data required by Government contracts. It would be much more cost effective if the Government would accept for delivery the engineering data in its electronic form rather than on paper. This Workshop Session approached this question from the perspective of the Government customer.

DISCUSSION. Since the Department of Defense is basically a single customer served by an extremely wide variety of suppliers utilizing an extremely wide variety of internal electronic systems, it became obvious that the first requirement for Government acceptance of electronically transmitted engineering data was some form of standardization. The most appropriate form of standardization for purposes of contractual requirements is a Military Standard. Thus, it was the panel's recommendation that a Military Standard on the subject of electronic data transfer be promulgated. The following is a list of items recommended for consideration in developing such a Standard:

a. The panel considered the various media available for transfer of engineering data. An assessment of the current state-of-the-art in Electronic Mail transfer systems indicated that it would be counter productive to seriously consider magnetic tape, disk, or diskettes as a media for transfer of engineering data. It is clearly within the current state-of-the-art to skip these types of media and go directly to the electronic transmission of the data via any of the many facilities currently available. It was the panel's recommendation that the Standard only include electronic transmission.

b: The Standard must provide for independence of the following elements:

1) Hardware - Since the industry is using an extremely wide variety of systems for the development and maintenance of engineering data, a successful Standard must be independent of the hardware on which the data is generated. Also, since the Standard will

be hardware independent, the engineering data will be instantly useful to the Government customer regardless of the equipment that he is using.

2) Storage Media - Once again, the industry and the Government are both using the entire spectrum of electronic media for storage of data. Therefore, a successful Standard cannot be limited to any type of storage media.

3) Transmission Media - The Standard must be independent of the medium to be used for transferring the engineering data electronically, whether it is via satellite or via RS-232 over the telephone.

4) Engineering Methodology - The Standard must not, either directly or indirectly, limit a contractor in his selection of engineering methodology to be used in producing his deliverables.

5) Internal Representation - The transfer of electronic data should be independent of the form in which the data is represented within any machine.

6) External Format - The transfer of electronic data should be independent of the format in which the data is transmitted. The consequence of this item is that there will be no impact on current Data Item Descriptions. The output engineering data can be formatted according to any DID specified in the contract.

c. The panel felt that it would probably be beneficial if the Standard specified some standard type of header for the data to be transferred to facilitate decoding by the Government customer.

d. The subject of security should be addressed in order that classified data could be transmitted when ever necessary.

e. In order to minimize the potential for incompatibility in an electronic data transfer, it is recommended that the subject of standard character and graphic sets be addressed for inclusion in the Standard.

f. Any Standard to be successful must provide for an electronic data transfer that is verifiable by the Government customer.

g. The Military Standard must not contain any provisions that would limit or, in any other way, bias the field of competition.

A MIL-STD alone is not sufficient to bring about the change in the form of engineering data for delivery. The panel felt strongly that Data Management policy needs to be promulgated from the OSD level that addresses this subject area and includes direction for the use of the MIL-STD. The entire acquisition community should be provided guidance in making the transition from paper to electronic data delivery. The following topics are recommended for consideration in developing and promulgating this needed policy directive:

a. The MIL-STD should start out as a tri-service standard. History has taught us that once the individual services have established policy of their own it is much more difficult, if not impossible, for them to concur on and then change to a unified standard.

b. The policy should provide guidance on "optional" vs "mandatory" use of the MIL-STD.

c. A transitional period should be provided where in both forms of deliveries are acceptable until such time that the new approach is completely in place.

d. When items are procured "off-the-shelf" or from "commercially available" inventory, the policy should provide for delivery of the supporting data in its existing form (as long as that data is acceptable).

e. The policy should provide for a "paperless" validation scheme.

f. All other elements of the acquisition system should be advised to take into account the impact on their areas brought about by the introduction of electronic data delivery. For example, the review and audit of a system design will necessarily take place utilizing video terminals rather than by persuing documents.

Since the technology and the practice are both already in use today, the panel believed that the sooner electronic data transfers were provided, the more cost effective it would be for Government and industry alike. Consequently, the panel recommends that this panel summary report be provided to the appropriate points of contact within the DOD.

LIST OF ATTENDEES

Joe Poloi
Senior Logistics Engineer
Honeywell
(612) 931-6142

Carl A. Eschenbach
P.O. Box 85158
Logicon, Inc.
San Diego, CA 92138
(619) 455-1330

Bruce C. Rinker
ASD/B-1C
Wright-Patterson
AFB, Ohio 45433
(513) 255-3367

Frank Phillips
Sanders Associates
95 Canal Street
Nashua, NH 03063
(603) 885-5492

Norm Fleig
AFCOLR/MS
Wright-Patterson
AFB, Ohio 45433
(513) 255-3001

Joe Motis
Lockheed
D50-13, Bldg.541
Sunnyvale, CA 94086

Jerry Shock
NAVEODTECHCEN
Indian Head, MD 20640
(301) 743-4231

Ray Jones
NAVEODTECHCEN
Indian Head, MD 20640
(301) 743-4419

Vincent J. Moravek
P.O. Box 179
Martin Marietta Aerospace
Denver, CO 80201

COL J.W. Lloyd
Headquarters,
DARCOM
Washington, DC
(703) 274-8245

Mike Bellia
Raytheon Co.
350 Lowell St.
Andover, MA 01810
(617) 475-5000, ex 2296

Dave Smock
NSWC/WO
Silver Spring, MD 20910
(202) 394-1573

Carl X. Lewis
General Electric Co.
50 Fordham Road
Wilmington, MA
(617) 657-4717

Dr. Ray Calhoun, MS 333
Texas Instruments
13500 N. Central Expressway
Dallas, TX 75265
(214) 867-9647

Wm. W. Thomas
RCA - Government
Systems Division
Bldg. W6-1
Route 38
Cherry Hill, NJ 08358
(609) 338-5822

WORKSHOP #6
ENGINEERING DATA AUTOMATION

Chairman: Herbert L. Atkins
EG&G, Washington Analytical Services Center Inc.

Panel: Robert Carrier
Raytheon Company

James Dalgety
Defense Logistics Agency
(Secretary)

Bernard C. Lazorchak
Joint Committee on Printing

Workshop #6 - Engineering Data Automation

Attendance - Per Attached

The participants included representatives from the three major services, Office of the Under Secretary of Defense, DLA and Capital Hill. The ratio of 70% Industry and 30% Government was most effective in reviewing the requirements of the Government versus Industry capabilities. The four topics furnished by the chairman for discussion were:

1. Automated Contract Reporting - Problems & Issues
2. Automation of Technical Requirements
3. Automation of Procurement Documentation
4. Automated Technical Documentation

Mr. B.C. Lazorchak then led a discussion on pointing and proffered some excellent points that need to be addressed in automation of documentation. The points discussed were:

1. In an integrated system, each - ility has to forget his specific role and cross functional boundaries to ensure success.

2. An overall plan needs to be developed to account for all the potential functions for automation.

3. Leave the computer literacy to the systems analysts and rely on your knowledge of the technical data world.

4. Stress and ensure *hardware independence.*

5. An audit is needed on cost savings as a result of implementing the systems.

6. ADPA can "lean-on" the JCP for expertise in printing questions.

The following questions were presented by members of the workshop to Mr. Lazorchak:

Q. Who is responsible for interface (between systems - between systems and field users)?

A. No one at this time.

Q. There are problems with the computer/and operating system) itself.

A. That is the precise point; we have to avoid machine dependence.

Q. Shouldn't the Government develop a plan for the data base?

A. Communication is needed first. Have to have the big picture as to cost of conversion, etc.

Q. Some contractors are trying to plan now for eventual digital delivery to the Government but where are the needed standards?

A. The ANSI X 3 Committee is working in the standard area; however, ANSI is too far away and technology is moving too fast.

A discussion followed concerning the computer machine language incompatibility. During the past year increased emphasis is being placed on interactive accessing of contractor data bases. NATO vendors and governments are increasing the independence on it. Mr. Lazorchak mentioned a common data dictionary is now being used on the (Capital) Hill. Mr. Robert Rhodes, Lockheed Space and Missiles, accepted chairmanship of an ad hoc committee to determine what is needed in a data dictionary. He will report at the next meeting his finding; however, he will accept any help offered.

Col. Kuster, USAF/ASO, advised the panel that three major AF acquisitions are currently allowing the AF to interrogate the contractors management data base on a real time basis. Our uniqueness is that the contractor is furnishing the AF the interrogating terminal to ensure compatibility. This led into the next effort to be undertaken by the panel: the development of a uniform "Statement of Work" language that would allow the Government to real time interrogate a contractor's management data base and thereby eliminate the reams of paper furnished the Government monthly for contract management. Mr. John Endicott, GD/Convair, accepted chairmanship of an ad hoc committee to develop a uniform SOW clause.

A third ad hoc committee was established and is chaired by Al Turino, GTE/Sylvania. Al has spent much time with compugraphics and other graphics concerns to tag and get the computers to communicate with each other. The thrust of his committee is to define data base requirements for graphics and manufacturing applications and associated integrated communications.

A final question presented to Mr. James D. Richardson, DMSSO, concerned what DoD was doing about automation in addition to those discussed by the DoD panel earlier in the day. He cited four Navy programs:

- NTIPS
- Automation of NPFC - NPODs goes to RFP in 30 days
- NATSF - EDMKS
- NAVSEA - Automating three depositories

ENGINEERING DATA AUTOMATION
WORKSHOP #6

ATTENDEES

Name	Address	Telephone
Robert Ansley	Motorola - GEG 8201 E. McDowell Rd. Scottsdale, AZ 85252	
Herbert T. Ashley	NSWSES Code 5122 Port Hueneme, CA	(805) 982-5039
Herbert L. Atkins	EG&G, Washington Analytical Services Center, Inc. 2150 Fields Rd. Rockville, MD 20850	(301) 840-3053
E. F. Averi	GTE - Sylvania 1 Research Dr. Westborough, MA 01581	
Ed Bastek	Motorola - GEG 8201 E. McDowell Rd. P.O. Box 1417 Scottsdale, AZ 85252	(602) 949-3357
Arnold M. Batina	Ball Aerospace Systems Div. P.O. Box 1062 Boulder, CO 80306	
Raymond J. H. Beckingham	Hughes Helicopters Inc. Bldg 6, C/68 Culver City, CA 90230	(213) 305-5241
David G. Blackstone	Ingersoll-Rand Co. Painted Post, NY 14870	
Dr. Ray Calhoun	Texas Instruments Mail Sta. 333 13500 N. Central Expressway Dallas, TX 75265	(214) 867-9647
Robert Carrier	Raytheon Company Equipment Development Lab Boston Post Road Wayland, MA 01778	(617) 385-2721 x 448
Jerry Cichowicz	Chemical Systems Laboratory Environmental Tech Div. Edgewood Area of Aberdeen Proving Ground, MD 21010	
James Dalgety	DLA1-SCT Cameron Station Alexandria, VA 22151	

Name	Address	Telephone
George Dallas	Martin Marietta Denver Aerospace P.O. Box 179 Mail 0438 Denver, CO 80201	
John Endicott	General Dynamics Convair Div. (MZ34-6290) P.O. Box 80847 San Diego, CA 92138	(619) 277-8900 X 1782
Roger Frazier	Naval Plant Representative Office Vought Corporation P.O. Box 225907 Dallas, TX 76265	
Otto F. Garrett	International Laser Systems 3404 North Orange Blossom Trail Orlando, FL 32804	(305) 295-4010
Ed Gendron	Smith & Wesson 2100 Roosevelt Ave. Springfield, MA	
Linus Glowienka	Ken Cook Co. 9929 W. Silver Spring Rd. Milwaukee, WI 53225	
Michael J. Goy	HQ AFLC-CASO/LODS Federal Center Battle Creek, MI 49016	(616) 962-6511 x 9351 AV 369-9351
Michael A. Halverson	Texas Instruments Inc. P.O. Box 226015 M/S 3194 Dallas, TX 75266	
Mel Hastings	Westinghouse P.O. Box 1488 Annapolis, MD 21404	(301) 260-5735
I. L. Johnson	GTE - Sylvania 77 A Street Needham, MA 02194	
John Kicak	HQ DARCOM (DRCMT-S) 5001 Eisenhower Ave. Alexandria, VA 22333	
Col. Ralph Kuster	Flight Dynamics Lab Wright-Patterson AFB, OH 45433	
Bernard C. Lazorchak	Joint Committee on Printing S-151 U.S. Capital Washington, DC	

Name	Address	Telephone
SMSgt Danny Lewis	Air Force Coordinating Office for Logistics Research AFCOLR Wright-Patterson AFB, OH 45433	(513) 255-4028 AV 785-4028
George Magda	Aerojet Electrosystems Co. 1100 W. Hollyvale Azusa, CA 91702	
Reed Magness	Chemical Systems Lab DRDAR-CLT-I Aberdeen Proving Ground, MD 21010	
Michael D. Marraffino	GTE Systems 77A Street Needham Heights, MA 02194	
Glen E. Moore	Aerojet Electrosystems Co. Dept. 3221, Bldg 59 P.O. Box 296 Azusa, CA 91702	
Jack Z. Moore	VSE Corp 2550 Huntington Ave. Alexandria, VA 22303	
Richard A. Napier	Rockwell Intl CCSD 1200 N. Alma Rd. Richardson, TX 75081	
Gordon Neary	McDonnell Douglas P.O. Box 516 St. Louis, MO 63166	(314) 232-3671
Milton E. Pietz	Rocketdyne AB16 6633 Canoga Ave. Canoga Park, CA 91304	(213) 710-3736
Scott Polland	GTE Systems M/S 6209 P.O. Box 7188 Mt. View, CA 94039	
Robert D. Rhodes	Lockheed Missiles & Space Co. B541 0/50-13 P.O. Box 504 Sunnyvale, CA 94086	
Sam L. Rice	HQ ARRCOM DRSAR-LET-C Rock Island Arsenal Rock Island, IL 61299	

Name	Address	Telephone
Ellwood H. Richardson	Martin Marietta Denver Aerospace P.O. Box 179 Mail 0438 Denver, CO 80201	
James Richardson	DMSSO 5203 Leesburg Pike, Suite 1408 Falls Church, VA 22041	
Isadore Shapiro	Dept. of Army Harry Diamond Laboratories DELHD-IT-EA 2800 Powder Mill Rd. Adelphi, MD 20783	
Fred G. Tessier	International Laser Systems 3404 North Orange Blossom Trail Orlando, FL 32804	(305) 295-4010
Walt Thiele	Delco Electronics 6767 Hollister Ave. Goleta, CA 93117	
William W. Thomas II	RCA Government System Div. Bldg 206-1, Route 38 Cherry Hill, NJ 08385	
Robert I. Travis	Martin Marietta Aerospace Mail No. 0438 Box 179 Denver, CO 80201	
Alfred Turino	GTE - Sylvania Systems Group P.O. Box 188 Mt. View, CA 94042	(415) 966-3227
Barbara Vogel	Honeywell Inc. 113350 U.S. Highway 19 S. Clearwater, FL 33546	
Robert J. Winklareth	XMCO Inc. 8200 Greensboro Dr. McLean, VA 22102	

ADPA TECHNICAL DOCUMENTATION DIVISION
25TH ANNUAL MEETING

ATTENDANCE ROSTER

ALBERT T ACKERMAN, JR
NAVAL WEAPONS SURFACE CENTER
ENGINEERING TECHNICIAN
CODE 70421
CRANE IN 47522

CHARLES R. ADAMS
INTEGRTD AUTOMTN INFO SYS
BERKELEY CA 94701

SAMUEL ALVINE, JR.
SINGER COMPANY
KEARFOTT DIV
150 TOTOWA RD /MS12A36
WAYNE NY 07470

ROBERT ANSLEY
MOTOROLA, INC.
COORDINATOR, SECTION DRAFTING
8201 E. MCDOWELL RD., MD 1137
SCOTTSDALE AZ 85252

HERBERT T. ASHLEY
US NAVY, NSWSES
GENERAL ENGINEER
NSWSES CODE 5122
PORT HUENEME CA 93043

HERBERT L ATKINS
EG&G WASH ANALY SERV
HEAD DATA MGMT DEPT CODE 348
2150 FIELDS ROAD
ROCKVILLE MD 20850

EDWARD F. AVERI
GTE SYLVANIA
ACQ. DATA MGR.
1 RESEARCH DR.
WESTBOROUGH MA 01581

RAYMOND J H BACKINGHAM
HUGHES HELICOPTERS INC
ENGINEERING SERVICES
MS BODG 6 C68
CULVER CITY CA 90230

FRANK BALANTIC
PUBLICATIONS DATA INC
MKTG MGR
1727 VETERANS MEMORIAL HWY
CENTRAL ISLIP NY 11722

RICHARD R BARTA
IBM CORP - FSD
MGR ENGRNG STAND & PROD SAFETY
0420 579
OWEGO NY 13827

EDWARD J BASTEK
MOTOROLA GED
MGR CONFIG/DATA MGMT
8201 E MCDOWELL ROAD
SCOTTSDALE AZ 85252

ARNOLD M BATINA
BALL AEROSPACE
SYSTEMS DIV., P.O. BOX 1062
BOULDER INDUSTRIAL PARK
BOULDER CO 80306

O. MICHAEL BELLIA
RAYTHEON CO.
PROD. ENGR.
350 LOWELL ST.
ANDOVER MA 01810

LAWRENCE M. BIRK
XMCO, INC.
DIRECTOR, ILS SYS. OPS.
755 W BIG BEAVER RD., STE. 800
TROY MI 48084

DAVID G BLACKSTONE
INGERSOLL RAND COMPANY
SR TECH WRITER
HAMILTON STREET
PAINTED POST NY 14870

E. BOOZER
LITTON
DATA MANAGEMENT
5500 GEORGIA AVE.
WOODLAND HILLS CA 91365

DENISE D. BRADY
NAVAL ORDNANCE STATION
DATA MANAGEMENT SPEC.
CODE 5121K
INDIAN HEAD MD 20640

MATTHEW E. BRISLAWN
THE BOEING CO.
BUSINESS MANAGER
INFORMATION SYSTEMS DIVISION
SEATTLE WA 98101

C H BURK
VOUGHT CORPORATION
ENGINEERING SPECIALIST
PO BOX 225907
DALLAS TX 75265

LORNA BURNS
HUGHES AIRCRAFT CO
BLDG 100 MS X709
PO BOX 90515
LOS ANGELES CA 90009

DAN BURRS
FMC CORPORATION
SR STANDARDS ENGINEER
4800 EAST RIVER ROAD
MINNEAPOLIS MN 55421

RAY CALHOUN
TEXAS INSTRUMENTS INC
DATA MANAGER
BOX 226015 MS 384
DALLAS TX 75266

DELORIS CAMERON
LITTON-DATA SYST. DIV.
CONFIG. DATA MANAGER
8000 WOODLEY
VAN NUYS CA 91409

MR ROBERT H CARRIER
RAYTHEON COMPANY
EQUIPMENT DEV LABS
BOSTON POST ROAD
WAYLAND MA 01778

JAMES H CASEY
ARMY AVIATION SYS CMD
3900 BOWEN
ST LOUIS MO 63116

GERALD J. CAVANAUGH
GENERAL ELECTRIC CO.
CONSULTANT - CAE&D
1285 BOSTON AVE.
BRIDGEPORT CT 06602

JOSEPH G CENCICH
GM CORP
DETROIT DIESEL ALLISON DIV
13400 W OUTER DR GMPD-1
DETROIT MI 48228

JERRY CICHOWICZ
DEPT ARMY
INDUSTRIAL ENGINEER
DRDAR-CLT-I
ABERDEEN PG MD 21010

LARRY A CISKOWSKI
BOEING COMPANY
CORP DRAFTING STANDARDS
P O BOX 3999 M/S 8C-53
SEATTLE WA 98124

DON CLEVELAND
TAURIO CORPORATION
1901 N. BEAUREGARD ST.
SUITE 300
ALEXANDRIA VA 22311

JOHN D. COOPER
CACI, INC.
1700 N. MOORE ST.
PH FLOOR
ARLINGTON VA 22209

GERRY COPE
MARTIN MARIETTA AEROSPACE
BALTIMORE DIVISION
103 CHESAPEAKE PARK PLAZA
BALTIMORE MD 21220

G. B. COPE
123 DUNCANNON ROAD, GLENWOOD
BEL AIR MD 21014

PAUL T COURTOGLOUS
ESD/AFSC
USAF/TOSC, HANSCOM AFB
CHIEF, CONFIG & DATA MGMT DIV
BEDFORD MA 01731

JAMES DALGETY
DEFENSE LOGISTICS AGY.
TECHNICAL DATA SPEC.
CAMERON STATION
ALEXANDRIA VA 22151

GEORGE M DALLAS
P O BOX 179, M/S 8203
DENVER CO 80201

MICHAEL A. DANIELS
JOHNS HOPKINS UNIVERSITY
CONFIGURATION MGMT. OFFICER
SPACE TELESCOPE INSITITUE
LAUREL MD 20707

GEORGE DENES
LITTON
MANAGER
5500 CANOGA AVE.
WOODLAND HILLS CA 91365

WILLIAM R DEWAAL
HARRY DIAMOND LAB
MECH ENGINEER
2800 POWDER MILL ROAD
ADELPHI MD 20783

LARRY F DIETZ
USA ARRADCOM
CONFIGURATION MGMT OFFICER
DRCPM-CAWS-CM BLDG 172
DOVER NJ 07801

FRANK E DOUGHERTY JR
AAI CORPORATION
DRAFTING SYSTEMS DIRECTOR
P O BOX 6767
BALTIMORE MD 21204

RONALD V DRONSEIKO
RAYTHEON CO
DIV CONF MGR
HARTWELL ROAD
BEDFORD MA 01730

WILLIAM M DRUM
QUALITY ASSURANCE OFFICE
APPLIED TECHNOLOGY LAB
USARTL(AVRADCOM)
FT EUSTIS VA 23604

CLIVE R DUROSE
WESTINGHOUSE ELECTRIC
SUPR ENGR
1469 JUSTIN PL
CROFTON MD 21114

JOHN M EBERSOLE
IBM FEDERAL SYSTEMS DIV
STANDARDS ADMINISTRATOR
18100 FREDERICK PIKE
GAITHERSBURG MD 20879

PHILLIP W. EDENFIELD
US AIR FORCE
DATA MANAGER
344 OHIO AVE.
VALPARAISO FL 32580

WILLIAM B EGGERS
NAVAL ORDNANCE STA
5243A TECH DOC DIV
NAVAL ORDNANCE STATION 6121A
INDIAN HEAD MD 20640

ROY S. EMBERLAND
LITTON G/CSD
MGR. CONFIG. MGMT.
5500 CANOGA AVE.
WOOKLAND HILLS CA 91364

CHARLES J. EMBREY
PACER SYSTEMS, INC.
1755 JEFF DAVIS HWY #510
ARLINGTON VA 22202

JOHN E ENDICOTT
GENERAL DYNAMICS/CONVAIR
MS 32-6290
PO BOX 80847
SAN DIEGO CA 92112

CARL A ESCHENBACH
PO BOX 85158
4010 SORRENTOR VALLEY BLVD
SAN DIEGO CA 92138

BERNARD W FATIG
520 BTEWART AVENUE
GLEN BURNIE MD 21060

LAWRENCE S FELDMAN
USMC LOGISTICS SUPPORT BASE
TECHNICAL OPERATIONS DIV
P840
ALBANY GA 31704

MR CHARLES D FISHER
RCA
GOVT COMM SYS
BUILDING 10-6-2
CAMDEN NJ 08102

ROGER F. FISSETTE
GTE PRODUCTS CORP.
MANAGER, TECHNICAL WRITING
77 A STREET
NEEDHAM MA 02194

LTC. NORMAN FLEIG
US AIR FORCE
AFCOLR/MS
WPAFB OH 45433

KEITH E FOSTER
RAYTHEON COMPANY
C/DM MANAGER
HARTWELL AVENUE
BEDFORD MA 01730

ROGER P FRAZIER
VOUGHT CORP
DATA MANAGER NAV PLNT REP OFC
PO BOX 225907
DALLAS TX 75265

VICTOR FREDETTE, JR
US NAVAL ORDNANCE STA
CODE 51211K
INDIAN HEAD MD 20640

OTTO F. GARRETT
INTERNATIONAL LASER SYST.
DESIGN SUPPORT MANAGER
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO FL 32804

EDMUND M GENDRON
SMITH & WESSON
MGR ENGR SERVICES
3100 ROOSEVELT AVE
SPRINGFIELD MA 01104

DANNY L. GILLIAM
ROCKWELL INT'L
DATA MANAGER
3200 E RENNER RD., CS-7
RICHARDSON TX 75081

MR LINUS L GLOWIENKA
KEN COOK COMPANY
9929 WEST SILVER SPRING ROAD
MILWAUKEE WI 53225

MR THEODORE L GOLMIS
HUGHES AIRCRAFT CO
BLDG 604 M/S F-122
P.O. BOX 3310
FULLERTON CA 92634

MICHAEL J. GOY
USAF
SR., EQUIP. SPECIALIST
FEDERAL CENTER
BATTLE CREEK MI 49016

JEROME GRAY
RT 2 BOX 79V
PISGAH MD 20640

PAT GREENWOOD
HERCULES INC
ENGRNG ASST CONFIG MGMNT
PO BOX 98
MAGNA UT 84044

THOMAS J. GRIFFIN
US AIR FORCE
CONFIGURATION MANAGEMENT OFCR.
ASD/XRJ
WPAFB OH 45433

MICHAEL A. HALVERSON
TEXAS INSTRUMENTS INC.
ELECTRO-OPTICS DIV. DATA MGT
1922 BAYLOR DR.
RICHARDSON TX 75081

JEAN HARMAN
NAVSEA
DIV. DIR. SPECS. & STDZN PROG.
SEA55Z3
WASHINGTON DC 20362

JOHN R HART
BOEING AEROSPACE COMPANY
PO BOX 3999
M/S 8K-61
SEATTLE WA 98124

ROBERT E HARTMAN
TRW
CONFIG CONTROL ENGR
PO BOX 1310
SAN BERNARDINO CA 92402

MELVIN S HASTINGS
WESTINGHOUSE ELECT CORP
P O BOX 1488
ANNAPOLIS MD 21404

JOE HAUCK
DAYTON T BROWN INC
SALES & MKTG MGR
CHURCH ST
BOHEMIA NY 11716

R. B. HEGGEM
WESTINGHOUSE ELECTRIC CORP.
CONFIG MGMT ANALYST
HENDY AVE., BLDG. 21-13
SUNNYVALE CA 94088

WILLIAM J HEIM
ENGR DATA MGT SPECIALIST
US NAVY
NAVAL WEAPONS CENTER 3651
CHINA LAKE CA 93555

THOMAS J HENDERSON
FORD AEROSPACE & COMM CORP
BUSINESS DESIGN SPECIALIST
3939 FABIAN WAY MS A45
PALO ALTO CA 94303

GEORGE J. HROMNAK
HQ. ARRADCOMN, DEPT. OF ARMY
CH. TECH. DATA CONFIG MGMT DIV
DRDAR-TST
DOVER NJ 07801

CAPT NELSON P. JACKSON
USN, RET ADPA
SUITE 900
1700 NORTH MOORE STREET
ROSSLYN VA 22209

ISACC JOHNSON
GTE PRODUCTS CORPORATION
99 A STREET
NEEDHAM MA 02194

RICHARD K. JOHNSON
TALLEY OF ARIZONA
MANAGER CONFIGURATION MGMT
4531 E. MCKELLIPS
MESA AZ 85208

RAYMOND L JONES
NAVAL EOD FACILITY
MECHANICAL ENGINEERING TECH
INDIAN HEAD MD 20640

ROGER JONES
NSWSES
DEPUTY DEPARTMENT MGR.
CODE 0610
PORT HUENEME CA 93043

STEVEN R KAUFFMAN
NAVAL ORD STA INDIAN HEAD
ENGR TECH
CODE 5222F
INDIAN HEAD MD 20640

JAMES R KAY
SHILEY SCIENTIFIC INC
SUPERVISOR DOCUMENT CONTROL
17600 GILLETTE AVENUE
IRVINE CA 92714

JOHN KICAK
US ARMY DARCOM
DRCMT-S
5001 EISENHOWER AVENUE
ALEXANDRIA VA 22333

RON KIESNOSKI
DAYTON TO BROWN
SALES MGR
CHURCH ST
BOHEMIA NY 11716

WILLIAM KNIGHT
AEROJET ELECTRO SYSTEMS
SUPERVISOR, CONFIGURATION MGMT
1100 W HOLLYVALE ST., 160/4351
AZUSA CA 91702

RICHARD E KNOB
SPERRY RAND CORP
SPERRY GYROSCOPE DIV
3311 AUSTIN AVE
WANTAGH NY 11793

WILLIAM KUSHNER
MCLAUGHLIN RESEARCH CORP.
DATA MANAGER
5200 EISENHOWER AVE.
ALEXANDRIA VA 22304

COL WALKER A. LARIMER USAF
DEF MAT SPEC & STANDARDS
DIRECTOR
TWD SKYLINE PLACE SUITE 1403
FALLS CHURCH VA 22041

JOHN A LASCO
SPACE DIV/AFSC
SD/AQM WORLDWAY POSTAL CENTER
PO BOX 92960
LOS ANGELES CA 90009

BERNARD LAZORCHAK
US CONGRESS
JOINT COMMITTEE ON PRINTING
RM ST4 US CAPITOL
WASHINGTON DC 20510

CARL X. LEWIS
GENERAL ELECTRIC CO.
DATA PROGRAMS ADMINISTRATOR
50 FORDHAM RD.
WILMINGTON MA 01887

SMSGT. DANNY LEWIS
US AIR FORCE
AFCOLR/MS
WPAFB OH 45433

GEORGE L. LEWIS
NORTHROP CORPORATION
MGR., CONTRACT DATA REQT'S
15150 MAGNOLIA #270
WESTMINSTER CA 92683

ROBERT D LINT
HONEYWELL MARINE OPS
SR DATA MGMT ANALYST
5303 SHILSHOLE AVENUE NW
SEATTLE WA 98107

COL. JOSEPH LLOYD
US ARMY DARCOM
6946 COTTONTAIL CT.
SPRINGFIELD VA 22153

GEORGE MAEDA
AERDJET ELECTROSYSTEMS
ELEC DSGN & DRFT SPV DEPT 4353
BLDG 194 1100 W HOLLYVALE AVE
AZUSA CA 91702

REED MAGNESS
DEPT OF ARMY
PHYSICAL SCIENCE ADM
DRDAR-CLT-I
APG MD 21010

A W MAGNUSSON
WESTINGHOUSE ELECTRIC CORP
SENIOR DESIGN ENG
HENDY AVE BLDG 21-13
SUNNYVALE CA 95124

SANDRA L MARKMAN
MARTIN MARIETTA AEROSPACE
CHIEF TECH REQU/DOCUMENTATON
PO BOX 1681 M/S CM111
VAFB CA 93437

BEN H. MARSHALL
VOUGHT CORP.
SPEC/DATA ENGINEERING SPEC.
P. O. BOX 225907, MS 194-23
DALLAS TX 75265

CHARLES H. MARSHALL
HQ USAF/DCS
ACQUISITION
WASHINGTON DC 20330

JAMES R MCGREGOR
NSWSES
ASST FOR TECH OPS
CODE 4304C
PORT HUENEME CA 93043

RICHARD J. MERSCH
USA, MERADCOM
GENERAL ENGINEER
DRDME-DE
FORT BELVOIR VA 22060

JAMES A MILLER
LOCKHEED CALIF CO
MGMT SYS ENG COORDINATOR
PO BOX 551
BURBANK CA 91520

GLEN E MOORE
AEROJET ELECTRO SYS CO
ASSOC PROG MGR DEPT 3221
BLDG 59 1100 W HOLLYVALE ST
AZUSA CA 91702

JACK Z. MOORE
VSE CORPORATION
VICE PRESIDENT
2550 HUNTINGTON AVE.
ALEXANDRIA VA 22303

VINCENT J MORAVEK
MARTIN MARIETTA AEROSPACE
CHIEF, DESIGN SUPPORT
PO BOX 179
DENVER CO 80201

J M MOTIS
LOCKHEED MSLS & SPC CO
LOCKHEED MISSILES & SPACE CO
P O BOX 504
SUNNYVALE CA 94086

RICHARD A. NAPIER
ROCKWELL INT'L-CCSD
MGR. MECH. STDS. & DRAFTING
3200 E. RENNER RD. CS7 120-137
RICHARDSON TX 75081

G F NEARY
MCDONNELL DOUGLAS CORPORATION
DEPT 201 BLDG 33 ROOM 571
P O BOX 516
ST LOUIS MO 63166

V A NESS
VOUGHT CORP
P O BOX 225907
DALLAS TX 75265

PHILLIP R. PARKER
INTERNATIONAL DESIGN & MFG.
DIRECTOR, CONTRACT ADMIN.
2305-C S. RIDGEWOOD AVE.
EDGEWATER FL 32032

ANDREW PEREZ
SINGER CO.
PROGRAM CONFIGURATION CO-ORD.
CROCKER HILL ROAD
BINGHAMTON NY 13902

FRANK PHILLIPS
SANDERS ASSOC.
MGR. ENG. WRITING
95 CANAL ST., NAM3-4
NASHUA NH 03061

MILTON E. PIETZ
ROCKWELL INTERNATIONAL
ROCKETDYNE DIV. CONF & DATA MG
6633 CANOGA AVE.
CANOGA PARK CA 92304

JOSEPH G POLAI
HONEYWELL INC
DEVELOPMENT ENGINEER
600 SECOND ST NE MS MN11-2490
HOPKINS MN 55386

W SCOTT POLLAND, JR
SYLVANIA SYSTEMS GROUP
DIVISION DATA MGR
PO BOX 7188 MS 6209
MOUNTAIN VIEW CA 94039

COL. SIDNEY F. PUTNAM
CMDR., USA CECOM
ATTN: DRSEL-ME
FT. MONMOUTH NJ 07703

NORMAN RADITZ
NAVAL AIR ENGINEERING CENTER
GENERAL ENGINEER
LAKEHURST NJ 08733

MR JAMES REMIKER
GENERAL DYNAMICS/CONVAIR
MS 22-6180
PO 80847
SAN DIEGO CA 92138

ROBERT D RHODES
LOCKHEED MSLES & SPACE CO.
B/102 0/50-13
P.O. BOX 504
SUNNVALE CA 94088

SAM L RICE
HQ, US ARMY ARRCOM
DATA MANAGEMENT SPEC,
DRSAR-LET-C
ROCK ISLAND ARN IL 61299

ELLWOOD H. RICHARDSON
MARTIN MARIETTA AEROSPACE
SUPERVISOR, ENGR. PROCEDURES
P.O. BOX 179, MN 0438
DENVER CO 80201

BRUCE C RINKER
686 AUGUSTA DRIVE
FAIRBORN OH 45324

OSWALD ROGERS
US AIR FORCE
DATA MANAGEMENT/CONFIGURATION
ASD/YYCD
WPAFB OH 45433

WALLACE E ROOK
CERBERONICS INC
5600 COLUMBIA PIKE
BAILEY'S CRSRDS VA 22041

ANTHONY ROSS, JR
US ARMY TANK AUTOMOTIVE CMD.
MECH. ENGINEERING TECH.
DRSTA-GSTM
WARREN MI 48093

HAL E. ROWLAND
SUNDSTRAND AVIATION OPERATIONS
CONTRACT DATA MANAGER
4747 HARRISON AVENUE
ROCKFORD IL 61101

J. W. SAUL
HARRIS CORP.
CONFIGURATION MANAGER
P.O. BOX 92000
MELBOURNE FL 32901

CAPT. JACK O. SAWDY
US AIR FORCE
AEROSPACE ENGR., DESIGN & ANAL
AFWAL/FIB
WPAFB OH 45433

MR BURTON G SCHAEFER
PITNEY BOWES
BUSINESS SYSTEMS ENGINEERING
380 MAIN ST PO BOX 6050
NORWALK CT 06852

VINCENT J SCHENO
US ARMY ARRADCOM
CHIEF CAD-TD/CM BRANCH
DRDAR-TSC-E
ABERDEEN PG MD 21010

RONALD J. SCHRAGE
US AIR FORCE
DATA MANAGEMENT OFFICER
ASD/XRJ
WPAFB OH 45433

CARL J SEAL
EMERSON ELECTRIC COMPANY
MANAGER STANDARDS & PROCEDURES
8100 W FLORISSANT AVENUE 2624
ST LOUIS MO 63136

I SHAPIRO
H D LABS
DELHD-IT-EA
2800 POWDER MILL ROAD
ADELPHI MD 20783

GERALD D. SHOCK
NAVAL EOD TECH. CTR.
GENERAL MANAGER
CODE 451
INDIAN HEAD MD 20640

ALLAN D SIGNOR
US NAVAL SEA SYS CMD
CONFIG DATA MGR
PO BOX 296
PORT HUENEME CA 93041

RICHARD P SMITH
HONEYWELL, INC.
MGR. PRODUCT DIFINITION
13350 US HWY. 19 S., MS 740-4A
CLEARWATER FL 33516

D L SMOCK
NAVAL SPRT WPNS CNTR
WHITE OAK LAB
SUP GEN ENGR
SILVER SPRING MD 20910

R. LEON SNODGRASS
E G & G
ENGINEER
2150 FIELDS ROAD
ROCKVILLE MD 20840

THOMAS F. STACEY
MASSEY-FERGUSON-PERKINS
ACTIVITY COORDINATOR
32500 VAN BORN RD.
WAYNE MI 48184

PAULA J. STASIOWSKI
NAVAL AIR SYST. CMD.
STAND. SPEC., BLDG. #2
CODE 51122, JEFFERSON PLAZA
WASHINGTON DC 20361

R L STEPHENSON
HONEYWELL INC
SUPERVISOR-CONFIG MGMT
13350 US HWY 19 S MS 456-4A
CLEARWATER FL 33516

MAURICE E TAYLOR
ARMY ARMAMENT R&D COMMAND
ATTN: DRDAR-TSTS
DOVER NJ 07801

FRED G TESSIER
INT'L LASER SYSTEMS
CH-CONFIGURATION MGMT/DATA PRO
3404 N ORANGE BLOSSOM TRAIL
ORLANDO FL 32804

WALTER E. THIELE
GENERAL MOTORS
SUPV. DRAFTING
6767 HOLISTER AVE.
GOLETA CA 93117

WILLIAM W THOMAS
RCA CORPORATION
901 TRUPENNY RD/PH CHPT DIR
BLDG 206-1 RT 38
CHERRY HILL NJ 08358

OTAWAY M. THOMAS, III
CUBIC CORP
MGR. DOCUMENT SERVICE
9333 BALBOA AVE., MS 10-22
SAN DIEGO CA 92123

CHARLES E. TIEDEMANN
MCDONNELL DOUGLAS ASTRO
BLDG 101/MEZ/MS410
PO BOX 516
ST. LOUIS MO 63166

ROBERT I TRAVIS
MARTIN MARIETTA AEROSPACE
CHIEF ENGINEERING SUP SERV
PO BOX 179 M # 0411
DENVER CO 80201

ALFRED TURINO
GTE SYLVANIA
TECH DATA & CONTROLS MANAGER
BOX 188
MOUNTAIN VIEW CA 94042

RONALD L VAN BUSKIRK
AEROJET ELECTROSYSTEMS
SUPV DESIGN SUPPORT TAMS
1100 W HOLLYVALE ST BOX 296
AZUSA CA 91702

JOY L VIARS
DESIGNERS & PLANNERS, INC.
SECTION CHIEF SUITE 700
1725 JEFFERSON DAVIS HWY.
ARLINGTON VA 22202

BARBARA R. VOGEL
HONEYWELL, INC.
LEAD WRITER/EDITOR TECH. PUB
13350 U.S. HWY. 19 SOUTH
CLEARWATER FL 33546

M CATHLEENE WADDELL
NAVAL SEA SYSTEMS COMMAND
CONFIG MGMT ANALYST
CODE 61Z4213, NC2/7E48
WASHINGTON DC 20362

M. D. WALCH
HONEYWELL, INC.
DATA MGMT. ADMIN.
2600 RIDGWAY PARKWAY, NE
MINNEAPOLIS MN 55413

DR PETER C C WANG
NAVAL POSTGRADUATE SCHOOL
CODE 53 WG
DEPTS OF MATH & NATL SEC AFRS
MONTEREY CA 93940

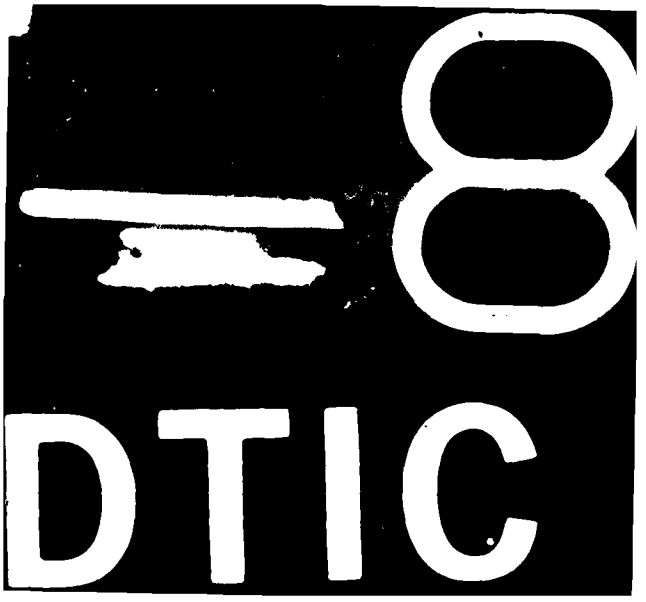
H. PETER WEISS
DOD JNT TACT COMM OFC
DATA MANAGEMENT SPECIALIST
197 HANCE AVE.
TINTON FALLS NJ 07724

RICHARD WELLS
AFLC/CASO/LODSHC
FEDERAL CENTER
BATTLE CREEK MI 49016

RICHARD WOZNICK
CONSULTANT
TECH PUBLICATIONS
1750 NEW HIGHWAY
FARMINGDALE NY 11735

EUGENE W. WRIGHT
TECH. PUB. CONSULTANTS
MANAGER, TECHDOC
60 CHAPIN ROAD
PINEBROOK NJ 07058

FRANK K. YOUNG
FMC CORP.
TACOM SUB. OFFICE
1105 COLEMAN AVE.
SAN JOSE CA 95108


8
DTIC