

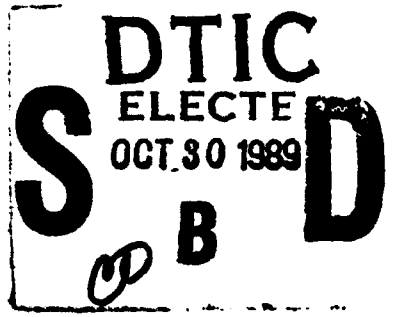
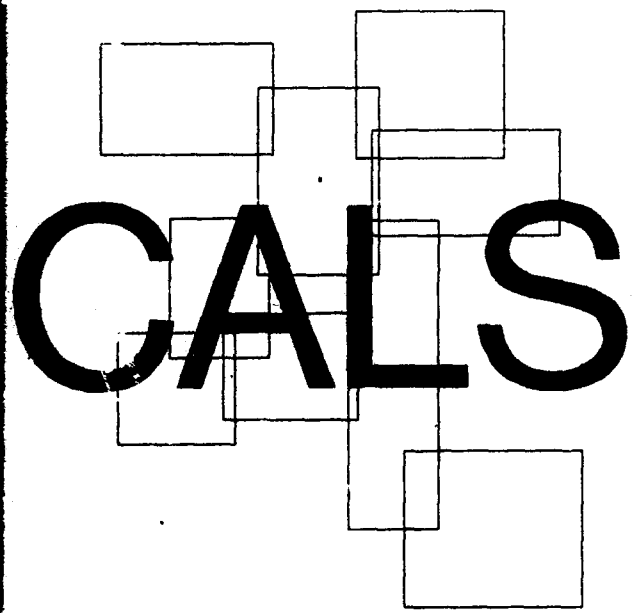
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Presentations at

CALS CONFERENCE

COMPUTER-AIDED ACQUISITION
AND LOGISTIC SUPPORT

CALS Phase 1.2 Conference



A DoD / Industry / NIST Conference

Held at Three Locations

- Philadelphia, Pennsylvania
20 April 1989
- Anaheim, California
27 April 1989
- Gaithersburg, Maryland
2 May 1989

United States Department of Commerce
National Institute of Standards and Technology

NIST
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PRESENTATION MATERIAL

Computer-aided Acquisition and Logistics Support (CALs)

Phase I.2 Conferences

**NCGA '89, 20 April 1989
Philadelphia, Pennsylvania**

**FCC/DGC West, 27 April 1989
Anaheim, California**

**NIST, 2 May 1989
Gaithersburg, Maryland**

A DOD/INDUSTRY/NIST CONFERENCE

CONTENTS

Introduction. 1

CALS Points of Contact. 3

CALS Bulletin Board System. 5

Agenda. 7

Biographical Sketches of Speakers 9

Presentations: 17

Government Perspective. 17

DoD Initiatives in Computer-aided Acquisition
and Logistics Support - Dr. Michael McGrath

Service Update 33

Computer-aided Acquisition and Logistic Support (CALS)
Mr. Alfredo Campo

Department of the Air Force Computer Aided
Logistics & Acquisition Support - Mr. Oscar Goldfarb

Industry Perspective 49

CALS Industry Steering Group - Mr. Harold Stormfeltz

Concurrent Engineering 59

Concurrent Engineering - Col. Larry D. Griffin

PDES, Inc. 71

Product Data Exchange Specification (PDES)
Mr. Robert Kiggins

PDES National Testbed. 81

National PDES Testbed - Ms. Cita Furlani

CALS Standards - Phase I.2 97

1989 CALS Standards - Phase I.2 - Mr. Bruce Lepisto

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697-0051) TELECON 30 Oct 89 CB

Paperless Technical Manuals.121
Joint DoD/Industry CALS Pageless Technical Manual Study Ms. Mary Anne Thompson	
Automated Interchange of Technical Information (MIL-STD-1840A).127
The Development of MIL-STD-1840A and Other CALS Standards Mr. David S. Bettwy	
Electronic Publishing.137
Update on MIL-M-28001 and Joint Service LSAR ADP Revisions Ms. Pam Gennusa	
Logistic Support Analysis Record (MIL-STD-1388-2B)143
MIL-STD-1388-2B and Joint Service LSAR ADP Revisions Mr. George Desiderio	
CALS Test Network.151
CALS Test Network: Verification and Application Testing Strategy - Mr. Mel Lammers	
IGES Validation.169
CALS Phase I.2 "IGES Validation" - Mr. David Remington	
Special Concurrent Session:.177
Competitive Gateway to DoD Contracting - Mr. Bruce Lepisto	
List of Registrants.187

INTRODUCTION

The CALS Phase I.2 Conference was held in conjunction with the National Computer Graphics Association's NCGA Integrate '89 in Philadelphia, Pennsylvania, on 20 April 1989; at the Federal Computer Conference and Defense & Government Computer Graphics Conference FCC/DGC West in Anaheim, California, on 27 April 1989; and at the National Institute of Standards and Technology (NIST) on 2 May 1989.

Computer-aided Acquisition and Logistic Support (CALS) is a DOD and Industry initiative. CALS addresses the integration and use of automated digital technical information for weapon system design, manufacture, and support.

CALS focusses on the generation, access, maintenance, and distribution of the technical data associated with weapon systems. This includes engineering drawings, product definition and logistic support analysis data, technical manuals, training materials, technical plans and reports, and operational feedback data. The CALS program will facilitate data exchange and access, and reduce the duplication of the data preparation effort. CALS provides both the initiative and the framework to integrate the existing islands of automation within DOD and Industry.

Closely tied to the successful implementation of the digital technologies is the timely and successful development and application of related standards. A CALS objective is to facilitate the digital transfer of logistic and technical data between industry and government by leveraging existing international and national standards and accelerating the development of new standards to support future requirements. Supporting the application of commercial standards are specific military standards, specifications, and a handbook prepared by DOD and coordinated among Industry, DOD, and other government agencies.

This CALS Phase I.2 Conference provided an update on the DOD and Industry activities for 1989, covered in detail the standards and specification efforts scheduled for the year, and provided details of CALS and CALS related efforts such as PDES Inc., the PDES National Testbed, paperless technical manuals, the CALS Test Network, IGES validation, and the DOD Concurrent Engineering Initiative.

These proceedings contain the visuals for the material presented at the conference, the speaker's biographical sketches, and the list of registrants.

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(301) 921-9842 OR (301) 948-7438
AVAILABLE 24 HOURS A DAY, 7 DAYS A WEEK
For the Exchange of Information Related to the CALS Program

1. The CALS Electronic Bulletin Board is operated for DOD and the Industry CALS Task Force by the CALS Program Support Office at the National Institute of Standards and Technology. Through it, users can identify key points of contact, upcoming meetings, and other bulletin boards of interest to the CALS community. Selected CALS documents, such as MIL-STD-1840A, can be downloaded in a variety of formats. Questions or comments can be sent to the system operator or other users.

2. You need only a standard ASCII terminal or computer to use the CALS bulletin board system. Set your terminal or computer to:

- 300, 1200, or 2400 baud
- 8 or 7 data bits
- Even or no parity
- 1 stop bit

3. Dial (301) 921-9842 or (301) 948-7438. After carrier detection there will be a pause by the system to identify your communication baud rate. Once the system has identified the baud rate at which you are communicating, it will guide you through the bulletin board by asking key questions and providing helpful menus. (You assign your own password at the initial session. In subsequent sessions only your first name, last name, and password are required to gain access to the Bulletin Board.)

4. The CALS Electronic Bulletin Board is used for:

- o Electronic messaging system for the CALS community.
- o Electronic file transfer, including downloading of the CALS standards.
- o Bulletins for meetings, conferences, workshops, and other timely news.
- o Key points of contact (including other specialized BBS's) in the CALS community. Note: A separate, dedicated BBS is being established to support the CALS distributed testbed.
- o Other on-line CALS and standards-related information.

5. If you have a question or a problem, please call the voice line at (301) 975-6641 and ask for Dave Bettwy.

**COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT
(CALs)
PHASE I.2 CONFERENCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
2 MAY 1989**

AGENDA

- 0745 **REGISTRATION**
- 0830 **Introduction**
- 0840 **Government Perspective**
 Dr. Michael McGrath, Director
 DOD CALS Office, OASD
- 0910 **Service Update**
 Mr. Alfredo Campo, OAS, Army Assistant Deputy
 for Logistics
 RADM Guy Curtis, USN, Assistant DCNO, Logistics
 Mr. Oscar Goldfarb, OAS, Air Force, Deputy for
 Supply Maintenance and Logistics Plans
 Dr. Walter Simonson, DLA, Chief of Research
 Development Office
- 1000 **Coffee Break**
- 1030 **Industry Perspective**
 Mr. Harold Stormfeltz, Vice Chairman
 Industry Steering Group, Northrop
- 1050 **Industry Panel**
 Industry Steering Groups' Technology Area Task
 Groups
- 1130 **Concurrent Engineering**
 Col. Larry D. Griffin, Deputy Director,
 Weapon Support Improvement Group, OASD
 (Production & Logistics)
- 1200 **PDES, Inc.**
 Mr. Robert Kiggins, General Manager, PDES, Inc.
- 1230 **PDES National Testbed**
 Ms. Cita Furlani, Leader
 PDES Test Bed Group
 National Institute of Standards & Technology

- 1300 **LUNCH**
- 1400 **CALS Standards - Phase I.2**
 Mr. Bruce Lepisto, Deputy Director, DOD CALS
 Office, OASD (Production & Logistics)
- 1420 **Paperless Technical Manuals**
 Ms. Mary Anne Thompson
 Digital Information Exchange Task Group:
 Technical Manuals, TRW, Inc.
- 1440 **Automated Interchange of Technical Information**
 (MIL-STD-1840A)
 Mr. David S. Bettwy, Deputy Chief
 Automated Production Technology Division
 National Institute of Standards & Technology
- 1500 **Electronic Publishing (MIL-M-28001A)**
 Ms. Pam Gennusa, Director Product Marketing
 Datalogics
- 1520 **Logistic Support Analysis Record (MIL-STD-1388-2B)**
 Mr. George Desiderio, OASD,
 Weapon Support Improvement Group
- 1540 **CALS Test Network**
 Mr. Mel Lammers, CTN Program Manager
 Air Force Logistics Command
- 1600 **IGES Validation**
 Mr. David Remington, Chairman, IGES/PDES
 Verification Testing Methodology Committee

**BIOGRAPHICAL SKETCHES OF SPEAKERS
CAL S PHASE I.2 CONFERENCE
JOINT DOD/INDUSTRY/NIST
2 MAY 1989**

**David S. Bettwy
Automated Production Technology Division
National Institute of Standards and Technology**

Mr. Bettwy is Deputy Chief of the Automated Production Technology Division at the National Institute of Standards and Technology (NIST) formerly the National Bureau of Standards. Mr. Bettwy has a BSME degree from George Washington University, has been with NIST for 11 years, and previously was with the Harry Diamond Laboratories (HDL) of the Army Materiel Command for 25 years. Mr. Bettwy's experience in DoD and DoC includes responsibility for electromechanical R&D in the area of ordnance devices, configuration management of corporate technical data package repositories, management of manufacturing facilities, and acquisition of production quantities of electronic fuzes for ordnance applications. At NIST he was involved with the planning and installation of the Center for Manufacturing Engineering's Automated Manufacturing Research Facility. Mr. Bettwy is currently involved with the NIST technical support of the DoD Computer-aided Acquisition and Logistic Support (CAL S) program.

**Alfredo Campo
OAS ARMY (I&L)
The Pentagon**

As the Deputy to the Deputy Assistant Secretary of the Army for Logistics, maintains detailed cognizance over the total spectrum of Logistics Programs to include Supply, Maintenance, Transportation, Services, Logistics Systems and Physical Security.

Mr. Campo received his PHB (Psychology) from the University of Detroit in 1966 and his MPA (Government) from the George Washington University in 1985. He also has completed many other technical and managerial programs including National Security Management Program (National Defense University); Executive Leadership and Management Program (Federal Executive Institute); and Executive Program for Senior Defense Managers (J.F. Kennedy School of Government, Harvard University).

Mr. Campo's professional experience includes various logistics and data processing assignments in Detroit, St. Louis, and Ft. Monmouth, NJ from 1965-1977; Branch Chief, Log Systems Division Office, Deputy Chief of Staff for Logistics, HQ, DA from 1977-1980; Assistant for Logistics Systems OASA (IL&FM) from

1980-1984; and Assistant Deputy for Logistics OASA(I&L) from 1984
- Present.

Rear Admiral Guy H. Curtis, III
US Navy
The Pentagon

Rear Admiral Guy Haladane Curtis, III is currently assigned as the Assistant Deputy Chief of Naval Operations (Logistics).

After graduation from the U.S. Naval Academy and commissioning in 1959, Ensign Curtis served for two years on the aircraft carrier USS INDEPENDENCE (CVA 62) and then entered Submarine School. Upon graduation from Submarine School and completion of nuclear power training, LTJG Curtis reported to the Blue Crew of the USS ETHAN ALLEN (SSN 608), the first submarine to be designed and built as a Fleet Ballistic Missile Submarine. In May 1965 he was assigned to the Nuclear Power Training Unit in West Milton, New York, as Engineer Officer of the S3G Prototype where he trained nuclear power plant operators for the Fleet and tested advanced nuclear power plant designs.

From June 1968 to July 1975, Commander Curtis served aboard three nuclear attack submarines, USS STURGEON (SSN 637), USS DACE (SSN 607) and USS WIIALE (SSN 638), where he served as Commanding Officer. In July 1975 Commander Curtis reported for duty as Chief Staff Officer and Training Officer of the Submarine Squadron in La Maddalena, Sardinia. Following a two-year tour there, Captain Curtis reported to Washington, DC, for a three-year assignment as Executive Assistant to the Deputy Chief of Naval Operations (Submarine Warfare).

In May 1980 Captain Curtis assumed command of Submarine Squadron FOURTEEN the nation's first strategic nuclear submarine squadron, in Holy Loch, Scotland. Upon completion of this tour, Captain Curtis served as Chief of Staff for the Commander, Submarine Force, U.S. Atlantic Fleet in Norfolk, Virginia, from August 1981 to July 1983. He was selected for Commodore during this tour.

Commodore Curtis then reported to the Chief of Naval Operations in Washington, DC, as Director of the Strategic Submarine Division (OP-21). Following this, he served as the Program Manager of the SEAWOLF (SSN 21) class submarine Acquisition Program (PMS 350) in the Naval Sea Systems Command from November 1983 to September 1988. He supervised the design and acquisition process of this revolutionary submarine, the first of a new class leading the Navy into the 21st Century. During this tour, the grade of Commodore was changed to Rear Admiral (Lower Half). He was selected for promotion to Rear Admiral (Upper Half) in November 1986.

George Desiderio
Defense Systems & Program Office

Mr. George Desiderio is assigned as a general engineer to the DoD Defense Systems and Program Office (DSPO). Mr. Desiderio is responsible to the OASD(P&L) staff for coordinating policy development for Integrated Logistic Support (ILS) and Logistic Support Analysis (LSA). His current projects involve standardization efforts for Level of Repair Analysis, Reliability Centered Maintenance, Military Training Programs, the revision to MIL-STD-1388-2A, and establishment of interfaces between LSAR and other ILS elements. Mr. Desiderio has over 15 years experience in military operations, supply and maintenance, and acquisition logistics. Prior to his assignment at DSPO, he served on active duty as a commissioned officer in the U.S. Army and then as the LSA program administrator at USAF Electronic Systems Division, Hanscom AFB, Massachusetts. His military experience includes assignments at various operational and staff levels in both combat and combat service support units in Europe and the United States. A major in the U.S. Army Reserve, Mr. Desiderio holds a bachelor of science degree in engineering from the U.S. Military Academy, West Point, New York, and a Master of Science degree in Engineering from Northeastern University.

Cita M. Furlani
Center for Manufacturing Engineering
National Institute of Standards and Technology

Cita M. Furlani is the project manager for the National Product Data Exchange Specification (PDES) Testbed at the National Institute of Standards and Technology (NIST). The Testbed utilizes the Automated Manufacturing Research Facility (AMRF) of NIST. Ms. Furlani participated in the design of the AMRF from the beginning of the project in 1981 with particular responsibility for the material handling system and the data administration system. Related experience at Harry Diamond Laboratories, U.S. Army. M.S. in Computer and Electronic Engineering, George Mason University. B. A. in Physics and Mathematics, Texas Christian University.

Pam Gennusa
Datalogics

Pam Gennusa is Director of Marketing at Datalogics, where she has been for the past five years. During that time, Pam served as Program Manager on their contract for the Air Force's Automated Technical Order System (ATOS) project. She moved into the marketing side of the business and began their Product Marketing Group in 1987, beginning with products focused on technical documentation and SGML support. Pam is active on both

the ANSI and ISO committees responsible for the SGML standard, ISO 8879. She serves as Co-Chair of the CALS Industry Work Group Electronic Publishing Committee. Pam also conducts seminars on SGML for the Graphic Communications Association and is an executive board member of the International SGML Users Group.

Oscar A. Goldfarb
SAF/ALG
The Pentagon

Mr. Oscar A. Goldfarb is the director for supply, maintenance and logistics plans, Office of the Deputy Assistant Secretary of the Air Force (Logistics). He is responsible to the deputy assistant (logistics) in all matters associated with supply and maintenance, as well as logistics planning and research, international logistics, munitions, acquisition logistics and information management systems.

Mr. Goldfarb received a bachelor's degree in industrial psychology from the University of Pennsylvania in 1958. As a distinguished graduate, he received a master's degree in logistics management from the Air Force School of Systems and Logistics in 1967. Mr. Goldfarb served in the U.S. Marine Corps Reserve.

Mr. Goldfarb entered civil service in 1959 with the Navy Aviation Supply Office, Philadelphia, Pennsylvania, where he was an item manager and systems analyst. In 1967 through 1975, he held increasingly responsible positions with the Naval Supply Systems Command, Washington, DC, in provisioning and operations research and as head of supply policy and planning with the Naval Air Systems Command. He was appointed to his present position in February 1977.

Mr. Goldfarb has received numerous professional honors. He was elected a fellow in the Society of Logistics Engineers and he received the 1981 Founders Medal, the Society's highest award. Mr. Goldfarb is the recipient of the Air Force Meritorious Civilian Service Medal and the Exceptional Civilian Service Medal.

Larry D. Griffin
WSIG (A&L)
The Pentagon

Colonel Larry D. Griffin is Deputy Director of the Weapon Support Improvement Group, Office of the Assistant Secretary of Defense, Production and Logistics. He is responsible for readiness and supportability assessments for major weapon systems and concurrent engineering. Prior to his current position,

Colonel Griffin was Director of Reliability and Maintainability at the Air Force Acquisition Logistics Center and has been responsible for acquisition and service engineering on major Air Force Systems within the Air Force Logistics Command and the AIM-7F Advanced Air-to-Air Missile.

Colonel Griffin received a bachelor's of science degree in Aerospace Engineering from the University of Arizona and a MBA in Operations Management from Wharton Graduate School of Business, University of Pennsylvania.

Robert G. Kiggans
South Carolina Research Authority

Mr. Kiggans has over twenty years experience in program and technical management, command and control systems and advanced computing technologies. As Assistant Director and General Manager at the South Carolina Research Authority (SCRA), Mr. Kiggans manages the PDES, Inc. Program, a multi-million dollar joint industry/government effort to accelerate Product Data Exchange Specification (PDES) development and implementation. He also directs long range planning and new business initiatives for a major segment of the SCRA.

As Deputy Director at the Defense Advanced Research Projects Agency (DARPA), Mr. Kiggans was responsible for planning, budgeting and organizing an information science and technology office with a 200 million dollar annual research budget. Mr. Kiggans also played a key role in the development of the multi-billion dollar computer/communication modernization of the Worldwide Military Command and Control Information System. Earlier in his career, he was a software systems engineer with Electronic Data Systems (EDS).

A veteran of the Vietnam War, Mr. Kiggans had over 150 B-52 combat missions in Southeast Asia where he was awarded 10 Air Force Medals and the Distinguished Flying Cross. His other military awards included the Defense Superior Service Medal, Defense Meritorious Service Medal, and Air Force Meritorious Service Medal.

Mr. Kiggans is a 1965 graduate of the Citadel and has a masters degree from the Air Force Institute of Technology.

Melvin S. Lammers
Air Force Logistics Command
Wright Patterson Air Force Base

Melvin S. Lammers is currently assigned as Assistant Chief of the Technology Support Office in the Logistics Management

Systems Center of the Air Force Logistics Command at Wright Patterson Air Force Base. He is also the Director of the DoD Computer-aided Acquisition and Logistics Support (CALs) Test Network (CTN) and the CALs Standards Lead Service Office which is being established in 1990 at AFLC for the Department of Defense. He is also responsible for interface with industry, university, and government research laboratories to advance the use of technology in information systems, computing and communications systems in the Air Force Logistics Command (AFLC). He has extensive background in computer system design and project management with the Air Force. He graduated from the Ohio State University with a degree in Industrial Engineering and is a 1981 graduate of the Industrial College of the Armed Forces at the Defense University, Ft. McNair, Washington, DC.

Mr. Bruce Lepisto
Deputy Director, DoD CALs Policy Office
OASD(P&L)WS
The Pentagon

Bruce Lepisto is the Deputy Director of the Computer-aided Acquisition and Logistic Support (CALs) Policy Office, in the Office of the Secretary of Defense (OSD). He has been involved with the CALs program since its inception, and was Co-editor of the original Institute for Defense Analysis (IDA) CALs Study report that led the Department of Defense to establish the CALs program.

Mr. Lepisto is a career DoD employee with over twenty years experience in both acquisition and operational logistics. Prior to joining the OSD staff in 1984, he worked for the United States Air Force, most recently as Deputy Director for Data Management of the JLC's Joint Depot Maintenance Analysis Group (JDMAG). His Air Force professional experience includes depot posture planning, support policy, data system design and management, and productivity and cost analysis. He is a senior member of the Society of Logistics Engineers, a member of the Steering Committee of the national IGES/PDES Organization, and a member of the ANSI/ASME Y14.26 committee on Computer Aided Preparation of Product Definition Data.

Dr. Michael F. McGrath
Director, DoD CALs Policy Office
OASD(P&L)WS
The Pentagon

Michael F. McGrath is the Director of the CALs Policy Office in the Office of the Secretary of Defense (OSD). He has close to twenty years of weapon system acquisition experience, and is well acquainted with user needs for CALs in both government and

defense contractor operations. His previous assignments on the OSD staff included reviewing major weapon system support programs for the Defense Systems Acquisition Review Council (DSARC) and serving as principal author of the top level DoD policy directive on "Integrated Logistic Support." Prior to joining the OSD staff in 1980, he held various engineering and logistics management positions in the Defense Logistics Agency and the Naval Air Systems Command. Dr. McGrath holds B.S. and M.S. degrees in Space Science and Applied Physics and a doctorate in Operations Research.

David O. Remington
NSWC

Engineer (degree in aeronautical engineering) for thirty years, the last twelve of which have been actively involved in computer-aided-this-and-that as the technology has grown, including being system manager of an eight processor, distributed CAD/CAM system. Worked as part of the IGES/PDES Organization's testing project for the past three years, and as chair of the IGES Verification Testing Methodology Committee for the past year.

H. B. Stormfeltz
Northrop Corporation
Aircraft Division

H. B. Stormfeltz (Stormy) is currently the manager of the Supportability Technology Development Center. In this position he is responsible for developing Advanced Aircraft Supportability Programs and the activities of the Supportability Technology Development Center. Prior to his current position he was the ILS Director for the company funded F-20 Programs which included developing unique contractor operated support programs worldwide.

In a previous assignment as manager of the F-5/T-38 Support programs, he directed the company's support efforts worldwide in 24 countries. In 1972 he established an Integrated Logistics Support Group to develop international support plans for the COBRA Aircraft European consortium. Before transferring from Engineering to the Logistics Department his assignments included a resident member of the technical consultant team in Europe for the NATO Hawk Weapon System and special assignments involving acquisition of European-developed weapons.

Stormy joined Northrop in 1955 as a Mechanical Design Engineer. He earned a Bachelor of Science Degree in Aeronautical Engineering from Northrop Institute of Technology and a Master's Degree in Engineering from UCLA.

In the fall of 1986 as a result of DoD's Computer-aided Acquisition and Logistics Support (CALs) initiative he became one of NSIA's representatives to the newly formed CALs Industry Steering Group (ISG). Currently, he is the Vice Chairman and Chief Operating Officer, having the responsibility for organizing and coordinating the efforts of the CALs Task Groups.

In July of 1988, Stormy received the Edward M. Greer Award for meritorious service to the Department of Defense activities in the area of Integrated Logistics Support.

Mary Anne Thompson
TRW

Ms. Thompson has over 25 years experience in the aerospace community including key management responsibilities on major Intelligence Community programs, leadership in aerospace industry and professional organizations, and national leadership in the field of aerospace education. Ms. Thompson currently serves as Manager of the Technical Support Services Department, Systems Division, Federal Systems Group, TRW, Inc., Fairfax, Virginia, with corporate management responsibilities for: development of documentation technologies, training in Military and Government agency documentation standards, Division technical writers, editors, document configuration managers, and CALs-related Technical Manual programs. Ms. Thompson currently serves on the Paperless Technical Manual Study Group of the CALs DoD - Industry Advisory Committee participating in the development of functional requirements and specifications for the next generation of Pageless Technical Documentation. She has served as Consultant to the White House Young Astronaut Program, is listed in personalities of the South (1976 and 1977) and the International Biographical Index (1976), is a 1987 recipient of the Air Force Association National Medal of Merit, and is President of the Air Force Association, D. W. Steele Chapter, which serves over 3,500 aerospace industry and military community members in the Washington area.

Ms. Thompson holds a B.S. degree from the Pennsylvania State University, and graduate degrees from the University of Nebraska and Troy State University.



DoD Initiatives in Computer-Aided Acquisition and Logistics Support

**MICHAEL McGRATH
OFFICE OF THE SECRETARY OF DEFENSE**

7-4011

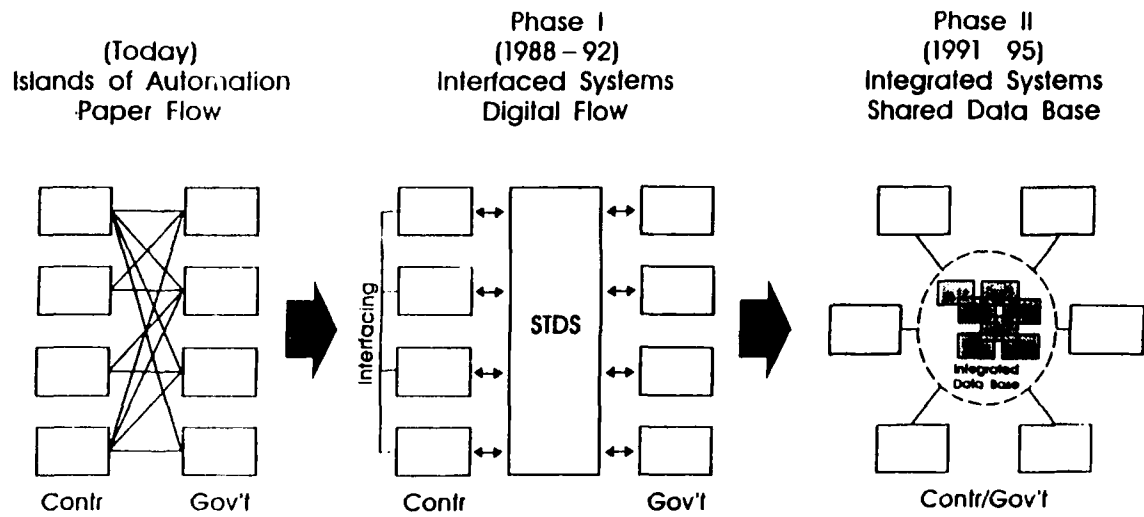
CALS: A Strategy For Change

" I have approved a strategy for transitioning from our current paper-intensive weapon system support* processes to a largely automated and integrated mode of operation, with substantial progress by the end of this decade"

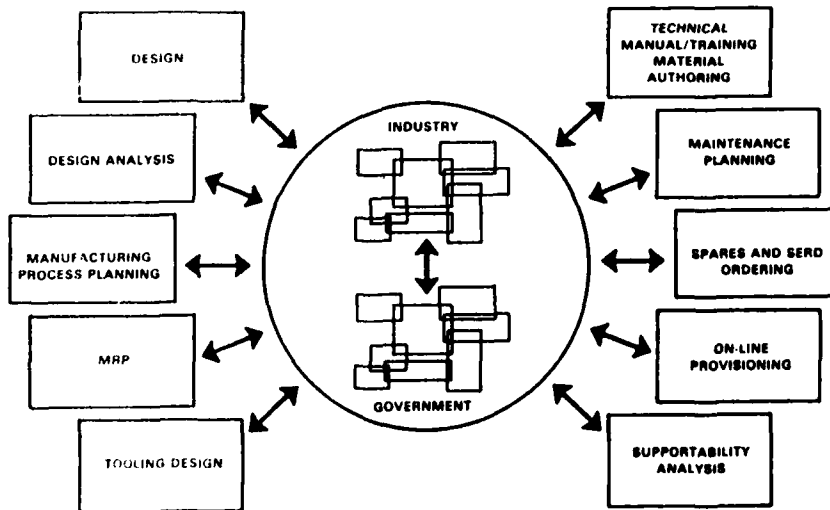
**William H. Taft IV
Deputy Secretary of Defense
September 1985**

*** Expanded in 1986 to include design, manufacturing and support**

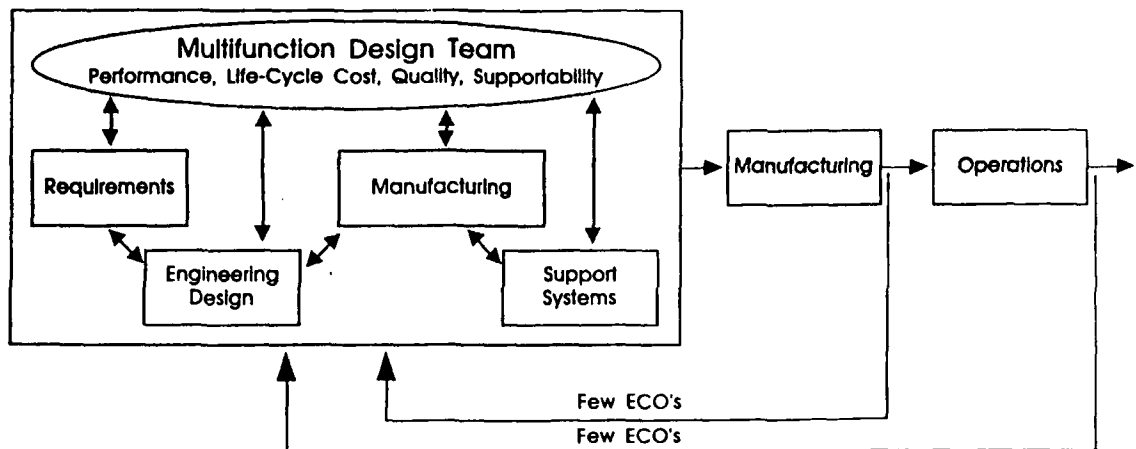
CALS Phased Development



CALS INTEGRATION TARGET



Concurrent Engineering



- Optimize product design, manufacturing process, support process
- Total quality – "Get it right the first time"
- Shorten acquisition time, reduce life cycle costs

EXAMPLES OF PROCESS IMPROVEMENTS

- o **CONCURRENT ENGINEERING**
 - o 40-60% reductions in development time, 30% cost reduction, improved quality (IDA Study)
- o **INTEGRATION OF CONTRACTOR PROCESSES**
 - o CIM productivity gains of 40-70% (Nat'l Academy of Science)
 - o 35% cost avoidance in ILS development (A-12)
- o **AUTOMATION OF TECHNICAL MANUALS**
 - o 30-40% savings in authoring (A-12, others)
 - o 9:1 reduction in change page cycle time (AFTOMS Goal)
 - o 35% improvement in troubleshooting accuracy (AF IMIS)
- o **SPARES ACQUISITION**
 - o Online provisioning, ordering saves time and TDY (B-2)
 - o 20% reduction in administrative leadtime (EDMICS Goal)
 - o 90% reduction in production leadtime (RAMP Goal)

LONG TERM SCHEDULE

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
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CONCEPT FORMULATION

- CALS Study
- DepSecDef Memo

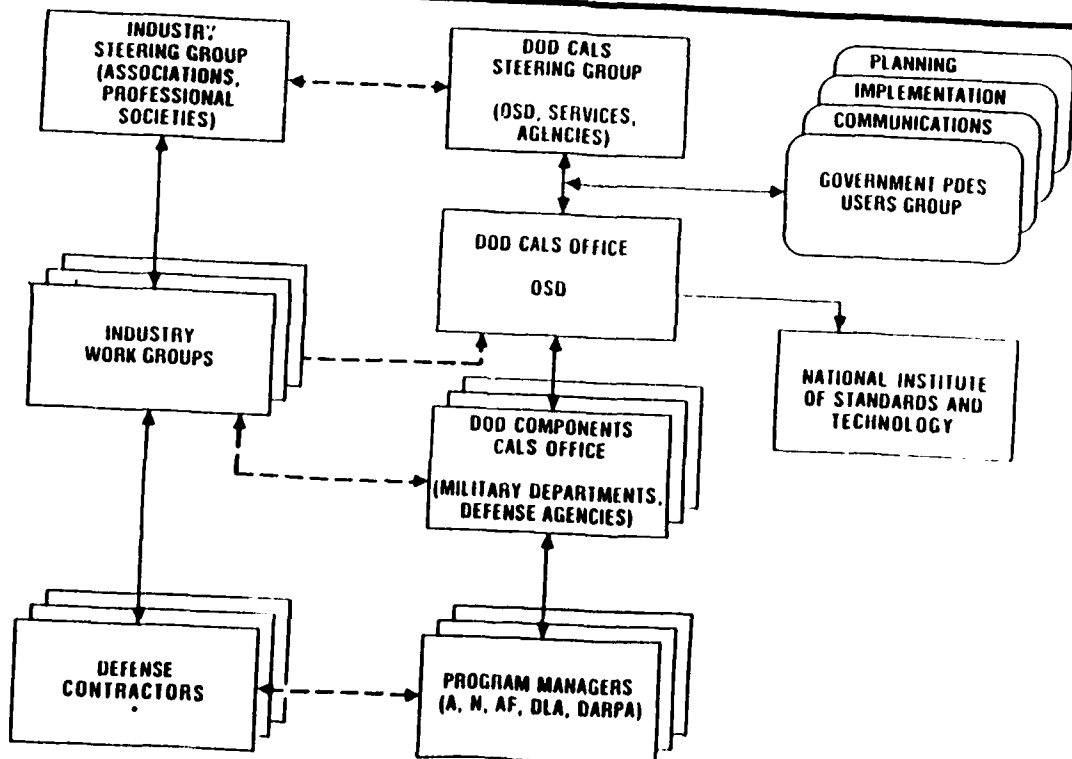
DEMONSTRATION VALIDATION

- CALS Offices, Industry Task Force, NIST
- Prototypes, Testbed Projects
- Lead Weapon Systems
- Initial Standards

FULL SCALE DEVELOPMENT / ROUTINE IMPLEMENTATION

- DepSecDef Implementation Guidance, DAB Reviews
 - CALS Handbook, Training
 - CALS Test Network for User Applications
 - Vendor Products, Conformance Tests
 - Contractor Integration
 - Infrastructure Modernization, Integration
 - Redesign of Functional Processes
-
- Reliance on Contractor Data Bases
 - Digital Delivery & Use

CALS MANAGEMENT ORGANIZATION



CALS Implementation Policy (DEPSECDEF Memo, 5 Aug 1988)

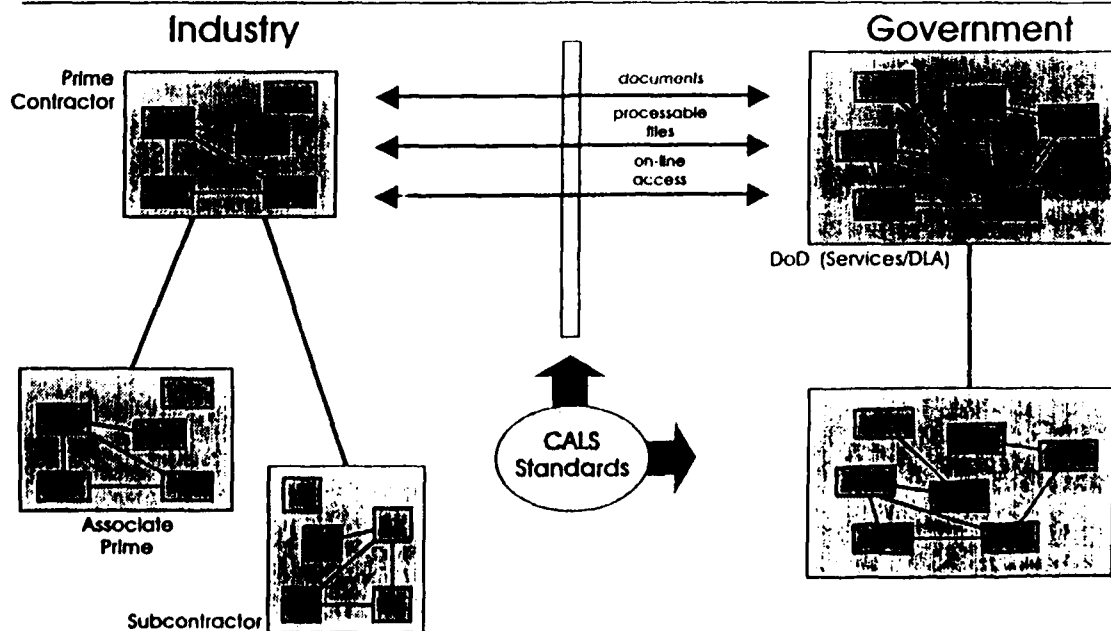
Weapon System Contracts

- New developments – obtain proposals for:
 - Integration of contractor data systems
 - DoD access to contractor data bases
 - Contract deliverables in digital form
- Review existing contracts for retrofit opportunities
- "Each application decision shall be made on its own merits with respect to the productivity and quality improvements expected at either prime contractor or subcontractor level"

Infrastructure

- Program for automated systems to receive, store, distribute and use digital weapon system technical info

CALS Phase I Environment



DoD CALS IMPLEMENTATION

	OSD	SERVICES/DLA
STANDARDS	DEVELOP AND TEST STANDARDS	INCORPORATE IN WS AND ADP SYSTEMS PARTICIPATE IN CTN
ACQUISITION GUIDANCE	ACQUISITION POLICY DEFENSE ACQUISITION REVIEWS	CONTRACTS/RPFs SERVICE ACQUISITION REVIEWS
TECHNOLOGY	SPONSOR TECHNOLOGY DEVELOPMENT AND DEMOS	FUNDED R&D PROJECTS WEAPON SYSTEM DEMONSTRATIONS
INFRASTRUCTURE	CORPORATE ARCHITECTURE INTEROPERABILITY RQMTS	ADP MODERNIZATION AND INTEGRATION SERVICE ARCHITECTURE
MANAGEMENT	CORPORATE PLANNING AND POLICY INTERFACE WITH INDUSTRY	SERVICE/DLA CALS OFFICES EDUCATION

9-2463

STANDARDS

ACTIONS SINCE OCT 1988

- o Publication of additional CALS standards, CALS Handbook
- o Draft proposal for PDES version 1.0 to ISO
- o Development of 1989 increment to CALS standards
 - Standards for Technical Manuals
 - Standards for Electronics
 - EDI transfer of CALS files
 - Relational Data Model for LSAR

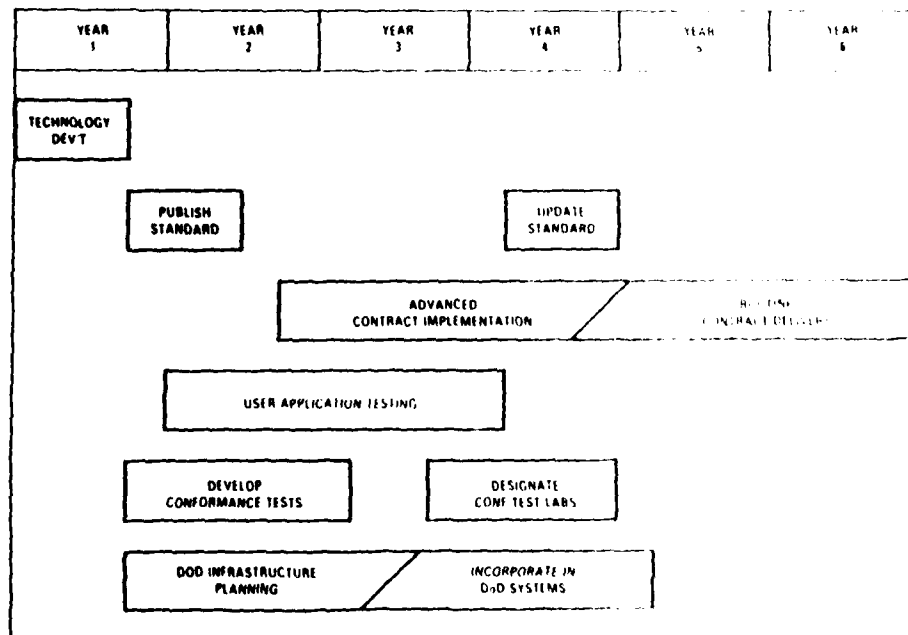
NEAR TERM ACTIONS PLANNED

- o Coordination of 1989 increment to CALS standards
- o Expansion of CALS Test Network projects
- o Top down planning for PDES

Current CALS Standards

DoD Standard	Date	Nat'l/Int'l Standard	Applications
MIL-STD-1840A	DEC 87	-	<ul style="list-style-type: none"> ■ Data Interchange File Management ■ CAD, Vector Graphics Engineering Drawings TM Illustrations (Optional) ■ Automated Publishing Tech Manuals ■ Raster Scanned Images Engineering Drawings Tech Manual Illustrations ■ Vector Graphics TM Illustrations (Preferred) ■ Implementation Guide Model SOW's, CDRI's
MIL-D-28000	DEC 87	IGES	
MIL-M-28001	FEB 88	SGML	
MIL-R-28002	DEC 88	GRP 4 Raster	
MIL-D-28003	DEC 88	CGM	
MIL-HDBK-59	DEC 88		

IMPLEMENTATION STEPS



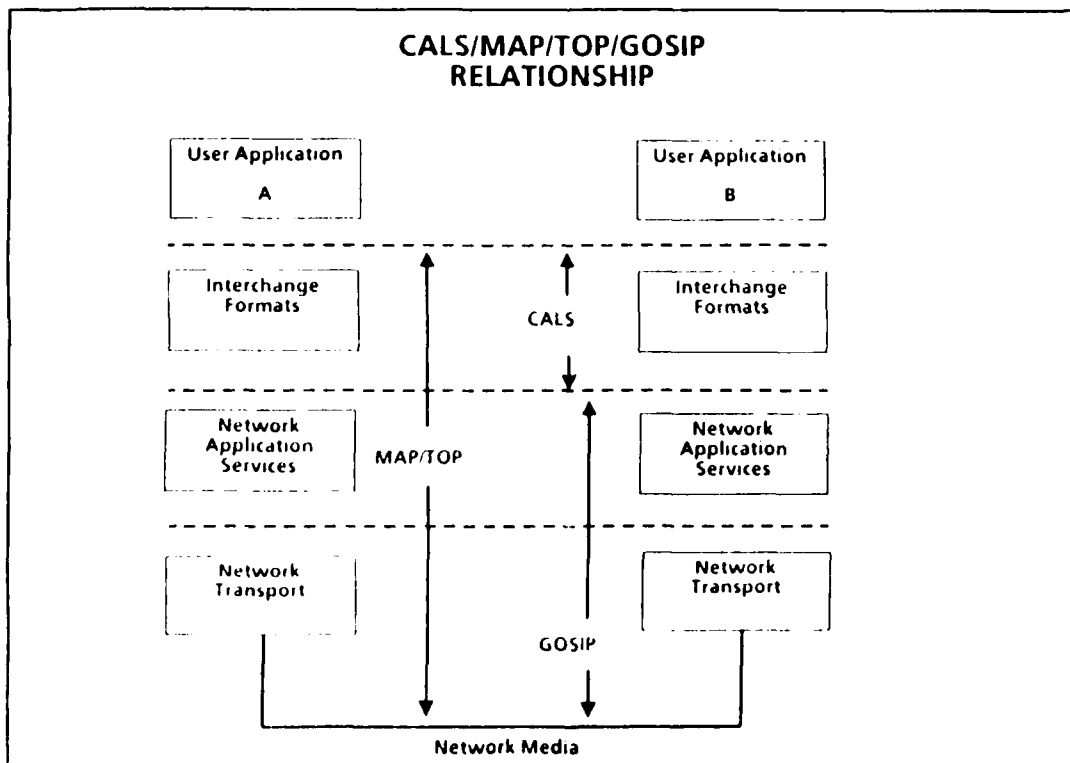
CALS TEST NETWORK

CTN

- AIR FORCE WILL BECOME LEAD SERVICE ACTIVITY FOR CALS STANDARDS
 - MANAGE STANDARDS & APPLICATION GUIDANCE
 - CTN AS A SUPPORT FUNCTION
- ACTIVE PARTICIPATION BY ARMY, NAVY, DLA, OTHER AGENCIES & INDUSTRY
- CTN FUNCTIONS
 - DEMONSTRATE NEW TECHNOLOGY
 - PERFORM USER/APPLICATION TESTS
 - PROTOTYPE CONFORMANCE TESTS
 - PROTOTYPE ACCEPTANCE TESTS

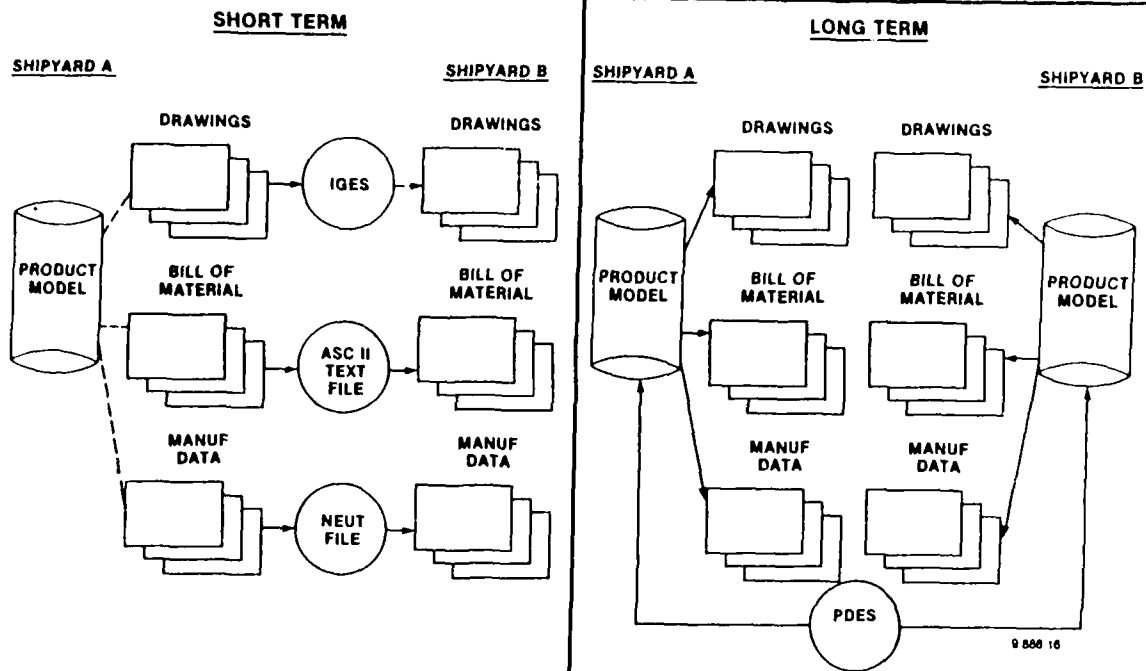
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SPECIFICATIONS



SEAWOLF DIGITAL DATA TRANSFER PROGRAM

WORKING GROUP D — TECHNICAL APPROACH



5-1749

PDES Development

Product Data Exchange Specification

- Importance to CALS
 - Logical structure for Phase II shared data base
 - Expands possibilities for industrial networking
- Key players
 - IGES/PDES standards organization
 - PDES, Inc.
 - National PDES testbed (NIST)
 - Government PDES users group

FUTURE STANDARDS

CALS TECHNICAL AND DATA STANDARDS

- 1989
 - EXTENSIONS TO SGML 28001 (ADD'L DOCUMENT TYPES)
 - PAGELESS TECH MANUALS
 - STDS FOR ELECTRONIC PRODUCTS (IPC...)
 - OTHER IGES SUBSETS
 - LSAR RELATIONAL TABLES AND DATA MODEL
 - EDI TRANSACTIONS
- 1990-91,
 - TECHNICAL REPORTS, PLANS SPECS (ODA/ODIF,SPDL)
 - ILS DATA DICTIONARIES
 - INITIAL PRODUCT DATA EXCHANGE SPECIFICATION (PDES)
 - INITIAL IRDS ENHANCEMENTS

FUNCTIONAL STANDARDS IMPACTED

- 1989
 - LSAR (MIL-STD-1388-2B)
 - TRAINING (MIL-STD-1379,...)
- 1990-91
 - SPARES ACQUISITION, CONFIGURATION MGT, LORA, OTHER FUNCTIONAL AREAS

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TESTBEDS AND TECHNOLOGY

ACTIONS SINCE OCT 1988

- o ATF CALS Demos
- o PDES Testbed activated at NIST. PDES, Inc. operational.
- o Government PDES Users Group report and recommendations
- o Expansion of capabilities in CALS Test Network

NEAR TERM ACTIONS PLANNED

- o RAMP Demonstration of PDES-driven parts mfg
- o Tests of delivery of raster scanned engineering drawings
- o Prototype of conformance tests in CTN
- o Technology evaluations for A-12 and ATF pageless tech manuals

ACQUISITION

ACTIONS SINCE OCT 1988

- o Candidate weapon systems identified for CALS implementation
- o Standing committee established for small business
- o Concurrent Engineering Report and policy memo

NEAR TERM ACTIONS PLANNED

- o Reviews of CALS implementation by DAB, Services
- o Contract studies, industry advisory groups
 - CALS cost analysis guidelines
 - Incentives guidance, recommended improvements
 - Functional spec for contractor integrated technical information services
 - Generic risk assessment for CALS data protection
 - Continued process improvement studies (CE, spares, TM's)

CALS WEAPON SYSTEM IMPLEMENTATION

DEPSECDEF AUGUST 5, 1988 MEMO: CALS REQUIREMENTS IN WEAPON SYSTEM ACQUISITION

LEAD WEAPON SYSTEMS

- o ATF - ADVANCED TACTICAL FIGHTER (AF)
- o A-12 - ADVANCED TACTICAL AIRCRAFT (N)
- o LHX - NEW LIGHT HELICOPTER (A)
- o SSN-21 - SEAWOLF CLASS SUBMARINE (N)
- o V-22 - OSPREY TILT-ROTOR AIRCRAFT (N)

ADDITIONAL CANDIDATES

ARMY

- o PATRIOT
- o FAADS (NLOS COMPONENT)
- o HOWITZER IMPROVEMENT
- o MLRS BINARY CHEMICAL WARHEAD
- o STRATEGIC DEFENSE SYSTEM
- o ALL SOURCE ANALYSIS SYSTEM
- o AIRBORNE ADVERSE WEATHER WS
- o AAWS-M
- o AAWS-H
- o AH-64 IMPROVEMENT PROGRAM
- o NBC RECON SYSTEM
- o FOLLOW-ON TO LANCE

AIR FORCE

- o B-2 BOMBER
- o C-17 AIRCRAFT
- o SRAM II
- o LANTRIN
- o MILSTAR
- o JOINT STAR
- o AWACS RADAR IMPRO
- o REACT
- o PEACEKEEPER MISSILE
- o RAIL GARRISON
- o SMALL ICBM
- o CONVENTIONAL CRUISE MISSILE
- o HYPERVELOCITY MISSILE
- o OTHERS

NAVY

- o AAARM MISSILE
- o ASPJ JAMMER
- o LRAAAC AIRCRAFT
- o ADVANCED INTERDICTION WS
- o F-14 AIRCRAFT
- o AV-8B AIRCRAFT
- o TOMAHAWK
- o SHIP SYSTEMS BEING IDENTIFIED

Paying For CALS

- New weapon system acquisitions
 - Part of competitive cost of new programs
 - *Will save money in acquisition*
- Retrofit to existing programs
 - Need incentives (e.g. IMIP)
 - Industry recommendations due
- DoD infrastructure systems
 - Line items, industrial funds in DoD component budgets
 - Alternative; purchase services rather than systems

INFRASTRUCTURE

ACTIONS SINCE OCT 1988

- o RFI released for Navy CAD-2
- o DSREDS/EDCARS sites activated. Retrofit planned.

NEAR TERM ACTIONS PLANNED

- o Air Force AFTOMS Milestone 0 Review - May
- o Navy/DLA EDMICS contract award - June
- o Army CALS contract awards - August
- o Architecture Guidelines - August

DoD INFRASTRUCTURE SYSTEMS

OBJECTIVES

- CAPABILITY TO RECEIVE AND USE DIGITAL DATA
- UNIFIED INTERFACE WITH INDUSTRY
- INTEROPERABILITY AMONG DoD SYSTEMS

ACTIONS TAKEN

- CALS STANDARDS INCORPORATED IN RFP's AND RETROFIT PLANS
 - REPOSITORIES (DSREDS/EDCARS, EDMICS)
 - TECHNICAL MANUALS (AFTOMS)
 - CAD (NAVY CAD-2)
 - SYSTEM INTEGRATION (ACALS)
- DoD PLANNING GROUP REVIEWING COMMON ARCHITECTURE REQUIREMENTS

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AUTOMATED ENGINEERING DATA REPOSITORIES

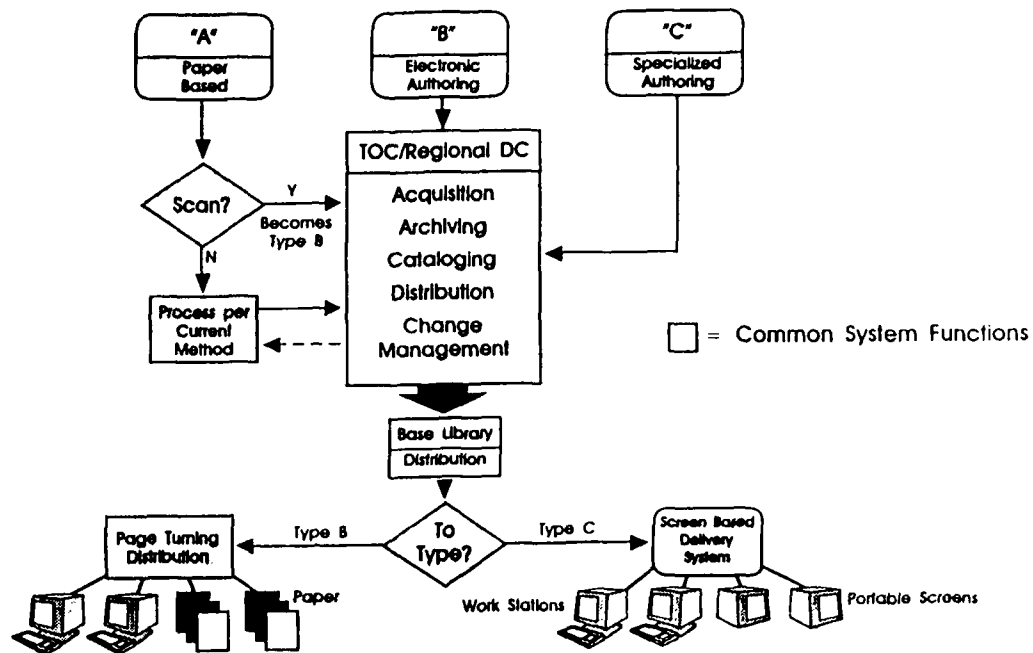
TECHNICAL APPROACH

- CONVERT APERTURE CARDS TO DIGITAL IMAGE FILES
- CAPTURE NEW DRAWINGS AND CAD DATA USING CALS STANDARDS
- MASS STORAGE IN OPTICAL DISK JUKEBOXES
- OUTPUT EITHER APERTURE CARDS OR DIGITAL FILES

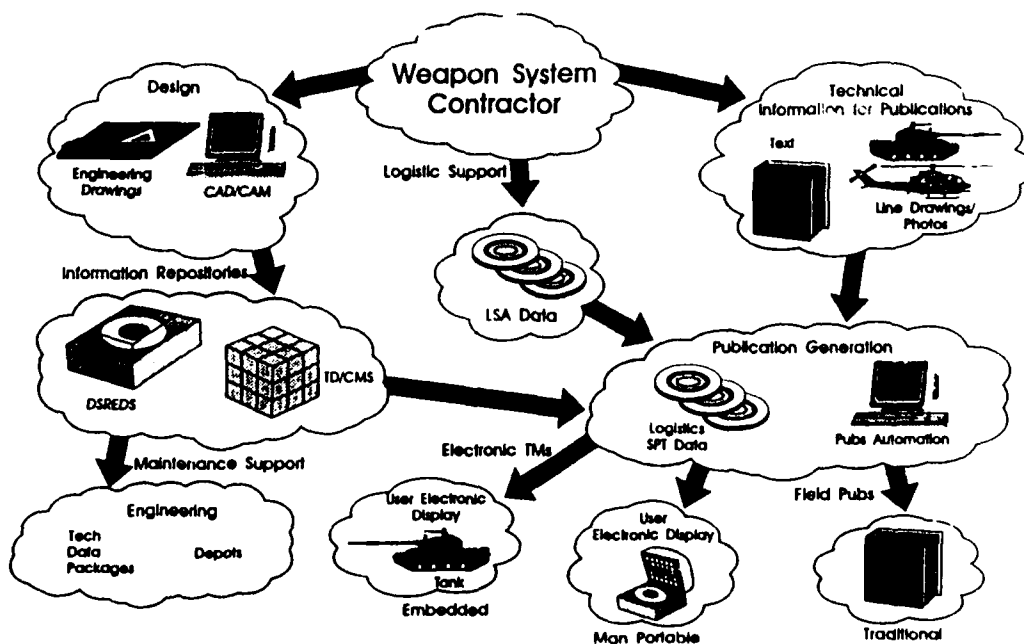
STATUS

- ARMY AND AIR FORCE SYSTEM (DSREDS/EDCARS) UP AND RUNNING AT ALL 12 SITES. DIGITAL INPUT AND OUTPUT BY 1991.
- NAVY AND DLA SYSTEM (EDMICS) IN SOURCE SELECTION. CONTRACT AWARD LATE 1989. PRODUCTION DELIVERIES BEGIN 1990.

Air Force Tech Order Management System (AFTOMS)



Army CALS Conceptual Linkage



MANAGEMENT

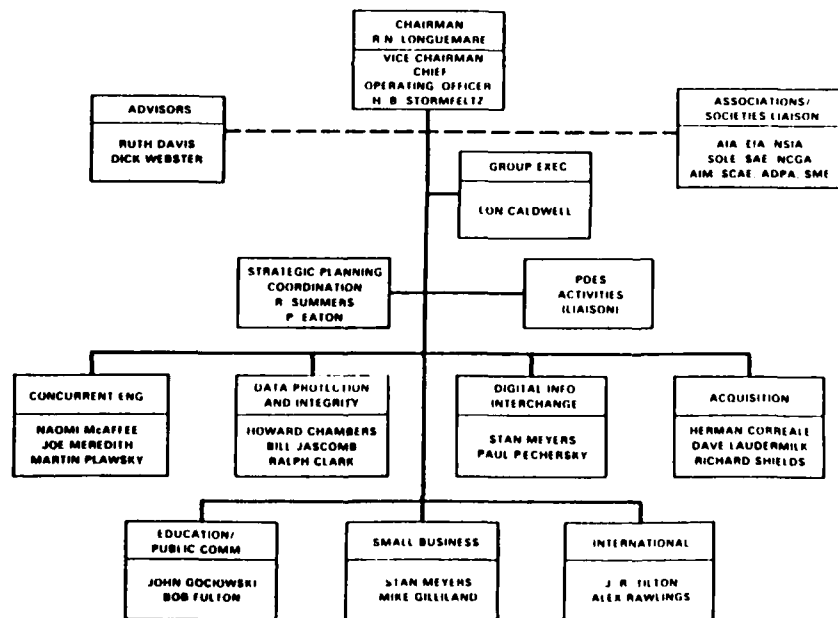
ACTIONS SINCE OCT 1988

- o CALS international discussions in Europe, Canada
- o CALS Training Module in Program Managers Course (DSMC)

NEAR TERM ACTIONS PLANNED

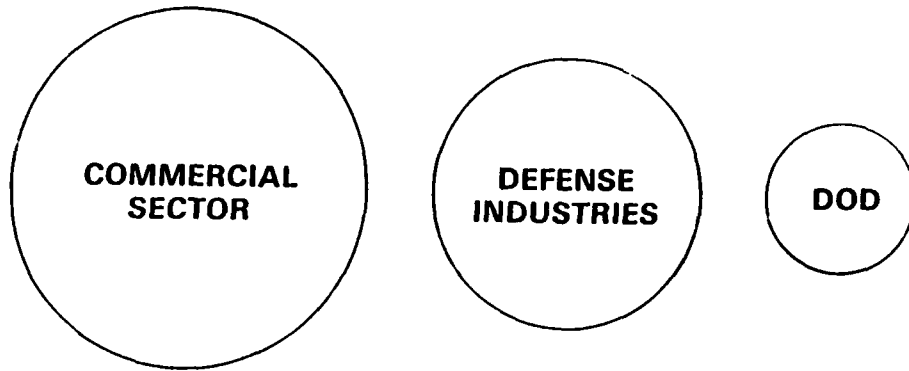
- o 3-Day course on CALS Implementation - July
- o CALS Master Plan - November
- o CALS Expo '89 - December

CALS INDUSTRY STEERING GROUP (ISG)



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CALS MARKETS



8 1009

Conclusion

Substantial Progress On All Fronts

- CALS strategy is being implemented
 - Standards
 - Technology
 - Acquisition requirements and incentives
 - DoD systems
- CALS requirements being included in RFP's
 - Retrofit opportunities will also be reviewed
- DoD/industry cooperation has been exemplary



COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALs)

Mr. Alfredo Campo

PEO STAMIS

OSD CALS PROGRAM

- **DIRECTED BY DEPSECDEF MEMO - 24 SEP 85**
- **INVOLVES ALL MILITARY SERVICES, DOD AGENCIES, AND INDUSTRY**
 - **JOINT DOD/INDUSTRY DEVELOPMENT OF STANDARDS**
- **INITIAL FOCUS ON TECHNICAL PUBLICATIONS, ENGINEERING DRAWINGS, AND LOGISTIC SUPPORT ANALYSIS (LSA) DATA**
- **DOD GOAL: BY EARLY 1990'S, ALL NEW WEAPON SYSTEMS WILL BE SUPPORTED ELECTRONICALLY, REPLACING CURRENT PAPER-BASED INFORMATION**

PM CALS

ARMY CALS PROGRAM

- **IMPLEMENT THE DOD PROGRAM**
- **EVOLVE FROM CURRENT INITIATIVES**
- **PROVIDE CAPABILITY ARMY-WIDE**
- **LEAD WEAPON SYSTEM IS LHX**

PM CALS

PEO STAMIS

BUSINESS NEED

INCREASE READINESS

INCREASE COMBAT CAPABILITY

REDUCE COSTS

CONCENTRATE ON DESIGN AND SUPPORTABILITY,

AND ESTABLISHING THE INFRASTRUCTURE

NECESSARY TO INTEGRATE DATA

PM CALS

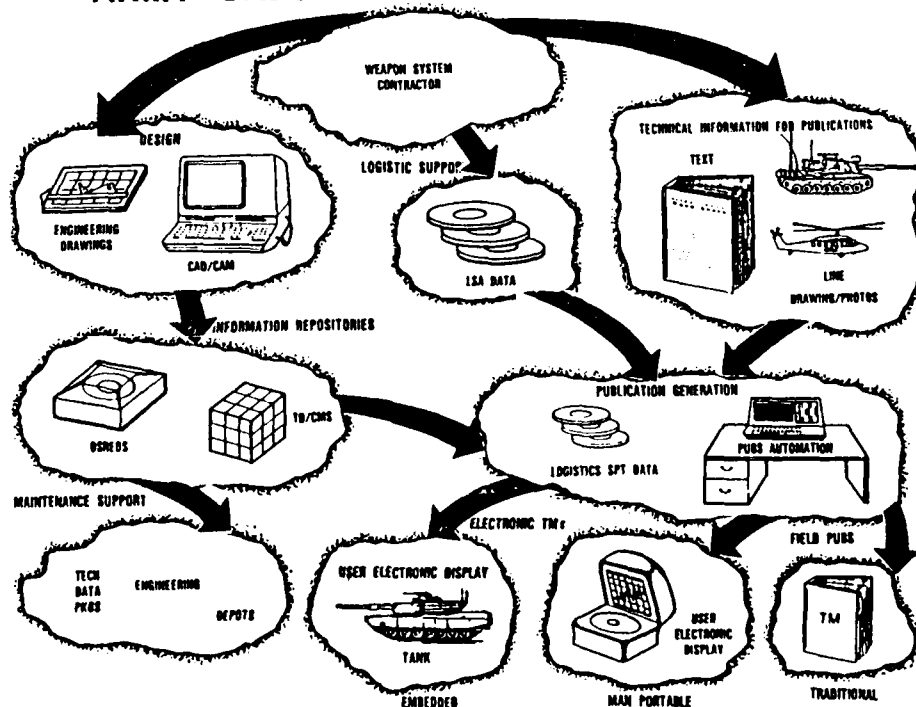
CALS BENEFITS FOR THE ARMY

- DATA INTEGRATION
 - MORE EFFECTIVE USE OF TECHNICAL LABOR
 - INCREASE IN TIME AVAILABLE FOR DOCUMENT REVIEW
 - REDUCTION IN ERROR RATE BY SOURCE DATA AUTOMATION
 - INCREASE IN DECISION-MAKING/FORECASTING ACCURACY
 - REDUCTION IN TIME TO GET INFO TO USERS
 - REDUCTION IN DATA STORAGE FACILITIES
- IMPROVED READINESS

PM CALS

PEO STAMIS

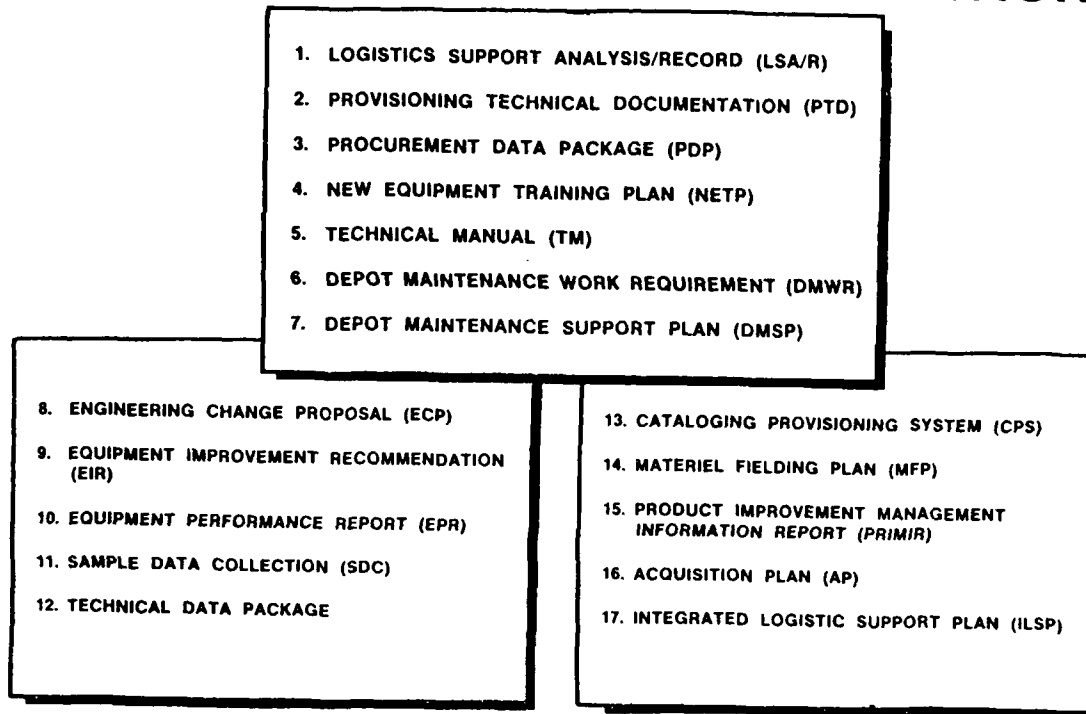
ARMY CALS CONCEPTUAL ARCHITECTURE



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RESOURCE CRITICAL INFORMATION



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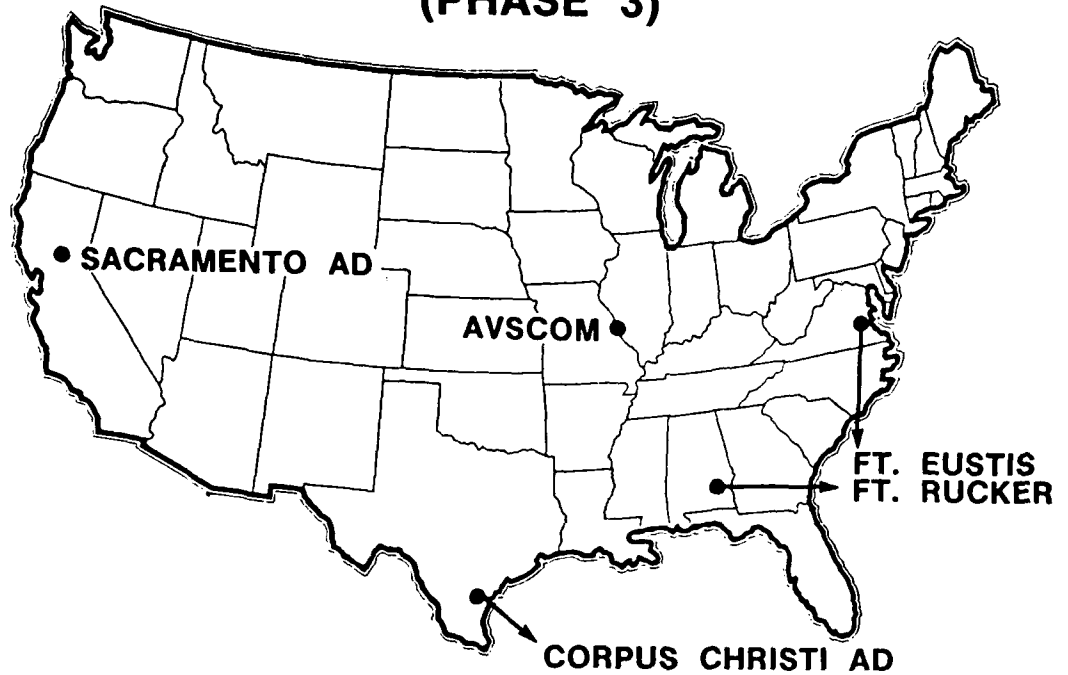
SEVEN APPLICATION AREAS FOR INITIAL IMPLEMENTATION

- LOGISTIC SUPPORT ANALYSIS/LOGISTIC SUPPORT ANALYSIS RECORD (LSA/LSAR) INCLUDING MAINTENANCE ALLOCATION CHART (MAC) & REPAIR PARTS AND SPECIAL TOOLS LIST
- PROVISIONING TECHNICAL DOCUMENTATION (TECH DATA PKGS & ENGINEERING DRAWINGS)
- DATA REQUIREMENTS DOCUMENTATION
- BASIS OF ISSUE PLAN FEEDER DATA (BOIPFD), QUALITATIVE & QUANTITATIVE PERSONNEL REQUIREMENTS INFORMATION (QQPRI), NEW EQUIPMENT TRAINING PLAN (NETP)
- TECHNICAL MANUAL SOURCE DATA (TRADITIONAL & INTERACTIVE PUBLICATIONS)
- DEPOT MAINTENANCE WORK REQUIREMENT
- DEPOT MAINTENANCE SUPPORT PLAN

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PROTOTYPE BCM SITES (PHASE 3)

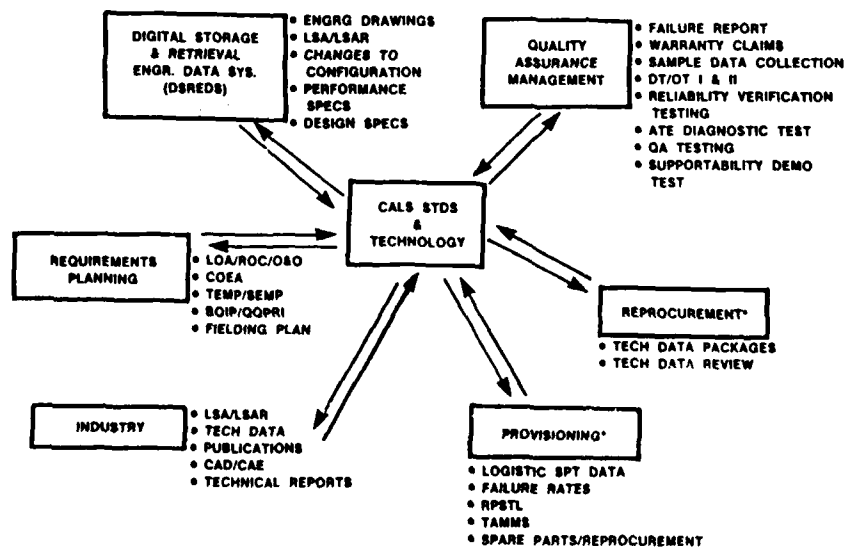


PM CALS

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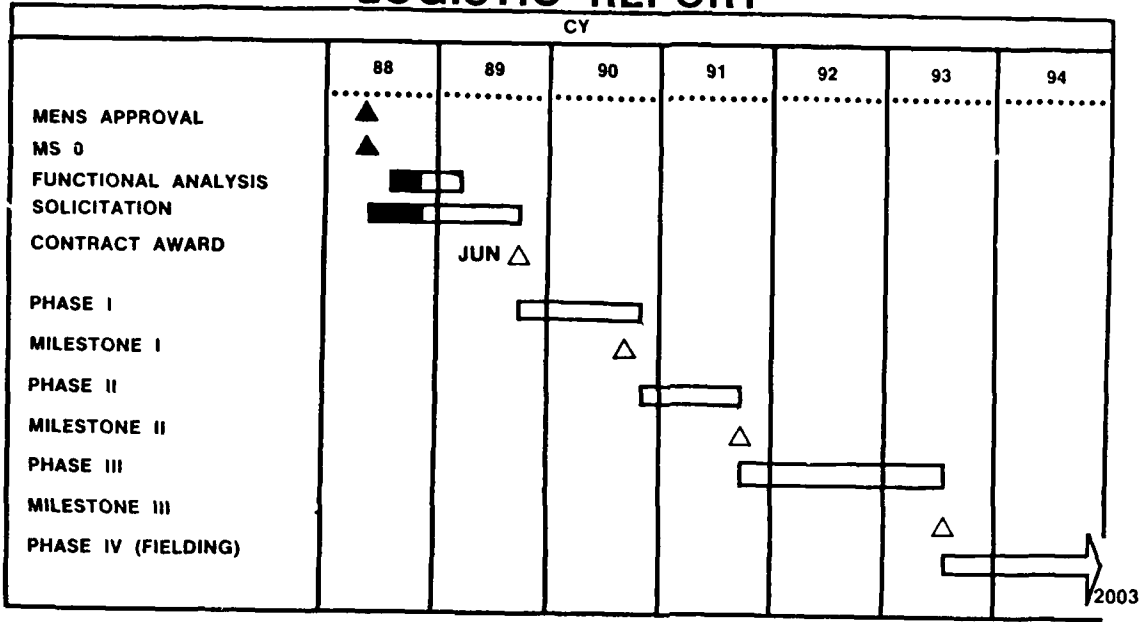
COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT WHOLESALE LEVEL INFORMATION FLOW



* HAS INTERFACE WITH CCSS

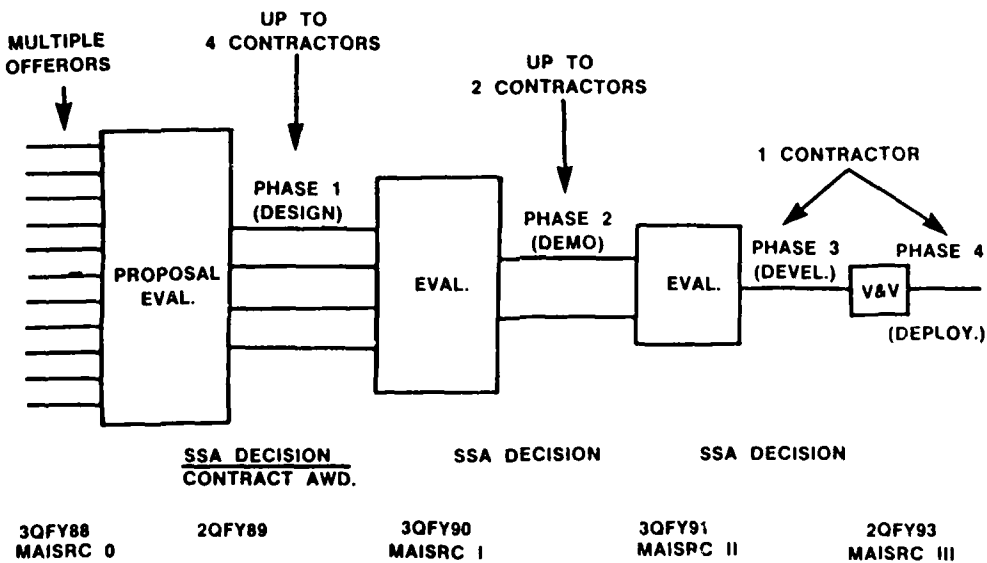
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COMPUTER-AIDED ACQUISITION AND LOGISTIC REPORT



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PROGRAM STRATEGY



PM CALS

PHASED APPROACH

MILESTONE 0 - MISSION NEED APPROVAL

PHASE 1: CONCEPT DESIGN (JUN 89 - MAR 90)

- CALS ARCHITECTURE CONTRACTS AWARD
- 2 - 4 CONTRACTORS
- DELIVERABLES
 - CONCEPT DEVELOPMENT
 - TRADE OFF ANALYSES/LCCE
 - CALS ARCHITECTURE
 - TRANSITION PLAN
- EVALUATION:
 - OVERALL SYSTEM CONCEPT AND ARCHITECTURE
 - PROJECTED COSTS FOR DEVELOPMENT AND FIELDING

PM CALS

PHASED APPROACH

MILESTONE 1 - SELECTION OF CONCEPTS FOR DEMONSTRATION

PHASE 2: DEMONSTRATION (JUL 90 - JAN 91)

- 2 CONTRACTORS
- FEATURES:
 - IWSDS SCHEMA/GLOBAL INDEX
 - INTERACTIVE LSAR
 - TECH PUBS DOWNLOAD
 - DISTRIBUTION TECHNICAL DOCUMENTATION USING MIL STD 1840A
 - ILS WORKBENCH
- DELIVERABLES:
 - OPERATIONAL DEMONSTRATION OF TECHNICAL CONCEPT
 - PROPOSALS FOR DEVELOPMENT AND FIELDING
- EVALUATION:
 - TECHNICAL CAPABILITY
 - PROJECTED COSTS & SCHEDULE

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PHASED APPROACH

MILESTONE II - SELECTION OF ONE CONCEPT FOR DEVELOPMENT

PHASE 3: CONCEPT DEVELOPMENT (JUN 91 - DEC 92)

- 1 DEVELOPMENT CONTRACTOR
- DEVELOPMENT OF BCM
- DELIVERABLES:
 - SYSTEM SOFTWARE
 - DOCUMENTATION
 - HARDWARE FOR TEST SITES
- EVALUATION:
 - SYSTEMS ACCEPTANCE TESTING OF 3 LEVELS AT 6 SITES

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PHASED APPROACH

MILESTONE III - FIELDING DECISION

PHASE 4: DEPLOYMENT (APR 93 - SEP 03)

- DEVELOPMENT CONTRACTOR
- IMPLEMENTATION/FIELDING TO REMAINING 51 BCM SITES
- DELIVERABLES:
 - HARDWARE/SOFTWARE
 - SYSTEM INTEGRATION/INSTALLATION
 - TRAINING
 - SYSTEM MANAGEMENT

PM CALS



Computer Aided Logistics & Acquisition Support

Mr. Oscar Goldfarb

Technical

- Engineering drawings/descriptive data
 - Describes weapon system
 - Part procurement
- Technical orders
 - Describes how weapon system is used and must be maintained
 - Maintenance manuals
- Logistics support analysis
 - Describes weapon system in logistics terms so that support can be acquired
 - Training
 - Failure analysis
 - Parts
 - Skill levels of maintenance personnel

Flying Regulations

- Pilots should carry hankies in a handy position to wipe off goggles
- Do not trust altitude instruments
- Motors have been known to stop during a long slide, if pilot wishes to use motor for landing he should open throttle
- Do not use aeronautical gas in cars and motorcycles
- It is advisable to carry a good pair of pliers in a position where both pilot and passenger can reach them in case of an accident
- Joy rides will not be given to civilians

Engineering Data Repositories Hold 40,000,000 Drawings

- Manage 240,000 different technical orders
 - 20,000,000 pages
 - 40% graphics - 60% text

- Tech data growing

<u>Year Fielded</u>	<u>Aircraft</u>	<u>Pages of T.O.s</u>
1958	F-4	500,000
1967	FB-111	624,000
1974	F-16	660,000
1984	B-1B	1,000,000
	Next	1,500,000

- Data is volatile
 - 2,000,000 pages change annually

Efforts Underway to Automate Technical Orders

- **First generation automated technical order system**
 - **T.O. page update capability exists at each Air Logistics Center**
 - **Building "electronic" data base**
 - **Automated paper format**

Improved Technical Data System

Second Generation

- **Developed by Northrop for Black Program**
- **First integrated T.O. system**
 - **Could move away from paper format**
 - **Automated links for related information**

(ITDS)

Improved Technical Data System

- A "paperless" system for the authoring and use of technical orders
- Comprised of a producer system and a user system
 - Producer system currently supports authoring and delivering technical data to current CALS standards
 - User system is being developed to provide electronic delivery to the technician for weapon system support at all levels
- Interfaces with the Logistics Support Management Information (LSMIS) and engineering databases to provide an integrated technical data development/delivery environment
- 30% savings in technical data development

Integrated Maintenance Information System

Third Generation

- R&D program to establish knowledge based system
 - Link T.O., diagnostics and maintenance info systems
 - Interactive diagnostics
 - Portable flight line terminals
- 25% improvement in diagnostics during flight line demo program

Categorization of T.O.s

Developer & End User Perspective

- Unintelligent
 - Raster storage
 - Page format
- Semi-Intelligent
 - Electronic generation & storage
 - Page format
- Intelligent
 - Relational data structure
 - Interactive use

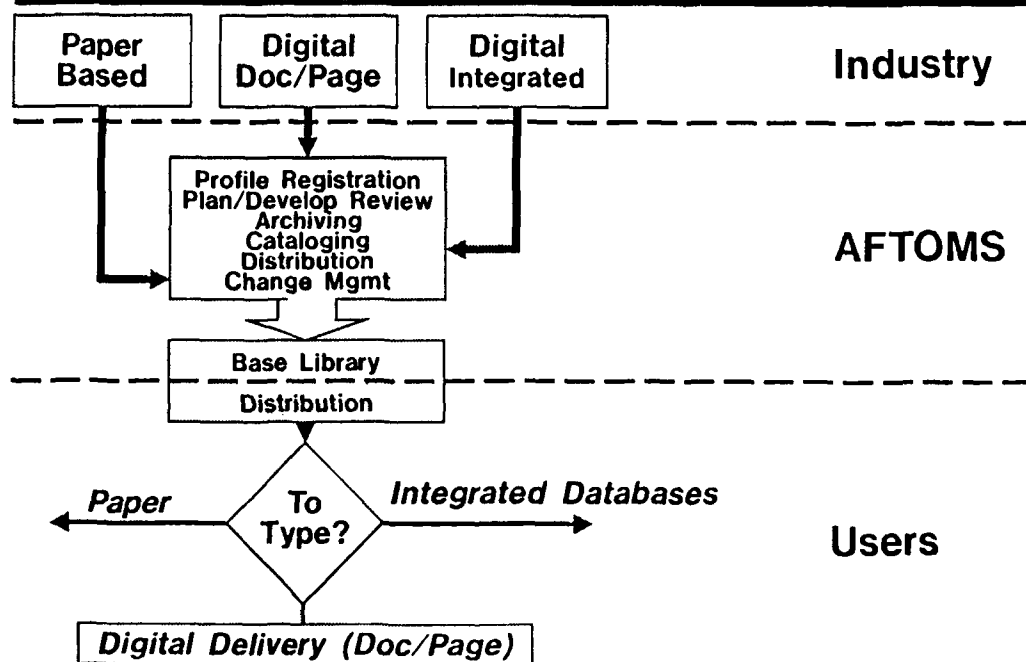
Infrastructure Perspective

- Type A
 - Page format paper
- Type B
 - Page format-digital delivery
 - Page turner usage (paper or display)
- Type C
 - Screen oriented
 - Digital delivery
 - Electronic display



AFLC designated implementing command
 Directs modernization of Air Force I.O. system
 Single organization with cradle to
 grave responsibility
 Automated acquisition, storage, distribution,
 and management
 One system for paper and digital I.O.s
 Distribution of I.O.s to base level

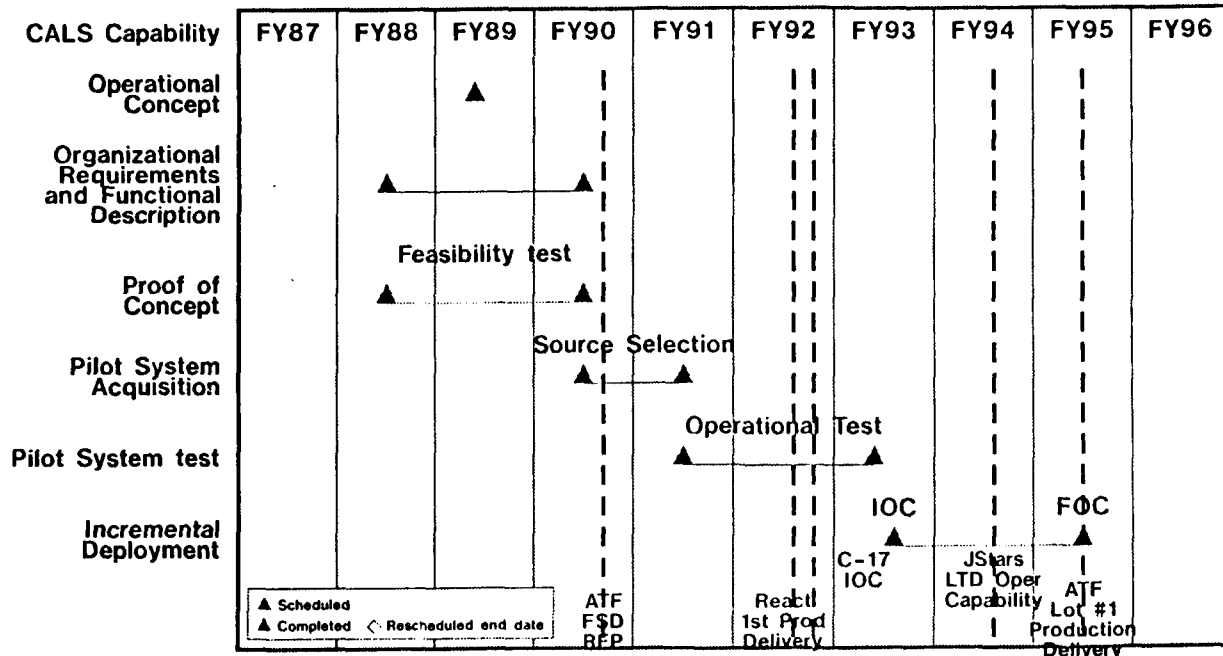
Technical Order Functional Concept



Air Force Technical Order Management System

Title: AFTOMS Implementation

As of: Dec 88



Concept Integration

- ATOS automates the paper change process
- AFTOMS manages the overall T.O. requirement
- IMIS provides R&D for data base integration
- ITDS and follow-on programs implement IMIS technology at base level

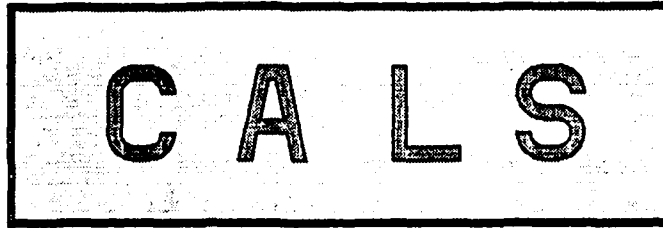
Automating Technical Orders

- Moving from paper to automated T.O. will be major cultural shift
- Readiness issues must be addressed
- Need contract specification now for weapon systems under development to capture "intelligent" data
 - User systems not yet defined/programmed
 - Specifications under development

Benefits of Technical Order Automation

- Cost
 - Reduce development cost - \$135 Million per year
 - Reduce change cost - \$100 Million per year
 - Reduce life cycle cost - \$583 Million per major weapon system
- Timeliness
 - Reduce change cycle by 115 days
 - Reduce acquisition time
- Mission effectiveness
 - Increase usefulness of T.O. information
 - Better fault detection
 - Better fault isolation
 - Reduce weight and volume of T.O.
 - 1500 lbs on C-17

Computer Aided Acquisition and Logistics Support



Industry

Steering

Group

Mr. Harold Stormfeltz

8802-33 (1)

EVENTS

SEPTEMBER 1985 - CALS POLICY INITIATED

SPRING 1986 - ORGANIZED (DOD & INDUSTRY)

AUGUST 1988 - CALS IMPLEMENTATION POLICY

DECEMBER 1988 - JANUARY 1989 - STANDARDS & MIL-HDBK-59 RELEASED

**CALS POLICY INITIATIVE
(DEPSECDEF MEMORANDUM)
(SEPTEMBER 1985)**

OBJECTIVES

- ACCELERATE INTEGRATION OF R&M DESIGN TOOLS INTO CONTRACTOR CAD/CAE SYSTEMS
- AUTOMATE CONTRACTOR PROCESSES FOR GENERATING LOGISTIC TECHNICAL INFORMATION
- RAPIDLY INCREASE DOD CAPABILITY TO RECEIVE, DISTRIBUTE AND USE TECHNICAL INFORMATION IN DIGITAL FORM
 - BY 1990, NEW MAJOR WEAPON SYSTEMS WILL ACQUIRE TECHNICAL INFORMATION IN DIGITAL FORM

**CALS IMPLEMENTATION POLICY
(DEPSECDEF MEMO, 5 AUG 1988)**

WEAPON SYSTEM CONTRACTS AFTER SEP 88

- NEW DEVELOPMENTS -- OBTAIN PROPOSALS FOR:
 - INTEGRATION OF CONTRACTOR DATA SYSTEMS
 - DOD ACCESS TO CONTRACTOR DATA BASES
 - CONTRACT DELIVERABLES IN DIGITAL FORM
- REVIEW EXISTING CONTRACTS FOR RETROFIT OPPORTUNITIES
- "EACH APPLICATION DECISION SHALL BE MADE ON ITS OWN MERITS WITH RESPECT TO THE PRODUCTIVITY AND QUALITY IMPROVEMENTS EXPECTED AT EITHER PRIME CONTRACTOR OR SUBCONTRACTOR LEVEL"

"COMPUTER AIDED"

PRODUCT
DEFINITION

ACQUISITION

PRODUCT
DELIVEREY

AND

LOGISTICS SUPPORT

8802 33 (33)

DEPARTMENT OF DEFENSE
COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CAL)S
PROGRAM IMPLEMENTATION GUIDE
MIL-HDBK-59

THE HANDBOOK PROVIDES INFORMATION AND GUIDANCE TO PERSONNEL RESPONSIBLE FOR THE ACQUISITION AND USE OF WEAPON SYSTEM TECHNICAL DATA. ITS PURPOSE IS TO ASSIST IN THE TRANSITION FROM PAPER-INTENSIVE PROCESSES TO DIGITAL DATA DELIVERY AND ACCESS. IT ALSO SUPPORTS THE STRUCTURING OF CONTRACT REQUIREMENTS TO ACHIEVE INTEGRATION OF VARIOUS CONTRACTOR AUTOMATED CAPABILITIES FOR DESIGN, MANUFACTURING, AND LOGISTIC SUPPORT.

(REF. MIL-HDBK-59)

CALS

PURPOSE

IMPROVE INDUSTRY AND DOD PRODUCTIVITY AND QUALITY
AND THUS IMPROVE SUPPORTABILITY, MILITARY READINESS
AND COMBAT EFFECTIVENESS.

(REF. MIL-HDBK-59)

8802-33 (31)

CALS

OBJECTIVES

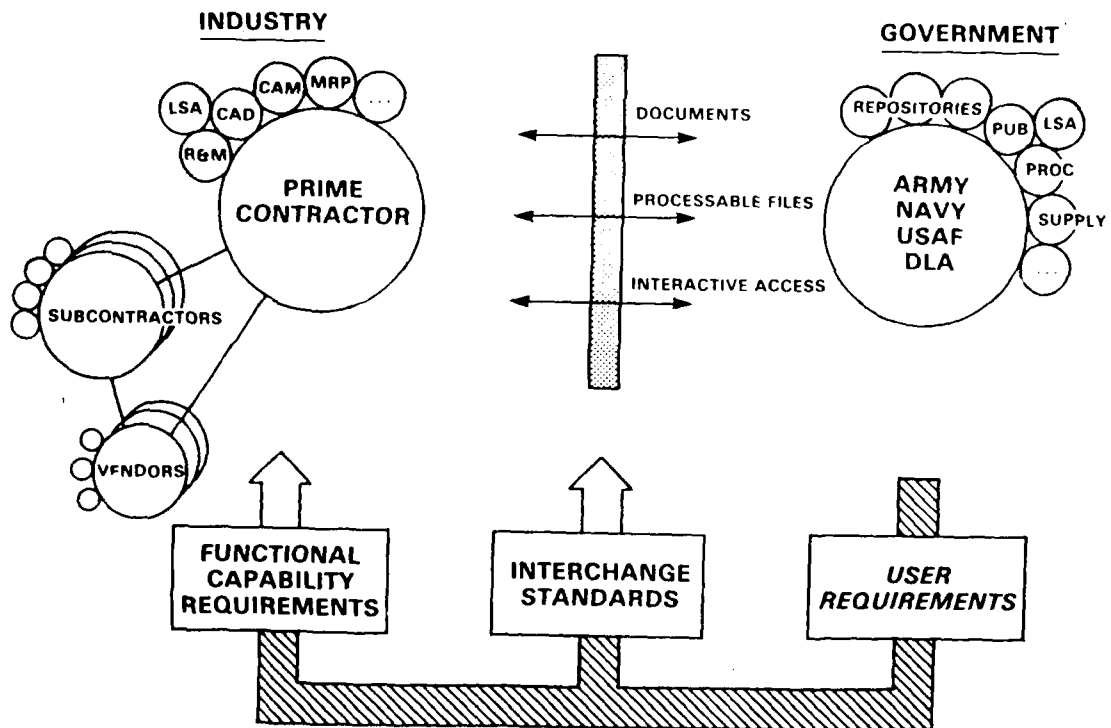
TO ACCELERATE THE INTEGRATION OF DESIGN TOOLS SUCH AS THOSE FOR RELIABILITY AND MAINTAINABILITY INTO CONTRACTOR COMPUTER-AIDED DESIGN AND ENGINEERING SYSTEMS AS PART OF A SYSTEMATIC APPROACH THAT SIMULTANEOUSLY ADDRESSES THE PRODUCT AND ITS LIFE CYCLE MANUFACTURING AND SUPPORT REQUIREMENTS.

TO ENCOURAGE AND ACCELERATE THE AUTOMATION AND INTEGRATION OF CONTRACTOR PROCESSES FOR GENERATING WEAPON SYSTEM TECHNICAL DATA IN DIGITAL FORM.

TO RAPIDLY INCREASE DOD'S CAPABILITIES TO RECEIVE, STORE, DISTRIBUTE, AND USE WEAPON SYSTEM TECHNICAL DATA IN DIGITAL FORM TO IMPROVE LIFE CYCLE MAINTENANCE, TRAINING, AND SPARE PARTS REPROCUREMENT, AND OTHER SUPPORT PROCESSES.

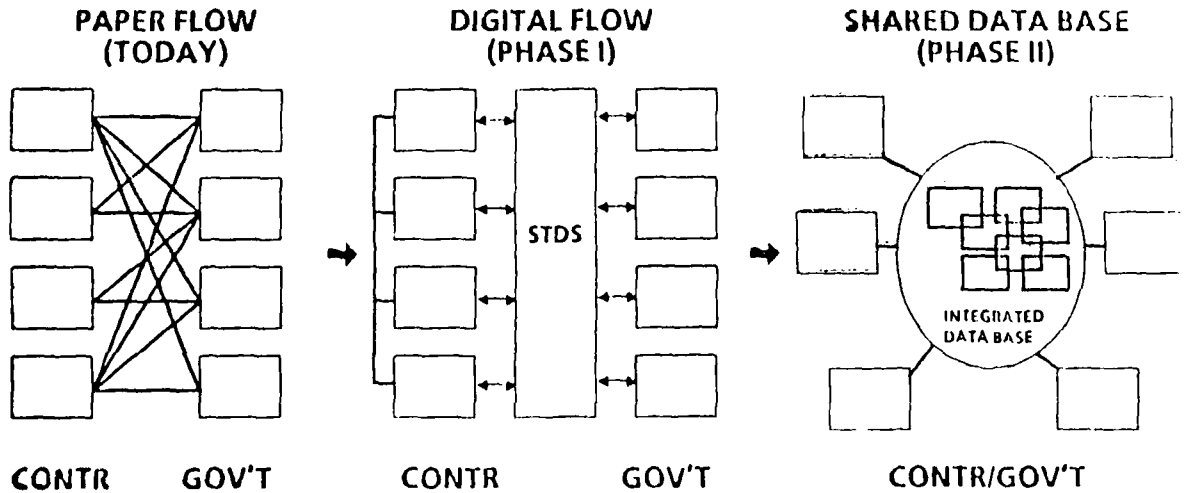
(REF. MIL-HDBK-59)

DIGITAL INFORMATION EXCHANGE



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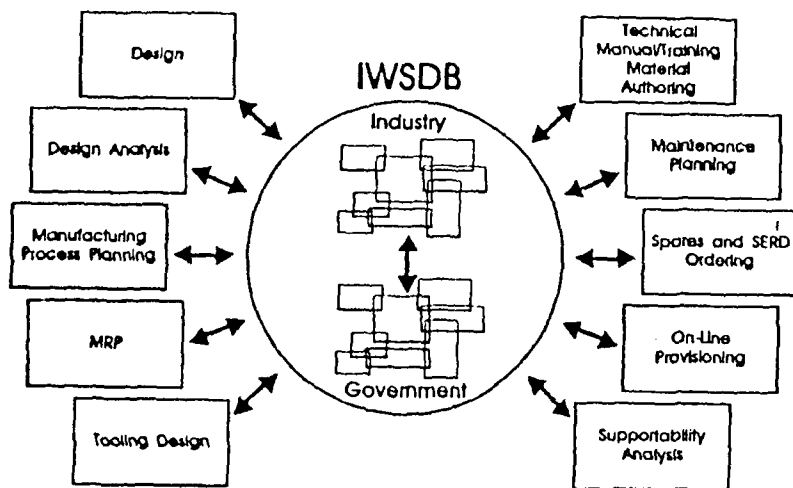
CALS EVOLUTION



- INTEGRATION PROGRAM
- TRANSITION TO "NEAR PAPERLESS" DESIGN, MANUFACTURING, SUPPORT
- GAIN BENEFITS OF A HIGHLY AUTOMATED AND INTEGRATED SYSTEM

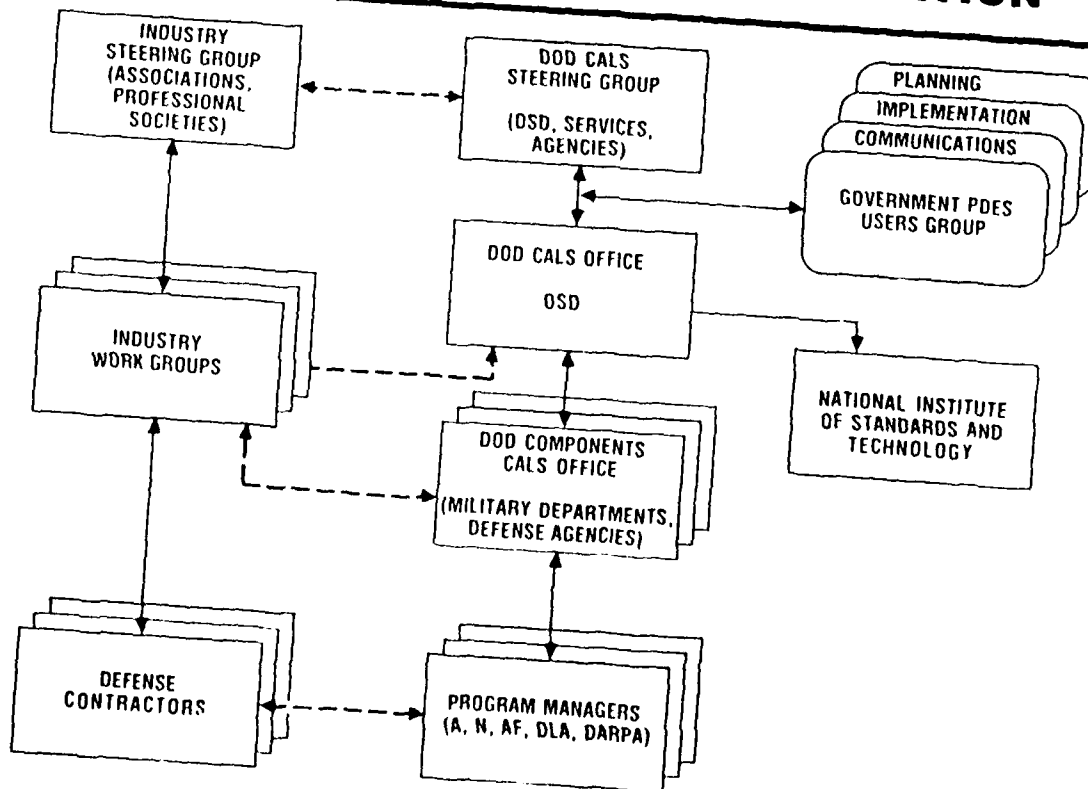
Phase II Integration Target

Integrated Weapon System Data Base (IWSDB)

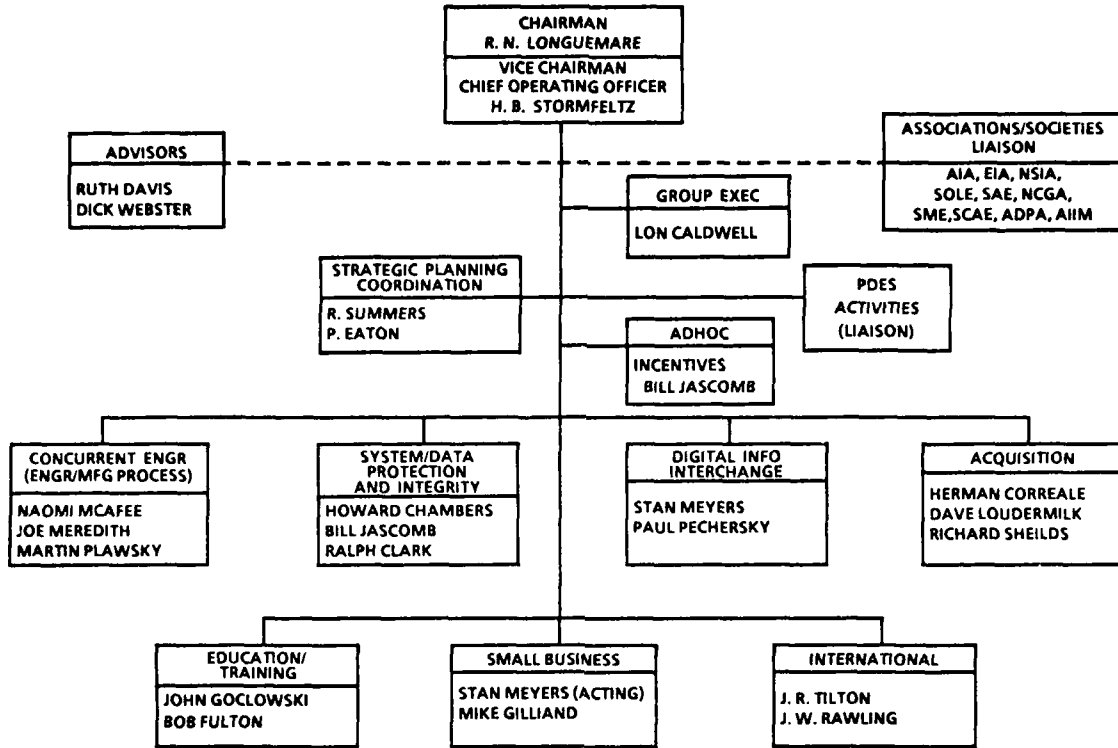


Standard interface through data dictionary

CALS MANAGEMENT ORGANIZATION

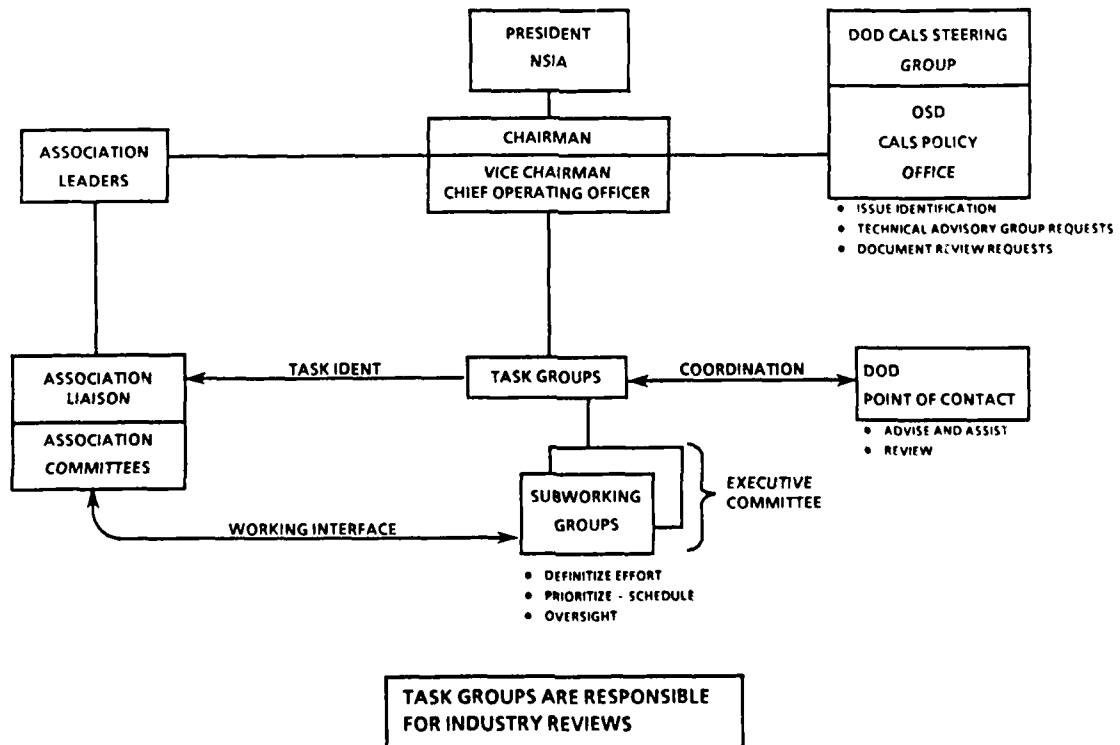


CAL S INDUSTRY STEERING GROUP (ISG)



8802-33 (2)

OPERATIONS



(ISG) ACCOMPLISHMENTS

- ASSISTED DOD IN THE REVIEW OF CORE I STANDARDS. (MIL-STD-1840, MIL-M-28000 SERIES ETC.)
- PROVIDED INPUTS TO "MILITARY HANDBOOK - PROGRAM IMPLEMENTATION GUIDE."
(MIL-HDBK-59, 20 DEC 88)
- PROVIDED RECOMMENDATIONS TO OSD CALS POLICY OFFICE AND DOD CALS STEERING GROUP.
- PROMOTED CALS STRATEGY THROUGHOUT INDUSTRY.

(ISG) INDUSTRY EFFORT: 75 MAN YEARS (1987)

450 ACTIVE PARTICIPANTS (1988)

PRIMARY CONCERNS

- EDUCATION OF BOTH INDUSTRY AND DOD
- BUSINESS ELEMENTS ARE LAGGING IMPLEMENTATION PLANS
- DOCUMENTATION DEVELOPMENT; DID'S - SPECIFICATIONS ETC,
MUST BE ACCELERATED
- SYSTEMS/DATA PROTECTION POLICY IS REQUIRED ALONG WITH
THE PROPER MECHANISM FOR REQUIRING PROGRAMS TO HAVE
A PROTECTION PLAN
- CONCURRENT ENGINEERING MUST BE INTEGRATED UNDER THE
CALS STRATEGY
- RESOLVE DIFFERENCES BETWEEN DOD AND MILITARY SERVICE
STANDARDS AND POSSIBILITY OF MILITARY SERVICES USING
DIFFERENT STANDARDS
- APPARENT MULTIPLE DATA DICTIONARY ACTIVITIES

SUMMARY

DOD/INDUSTRY CHALLENGE

CALS STRATEGIES WILL APPLY TO 15-20 PERCENT OF THE WEAPON SYSTEMS BY THE YEAR 2000 ----

WHAT ABOUT THE EXISTING SYSTEMS THAT WILL STILL BE IN SERVICE (80-85 PERCENT)?

MIGRATE CALS STRATEGIES INTO SUPPORTING EXISTING SYSTEMS TO REDUCE O&S COSTS.

SUMMARY

- INDUSTRY COMMITTED TO ACHIEVING PRODUCTIVITY/QUALITY GAINS THROUGH AUTOMATION
- INDUSTRY IMPLEMENTING SYSTEMS TO SATISFY CALS STRATEGY (77% OF 1987 SURVEY RESPONDEES HAVE DIGITAL INTERFACES ESTABLISHED)
- CONCERTED PLANNING AND INVESTMENT BY BOTH INDUSTRY AND DOD REQUIRED TO MEET GOALS
- INDUSTRY AND DOD MUST ACCELERATE IN-HOUSE TRAINING/ INDOCTRINATION PROGRAMS TO MEET 1990 AND TAFT'S IMPLEMENTATION LETTER
- TEST NETWORK ACTIVITIES UNDERWAY. NEED INDUSTRY SUPPORT

INDUSTRY STEERING GROUP NEEDS YOUR PARTICIPATION

CONCURRENT ENGINEERING

Col. Larry D. Griffin

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CONCURRENT ENGINEERING

OVERVIEW

- **DEFINITION**
- **BACKGROUND**
- **STUDIES SUMMARY**
- **CURRENT ACTIVITIES**
- **SUMMARY**

CONCURRENT ENGINEERING

DEFINITION

AN INTEGRATED PROCESS WITHIN WHICH THE PRODUCT AND THE MANUFACTURING AND SUPPORT PROCESSES ARE ENGINEERED TOGETHER WITH EMPHASIS ON EFFICIENCY, INCREASED QUALITY AND REDUCED COST.

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CONCURRENT ENGINEERING

WHY DoD IS INTERESTED

CASE STUDY	COST	SCHEDULE	QUALITY
MCDONNELL DOUGLAS	60% ON SAVINGS ON BID FOR REACTOR AND MISSILE PROJECTS	SIGNIFICANT SAVINGS (REDUCTION FROM 45 WEEKS TO 8 HOURS) IN ONE PHASE OF HIGH SPEED VEHICLE PRELIMINARY DESIGN. 18 MONTH SAVING ON TAV 8B DESIGN	SCRAP REDUCED 58%, REWORK COST REDUCED 29%, AND NCN CONFORMANCES REDUCED 38%. WELD DEFECTS PER UNIT DECREASED 70% 68% FEWER CHANGES ON REACTOR 68% FEWER DRAWING CHANGES ON TAV 8B
BOEING BALLISTIC SYSTEMS DIVISION	REDUCED LABOR RATES BY \$28/HOUR. COST SAVINGS 30% 40%	PART AND MATERIALS LEAD TIME REDUCED BY 30%. ONE PART OF DESIGN ANALYSIS REDUCED BY OVER 90%	FLOOR INSPECTION RATIO DECREASED BY OVER 2/3. MATERIAL SHORTAGES REDUCED FROM 12% TO 0. 99% DEFECT FREE OPERATION
AT&T	COST OF REPAIR FOR NEW CIRCUIT PACK PRODUCTION CUT AT LEAST 40%	TOTAL PROCESS TIME REDUCED TO 46% OF BASELINE FOR 5ESS 1M	DEFECTS REDUCED BY 30% TO 87%
DEERE & COMPANY	30% ACTUAL SAVINGS IN DEVELOPMENT COST FOR CONSTRUCTION EQUIPMENT	60% SAVINGS IN DEVELOPMENT TIME	NUMBER OF INSPECTORS REDUCED BY 2/3
HEWLETT PACKARD CO. INSTRUMENT DIVISION	MANUFACTURING COSTS REDUCED 42%	REDUCED DEVELOPMENT CYCLE TIME 35%	PRODUCT FIELD FAILURE RATE REDUCED 60%. SCRAP AND REWORK REDUCED 75%
IBM	PRODUCT DIRECT ASSEMBLY LABOR HOURS REDUCED 45%	SIGNIFICANT REDUCTION IN LENGTH OF PMT DESIGN CYCLE 40% REDUCTION IN ELECTRONIC DESIGN CYCLE	FEWER ENGINEERING CHANGES GUARANTEED PRODUCTIBILITY AND TESTABILITY
NORTHROP	30% SAVINGS ON BID ON A MAJOR PROJECT	PART AND ASSEMBLY SCHEDULE REDUCED BY 50% ON TWO MAJOR SUBASSEMBLIES. SPAN TIME REDUCED BY 60%	NUMBER OF ENGINEERING CHANGES REDUCED BY 45%. DEFECTS REDUCED BY 35%

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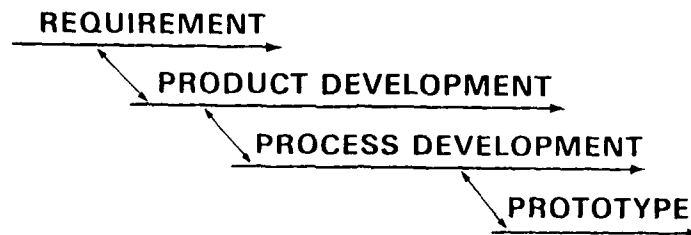
CONCURRENT ENGINEERING

CONCEPTUAL FRAMEWORK

SEQUENTIAL ENGINEERING



CONCURRENT ENGINEERING

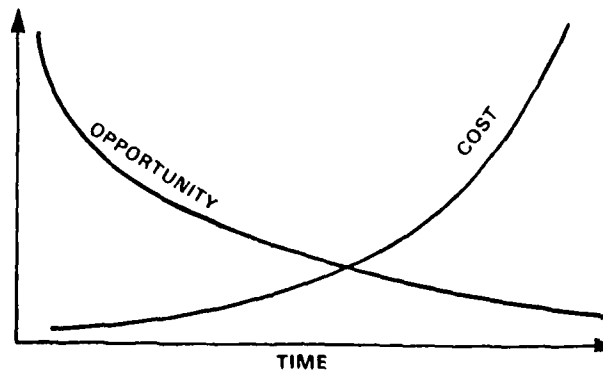
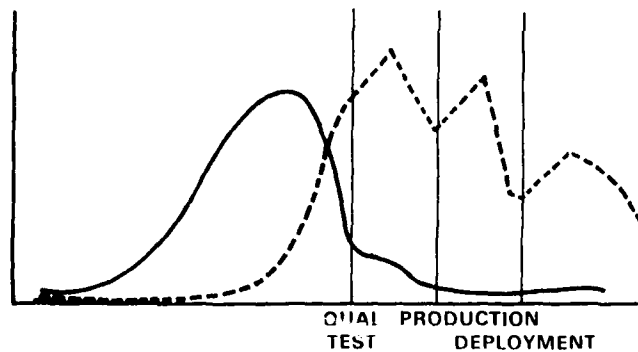


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CONCURRENT ENGINEERING

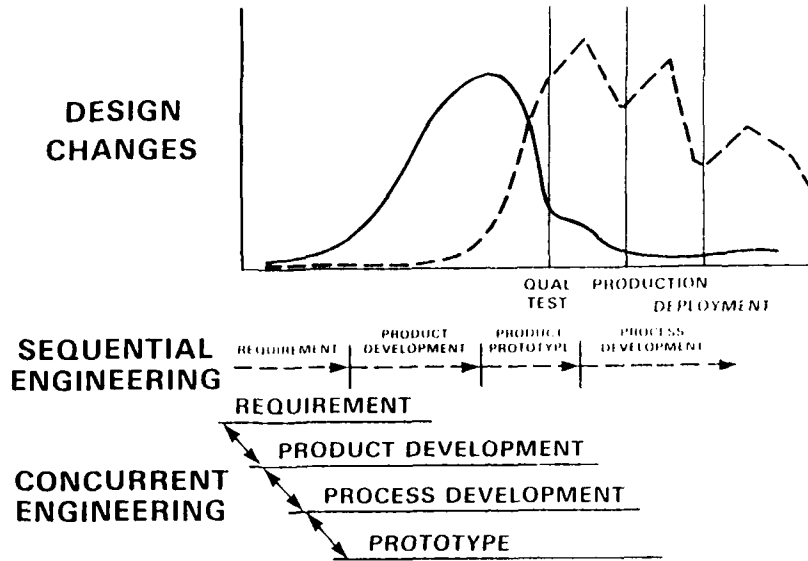
CONCEPTUAL FRAMEWORK

DESIGN CHANGES



CONCURRENT ENGINEERING

CONCEPTUAL FRAMEWORK



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CONCURRENT ENGINEERING

CONCEPTUAL FRAMEWORK

	WHAT ←	→ HOW
	<ul style="list-style-type: none"> ● REDUCED DESIGN CYCLE TIME ● REDUCED DESIGN CYCLES 	<ul style="list-style-type: none"> ● ROBUST PRODUCT & PROCESSES ● EARLY VERIFICATION OF CRITICAL PRODUCT & PROCESSES CHARACTERISTICS
<ul style="list-style-type: none"> ● REDUCED COST ● INCREASED QUALITY 	<ul style="list-style-type: none"> ● EARLY DESIGN CHANGES ● REDUCED DESIGN CHANGES 	<ul style="list-style-type: none"> ● RAPID PROTOTYPING ● EARLY INTEGRATION VERIFICATION
<ul style="list-style-type: none"> ● REDUCED DEVELOPMENT TIME 	<ul style="list-style-type: none"> ● HIGH MANUFACTURING YIELDS ● REDUCED INSPECTION REQUIREMENTS ● STREAMLINED DEVELOPMENT PROCESS ● REDUCED QUALIFICATION TESTING 	<ul style="list-style-type: none"> ● GOOD UNDERSTANDING OF CUSTOMER REQUIREMENTS ● JOINT OPTIMIZATION OF CRITICAL PRODUCT & PROCESS CHARACTERISTICS ● EARLY IDENTIFICATION & RESOLUTION OF BOTTLENECKS ● PROBLEM PREVENTION TESTING STRATEGY

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CONCURRENT ENGINEERING

CONCEPTUAL FRAMEWORK

- TOTAL SYSTEM ENGINEERING - FRAMEWORK FOR SYSTEM INTEGRATION AND OPTIMIZATION
- STREAMLINED DEVELOPMENT PROCESSES - REDUCE NON-VALUE ADDED WORK
- MULTIDISCIPLINE TEAMS - INTEGRATED PRODUCT AND PROCESS ENGINEERING
- QUALITY ENGINEERING METHODS - EFFICIENT PRODUCT AND PROCESS OPTIMIZATION
- CAD/CAE/CAM - MANAGEMENT OF CHANGE, RAPID TRANSFER OF BENEFITS, REDUCTION OF ERRORS, EFFICIENT DATA COLLECTION AND ANALYSIS, EFFECTIVE INTEGRATION

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CONCURRENT ENGINEERING

RELATIONSHIP TO CALS

- CALS R&M — ADDRESSES CAE FUNCTIONAL R&M DESIGN DECISION SUPPORT TO FACILITATE CONCURRENT ENGINEERING
- CALS STANDARDS — ADDRESSES THE SHARING OF DATA TO FACILITATE CONCURRENT ENGINEERING IN THE AREAS OF REQUIREMENTS, DEVELOPMENT, ENGINEERING, MANUFACTURING, AND SYSTEM SUPPORT
- CALS DOD INFRASTRUCTURE — ADDRESSES THE RECEIPT, STORAGE, AND DISTRIBUTION OF DATA FOR BOTH GOV'T INTERACTION IN CONCURRENT ENGINEERING AND INDUSTRY ACCESS TO SERVICE DATA ON FIELDED SYSTEMS.
- CALS ACQUISITION GUIDANCE — ADDRESSES THE NEED FOR CONTRACT REQUIREMENTS AND INCENTIVE MECHANISMS TO FACILITATE INDUSTRY INVESTMENTS IN AUTOMATION AND INTEGRATION

CONCURRENT ENGINEERING

BACKGROUND

- USD(A) MEMORANDUM — APRIL 1988
- INSTITUTE FOR DEFENSE ANALYSIS TASK FORCE OSD/SERVICES/INDUSTRY
70+ ORGANIZATIONS
- PYMATUNING GROUP INDUSTRY EXECUTIVES
20+ COMPANIES
- CALS TASK FORCE ON DESIGN INTEGRATION TECHNICAL—DOD/INDUSTRY
40+ COMPANIES

CONCURRENT ENGINEERING

DOD/INDUSTRY CONCURRENT ENGINEERING TASK FORCE

ELECTRONICS

IBM
TI
HONEYWELL
LITTON
GE
ITT
WESTINGHOUSE
AT&T
TRW
MCC
HUGHES

LAND VEHICLES

GD
JOHN DEERE
FORD

AIRFRAME

LOCKHEED
BOEING
GD
GRUMMAN
BELL
NORTHROP
McDONNELL DOUGLAS
HUGHES
AEROSPACE

MUNITIONS

AEROJET

ENGINE

GE
P&W
GARRETT

COLLEGES

HARVARD
MIT
CARNEGIE MELLON
PRINCETON
RPI
UNIV OF MARYLAND
UNIV OF WISCONSIN
UNIV OF IOWA
UNIV OF RHODE ISLAND

SHIPS

NEWPORT NEWS

CONCURRENT ENGINEERING

PYMATUNING GROUP EXECUTIVE TASK FORCE

AIRCRAFT

BOEING
GENERAL DYNAMICS
GRUMMAN
LOCKHEED
MCDONNELL DOUGLAS
NORTHROP

ELECTRONICS

HUGHES AIRCRAFT
HUGHES RADAR
IBM FEDERAL SYSTEMS
IBM COMPUTERS
ITT
WESTINGHOUSE ELECTRONIC SYSTEMS
WESTINGHOUSE DEFENSE RADAR

OTHER

AEROJET
BATTELLE
DRAPER LABS
IDA
IITRI
SAIC
SRI

CONCURRENT ENGINEERING

CALS TASK FORCE ON DESIGN INTEGRATION ELECTRONICS

PRIME CONTRACTORS

MCDONNELL AIRCRAFT
RAYTHEON
BOEING AEROSPACE
MARTIN MARIETTA
LOCKHEED-GEORGIA
NORTHROP
GENERAL DYNAMICS
ROCKWELL INTERNATIONAL
HONEYWELL
TRW

ELECTRONICS CONTRACTORS

LOCKHEED-ELECTRONICS
HARRIS
TEXAS INSTRUMENTS
ROCKWELL COLLINS
WESTINGHOUSE
LITTON AMECOM
GOULD
SANDERS
UNISYS
IBM
AT&T

CONSULTANTS & UNIVERSITIES

VIRGINIA TECH
UNIV OF MARYLAND
SIEGFRIED ENT
SIGMA PLUS
MCC
DACOM
PCA
GIORDANO
VEDA

GOVERNMENT

OASD
NOSC
USAF
AFHRL

CONCURRENT ENGINEERING

CALS TASK FORCE ON DESIGN INTEGRATION MECHANICAL SYSTEMS

CONTRACTORS

ALLIED-SIGNAL AEROSPACE
ALLISON GAS TURBINE DIV. G.M.
AUTOMATED IMAGES
AVONDALE SHIPBUILDING
BMY CORPORATION
BATH IRON WORKS
BELL HELICOPTER TEXTRON
CADILLAC GAGE TEXTRON
CONTROL DATA CORPORATION
FMC GROUND SYSTEMS
GE AIRCRAFT ENGINES
GD LAND SYSTEMS, FT. WORTH
GRUMMAN AIRCRAFT SYSTEMS
IBM
LOCKHEED AERO SYSTEMS
MCDONNELL AIRCRAFT, HELICOPTER
NEWPORT NEWS SHIPBUILDING
PRATT & WHITNEY
ROCKWELL INTERNATIONAL
SARGENT CONTROLS
SIKORSKY AIRCRAFT
SPERRY MARINE, INC.
WESTINGHOUSE ELECTRONICS
YORK INTERNATIONAL

CONSULTANTS UNIVERSITIES

ADVANCED TECHNOLOGY
D. APPLETON COMPANY
INTERGRAPH
MANAGEMENT SCIENCES
PROSPECTIVE COMPUTER ANALYSTS
SIGMA PLUS
STRUCTURAL DYNAMICS RESEARCH CORP.
W. G. BEAZLEY ASSOCIATION
UNIVERSITY OF IOWA
UNIVERSITY OF NEW MEXICO

GOVERNMENT

AF HUMAN RESOURCES LAB
ARMY ARMEMENT R&D CENTER
DOD PROD. ENG. SERVICES OFFICE
NAVSEA
NAVAL AVIATION DEPOT
OASD (P&L) CALS
US ARMY MAN ENG. COLLEGE

CONCURRENT ENGINEERING

STUDIES SUMMARY

- **INSTITUTE FOR DEFENSE ANALYSIS TASK FORCE**
 - CASE STUDIES
 - METHODS
 - CAE/CAD/CAM
 - QUALITY ENGINEERING
 - MANAGEMENT
 - MULTIDISCIPLINE TEAMS
 - SOURCES OF TRAINING
 - R&D FRAMEWORK
 - ACQUISITION AND TECHNOLOGY APPROACH
- **PYMATUNING TASK FORCE**
 - "INHIBITORS"
 - STRATEGY
- **NSIA-CALS INDUSTRY TASK FORCE**
 - CAE/CAD/CAM METHODS FOR R&M INTEGRATION
 - STRATEGY

CONCURRENT ENGINEERING

● STRATEGY

- IMPLEMENT THROUGH ACQUISITION PROCESS
"PROCESS EMPHASIS"
- DOD LEAD THROUGH EXAMPLE
- INCREASED TECHNOLOGY FOCUS ON TOTAL PROCESS IMPROVEMENT
- INDUSTRY RESPOND WITH INNOVATION IN PROCESSES

● CONSIDERATIONS

- INDUSTRY WILL ADOPT CONCURRENT ENGINEERING TO ENHANCE COMPETITIVE POSITION
 - IF DOD ENCOURAGES AND ENABLES
 - RECOGNIZES INNOVATION
- BARRIERS INCLUDE:
 - DOD FRACTIONATION OF REQUIREMENTS
 - TOO LITTLE ATTENTION TO PROCESS
 - TOO MANY "HOW TO" SPECIFICATIONS
 - LACK OF INCENTIVES

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CONCURRENT ENGINEERING

CURRENT ACTIVITIES

- | | |
|---|--------------------------------------|
| ● ACQUISITION IMPLEMENTATION | OSD/SERVICES/INDUSTRY
TASK FORCES |
| ● NEW MANUFACTURING
TECHNOLOGY GUIDELINES | OSD/AF/INDUSTRY
TASK FORCE |
| ● REVISION OF DOD TEMPLATES | OSD/SERVICES/DMB-DSB
TASK FORCE |
| ● REVISION OF KEY DOD
ENGINEERING PROCESS RELATED
STANDARDS | OSD/SERVICES/INDUSTRY
TASK FORCES |
| ● NEAR TERM EDUCATION/TRAINING | OSD/SERVICES |
| ● LONG TERM EDUCATION/TRAINING | SERVICES/INDUSTRY
TASK FORCE |
| ● FOCUSED DOD TECHNOLOGY PROGRAM | SERVICES |
| ● INDUSTRY INCENTIVES | PGI |
| ● PILOT PROGRAMS | SERVICES |
| ● OVERALL STRATEGY | DMB |

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CONCURRENT ENGINEERING

STATUS SUMMARY

- o **STUDIES**
 - oo **INSTITUTE FOR DEFENSE ANALYSIS**
 - INITIAL REPORT - MAR 1989
 - FOLLOWUP ON CASE STUDIES - OCT 1989
 - R&D ASSESSMENTS - MAR 1990
 - oo **PYMATUNING GROUP, INC.**
 - INITIAL REPORT - JAN 1989
 - INDUSTRY FORUM - CONTINUING
 - DOD STRATEGY - MAR 1990
 - oo **CALS CONCURRENT ENGINEERING TASK GROUP**
 - ELECTRONICS REPORT - APR 1989
 - MECHANICAL REPORT - SEP 1989
 - CALS REQUIREMENTS TO SUPPORT CONCURRENT ENGINEERING - MAR 1990
 - oo **DEFENSE MANUFACTURING BOARD**
 - INDUSTRY ACTIONS - MAR 1990
 - DOD ACTIONS

CONCURRENT ENGINEERING

STATUS SUMMARY (CON'T)

- o **IMPLEMENTATION**
 - oo **ARMY**
 - ACQUISITION CENTER
 - LHX
 - oo **AIR FORCE**
 - R&D
 - ACQUISITION PROCESS
 - ENGINEERING PROCESS STANDARDS
 - ATF, ALS
 - oo **NAVY**
 - DOD TRANSITION TEMPLATES
 - oo **INTERIM ACQUISITION GUIDELINES - USD(A)**

CONCURRENT ENGINEERING

VISION

- REDUCED DEVELOPMENT CYCLE — BY HALF
- ACHIEVES HIGH QUALITY/LOWER COST PRODUCTS
- THROUGH:
 - STREAMLINED PROCESSES
 - MULTIDISCIPLINE TEAMS
 - INTEGRATED DESIGN OF PRODUCT AND PROCESSES
 - PRODUCT/PROCESS OPTIMIZATION
 - PRODUCT DEFINITION
 - PAPERLESS PROCESSES FOR:
 - COMMUNICATION
 - ANALYSIS AND SIMULATION
 - DESIGN RELEASE
 - TRANSFER TO MANUFACTURE
 - RAPID MOCKUPS AND PROTOTYPES

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"THERE'S A WAY TO DO IT BETTER.

FIND IT."

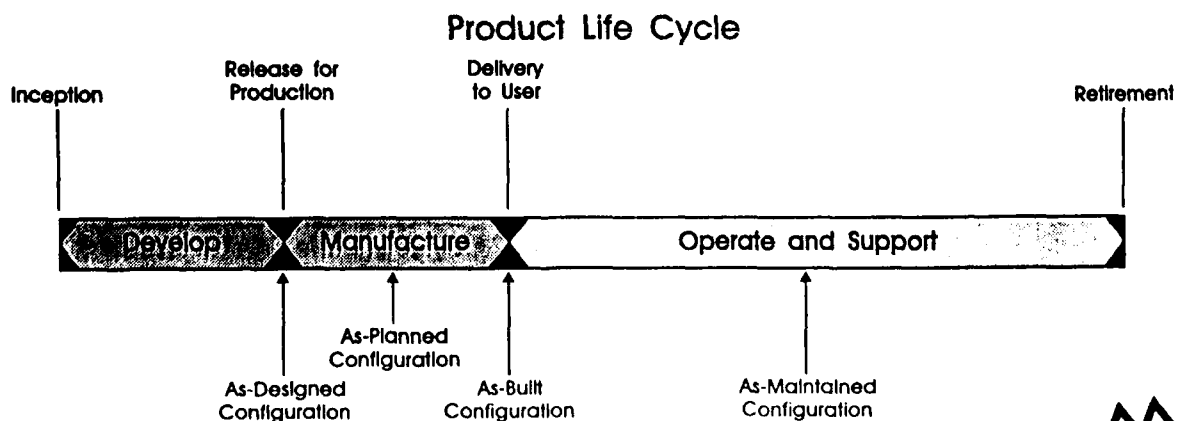
Thomas A. Edison



Mr. Robert Kiggins

Product Data Exchange Specification (PDES)

PDES will provide a complete, unambiguous, computer interpretable definition of the physical and functional characteristics of each unit of a product throughout its life cycle



Background

- Mid 1984 – Work began on the PDES standard by the voluntary IGES/PDES Organization
- 1987 – Industry interim PDES Executive Board formed
- April 1988 – Several major technology companies incorporated as PDES, Inc.
- August 1988 – SCRA was contracted to perform the developmental effort



Significance Of PDES

- PDES is a major Computer Aided Acquisition and Logistics Support (CAL S) building block
- As a standard method for digital product definition PDES will enable:
 - Communication among heterogeneous computer systems
e.g., Government ↔ Industry
Industry ↔ Industry
Industry ↔ Suppliers
 - Integration of manufacturing functions/processes
e.g., Design ↔ Manufacturing
Design ↔ Design Analysis
 - Automatic, paperless updates of system documentation (engineering drawings, technical manuals, etc.)



Overall Program Objectives

"Joint Industrial/Government Effort To Accelerate Product Data Exchange Specifications (PDES) Development And Implementation"

- Gain acceptance of the information definition in a standard information specification
- Accelerate implementation of technologies pertinent to the delivery and interpretation of such product definition information in heterogeneous computer environments



Member Companies

Member Companies as of December '88

Class I

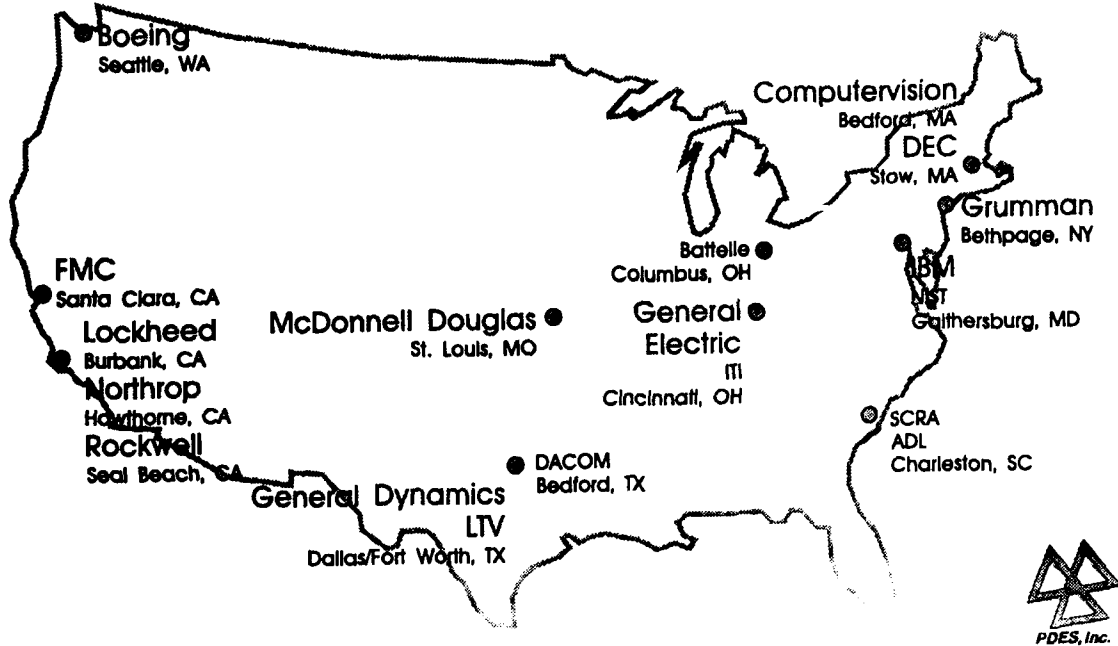
Boeing
General Dynamics
General Electric
Grumman
Lockheed
McDonnell Douglas
Northrop
IBM

Class II

LTV
Rockwell
Computervision
DEC
FMC



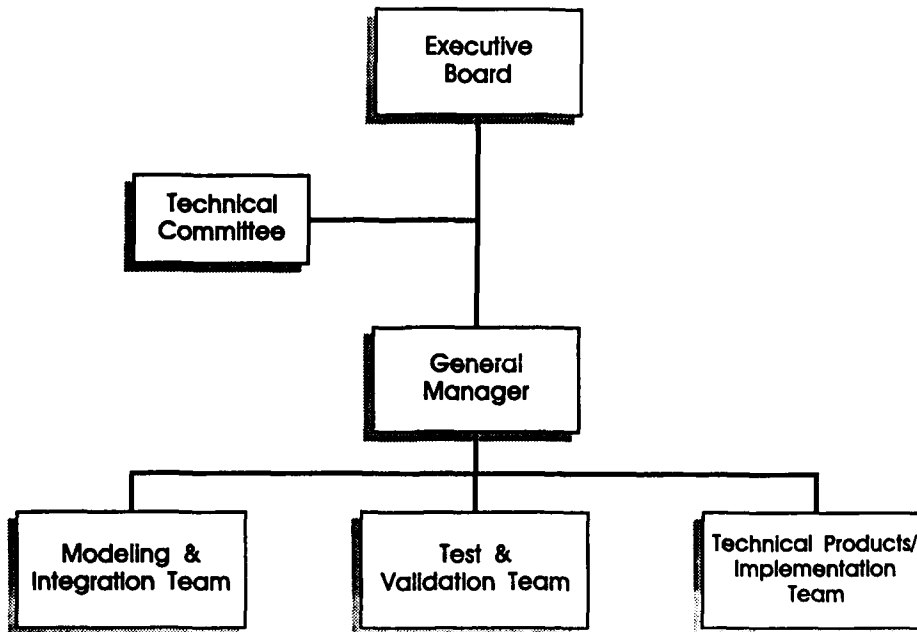
PDES, Inc. Team



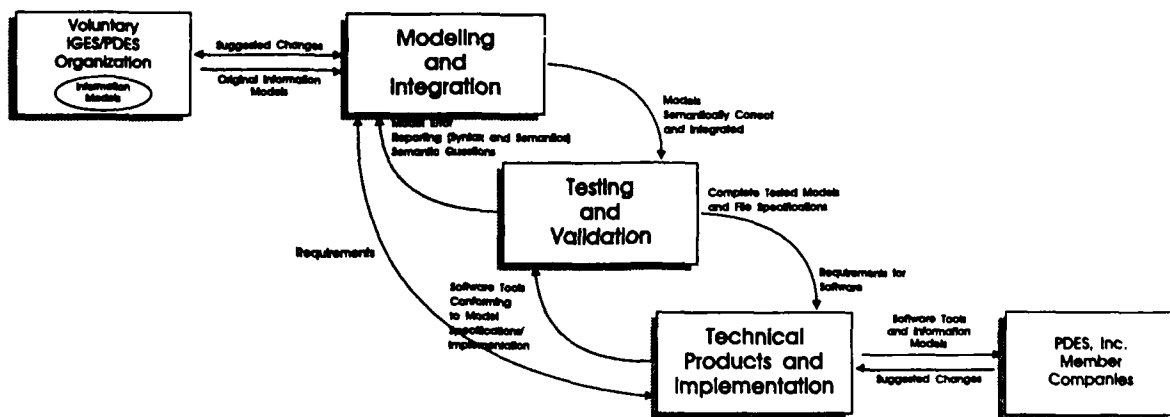
Technical Approach

- Use Initial PDES drafts of volunteer IGES/PDES Organization as baseline
- Concentrate on completing, integrating testing and validating existing PDES data models
- Focus on data exchange implementation using data base technology as method for testing information models

Organizational Structure



Technical Team Interface



Phase I Master Schedule

	SEP 88	OCT	NOV	DEC	JAN 89	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN 90	FEB	MAR	APR
Phase I																				
Tech Devel Plan																				
Modelling & Integration																				
Test & Validation																				
Technical Products																				
Phase I Release																				
Phase II																				
Tech Devel Plan (Draft)																				

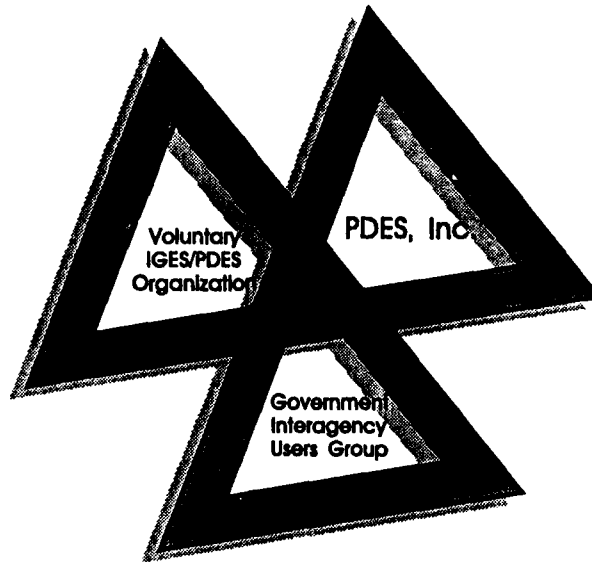


Risk Management

Risk Area	Risks	Risk Reduction
Technical	<ul style="list-style-type: none"> ● Baseline models untested/incomplete ● Technical team inexperienced with PDES models ● Software tools limited and quality unknown ● Testing methodology not well understood 	<ul style="list-style-type: none"> ● Technical team assigned to review/integrate models ● Ongoing IDEF1X/Express workshops for member technical labor ● Technical team to support software tool acquisition/development ● Testing/validation team focused on testing methodologies
Management	<ul style="list-style-type: none"> ● Geographic dispersion ● Motivation and control ● Dependence on voluntary organization ● High dependence on PDES National Testbed 	<ul style="list-style-type: none"> ● Maximum utilization of communications ● Emphasis on increasing stature of program ● Yearly evaluation reports ● MOU signed with NIST Testbed Group ● Draft MOU coordination with voluntary IGES/PDES Organization and Navy
Schedule	<ul style="list-style-type: none"> ● Phase I = 18 months ● Concurrent testing/multiple releases ● Concurrent testing/implementation approach 	<ul style="list-style-type: none"> ● Tracking WBS ● Prioritized scope ● Flexible release schedule ● Close coordination between teams ● Rigorous software development methodology
Resource	<ul style="list-style-type: none"> ● Initial program based on 20 Class I members/40 technical resources ● Resources, in some cases, are "equivalent" resources 	<ul style="list-style-type: none"> ● Prioritized scope ● Team leaders ● Manhour tracking by month ● Companies assume area responsibilities after initial baseline allocation



Program Interaction



PDES Interaction

-
- **PDES, Inc.**
 - Develop and demonstrate a pragmatic, implementable specification for product data
 - Industry funded
 - **Government Interagency Users Group**
 - Coordinate DoD and other agency implementation
 - Common interface with industry
 - National PDES testbed support
 - **Voluntary IGES/PDES Organization**
 - Volunteer effort by users, vendors to define current PDES baseline
 - NIST coordination of standardization efforts



Membership

- Class 1 Membership** ■ \$100,000 dues and 2 man-years of technical effort yearly
 - Class 2 Membership** ■ \$50,000 dues and 1 man-year of technical effort yearly
 - Class 3 Membership** ■ \$25,000 dues yearly – no technical effort required
 - Government Associate** ■ Dues and technical participation – as determined by the board
- Non-labor expenses up to a limit of 50K/year including:
 - travel
 - per diem
 - relocation
 - housing (if applicable)
 - computing support (while working at home location)
 - training of member company personnel



Benefits Of Membership

- Influence the implementation of an emerging U.S. and International standard
- Obtain hands-on experience using PDES
- Gain a head start on competitors in preparing for compliance with the U.S. DoD CALS requirement



CALS Expo '88 Remarks

The Assistant Secretary of Defense for
Production & Logistics stated:

*"I would like to commend industry for its initiative
in creating a product data exchange specification
cooperative - PDES, Inc.*

*I encourage you to learn more about this effort...
I would think that there would be a rush to join -
it will be increasingly so when more companies recognize
that CALS/PDES has the potential for providing a
competitive advantage."*

PDES, Inc.





National PDES Testbed

Cita M. Furlani

National Institute of Standards and Technology



Major Functions of Testbed

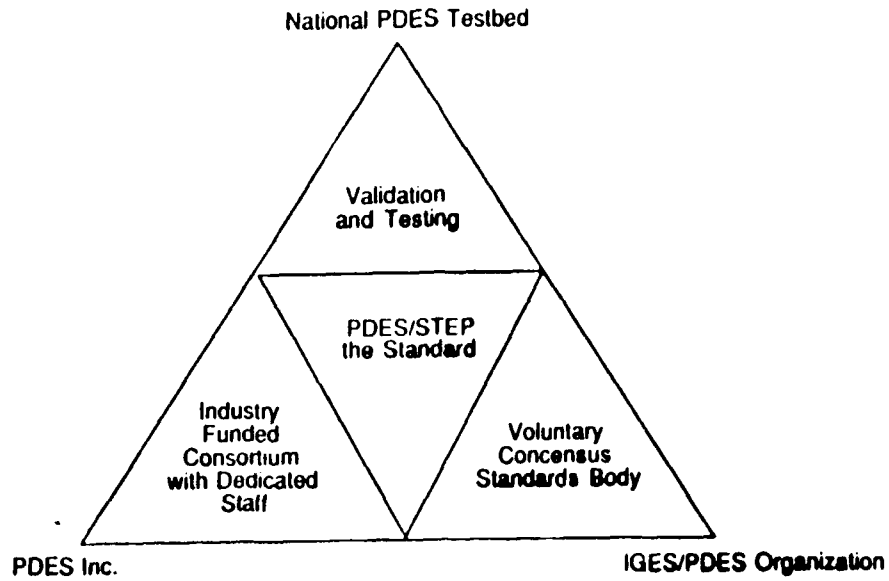
Automated Research Library

Test Facility

Demonstration Facility

Network of PDES Testbeds

Organizational Relationships

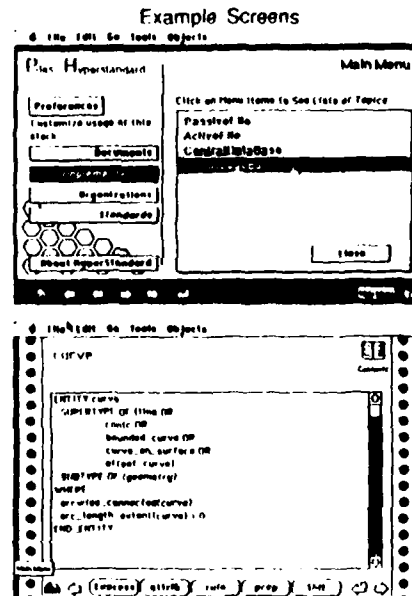


Automated Research Library - Goals

To provide a sharing of knowledge and/or experience.

To apply state-of-the-art technology to resolve the ancillary issues that are slowing the development of PDES.

- An application of hypertext technology to PDES
- Official LaTeX formatted documents are parsed automatically into screen views
- Implemented using HyperCard on Macintosh
- Tutorial and related documents may also be made accessible through a consistent user interface
- Placement of document onto a CD-ROM will allow for the storage of large quantities of information that can be accessed using these techniques.



Information Clearinghouse will provide:

- A central location accessible over electronic networks
- All PDES-related papers, cataloged
- PDES-related papers, models, and supporting documents in electronic form
- A Hyperstandard (hypertext version of PDES information)
- Provide repository of relevant standards
- Provide database of major projects related to PDES



Configuration Control provided for:

Two categories
Machine readable
Machine interpretable

Three organizations (presently)
IGES/PDES Organization
ISO/TC184/SC4
PDES, Inc.



Configuration Items

Draft Proposal
Information models and supporting documentation
Physical file and mappings
Test suites
Software tools for testing
Implementation software



Configuration Control - Tools

CMS (VAX/VMS)

SCCS (Unix-based hardware)

PPDM (Tandem)

IRDS-supported Dictionary Meta-model



Configuration Control - Dictionary Meta-Model

A conceptual model describing the documents and other conceptual models that are part of PDES

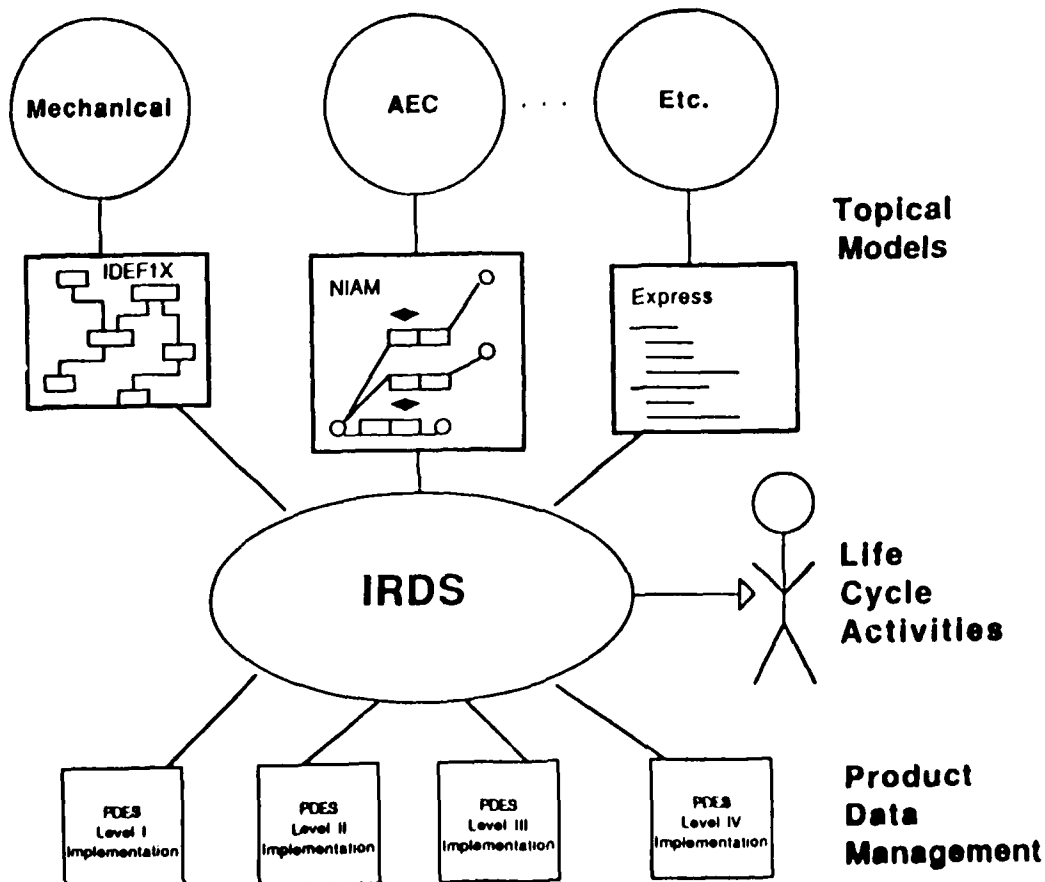
Uses the extensibility of IRDS

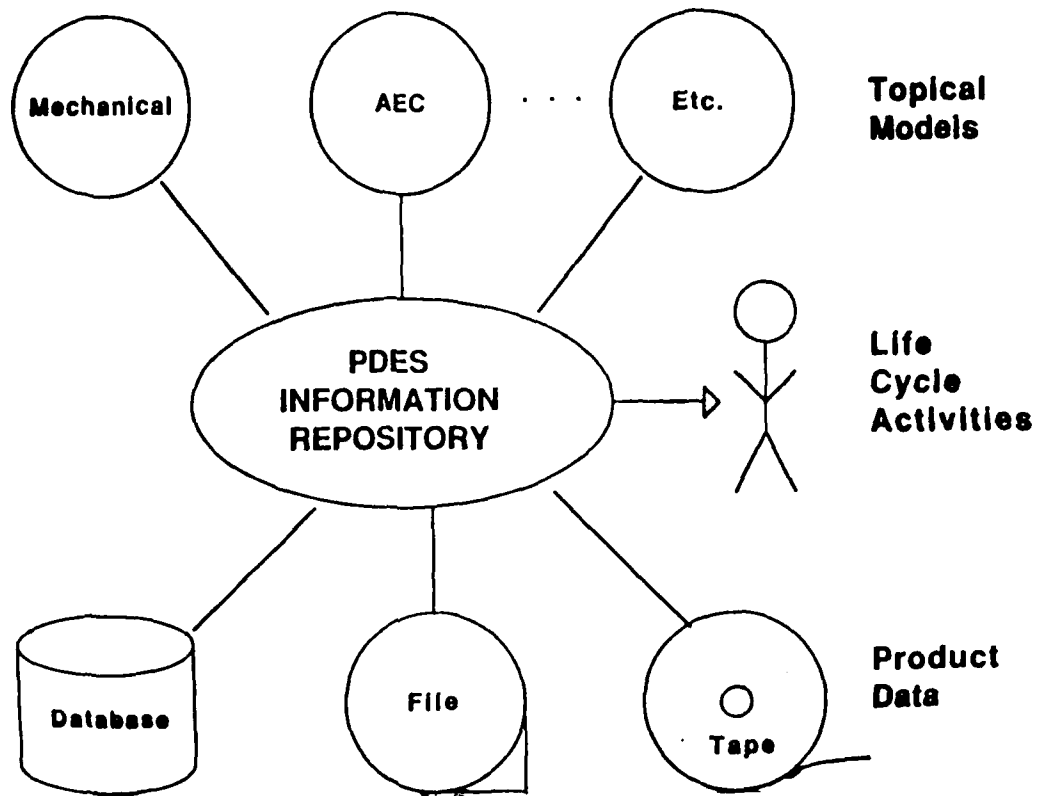
Provides a means for configuration control of PDES documents and information models

Will become the central tool for managing PDES information

IRDS (Information Resource Dictionary System)

- An ANSI standard for data dictionaries
- Its extensibility is being used to define a PDES Dictionary Meta-Model
- Can support the three schema architecture approach
- Provide a uniform mechanism for the storage of all PDES information models
- Supports the integration process by merging development and maintenance tools into one environment





Why Do We Need A Testbed?

To identify potential problems and serve as an arbitration mechanism to decide what is the "correct" interpretation of the specification.

To lead the way in using PDES data in experimental environments.

To demonstrate the practicality of the data in an operational environment.



Test Facility - Goals

To provide a forum for the development of techniques to validate and ensure the internal consistency of the specification.

To provide a place where particular instances of products can be fabricated and tested using a set of metrics.

To develop a program for conformance testing of implementations of PDES.



Loans or Donations

Prime/Computervision: CAD/CAM systems

Tandem: VLX system and software

Dacom: LEVERAGE

Control Data: PC-PRECISE

Case Consulting: Dynamod

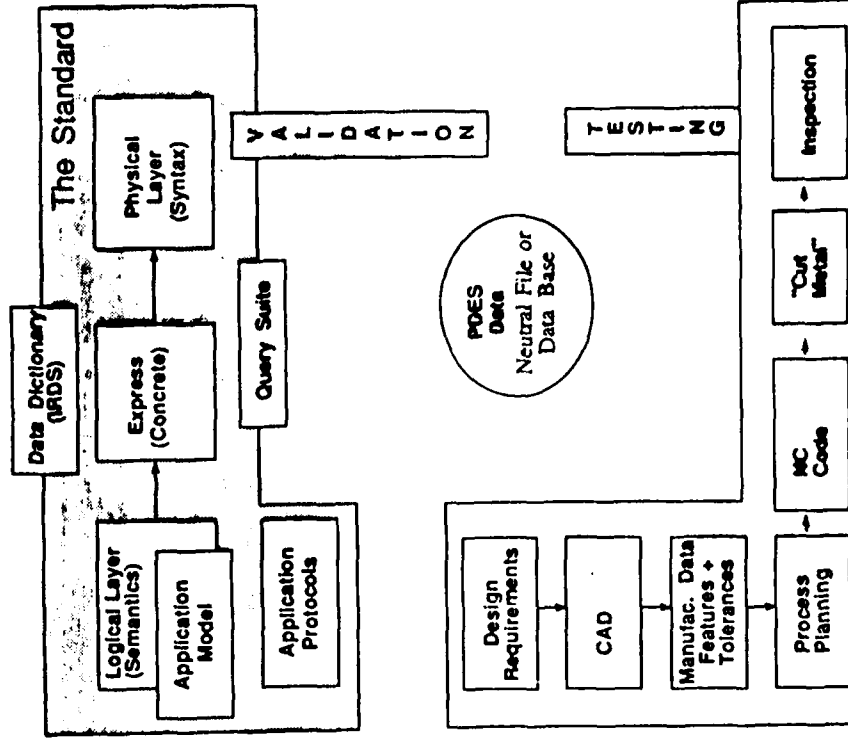
Oracle: Oracle

Ontologic: Vbase

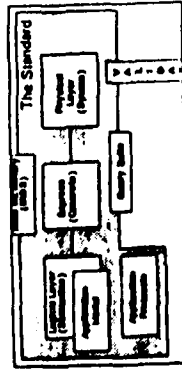
Serviologic: Gemstone

Graphael: Gbase

Domains of Validation and Testing



Validation



- Validation
 - The process of evaluating the specification against general design requirements.
- Application Protocols
 - Provide a framework to perform validation of specification.
- Data Dictionary
 - Configuration Control
 - Semantic Consistency
 - Source of information models
- Query Suites
 - A set of requirements for information required by the specified application.
 - Can be used to exercise reference path analysis to determine the completeness of the conceptual information model.

Four Pieces of an Application Protocol

- Conceptual information model

A definition of the information required for an application.

- Application protocol format specification

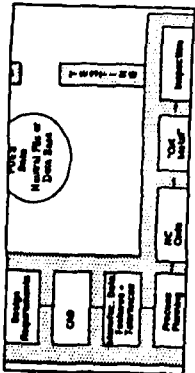
The particular entities to be used with particular restrictions on the values of their attributes.

- Protocol usage guide

A user's guide for the modeling conventions and entity mappings.

- Application protocol format test cases

Contain engineering product definitions from the application area. The test cases are complete and exercise all aspects of the information model.



Testing

- Testing is the combined analysis and verification to take place in the act of pushing data through a processing chain to "cut some metal."

- Testing Techniques

Instance Tables

Ad Hoc Queries

Pilot Applications

- Testing Systems

Design: An analysis of the design will verify the elements of the part which relate to the design requirements.

CAD: A geometric solid representation will be created and placed into a PDES representation

Manufacturing Data: The feature and tolerances necessary for manufacturing will be added to the PDES data.

Process Planning: Will use PDES features and tolerances combined with the solid representation to generate process plans.

NC Code: Specific NC code will be generated and the machine tools will create a part.

Inspection: The part will be inspected and compared to the design data.



Demonstration Facility - Goals

To establish the effectiveness and viability of PDES in the context of real world problems.

To establish a facility for giving demonstrations on all aspects of PDES technology as well as for providing work space for visitors.



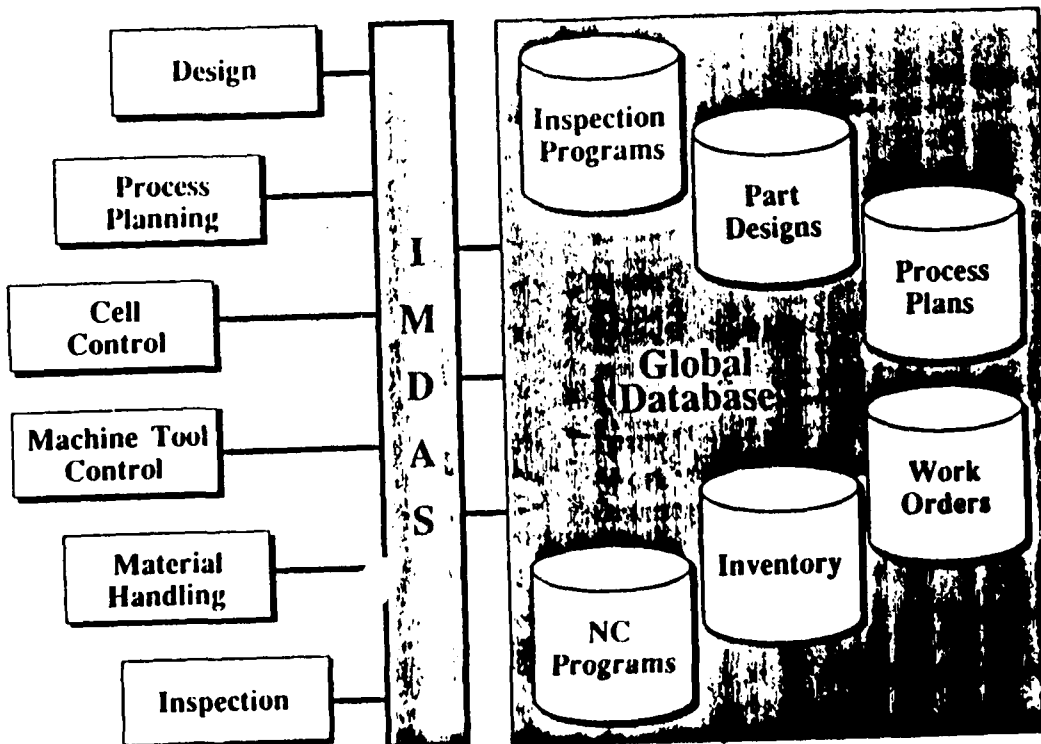
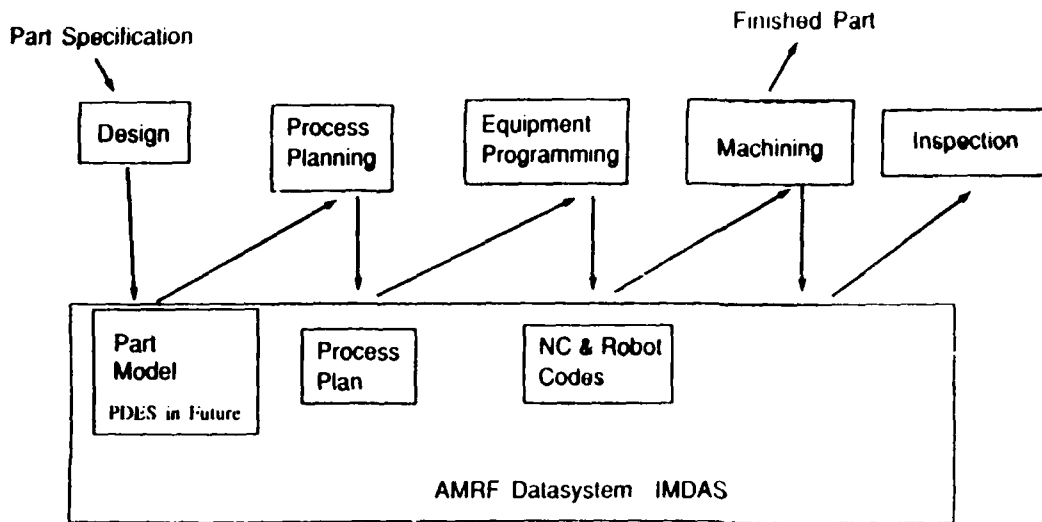
Demonstration Facility

Demonstrate levels of implementation

Laboratory provided for guest worker use

Experience base for understanding product data technologies

Utilizes Automated Manufacturing Research Facility



Integrated Manufacturing Data Administration System



Features of IMDAS

- Operates on data stored in *existing* databases, front-ending them with common transaction and data interface
- Unified semantic network data model (SAM*) for the global conceptual schema
- Interface to programs via operations in string form, supporting controllers with arbitrary programming languages
- Modular distributed architecture with hierarchical control, allowing incremental growth
- Separation of control from data, allowing direct data flow from producer to consumer



Principal Data System Interfaces Areas for Standardization

- User program to Data Service command and status (Data Manipulation Language)
- User program to Data Service data input and output
- Distributed Data Server to Local Data Server command and status (interchange representation of transactions)
- Data Server to Data Server data input and output (interchange representation of data)



Important Standardization Efforts

- Relational Data Manipulation Language (SQL)
 - ANSI X3.135-1986
- Navigational Data Manipulation Language (NDL)
 - ANSI X3.133-1986
- Remote Database Access (RDA)
 - ISO dp
- Manufacturing Messaging Standard (MMS)
 - EIA IE31, Project 1393A, now ISO dp ??? in TC184/SC2
- Data Interchange Standards
 - ISO 8824 Abstract Syntax Notation One (ASN.1)
 - ISO 8825 Basic Encoding Rules
 - ISO 8211 Data Descriptive File (DDF)



Standardization Efforts Server to Server Data Interface

- Remote Database Access approach
 - couples data to command and status
 - defines interchange of relational tables only
- IMDAS Approach
 - separates data from command and status
 - data routing is directed by commands
 - defines interchange of "generalized relations":
 - arbitrarily nested tables with set datatypes and structured datatypes
 - provides syntax with the data in interchange form



Network of PDES Testbeds - Goals

To test all aspects of PDES

To provide demonstrations of all aspects of PDES



National Testbed Network

- No single testbed will be capable of testing all PDES applications
- Group tests will be necessary to ensure complete testing
- Establish organizational and technical connections to other PDES testbeds
- For Example:

CTN: CALS Test Network

Lawrence Livermore National Laboratory

SCRA: South Carolina Research Authority



Summary

Automated Research Library

Test Facility

Demonstration Facility

Network of PDES Testbeds



Computer-Aided Acquisition and Logistic Support

COMPETITIVE GATEWAY TO
DoD CONTRACTING

BRUCE LEPISTO
OFFICE OF THE SECRETARY OF DEFENSE

THE PROBLEM

- ACHIEVE INDUSTRIAL PROCESS IMPROVEMENT
- IMPROVE WEAPON SYSTEM ACQUISITION COST, QUALITY, AND SCHEDULE
- ACCOMPLISH WITHIN FREE ENTERPRISE CONSTRAINTS
- ACHIEVE SHORT TERM GAINS THAT LAY THE FOUNDATION FOR LONG TERM IMPROVEMENTS

DOD POLICY

- DOD DIRECTIVE 5000.1: MAJOR SYSTEM ACQUISITION
 - READINESS IS A PRIMARY OBJECTIVE OF THE ACQUISITION PROCESS EQUAL IN IMPORTANCE TO BOTH PERFORMANCE AND SCHEDULE
 - “SUPPORTABILITY SHALL BE A DESIGN REQUIREMENT AS IMPORTANT AS COST, SCHEDULE AND PERFORMANCE...”
- DOD DIRECTIVE 5000.39: ACQUISITION AND MANAGEMENT OF ILS FOR SYSTEMS AND EQUIPMENT
 - THE OBJECTIVE OF ILS IS TO ACHIEVE AND SUSTAIN SYSTEM READINESS AT AN AFFORDABLE LIFE CYCLE COST (LCC)

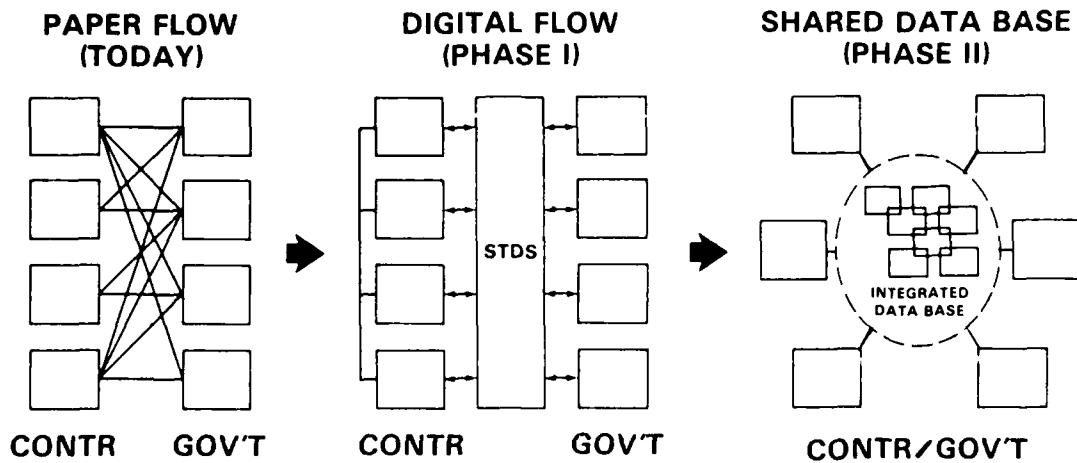
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THE SCOPE OF CALS

CALS IS NOT JUST LOGISTICS

CALS IS --
DESIGN
ENGINEERING
MANUFACTURING
PRODUCT SUPPORT

WHAT IS CALS?



- INTEGRATION PROGRAM
- TRANSITION TO "NEAR PAPERLESS" DESIGN, MANUFACTURING, SUPPORT
- GAIN BENEFITS OF A HIGHLY AUTOMATED AND INTEGRATED SYSTEM

8 4162

PROCESS LEVERAGE POINTS

- LONG TERM, HIGH PAYOFF
 - REQUIREMENTS, ENGINEERING
 - DETERMINE 90% OF COST, 50% OF SCHEDULE
 - NON-TOUCH
 - 70% LABOR
- SHORT TERM, MODERATE PAYOFF
 - FABRICATION PROCESSES
 - LABOR AND MATERIAL

BENEFITS-EXAMPLES

- AUTOMATION OF FUNCTIONS
 - MORE EFFICIENT PREPARATION & DELIVERY
 - 20-30% SAVINGS IN TECH MANUAL AUTHORING
 - 35% IMPROVEMENT IN TROUBLESHOOTING ACCURACY

- INTEGRATED DATA BASES
 - 20-35% SAVINGS IN ILS

- REDESIGNED PROCESSES
 - 20% ESTIMATED SAVINGS OVER SYSTEM LIFE CYCLE

THE CIM VISION

- FACTORY OF THE FUTURE RUN BY ROBOTS
- COMPATIBLE HARDWARE AND SOFTWARE PRODUCTS
- PAPERLESS OFFICE
- UNIVERSAL DATA STANDARDS
- FLEXIBILITY WITH LOW IMPLEMENTATION COST
- REAL-TIME COMPLIANCE WITH BUSINESS OBJECTIVES

THE CURRENT CIM REALITY

- ADVANCED MANUFACTURING TECHNIQUES FOR INDIVIDUAL PROCESSES
- ISLANDS OF AUTOMATION
- INCOMPLETE AND INCONSISTENT DATA COMMUNICATIONS
- LACK OF INFORMATION TECHNOLOGY STRATEGY
- LACK OF SUITABLE ENGINEERING DATA BASE
- LACK OF SUITABLE PLANNING METHODOLOGY

CALS POLICY INITIATIVE (DepSecDef MEMO, 24 Sep 1985)

OBJECTIVES

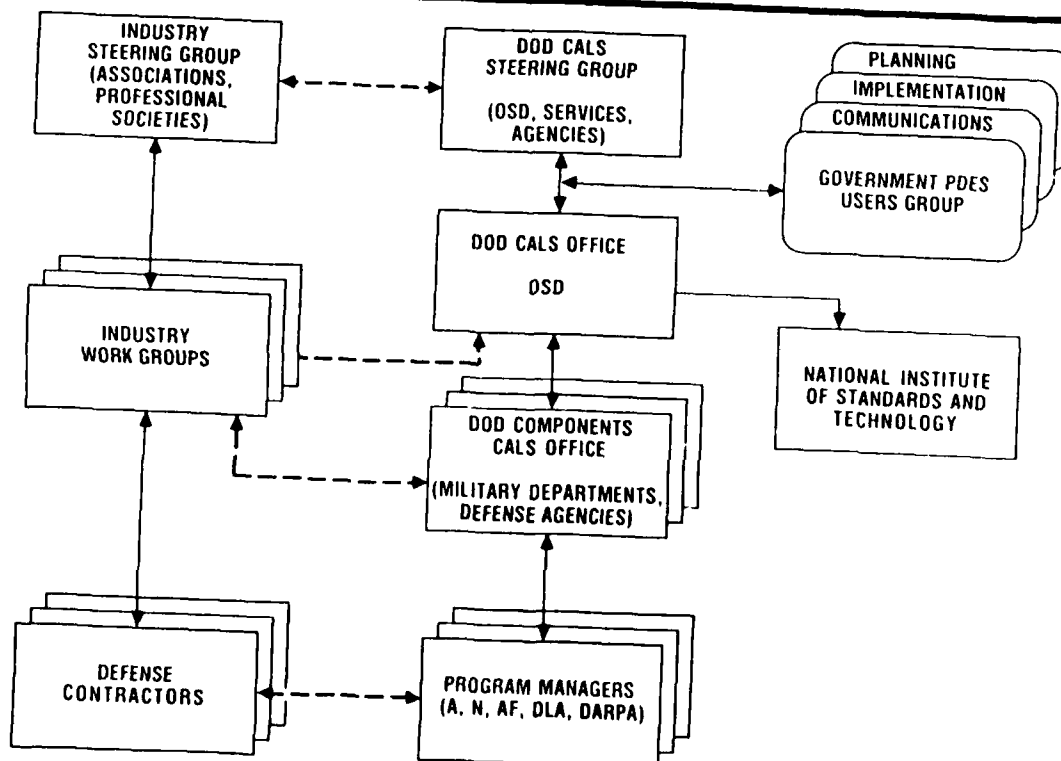
- ACCELERATE INTEGRATION OF R&M DESIGN TOOLS INTO CONTRACTOR CAD/CAE SYSTEMS
 - AUTOMATE CONTRACTOR PROCESSES FOR GENERATING LOGISTIC TECHNICAL INFORMATION
 - RAPIDLY INCREASE DoD CAPABILITY TO RECEIVE, DISTRIBUTE, AND USE TECHNICAL INFORMATION IN DIGITAL FORM
- BY 1990, NEW MAJOR WEAPON SYSTEMS WILL ACQUIRE TECHNICAL INFORMATION IN DIGITAL FORM

CALS IMPLEMENTATION POLICY

DEPSECDEF MEMO

- **SYSTEMS NOW IN FSD OR PRODUCTION**
 - REVIEW COST SAVING AND QUALITY OPPORTUNITIES FROM CHANGING TO DIGITAL DELIVERY OR ACCESS
- **SYSTEMS ENTERING DEVELOPMENT AFTER SEP 1988**
 - REQUIRE PROPOSALS FOR CALS DATA DELIVERY OR ACCESS
- **INFRASTRUCTURE SYSTEMS**
 - PROGRAM RESOURCES FOR SYSTEMS TO RECEIVE AND USE DIGITAL DATA
 - CONFIGURE OR ADAPT SYSTEMS TO SUPPORT CALS STANDARDS
- **ACQUISITION POLICY**
 - USD(A) WILL ISSUE FURTHER GUIDANCE ON CONTRACTING, INCENTIVES, SUBCONTRACTORS, FUNDING MECHANISMS.

CALS MANAGEMENT ORGANIZATION



SERVICE AND DLA PROGRAMS

TECHNOLOGY

- **ADVANCED INFORMATION INTEGRATION**
- **PARTS DATA ACCESS**
- **ELECTRONIC TECHNICAL MANUALS**
- **R&M DESIGN INTEGRATION**

INFRASTRUCTURE

- **PLANNING AND ARCHITECTURE**
- **ENGINEERING DATA REPOSITORIES**
- **COMPUTER-AIDED DESIGN**
- **AUTOMATED TECH MANUALS**
- **INTEGRATED WEAPON SYSTEM DATA BASE**

8-3824

CALS PROGRAM AT NIST

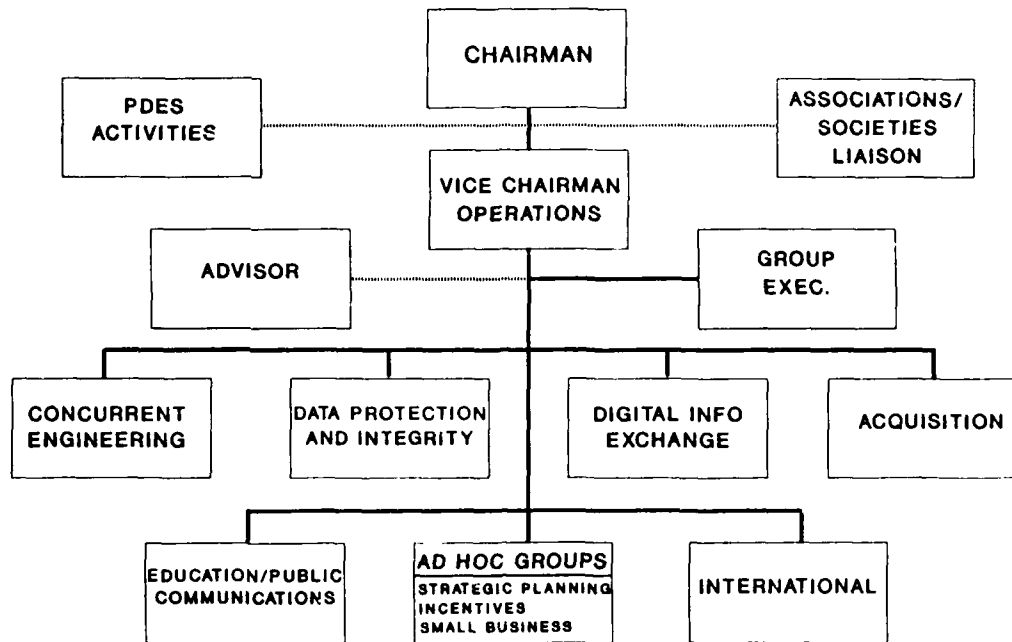
MAJOR AREAS OF SUPPORT

- **STANDARDS AND CONFORMANCE TESTS**
- **PLANNING AND MANAGEMENT SUPPORT**
- **NATIONAL PDES TESTBED**

PRIORITY ITEMS IN FY 1989

- **LSAR INFORMATION MODEL & DATA DICTIONARY**
- **FUNCTIONAL SPEC FOR CONTRACTOR INTEGRATED TECHNICAL INFORMATION SYSTEM**
- **EDI TRANSACTIONS FOR CALS**
- **OTHER PHASE 1.2 ADDITIONS TO CALS STANDARDS**
-- **ELECTRONICS, PAPERLESS TM's, ...**
- **CONFORMANCE TESTS FOR PHASE I STANDARDS**

INDUSTRY STEERING GROUP (ISG)



CALS STRATEGY

STANDARDS AND INTEGRATION REQUIREMENTS

Develop and test standards for digital technical data interchange. Define functional integration requirements.

WEAPON SYSTEM APPLICATION

Implement CALS requirements in weapon system contracts. Encourage industry investments, process improvements.

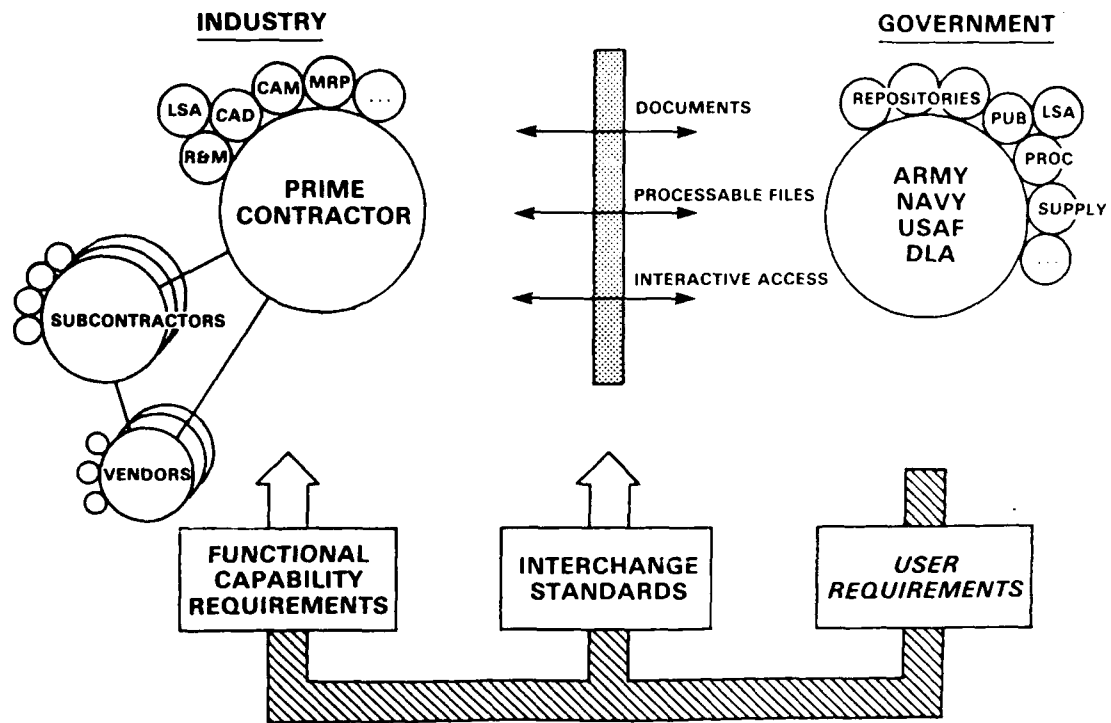
TECHNOLOGY

Sponsor technology development and demonstrations for integration of technical data bases, and for design, manufacturing, and support applications.

DOD AUTOMATED INFORMATION SYSTEMS

Implement CALS standards and integration requirements in DoD infrastructure modernization and architecture planning.

DIGITAL INFORMATION EXCHANGE



ACQUISITION AND LOGISTICS DATA PRODUCTS

- ENGINEERING DRAWINGS
- TECHNICAL MANUALS
- ENGINEERING ANALYSES
- LOGISTIC SUPPORT ANALYSIS DATA
- TECHNICAL REPORTS
- PROVISIONING DATA
- TRAINING MATERIALS
- INTEGRATED LOGISTIC SUPPORT PLANS

EVOLVING CALS TECHNOLOGIES

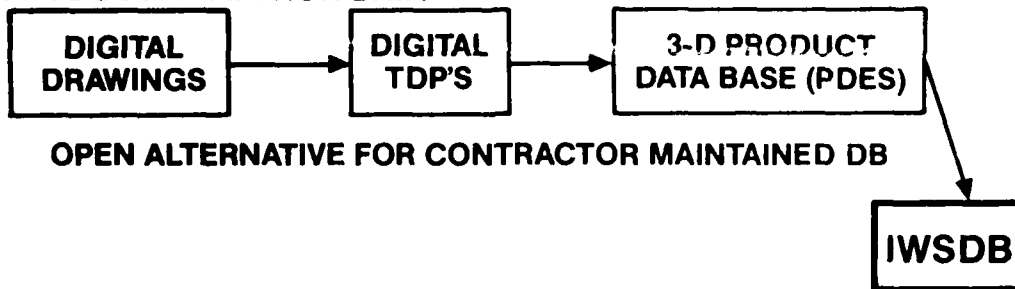
	<u>CURRENT</u>	<u>NEAR TERM</u>	<u>LONGER TERM</u>
• TECH MANUALS	• PAPER	• PRINT ON DEMAND • ELECTRONIC PAGE TURNERS	• INTELLIGENT INTERACTIVE MAINT AIDS
• ENGINEERING DWGS	• APERTURE CARDS	• RASTER SCAN • LIMITED VECTOR TRANSFER	• COMPLETE DIGITAL PRODUCT MODEL
• LOGISTIC SUPPORT ANALYSIS	• 1388 LSAR TAPE	• CONTRACTOR-SPECIFIC ONLINE ACCESS	• NEUTRAL QUERY OF HETEROGENEOUS SYSTEMS

7 0623

CALS MAJOR THRUSTS

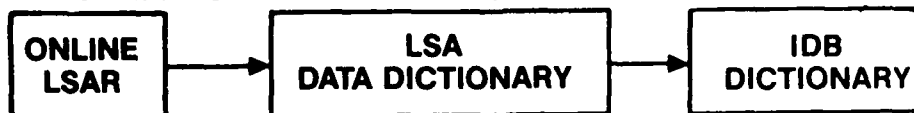
DATA

• PRODUCT DEFINITION DATA



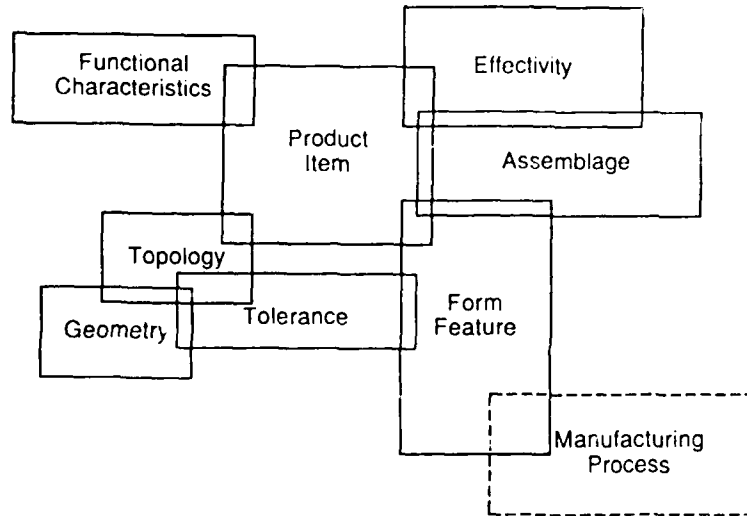
OPEN ALTERNATIVE FOR CONTRACTOR MAINTAINED DB

• INTEGRATED SUPPORT DATA BASE



OPEN ALTERNATIVE FOR ONLINE REVIEW & APPROVALS, PROVISIONING, ORDERING.

PDES Integrated Model - Version 1



PDES DEVELOPMENT PRODUCT DATA EXCHANGE SPECIFICATION

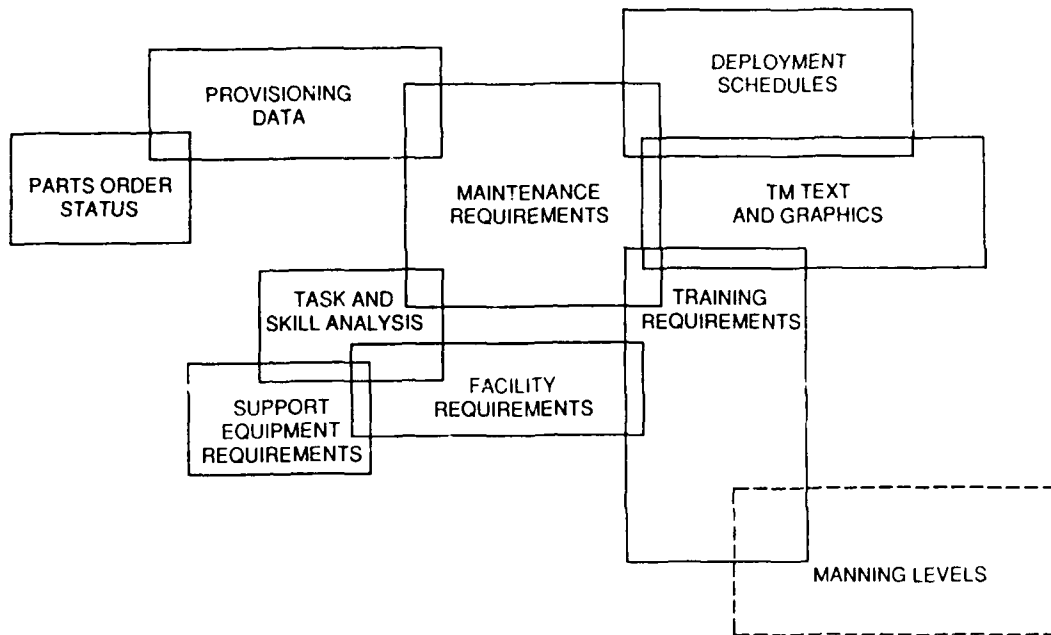
IMPORTANCE TO CALS

- LOGICAL STRUCTURE FOR PHASE II SHARED DATA BASE
- EXPANDS POSSIBILITIES FOR INDUSTRIAL NETWORKING

KEY PLAYERS

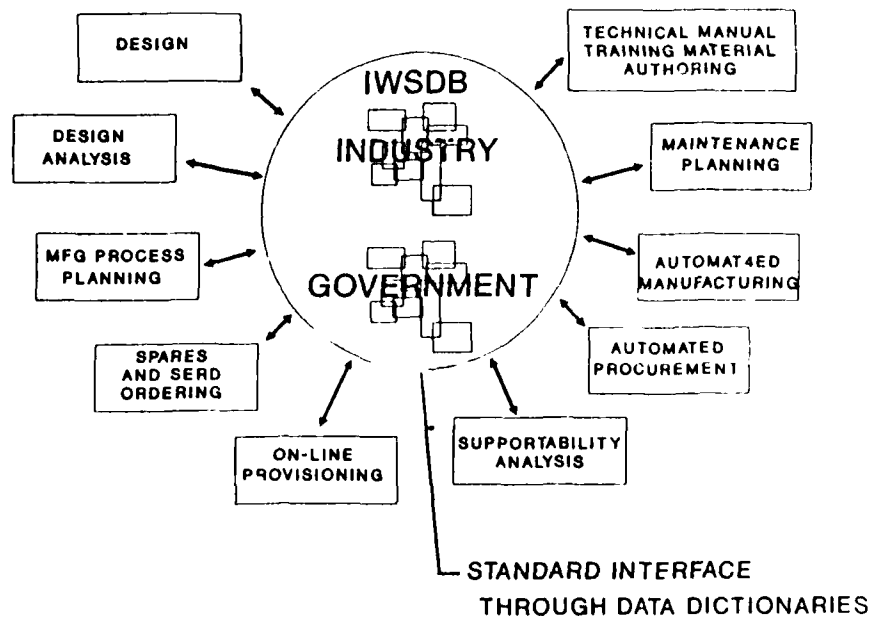
- IGES/PDES STANDARDS ORGANIZATION
- PDES, INC
- NATIONAL PDES TESTBED (NIST)
- GOVERNMENT PDES USERS GROUP

INTEGRATED SUPPORT DATA BASE



CALS '88 Priorities Presentation 2/2/88

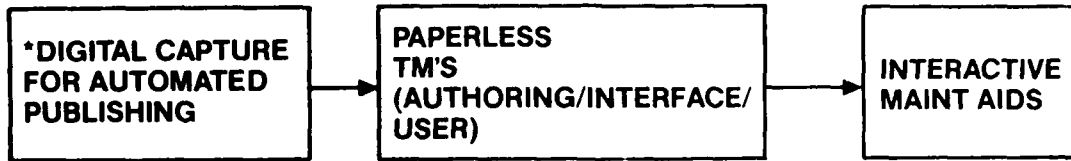
PHASE II INTEGRATION TARGET INTEGRATED WEAPON SYSTEM DATABASE (IWSDDB)



CALS MAJOR THRUSTS

APPLICATIONS

- TECHNICAL MANUALS

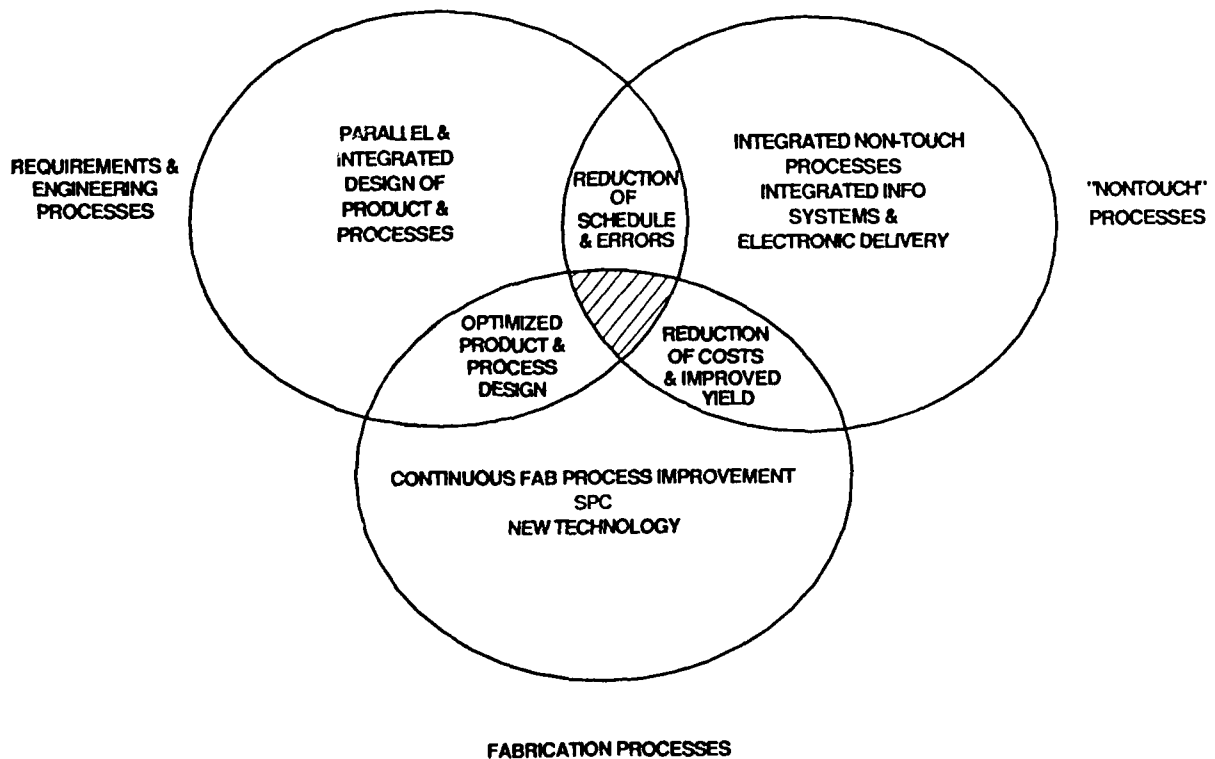


OPEN ALTERNATIVE FOR ELECTRONIC PRESENTATION OF EXPERT SYSTEM TROUBLESHOOTING ROUTINES

- SPARES ACQUISITION
- TRAINING MATERIALS
- OTHERS

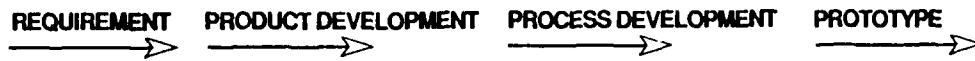
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POWER OF INTEGRATION

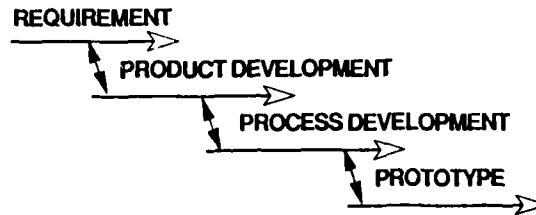


CONCURRENT ENGINEERING

SEQUENTIAL ENGINEERING



CONCURRENT ENGINEERING



AN INTEGRATED PROCESS WHICH ENGINEERS THE PRODUCT AND THE MANUFACTURING AND SUPPORT PROCESSES TOGETHER WITH EMPHASIS ON EFFICIENCY, INCREASED QUALITY AND REDUCED COST.

CALS STANDARDS CONCEPTS

- ANNUAL INCREMENTS
- ADDITIONS & EXTENSIONS, NOT CHANGES
- INCORPORATE EVOLVING TECHNOLOGY
- IMPLEMENTATIONS OF INTERNATIONAL INDUSTRY STANDARDS
- JOINT INDUSTRY-DoD DEVELOPMENT

CALs STANDARDS

TYPES AND RESPONSIBILITIES

<u>CATEGORIES</u>	<u>SOURCE</u>
FUNCTIONAL REQ'TS	FUNCTIONAL MGRS
DATA INTERCHANGE	CALS - PHASE I
DATA MGT & ACCESS	CALS - PHASE II
COMMUNICATIONS	NETWORK MGRS
APPLICATION GUIDANCE	CALS

CURRENT CALS STANDARDS

<u>DoD STANDARD</u>	<u>DATE</u>	<u>NAT'L/INT'L STANDARD</u>	<u>APPLICATIONS</u>
MIL-STD-1840A	DEC 87	-	DATA INTERCHANGE/FILE MANAGEMENT
MIL-D-28000	DEC 87	IGES	CAD, VECTOR GRAPHICS - ENG DRAWINGS - TM ILLUSTRATIONS - NC MACHINING
MIL-M-28001	FEB 88	SGML	AUTOMATED PUBLISHING - TECHNICAL MANUALS
MIL-R-28002	DEC 88	CCITT 4	RASTER SCANNED IMAGES - ENG DRAWINGS - TM ILLUSTRATIONS
MIL-D-28003	DEC 88	CGM	VECTOR GRAPHICS - TM ILLUSTRATIONS
MIL-HDBK-59	DEC 88	-	IMPLEMENTATION GUIDE - MODEL SOWs, CDRLs

1989 CALS STANDARDS

MIL-STD-1840A EXTENSIONS

- EDIF, IPC, VHDL APPLICATION FOR DESIGN OF ELECTRONIC PRODUCTS
- EDI TRANSACTION SET FOR TECHNICAL DATA

PRODUCT DEFINITION DATA

- MIL-D-28000 (IGES) 3-D PIPING/TUBING APPLICATION

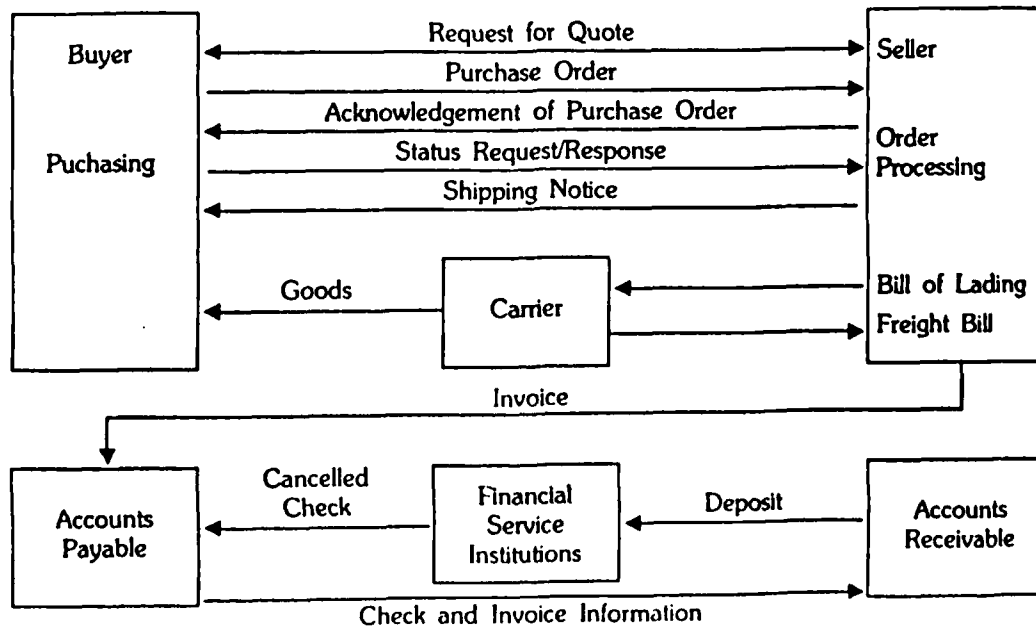
MIL-STD-1388-2B STANDARDS

- LSAR RELATIONAL DBMS IMPLEMENTATION
- IDEF DATA MODEL AND SQL APPLICATION

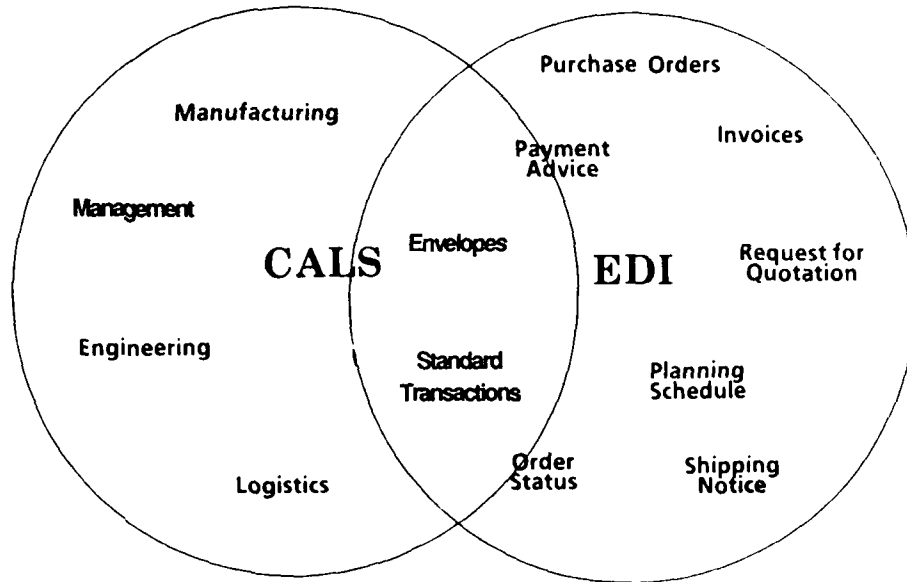
AUTOMATED PUBLISHING AND PAGELESS TECH MANUALS

- MIL-M-28001 EXTENSIONS - DTD's AND OS's
- PTM AUTHORIZING, DATA INTERCHANGE, DELIVERY

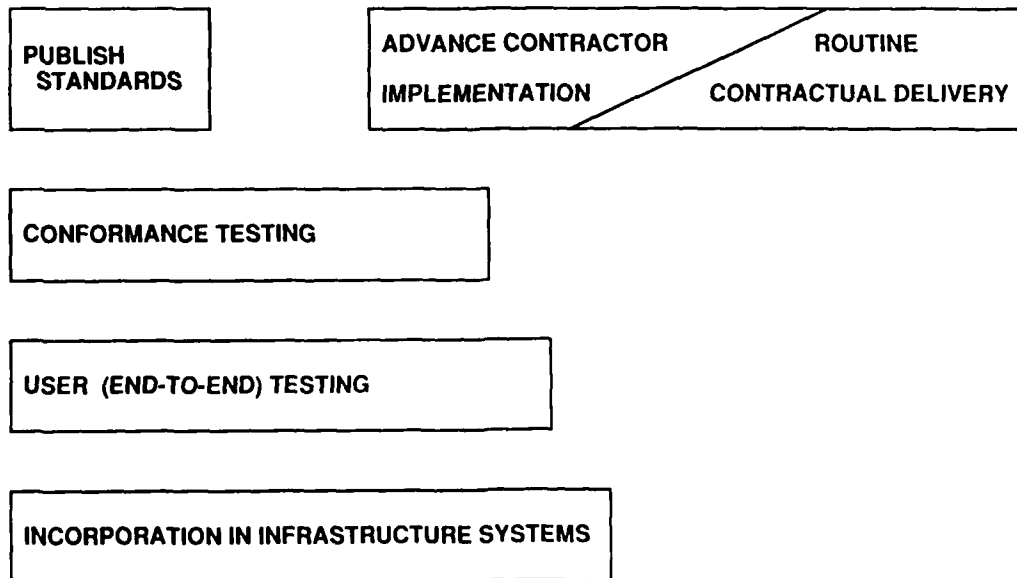
Electronic Data Interchange (EDI)



CALS AND EDI



IMPLEMENTATION STEPS

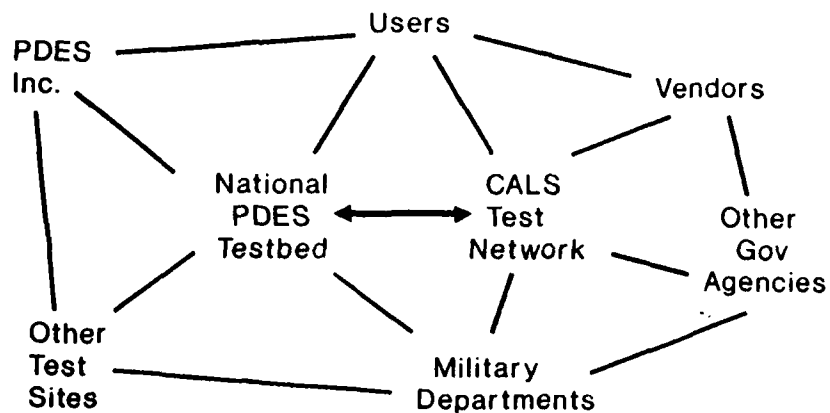


CALS TEST NETWORK

CTN OPERATION

- JOINT INDUSTRY-DoD PARTICIPATION
 - INDUSTRY & GOVERNMENT TEST NODES
 - GOVERNMENT CTN REVIEW BOARD
 - INDUSTRY CTN ADVISORY BOARD
- CTN 1989 ACTIVITY
 - PHASE I.0 & PHASE I.1 STANDARDS USER/APPLICATION TESTING
 - PHASE I.2 DEMONSTRATIONS
 - CONFORMANCE AND ACCEPTANCE TEST PROGRAM PROTOTYPES

TEST NODE INTERFACES



NATIONAL PDES TESTBED

National Institute of Standards and Technology

- RESEARCH, DEMONSTRATION, AND TECHNOLOGY TRANSFER
- DEVELOPMENT TESTING AND VALIDATION
- PDES CONFIGURATION MANAGEMENT
- INTEGRATION OF TOPICAL MODELS
- CENTRAL INFORMATION CLEARINGHOUSE

IMPLEMENTATION POLICY

IMPORTANT CONSIDERATIONS

- RECOGNIZE THAT INTEGRATION IS NOT AN "ALL OR NOTHING" PROPOSITION
 - See how far bidders can go
- ON-LINE ACCESS WILL BE LIMITED TO SELECTED CONTRACTOR DATA BASES
 - Principal targets are deliverables for review and approval
- ROUTINE DELIVERY OF DIGITAL DATA WILL BE PACED BY AVAILABILITY OF VALIDATED STANDARDS AND GOVERNMENT RECEIVING SYSTEMS
 - Define requirements now for data to be delivered in the 1990's
 - Seek flexible alternatives to hedge risks

BOTTOM LINE

- KEEP CALS TARGET IN SIGHT, BUT DO WHAT MAKES SENSE FOR EACH PROGRAM
- CALS LEAD PROGRAMS ARE GOOD EXAMPLES

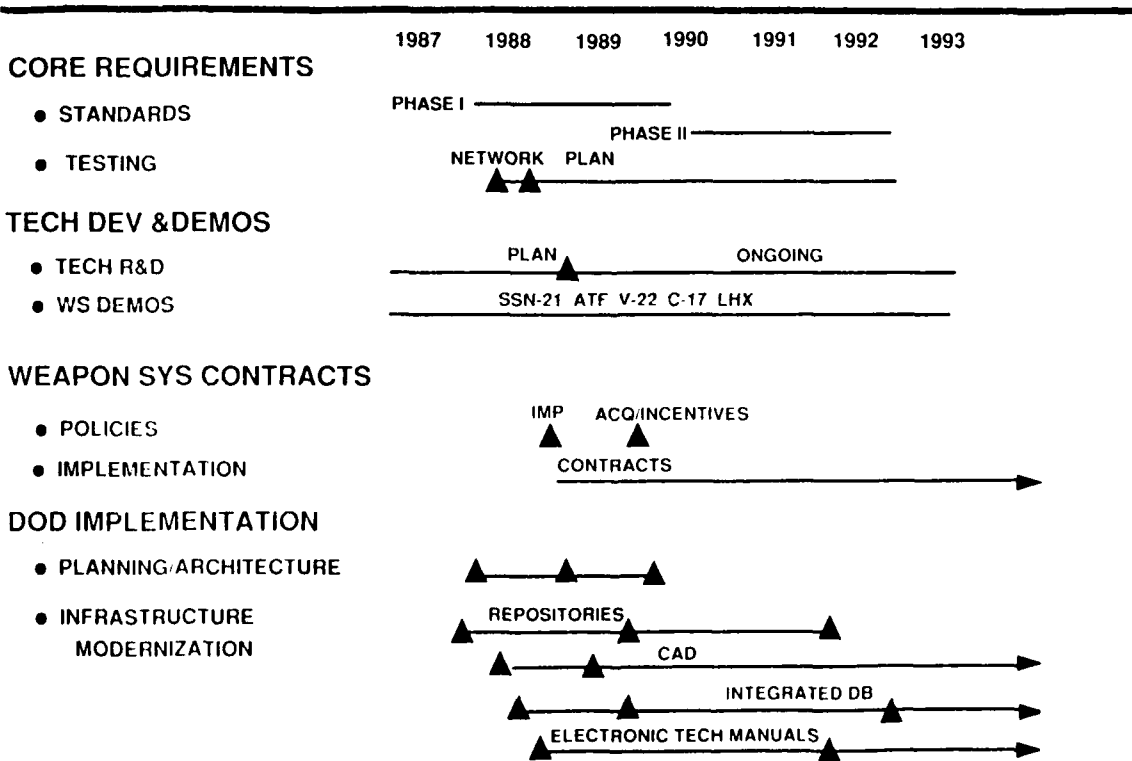
CALS IMPLEMENTATION ISSUES

ACQUISITION COMMITTEE CHARTERED

- RIGHTS TO DATA
- SECURITY, PRIVACY, EXPORT CONTROLS
- PROFIT STRUCTURE, INVESTMENT INCENTIVES
- DELIVERY, VERIFICATION, ACCEPTANCE
- LEGAL LIABILITY
- CO-OPERATIVE PRODUCTION (OTHER NATIONS)
- DAR, FAR REVISIONS
- ADP ACQUISITION PROCESS

8 3824

CALS SCHEDULE OBJECTIVES



MAJOR CALS WEAPON SYSTEMS

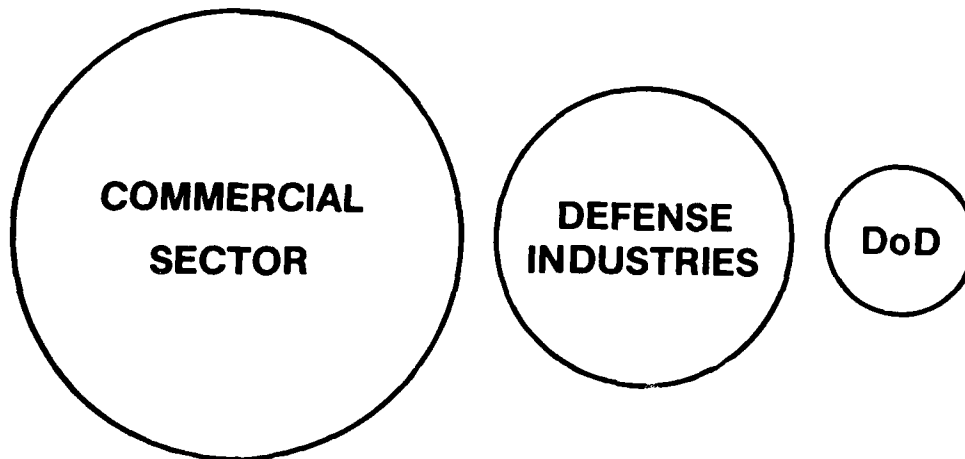
NAVY	A-12	ATTACK AIRCRAFT
USAF	B-2	STEALTH BOMBER
NAVY	SSN-21	SEAWOLF SUBMARINE
USAF	ATF	ADVANCED TACTICAL FIGHTER
ARMY	LHX	LIGHT HELICOPTER

OVER 25 ADDITIONAL PROGRAMS ALREADY
PROPOSED. OTHERS BEING STUDIED.

MANAGEMENT PRIORITIES

- STANDARDS AND INTEGRATION REQUIREMENTS
 - SUFFICIENCY FOR ROUTINE USE
 - TAILORING FOR UNIQUE PROGRAM NEEDS
 - CONFORMANCE TEST AND CERTIFICATION
- WEAPON SYSTEM APPLICATION
 - EDUCATION FOR DoD AND INDUSTRY
 - INVESTMENT INCENTIVES
 - ARTICULATION OF BENEFITS
 - SUBCONTRACTOR FLOWDOWN
- TECHNOLOGY
 - TECHNOLOGY TRANSITION
 - DATA PROTECTION AND INTEGRITY
- DoD SYSTEMS
 - ARCHITECTURE AND INTERFACES
 - TARGET CAPABILITIES AND DATES

CALS MARKETS



8 3889

BENEFITS

FROM INDUSTRY'S PERSPECTIVE

- PRODUCTIVITY GAINS THROUGH AUTOMATION & INTEGRATION
 - LESS EFFORT IN DESIGN/MANUFACTURING TRANSITION
 - LESS REDUNDANCY IN DATA PREPARATION
 - PAPERLESS INTERCHANGE AMONG PRIMES, SUBS
- QUALITY IMPROVEMENTS
 - PRODUCT DESIGN
 - DATA

FROM GOVERNMENT'S PERSPECTIVE

- PRODUCTIVITY GAINS
 - ACQUISITION
 - OPERATION
- IMPROVED READINESS
 - SHORTENED LEAD TIMES
 - TIMELY, ACCURATE, ACCESSIBLE DATA



THE DEPUTY SECRETARY OF DEFENSE

WASHINGTON, D. C. 20301

5 AUG 1988

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Computer-aided Acquisition and Logistic Support (CALs)

To achieve productivity and quality improvements, my September 1985 letter on CALs set the goal of acquiring technical data in digital form (rather than paper) for weapon systems entering production in 1990 and beyond. We have now taken a major step toward routine contractual implementation. The Department of Defense (DoD) has coordinated with industry the first in a series of CALs issuances of national and international standards for digital data delivery and access. These standards have been published in MIL-STD-1840A, "Automated Interchange of Technical Information," and supporting military specifications. The CALs standards will enable either digital data delivery or government access to contractor-maintained technical data bases.

Effective immediately, plans for new weapon systems and related major equipment items should include use of the CALs standards. Specifically:

- o For systems now in full-scale development or production, program managers shall review specific opportunities for cost savings or quality improvements that could result from changing weapon system paper deliverables to digital delivery or access using the CALs standards.
- o For systems entering development after September 1988, acquisition plans, solicitations, and related documents should require specific schedule and cost proposals for:
(1)-integration of contractor technical information systems and processes, (2) authorized government access to contractor data bases, and (3) delivery of technical information in digital form. These proposals shall be given significant weight for their cost and quality implications in source selection decisions. The CALs standards shall be applied for digital data deliverables.
- o DoD components shall program for automated systems to receive, store, distribute, and use digital weapon system technical information, including achieving the earliest possible date for digital input to DoD engineering data repositories. These systems shall be configured or adapted to support the CALs

standards. Plans for CALs implementation and productivity improvements will be addressed in Defense Acquisition Board and Major Automated Information System Review Council acquisition reviews, and in corresponding Service and Agency reviews.

Each application decision shall be made on its own merits with respect to the productivity and quality improvements expected at either prime contractor or subcontractor level. The Under Secretary (Acquisition) will issue further guidance on contract requirements, such as CALs options, in invitations for bid; opportunities and safeguards for small business and other vendors and subcontractors; government and contractor incentives; and funding mechanisms for productivity-enhancing investments in automation and CALs integration by defense contractors.

I believe that CALs is one of the most important and far-reaching acquisition improvements we have undertaken. I would appreciate having the Assistant Secretary (Production and Logistics) receive your plan of action within 90 days, including identification of systems where opportunities exist for cost savings or quality improvement through application of CALs technology, the investment required to achieve these benefits, and proposed schedules for implementation.

William H. Taft, IV
William H. Taft, IV

cc: Under Secretary of Defense (Acquisition)
Assistant Secretaries of Defense

JOINT DOD/INDUSTRY CALS PAGELESS TECHNICAL MANUAL STUDY

**AEROSPACE INDUSTRIES ASSOCIATION/DEPARTMENT OF DEFENSE
PAGELESS TECHNICAL MANUAL STUDY GROUP**

Ms. Mary Anne Thompson

JOINT DOD/INDUSTRY CALS PAGELESS TECHNICAL MANUAL STUDY

Initially...

Three Active Working Groups Involved

- * Specifications & Standards Group**
- * Communications Group**
- * Implementation Group**

None dedicated to technical publications !

JOINT DOD/INDUSTRY CALS PAGELESS TECHNICAL MANUAL STUDY

**CALS Pageless Technical Manual Study Group
Chartered by OSD CALS Policy Office in Fall of '87**

Objectives

1. **Develop recommendations for
Generic Data Interchange Functional Specification**
2. **Develop Generic Authoring System
Functional Specification**
3. **Develop Generic Delivery/Presentation
System Functional Specification**

JOINT DOD/INDUSTRY CALS PAGELESS TECHNICAL MANUAL STUDY

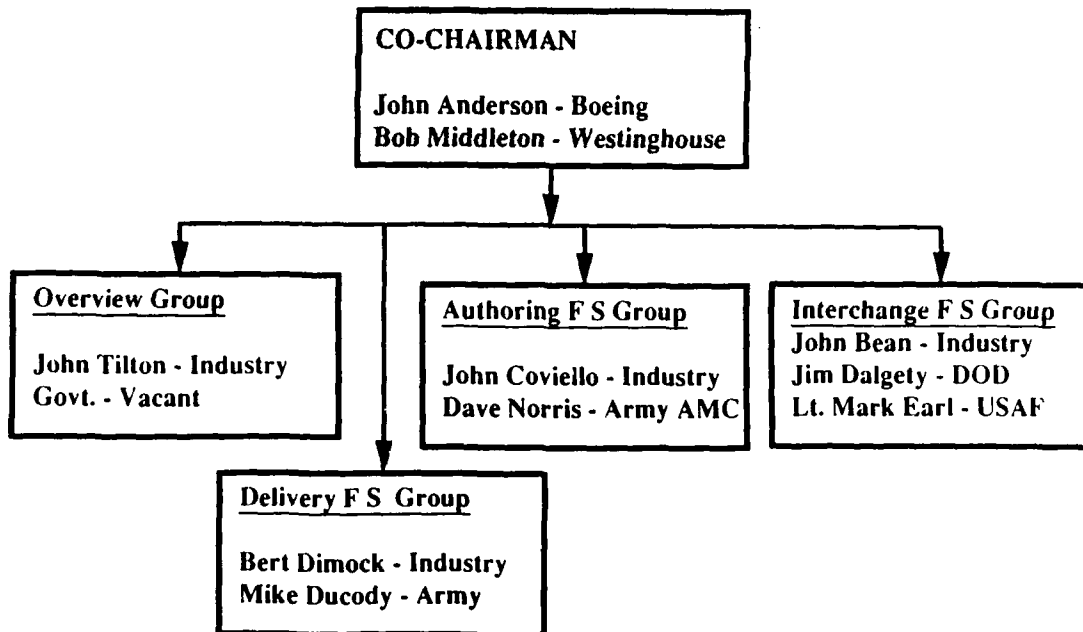
Study Group Membership

- * **DOD**
- * **Army, Navy, and Air Force**
- * **Industry**
 - **Prime Contractors -**
 - **Subcontractors -**
 - **Vendors -**
 - **Other Interested Industry Disciplines -**

***Membership is competent and
well qualified!***

ORGANIZATION & STRUCTURE

Leadership Roles



ACCOMPLISHMENTS TO DATE

- * Working Relationships Established
- * Expert Knowledge Available and Functioning
- * Concept Papers Complete
- * Generic Specifications - 1st Drafts Complete

Results of Effort Will Provide:

- *Universal Authoring System*
- *Means to Eliminate Redundant Effort*
- *Government and Industry Compatibility*
- *Standardized Performance From Everyone*
- *Interservice Compatibility in Technical Data Preparation, Delivery, and Presentation*
- *Maximized Cost Effectiveness Throughout CALS*

SOME PROBLEMS WE FACE...

- * *What is PTM Study Group's CALS Policy Office Charter Today?*
 - *Advisory?*
 - *Specification Developers?*
 - *or Both?*
- * *Near-term Need on A-12, ATF, and LHX Programs = Short-term Solutions*
 - *Separate Specifications Pursued by Navy and Air Force*
- * *Long-term Solution Benefits us All*
 - *"one face to industry"*
 - *Interchange specification ready for review*
- * *Contractors May Have to Support Multiple Authoring Systems*

RECENT ACCOMPLISHMENTS...

- *Letter to CALS Policy Office*
 - *A-12, ATF, & LHX Program Timing -*
 - *TMSS Difficulty -*
 - *PTMSG has Drafts for MIL-M-28001 (Interactive Electronic Delivery) & Content Data Model Document Type Definition*
- *Drafts are Ready for Use on B-2, ATF, ATA, LHX, etc.*
- *Industry Offers*
 - *to act as advisory group for near/short-term program requirements*
 - *continue to develop long-term generic functional specifications for paperless/pageless TMs*
- *Industry thinks DOD CALS Policy Office likes our offer*
- *Many Earlier Conflicts Resolved*

Slide 23

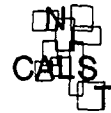
NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY

(Formerly the National Bureau of Standards)

The Development of MIL-STD-1840A
And Other
CALS Standards

David S. Bettwy
Center for Manufacturing Engineering
CALS Project Office

OVERVIEW



- The CALS Standards Process
- Standards in Place
- Standards in Development
- Future Plans

MIL-STD-1840A



- MIL-STD-1840A -- Automated Interchange of Technical Information
- MIL-D-28000 -- Digital Representation for Communication of Product Data: IGES Application Subsets
- MIL-M-28001 -- Markup Requirements & Generic Style Specifications for Electronic Printed Output & Exchange of Text
- MIL-R-28002 -- Raster Graphics Representation in Binary Format: Requirements For
- MIL-D-28003 -- Digital Representation for Communication of Illustration Data: CGM Application Profile
- MIL-HDBK-59 -- CALS Implementation Guide

1840A DELIVERY FORMS



TECHNICAL PUBLICATIONS

- Tagged ASCII Text (SGML)
- Illustrations (CGM, Raster, IGES, Gray Scale)
- Published format control (PDL, OS)

PRODUCT INFORMATION

- Product Data (IGES, Raster, EDIF, VHDL, IPC)

"ON-LINE" INFORMATION ACCESS

- Telecommunications (GOSIP)
- Distributed database standards & technology (IRDS, NDL, SQL, RDA)

1840A DELIVERY MEDIA



- Magnetic Tape
(FIPS PUBS 1, 2, 25, 50, 79)

- Telecommunications
(GOSIP, FIPS PUB 100)

MIL-D-28000



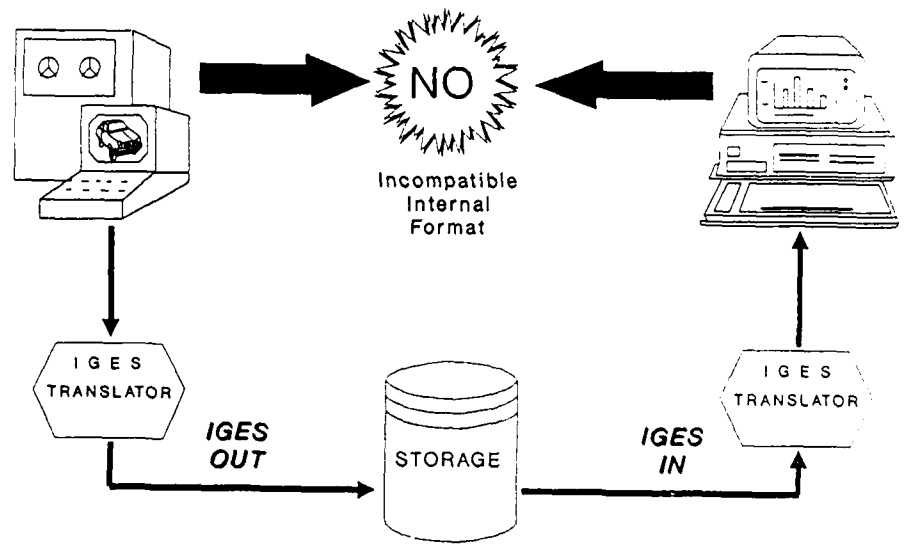
- MIL-STD-1840A -- Automated Interchange of Technical Information
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- MIL-M-28001 -- Markup Requirements & Generic Style Specifications for Electronic Printed Output & Exchange of Text
- MIL-R-28002 -- Raster Graphics Representation in Binary Format: Requirements For
- MIL-D-28003 -- Digital Representation for Communication of Illustration Data: CGM Application Profile
- MIL-HDBK-59 -- CALS Implementation Guide

IGES NEUTRAL INTERCHANGE FORMAT

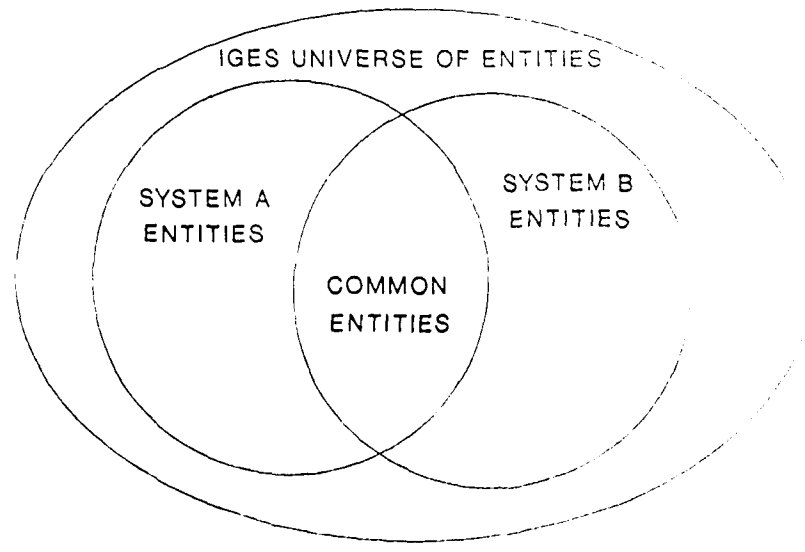


SYSTEM A

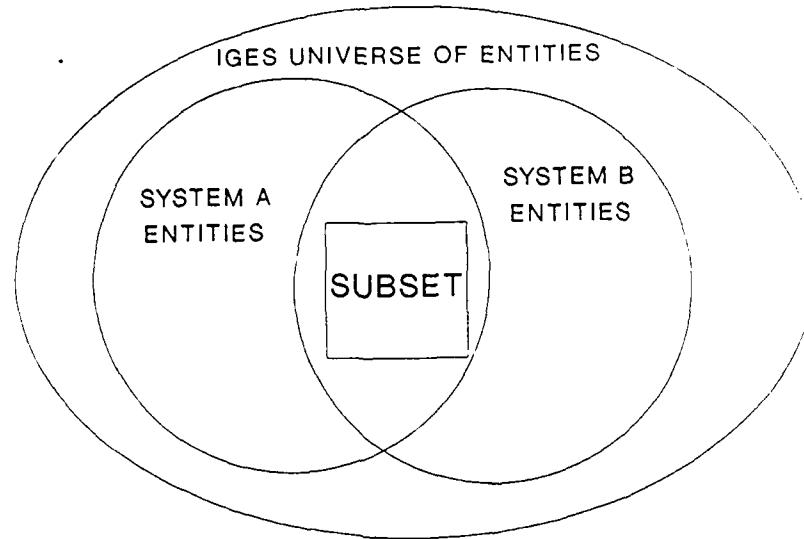
SYSTEM B



PURPOSE OF SUBSETS



PURPOSE OF SUBSETS



MIL-D-28000 CONTENT



SCOPE

Specification of discrete subsets of IGES entities by functional area.

FUNCTIONAL AREAS

- Class I Technical illustrations
- Class II Engineering drawings
- Class III Electrical/Electronic Applications
- Class IV Numerical Control Manufacturing
- Class V Piping and Tubing

MIL-D-28003



- MIL-STD-1840A -- Automated Interchange of Technical Information
- MIL-D-28000 -- Digital Representation for Communication of Product Data: IGES Application Subsets
- MIL-M-28001 -- Markup Requirements & Generic Style Specifications for Electronic Printed Output & Exchange of Text
- MIL-R-28002 -- Raster Graphics Representation in Binary Format: Requirements For
- MIL-D-28003 -- Digital Representation for Communication of Illustration Data: CGM Application Profile
- MIL-HDBK-59 -- CALS Implementation Guide

MIL-D-28003 (CGM)



"DIGITAL REPRESENTATION FOR COMMUNICATION OF ILLUSTRATION DATA: CGM APPLICATION PROFILE"

- Conformance to ANSI X3.122
- Entity ranges
- File inspection and acceptance criteria

MIL-R-28002



- MIL-STD-1840A -- Automated Interchange of Technical Information
- MIL-D-28000 -- Digital Representation for Communication of Product Data: IGES Application Subsets
- MIL-M-28001 -- Markup Requirements & Generic Style Specifications for Electronic Printed Output & Exchange of Text
- MIL-R-28002 -- Raster Graphics Representation in Binary Format: Requirements For
- MIL-D-28003 -- Digital Representation for Communication of Illustration Data: CGM Application Profile
- MIL-HDBK-59 -- CALS Implementation Guide

MIL-R-28002 (RASTER)



SCOPE

Describes the binary digital representation of raster data, delivered in the CCITT Group 4, Recommendation T6, form.

FUNCTIONAL TYPES

Type I -- Untiled Raster Image

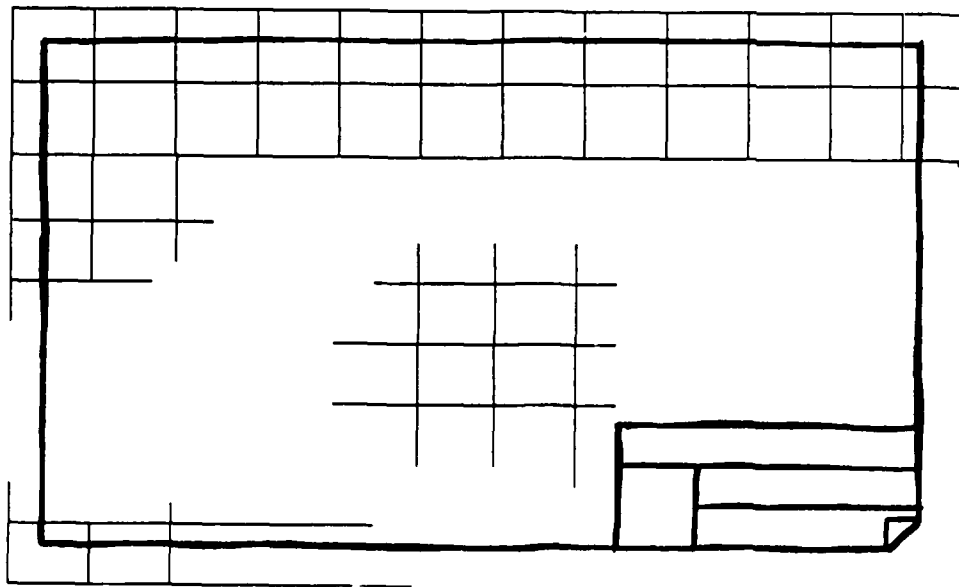
Type II -- Tiled Raster Image

RASTER DATA COMPRESSION



Line No.	W	B	W	B	W	B	W	B	W	B	W	B	W
1	42												
2	42												
3	42												
4	42												
5	4	3	10	3	22								
6	4	3	9	4	22								
7	4	4	8	4	22								
8	4	4	7	5	22								
9	4	4	7	4	23								
10	4	5	6	4	23								
11	4	5	5	5	9	7	7						
12	4	2	2	2	4	2	1	2	8	9	6		
13	4	2	2	2	4	2	1	2	7	4	3	4	5
14	4	2	2	3	2	2	2	2	6	4	5	4	4
15	4	2	2	7	2	2	6	3	7	3	4		
16	4	2	2	5	3	2	6	3	7	3	4		
17	4	2	2	5	3	2	5	4	7	3	4		
18	4	2	2	3	4	2	5	14	4				
19	4	2	2	2	4	2	5	14	4				
20	4	2	2	2	5	3	15						
21	4	2	2	2	5	3	15						
22	4	2	2	2	6	2	15						
23	4	2	2	2	6	3	8	2	4				
24	4	3	9	3	7	4	5	3	4				
25	4	3	9	4	7	10	5						
26	4	3	9	3	9	7	5						
27	29	3	10										
28	42												
29	42												
30	42												

RASTER IMAGE TILING



UPDATE ON MIL-M-28001 ELECTRONIC PUBLISHING

Datalogics, Inc.

Ms. Pam Gennusa

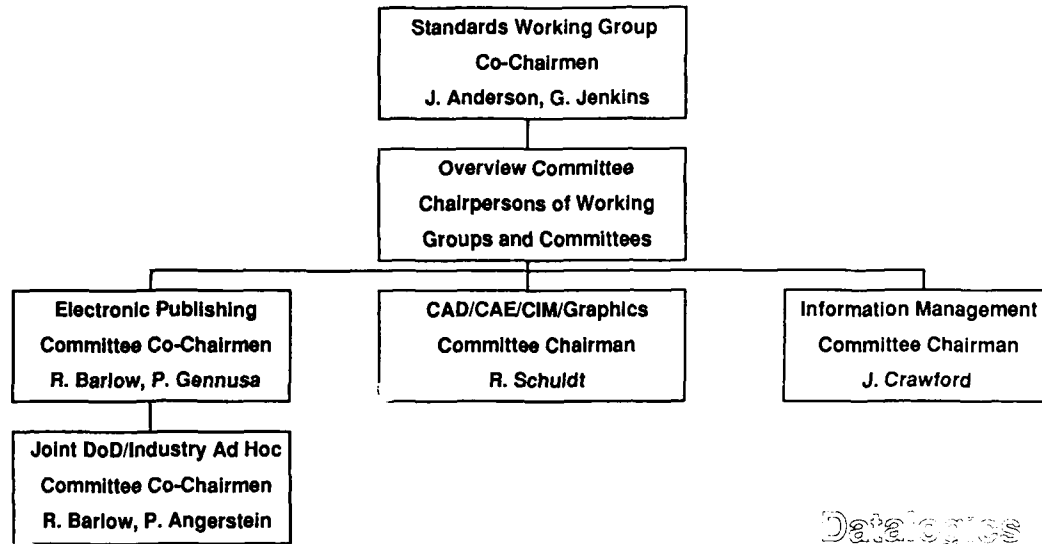
MISSION OF MIL-M-28001

Electronic Publishing for Paper Output

- Not for Electronic Retrieval**
- This Controls "Depth of Tagging" (level of granularity & structure vs. content)**

Extensible to Cover Variety of Technical Manual Document Types

MIL-M-28001 - CALS INDUSTRY STANDARDS WORKING GROUP ORGANIZATION



Datavision

WHO SITS ON ELECTRONIC PUBLISHING COMMITTEE

Contractors
Vendors
Services
OSD

Datavision

MIL-M-28001A - SCHEDULE

Draft (complete) Due Out for Coordination Review - 11 JUL 89

Comments Due Back - +70 Days (20 SEP 89)

Resolution Meeting - +4-5 weeks (week of 30 OCT 89)

Final Release - DEC 89

10/25/89

MIL-M-28001A - MAJOR STRUCTURAL CHANGES

Specification Proper - Similar to Current Version

Appendix A

- Information on Creating/Reading a DTD
- SGML Declaration
- General Purpose DTD - Equivalent to Non-Conforming DTD;
Uses All Elements in Baseline Tag Set
- Listing of Text Types

Appendix B

- Output Specification
- Guidelines for Using OS

10/25/89

MIL-M-28001A - MAJOR STRUCTURAL CHANGES - cont'd

Appendix C

- Entities Available for Use Across Applications

Appendix D

- MIL-M-38784 and Related Specifications DTDs
- Formatting Output Specification Instance (FOSI) for MIL-M-38784

Datalogics

WHAT'S COVERED IN SPECIFICATION PROPER?

Discusses Minimum Requirements for Delivery of an SGML Document

Via MIL-STD-1840A

Discussion of Rules for Creation of Additional DTDs

Datalogics

WHAT IS A BASELINE TAG SET?

Interpret This as a Data Dictionary

One Agreed-Upon Name for Each Element

**Descriptions Are Written, Natural-Language Explanations of Somewhat
Cryptic Nomenclature in the SGML DTD**

Datalogics

WHAT ARE AN OS AND A FOSI?

Output Specification (OS)

- **A finite Set of Style Characteristics to Convey Formatting Intent for Interchange of Technical Manuals**
- **A Mechanism for Binding Style Characteristics to Logical Elements in a DTD**
- **Current Version is Only Concerned with Paper Media**

Formatting Output Specification Instance (FOSI)

- **An Instance of the OS That Assigns Values to the Style Characteristics for a Particular DTD**

Use SGML Syntax

Datalogics

MIL-M-28001A - AMENDMENT 1

List of Generic DTDs for Use Across All Services

- **CALS Will Define and Publish DTDs & FOSIs That Relate to Common, Joint Set of Standards as Designed in MIL-STD-361**
 - * **Will Build on Work Being Done by Each Service (e.g., AFTOMS)**
- **High Priority for Services - Identify Standards as Candidates for Coordination**

Additional DTDs and FOSIs Included as Appendices E, F, G, etc.

Due for Publication in 1990

Datalogics

CONCLUSIONS

High Level of Industry Involvement

- **Aggressive Review Schedule Through CY89 to Complete MIL-M-28001A**
- **On-Going Activity Through CY89 on Next Amendment**

Continued Coordination Between Services

- **Continue Developing Complete Set of DTDs to Support Pending Procurements**

Datalogics

MIL-STD-1388-2B
AND JOINT SERVICE LSAR ADP
REVISIONS

Mr. George Desiderio

88-887-1

OUTLINE

- o BACKGROUND ON THE LOGISTIC SUPPORT ANALYSIS RECORD-WHERE WE ARE NOW?
- o PROBLEM AREAS ENCOUNTERED WITH THE PRESENT MILITARY STANDARD (MIL-STD-1388-2A) AND ASSOCIATED JOINT SERVICES LSAR ADP SYSTEM.
- o THE DEVELOPMENT OF A REVISED STANDARD AND SOFTWARE SYSTEM.
- o MIL-STD-1388-2B, DOD REQUIREMENTS FOR A LOGISTIC SUPPORT ANALYSIS RECORD
 - WHAT ARE THE REQUIREMENTS?
 - THE RELATIONAL JOINT SERVICES LSAR ADP SYSTEM.
 - SCHEDULE FOR RELEASE OF THE STANDARD AND SOFTWARE.

BACKGROUND

- o MIL-STD-1388-2A RESULTED FROM A JOINT SERVICE EFFORT TO ESTABLISH A COMMON FORMAT FOR THE DELIVERY OF LSAR DATA.
- o ESTABLISHED IN JULY 1984 AS THE COMPANION DOCUMENT TO MIL-STD-1388-1A.
- o DIRECTED TOWARD IMPROVING COST EFFECTIVENESS OF THE GENERATION, MAINTENANCE, ACQUISITION AND USE OF TECH DATA TO SUPPORT ILS.
 - STD DATA ELEMENT DEFINITIONS AND FORMATS.
 - CONSOLIDATION OF LOGISTICS ORIENTED DATA FROM ALL DISCIPLINES.
 - USE OF INTEGRATED DATA SYSTEMS TIED TO ENGINEERING AND MANUFACTURING DATA BASES.
- o INCLUDED A GOVERNMENT DEVELOPED ADP SYSTEM TO AUTOMATE DATA STORAGE AND REPORTING.

WHERE WE ARE NOW

- o MIL-STD-1388-2A, DOD REQUIREMENTS FOR A LOGISTIC SUPPORT ANALYSIS RECORD
 - DATA ENTRY INSTRUCTIONS
 - STANDARD OUTPUT SUMMARIES
 - MASTER FILES (FLAT FILE)
 - LCN, ALC, UOC ASSIGNMENT
 - APPLICATION & TRAINING GUIDANCE
 - DATA ELEMENT DICTIONARY W/OVER 600 LOGISTICS RELATED DATA ELEMENTS
- o JOINT SERVICES LSAR ADP SYSTEM
 - FLAT FILE STORAGE OF DATA
 - BATCH MODE DATA INPUT VIA 80 COLUMN PUNCH CARDS
 - MAINFRAME ORIENTED
 - 80 STANDARD OUTPUT SUMMARIES
 - WRITTEN IN ANSI STANDARD COBOL
 - PROVIDED AS GFE UPON REQUEST
 - VALIDATION PROCESS FOR CONTRACTOR DEVELOPED SYSTEMS

PROBLEM AREAS

- o PRESENT ADP SYSTEM IS NEITHER FLEXIBLE NOR INTERACTIVE.
- o REQUIRED MANY REDUNDANT DATA ENTRIES
- o LIMITED DATA FIELD WIDTH
- o DIFFICULT TO INTERFACE WITH OTHER TOOLS OR DATA BASES.
- o ORIENTED TOWARD MAINFRAME IMPLEMENTATION.
- o DIFFICULT TO MAINTAIN BOTH THE MILITARY STANDARD AND THE SOFTWARE SYSTEM.

REVISION EFFORTS

- o INITIAL EFFORTS TO DEVELOP A NEW STANDARD BEGAN ABOUT A YEAR AND A HALF AGO BY THE DOD LSA SPT ACTIVITY AND THE JOINT SERVICES LSA TECHNICAL WORKING GROUP.
- o FORMATION OF A DOD LSA/CALS INFORMAL STUDY GROUP - OCT 88.
- o OSD - NIST CONTRACT WITH BATTELLE/D. APPLETON CO. (30 NOV 88) TO PERFORM DATA MODELING.
 - IDEF1X MODELING TECHNIQUE
 - FUNCTIONAL AND TECHNICAL EXPERTISE PROVIDED BY LSA/CALS STUDY GROUP
- o CALS/LSA MODELING RESULTS.
 - LOGICAL MODEL OF LSAR DATA
 - BUSINESS RULES
 - RELATIONAL TABLES

REVISION OBJECTIVES

- o DEVELOP AN EASILY MAINTAINABLE MILITARY STANDARD AND LSAR ADP SYSTEM THAT IS:
 - INTERACTIVE AND FLEXIBLE - ON-LINE DATA ENTRY AND EDIT
 - CAPABLE OF INTERFACING READILY W/OTHER DATABASES
 - CAPABLE OF PROCESSING AD HOC QUERIES
 - PORTABLE ACROSS VARIOUS COMPUTER PLATFORMS AND PROPRIETARY SOFTWARE SYSTEMS
 - SUPPORTIVE OF A WIDER RANGE OF LOGISTIC PRODUCT REQUIREMENTS
- o SUPPORT THE INITIATIVES IN THE CALS AREA.
 - REDUCTION IN REDUNDANT DATA ENTRIES
 - INTEGRATED DATA BASES
 - DIGITAL DELIVERY OF DATA

MIL-STD-1388-2B

- o MAJOR CHANGE FROM MIL-STD-1388-2A.
 - REQUIREMENT FOR DATA TO BE DELIVERED IN RELATIONAL TABLE FORMATS INSTEAD OF FLAT MASTER FILES
 - ELIMINATION OF DATA INPUT RECORDS
 - ELIMINATION OF DATA ELEMENTS ASSOCIATED WITH CARD INPUTS
 - 83 ADDITIONAL DATA ELEMENTS FROM ACROSS FUNCTIONAL AREAS
 - ELIMINATION OF NON-PRODUCT ORIENTED OUTPUT SUMMARIES
- o RELATIONAL BASED JOINT SERVICES LSAR ADP SYSTEM.
 - GFE WILL NOT INCLUDE THE PROPRIETARY RDBMS
 - PORTABILITY THROUGH EXPORT OF SQL
 - NOT DEPENDENT UPON PROPRIETARY RDBMS
 - COMPATIBILITY WITH MAINFRAME, MINI, MICRO APPLICATIONS
- o VALIDATION PROCESS FOR COMMERCIAL SYSTEMS.
 - SIMILAR TO PRESENT PROCESS
 - NO REQUIREMENT FOR RDBMS TO MEET -2B REQUIREMENTS

MIL-STD-1388-2B

CONTENT HIGHLIGHTS

- EXPANDS INDEPENDENT LSAR SOFTWARE VALIDATION REQUIREMENTS
 - DEFINES TYPE 2 AND TYPE 3 SYSTEMS (ELIMINATES TYPE 1)
 - REQUIRES CAPABILITY TO ACCEPT RELATIONAL TABLES AS INPUT
- LSA CONTROL NUMBER (LCN) FIELD EXPANDED TO 18 CHARACTERS
- LCN CAN REPRESENT HARDWARE OR FUNCTIONAL BREAKDOWN
- NEW LSAR REPORTS
 - CALIBRATION MAINTENANCE REQUIREMENTS SUMMARY
 - TRANSPORTABILITY REPORT
 - MANPOWER AUTHORIZATION REQUIREMENTS SUMMARY

MIL-STD-1388-2B DRAFT DOCUMENT FORMAT

1388-2A

LSAR DATA ENTRY INSTRUCTIONS
LSAR REPORTS (80)
LSAR MASTER FILES (FLAT FILES)
LCN, ALC, UOC ASSIGNMENT
APPLICATION & TAILORING
DATA ELEMENT DICTIONARY

1388-2B

DELETED (NO DATA RECORDS)
LSAR REPORTS (21)
RELATIONAL TABLE FORMATS
NO CHANGE
NO CHANGE
ADDED NEW DATA ELEMENTS

JLSAR RELEASE 4
BENEFITS OF RDBMS

- *ALLOWS FOR EASIER CHANGES TO DATA BASE STRUCTURE*
- *LSAR DATA CAN BE SHARED WITH OTHER FUNCTIONAL AREAS*
- *ONE-TIME STORAGE OF DATA ELEMENTS IMPROVES QUALITY AND CONSISTENCY OF PRODUCTS*
- *ALLOWS FOR AD HOC REPORT GENERATION*
- *MORE PRACTICAL FOR ON-LINE ACCESS*

2B-REV-A

MIL-STD-1388-2B
ADDITIONAL CONSIDERATIONS

- ALL CURRENT MIL-STD-1388-2A CONTRACTS AND SOFTWARE WILL CONTINUE TO BE SUPPORTED
- AUTOMATED CONVERSION ROUTINES WILL BE DEVELOPED TO ALLOW TRANSITION FROM MIL-STD-1388-2A FILES TO MIL-STD-1388-2B RELATIONAL FILES
- CONTRACTORS MAY USE ANY RELATIONAL SOFTWARE DEEMED DESIRABLE, BUT, MUST BE VALIDATED
- ADDITIONAL FUNCTIONAL AREA PRODUCT REQUIREMENTS WILL BE INCORPORATED AS STANDARIZATION IS ACHIEVED
- COMPANION DOCUMENT WITH IDEF1X DATA MODEL AND BUSINESS RULES WILL BE PUBLISHED CONCURRENT WITH MIL-STD-1388-2B

2B-REV-B

CALS/LSA DATA MODELING PLANNED EFFORTS

- ACCEPTANCE TESTING OF CALS/LSA LOGICAL DATA MODEL (APR 89)
- ALPHA TESTING OF JSLSAR ADP SYSTEM RELATIONAL TABLES (MAY-DEC 89)
- BETA TESTING OF ADP SYSTEM PORTABILITY ISSUES (JUN-JUL 89)
- DEVELOP GUIDE CONTAINING CALS/LSA DATA MODEL AND BUSINESS RULES (DEC 89)

2B-REV-F

SCHEDULE

- MIL-STD-1388-2B
PREPARE DRAFT - AUG 88
DATA MODELING - 31 OCT 88 - 15 JAN 89
STAFF DRAFT DOCUMENT - 1 MAR 89 - 30 JUN
PUBLISH - 1 NOV 89
- JSLSAR ADP SYSTEM
INITIATE SOFTWARE DEVELOPMENT - 15 JAN 89
TEST SOFTWARE - 1 AUG 89 - 1 NOV 89
DISTRIBUTE SOFTWARE - 1 NOV 89

MIL-STD-1388-3B (PROPOSED)

- o A MILITARY STANDARD OR SPECIFICATION THAT DEFINES A MORE ADVANCED IMPLEMENTATION OF THE LSAR.
 - INTERACTIVE ACCESS OF DATA USING IDENTICAL SQL QUERIES
 - DATA SHARING ACROSS AUTOMATED INFORMATION SYSTEM BOUNDARIES

- o REQUIREMENTS FOR THE LSAR ADP SYSTEM STRUCTURE THAT CAN BE MAPPED TO THE IDEF1X MODEL USED TO DEVELOP MIL-STD-1388-2B. MIL-STD-1388-3B WILL CONTAIN.
 - IDEF1X DATA MODEL
 - SQL DATA DEFINITION LANGUAGE
 - BUSINESS RULES

- o STATUS -- CURRENTLY IN DISCUSSION PHASES ONLY.

CALS Test Network:

Verification and Application Testing Strategy

Melvin S. Lammers
Director, DoD CALS Test Network
Chief, Office of Technology Support, AFLC LMSC/SJT

Outline of Briefing



- CTN Objectives
- End-to-End Testing Defined
- Test Schedules
- Benefits of Testing

CALS Test Network (CTN)

Goal

Test and Demonstrate CALS Standards



Digital Technical Information

CREATION

TRANSFER

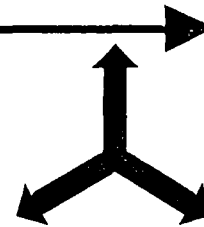
RECEIPT

104P 99

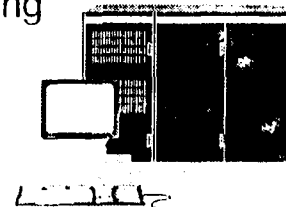
Objectives I



- Develop Distributed Testing Capability
 - Develop Software/Test Platforms
 - Identify Industry/Government Participants
 - Establish CTN Review/Advisory Boards



- Demonstrate Complete Data Delivery Process
 - Determine Functionality/Tech Capability
 - Manage User/Application Testing



Objectives II



- Evaluate Effectiveness of CALS Standards
 - Identify Needed Improvements
 - Prototype Conformance/Acceptance Tests
- Evaluate New Technology
 - Identify Requirements for New Standards
 - Identify Useful CALS Technologies

CTN ATTRIBUTES



- Focus on User Testing
 - CTN Planned Test (CPT)
 - Independently Planned Test (IPT)
- Demonstrate Effectiveness and Benefits
- Maintain Communication Network and Data Base
- Feedback to Standards Process and Vendor Implementations

MIL-STD-1840A

Envelope Std

MIL-STD-1840A: Is a standard which specifies the general format for computer tape transmission of digital technical data, and points to other necessary standards.

Used to package the digital technical manuals, or engineering drawings, for exchange between systems in industry or DOD.

Example: Exchanging a file of technical manuals between Lockheed and the Air Force

6 Jan 1989

MIL-D-28000

IGES

MIL-D-28000: Subsets of the Initial Graphics Exchange Standard (IGES). IGES is a national standard for neutral formatted vector graphics

Used to exchange engineering drawings & illustrations between dissimilar CAD/CAM systems and engineering data repositories in industry and DOD

Example: Exchanging a tail-component drawing for the F-15/F-14 between the Air Force and the Navy

00000

MIL-M-28001

(SGML)

MIL-M-28001: Markup requirements for electronic output of text, a standard for generically tagging digital technical publications so that they can be transferred between computer systems in a consistent manner

Used to ensure that the content of technical documents is consistent from industry to DOD and within the Services

Example: Tagging a WARNING notice so that it is always recognized as such rather than random text.

MIL-D-28002

CCITT Gp 4

MIL-D-28002 is a standard which implements the CCITT Gp 4 international standard for use in exchanging raster graphics data between CAD/ CAM systems and engineering data repositories

Used to transfer engineering drawings between and among industry and DOD

Example: Transfer of an engine-part drawing between Pratt & Whitney and the Air Force

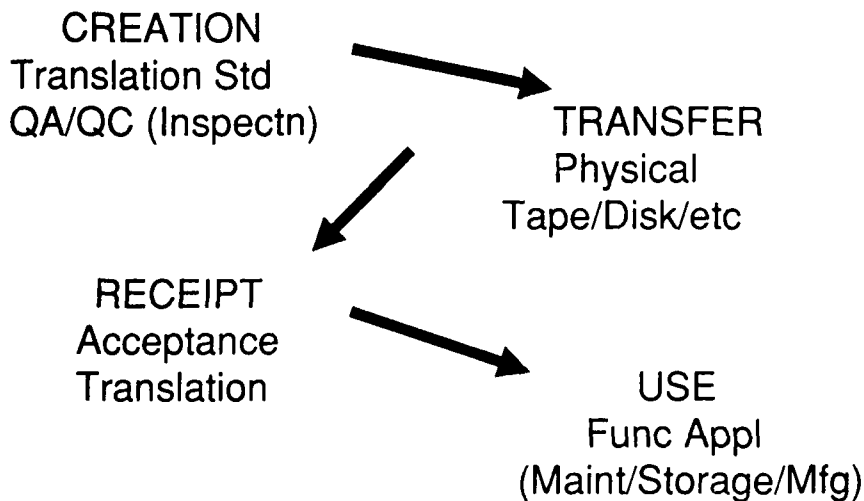
MIL-D-28003 CGM

MIL-D-28003 is the Computer Graphics Metafile (CGM) spec. which is an emerging industry standard for exchanging vector graphics between dissimilar systems

Used to exchange technical manual's graphic illustrations between and among industry and the Services

Example: Transfer a technical manual with illustrations from McDonnell-Douglas to the Air Force

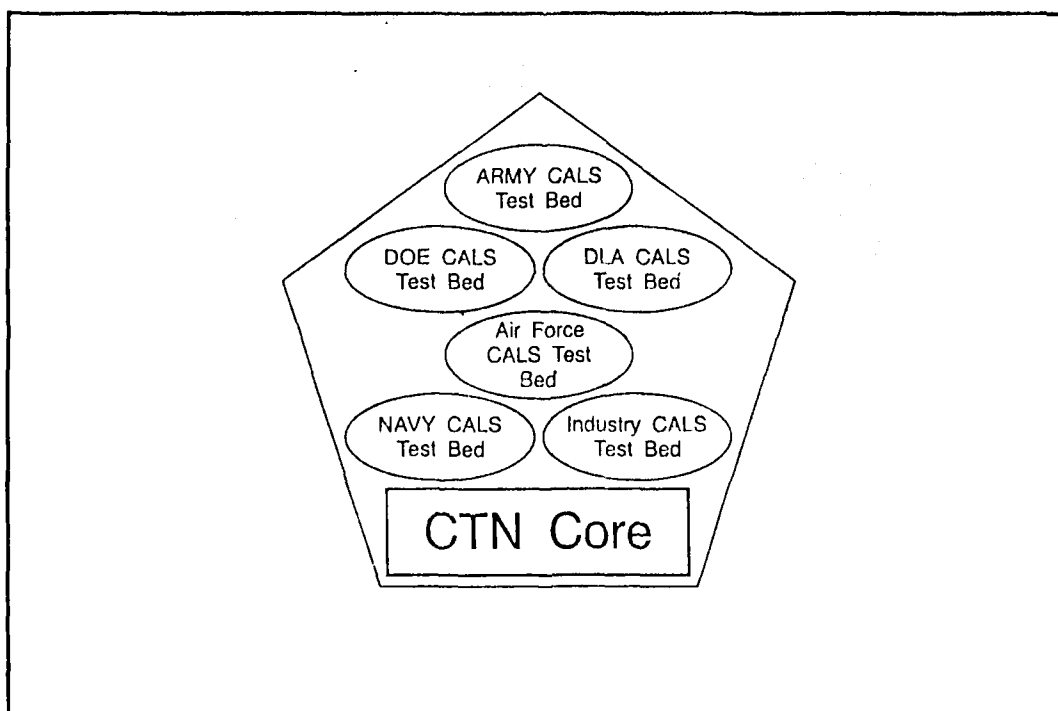
CTN View DATA DELIVERY PROCESS



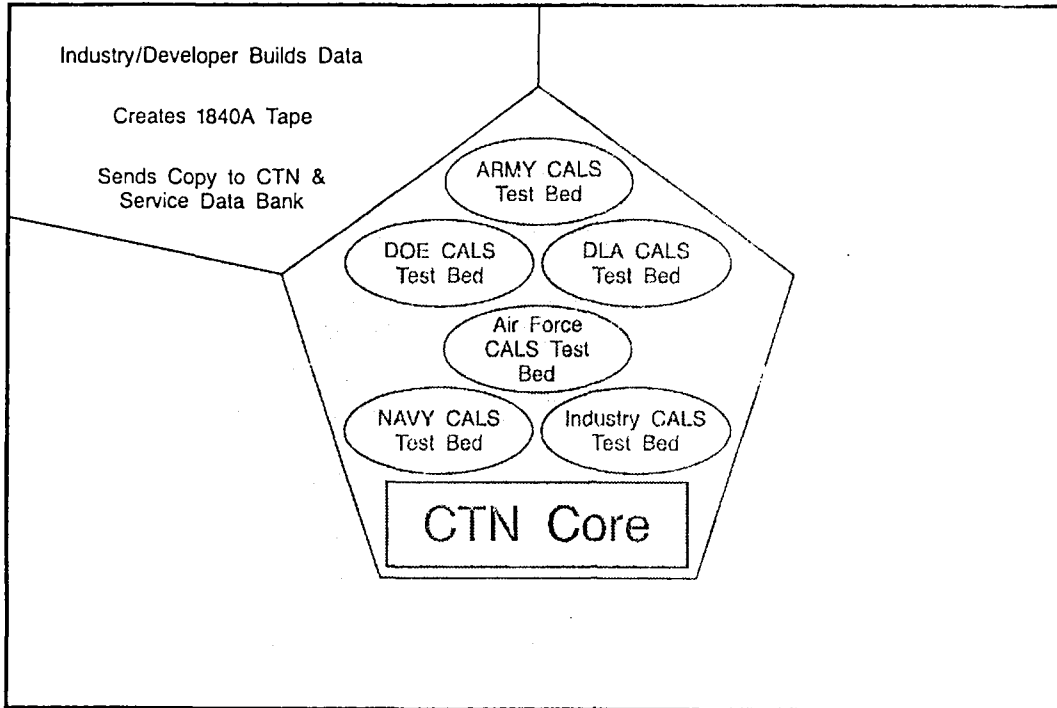
TYPES OF TESTING CAL S STANDARDS

Category	Target
Development <ul style="list-style-type: none"> Accomplished by Development Sites 	Standard
Conformance <ul style="list-style-type: none"> Developed by NIST Prototyped by CTN Accomplished by Certified Labs 	Products
User/Application <ul style="list-style-type: none"> Developed and Accomplished by CTN 	Process
Acceptance <ul style="list-style-type: none"> Developed by NIST and CTN Prototyped by CTN Accomplished by Receiving Sites 	Data

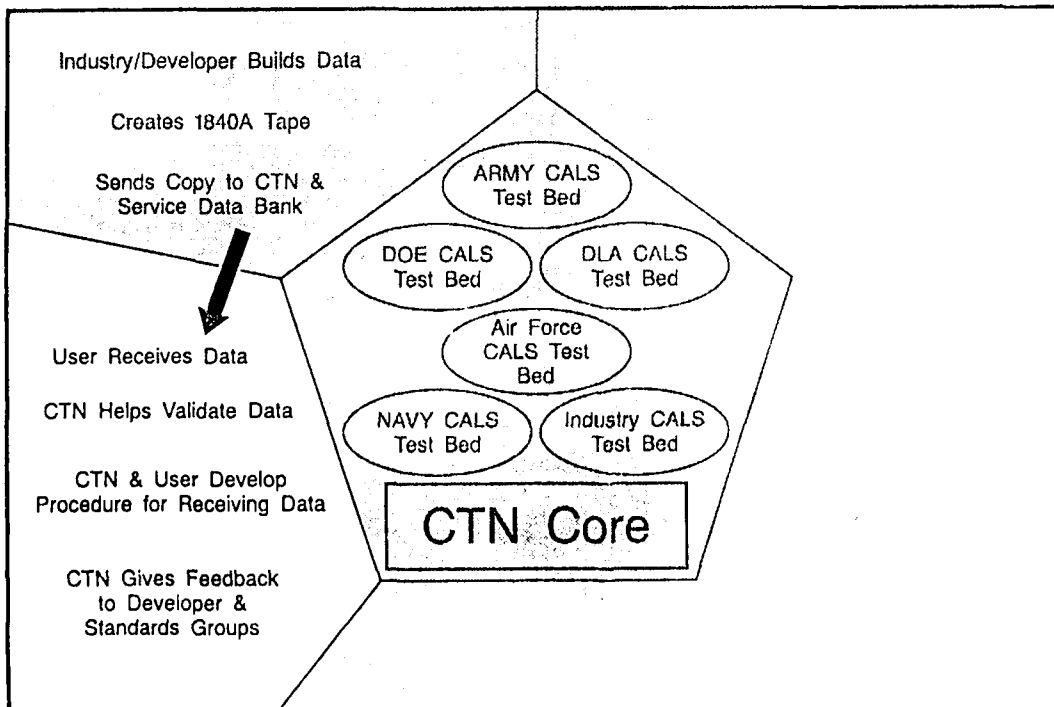
Functional Relationships



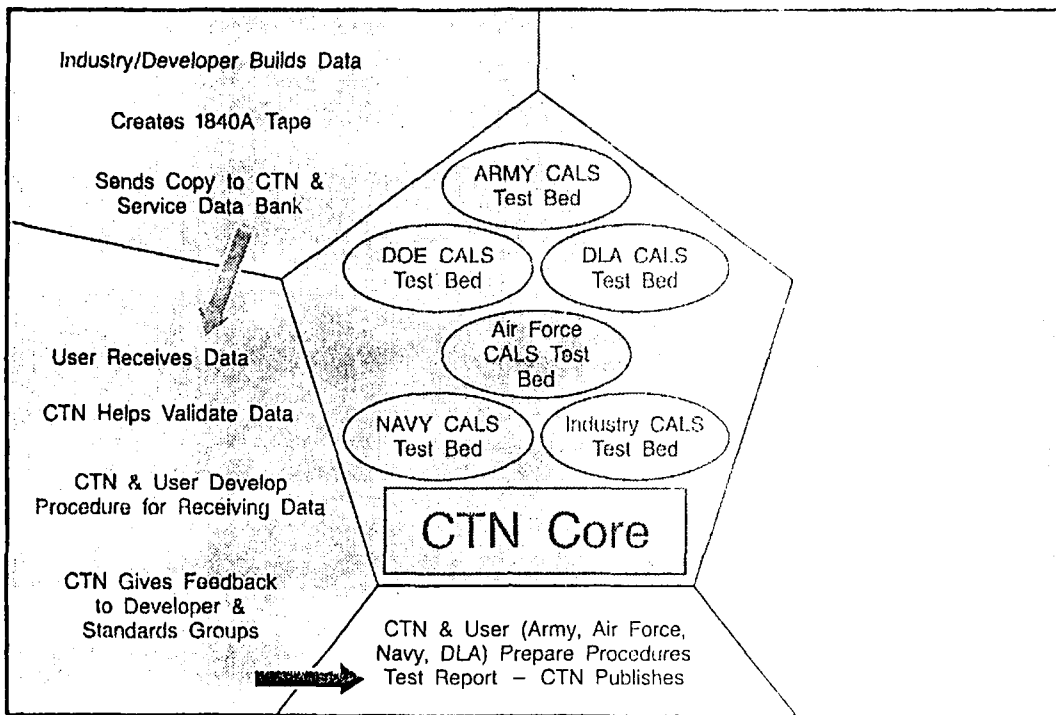
Functional Relationships



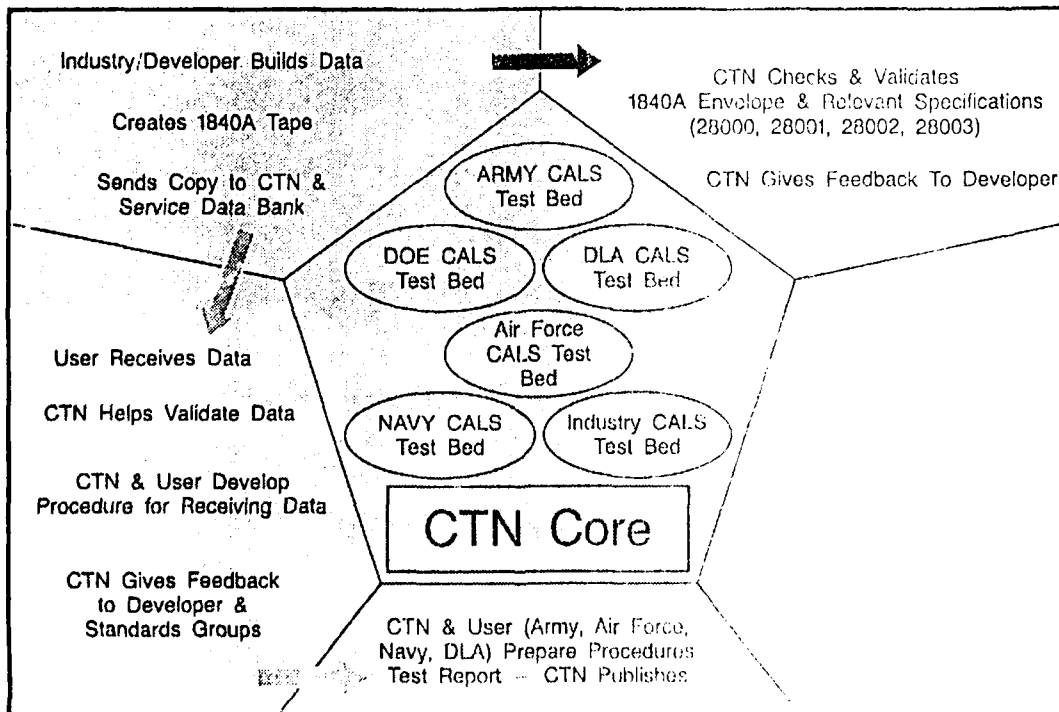
Functional Relationships



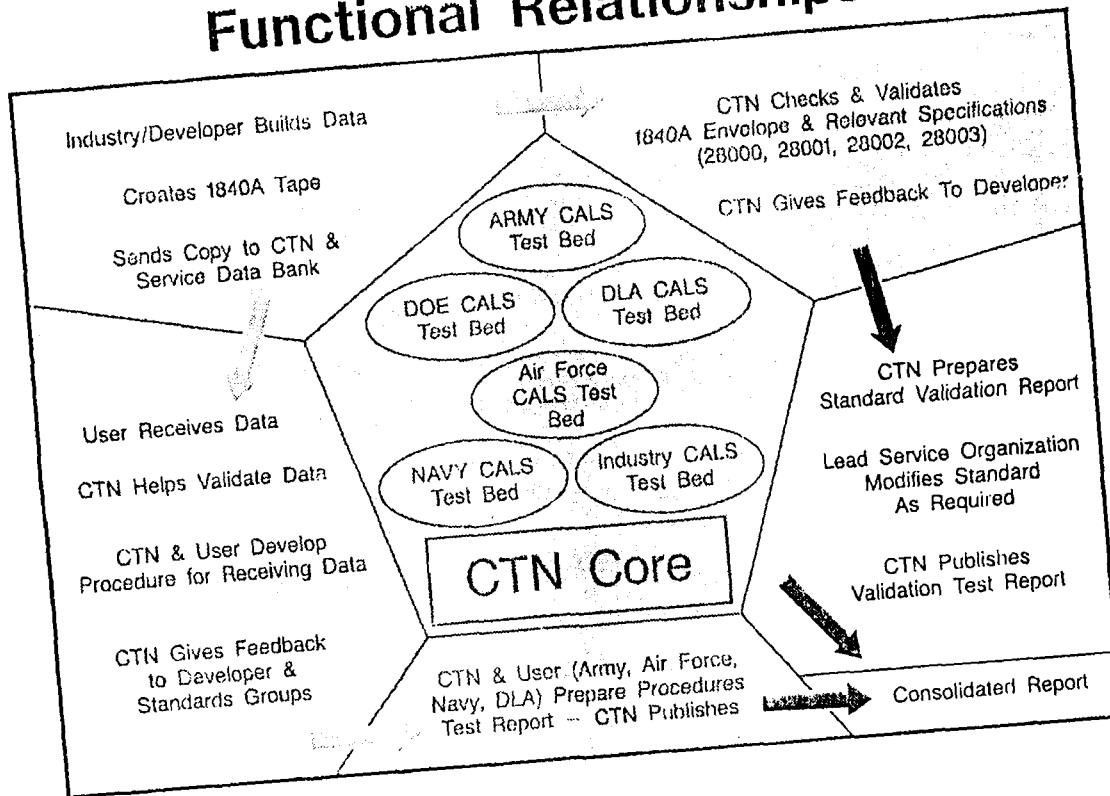
Functional Relationships



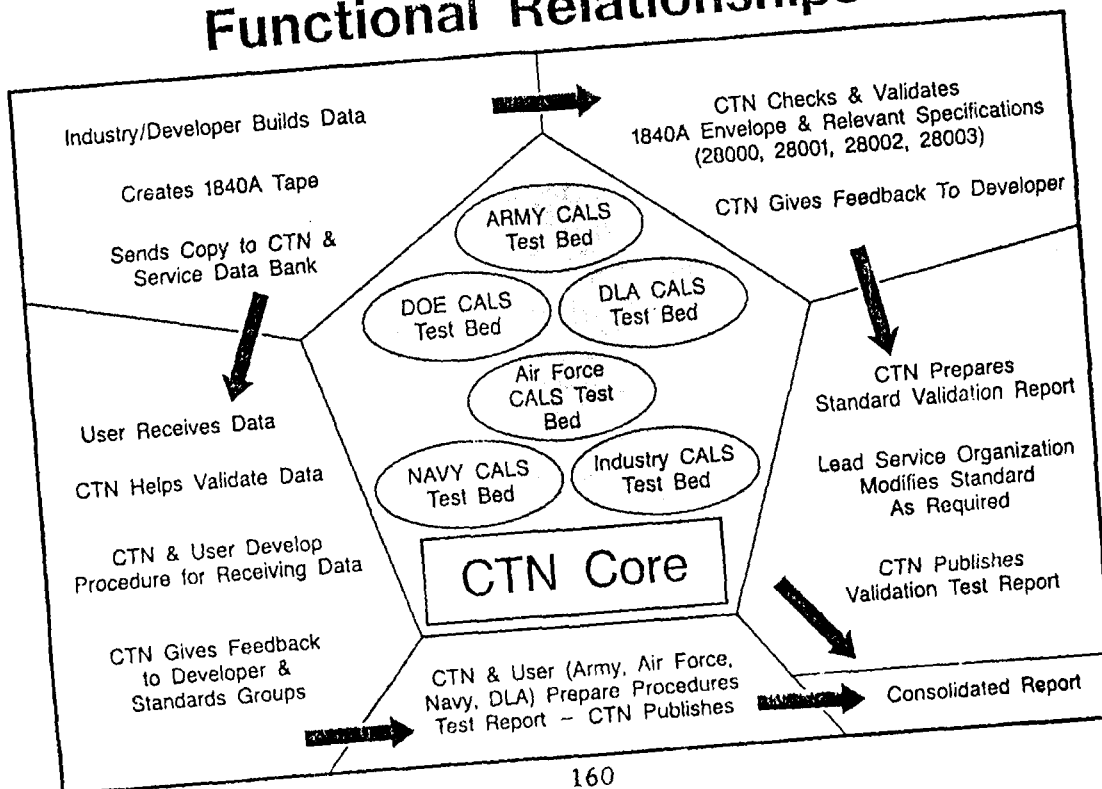
Functional Relationships



Functional Relationships



Functional Relationships



Lead Test Bed Concept I

CALS Test Network

- Centers of Expertise for Applications Testing
 - Engineering Drawings
 - Technical Publications
 - Support Data
 - Data Protection & Security
 - Configuration Management

200000

Lead Test Bed Concept II

CALS Test Network

- Conduct Testing of Applications
 - Plan Tests
 - Conduct Tests
 - Analyze Results

200000

Lead Test Bed Concept III

CALS Test Network



- Focus for Service Testing
 - Test Plan Coordination
 - Test Results Archive
 - Test Results Publications (in CTN Format)

30m000

End-To-End Testing



What Is Involved

Creation

- Prepare Data (Skills)
- Structure According To MIL-STD-1840A
 - Tags, DTD's, OS for Text
 - CGM(28003), IGES(28000) Raster(28002) for Illus.
 - IGES(28000), Raster(28002) (PDES) for Drawings & Engineering Data
 - MIL-SPEC-1388-XX for LSA Data
 - X.12 for EDI Data

End-To-End Testing



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 - X.12 for EDI Data

Transfer

- Inspect Tape for Conformance with MIL-STD-1840A
 - Readable
 - Header Data
 - Individual Stds
- Involves Use of Computer Programs
- Expert Analysts Required
- Time Required

End-To-End Testing



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Transfer

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Receipt

- Inspect Tape for Conformance with MIL-STD-1840A
 - Readable
 - Correct Data
 - Usable Data
- Involves New Procedures & New Skills
- Greater Precision Possible
- Greater Accuracy will be Required

Prepare Final Report

End-To-End Testing

What Is Involved

Creation

- Prepare Data (Skills)
- Structure According To MIL-STD-1840A
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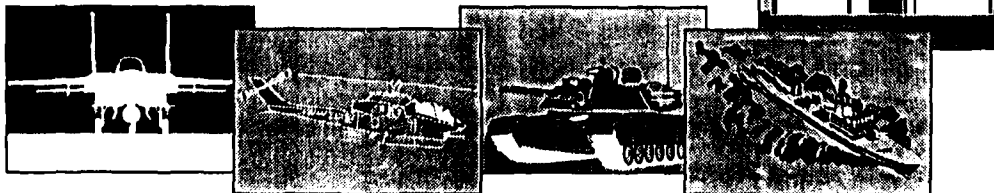
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Prepare Final Report

Organization

- CALS Test Network Manager
- Includes Testing Participation by Army, Navy, DLA, Industry, Other Govt. Agencies
- Located in Hq Air Force Logistics Command
- Planned Joint Manning by Air Force, Army, Navy



CTN Review Board (CTNRB)

Actions and Membership

*Review Test Proposals,
& Recommend Priority to OSD

*Review Test Results, Make
Technical Recommendations

*Report on CTN Progress &
Distribute & Publish Test
Results

*Members: Chair, CTN Dir.
OSD, Services, NIST, LLNL

*Industry CALS Task Force
Advisory Board

Schedule

*First Meeting held 30 Mar 89
at NIST

*Follow-up meeting on 16 May

*Quarterly & as required for
future meetings

Industry Participants

Applied Info Tech Research Cent
AT&T Federal Systems
Auto-Trol Technology
Avalanche Development
Boeing Military Airplane
Cadkey Inc.
CIMLINC Inc
Compugraphic
Context
Datalogics Inc
DataServ
Douglas Aircraft Co.
General Dynamics Electric Boat
General Dynamics Fort Worth
General Electric Aircraft Engines
Grumman Aerospace Corp
Grumman Data Systems
Honeywell Military Avionics Division
Hughes Aircraft
IBM
IGES Data Analysis
Interleaf

IVF Sweden
Knowledge Base International
Lockheed Georgia
McDonnell Aircraft Co.
Martin Marietta Elec & Missile Gp
Northrop Corporation
Publishing Technologies
Pratt & Whitney
Rockwell International
Scribe Systems Inc.
Softquad Inc.
Software Exoterica
STS Information Service
Swedish Inst Prod Engr Research
Sydeny Communications Ltd.
Syscon
Texas Instruments
TRW Inc
United States Video Corp
Vitro Corporation
Xerox Special Info Sys
Xyvision Inc.

Government Agencies

CALS Test Network

- Air Force Technical Order Mangement System (AFTOMS)
- Air Force EDCARS/Army DSREDS Engineering Data Repositories
- Air Force AFLC WR-ALC
- Army CALS, Fort Monmouth, NJ
- Armament Mat. Readiness Cmd.
- Lawrence Livermore National Laboratory (LLNL)
- National Institute of Standards & Technology (NIST)
- Navy David Taylor Research Center (DTRC)
- Navy/DLA EDMICS Engineering Data Repositories
- Navy Sea Combat Systems Engineering Station
- DOE CALS Sandia Nat. Lab. & Oakridge Nat. Lab.
- South Carolina Research Authority (SCRA)

166

Potential Participants

CALS Test Network

- Honeywell--Technical Manuals
- Boeing Military Airplane--Technical Manuals
- Auto-Trol--IGES Sub-Set Testing
- Xerox Air Force 50S Program--CALS Compliance Testing
- Government Printing Office--Contractor(s) Testing
- Swedish & NATO--Document/Drawing Interchange

166

Actions and Dates CALs Testing

What is to be Tested	Who is Involved	Est. Completion
Technical Publication Segment 1-SGML & 1st Set of DTDs & Illust.	Industry, CTN, Software Makers, Govt	1st Qtr FY 90
Technical Publication Segment 2-Output Spec & 2nd Set of DTDs & Illustrations	Industry, CTN, Software Makers, Govt	1st Qtr FY 91
Engineering Drawing Segment 1-IGES I,II	Industry, CTN, Software Makers, Govt	2nd Qtr FY 90
Engineering Drawing Segment 2-IGES III,IV	Industry, CTN Software Makers, Govt	2nd Qtr FY 91

Actions and Dates CALs Testing

What is to be Tested	Who is Involved	Est. Completion
Engineering Drawing Segment 3-RASTER, No tiling	Industry, CTN, Software Makers, Govt	2nd Qtr FY 90
Engineering Drawing Segment 4-RASTER, Tiling	Industry, CTN, Software Makers, Govt	2nd Qtr FY 91
LSA/LSAR, SQL	Industry, CTN, Software Makers, Govt	4th Qtr FY 91
LSA/LSAR, Relational Data Base	Industry, CTN Software Makers, Govt	2nd Qtr FY 92

CTN



Benefits

- Quality Improvements to Digital Data Delivery Process
 - Demonstration/Enrichment of CALS Standards
- Users' Needs Addressed
 - Weapon Systems Contractors
 - DOD/Other Government Agencies
 - Vendors Who Provide Products and Services
- Widely Tested Standards and Methods
 - Accelerated Confidence in Use of CALS Standards
 - Implementation of Direction in Taft Memo



CALS PHASE 1.2 - "IGES VALIDATION"

...SO, FOR IGES, WHAT:

- **CAN BE DONE?**
- **IS BEING DONE?**



CALS PHASE 1.2 - "IGES VALIDATION"

WHAT IS IGES?

- **A PHYSICAL FILE FORMAT**
- **A SET OF RULES FOR MAPPING VARIOUS ENTITIES AND THEIR ATTRIBUTES TO THAT FORMAT**

BUT...



CALS PHASE 1.2 - "IGES VALIDATION"

**AT PRESENT, NO OTHER CONFORMANCE
REQUIREMENTS TO BE ABLE TO SAY:**

"MY TRANSLATOR SUPPORTS IGES!"



CALS PHASE 1.2 - "IGES VALIDATION"

NO NEED TO:

- **SUPPORT A MINIMUM NUMBER OF ENTITIES**
- **MAP A "LINE" TO A "LINE"**
- **GRACEFULLY HANDLE UNSUPPORTED ENTITIES...**

ETC.



CALS PHASE 1.2 - "IGES VALIDATION"

IN SPITE OF ALL THIS:

***A PRACTICAL, USEFUL TESTING PROGRAM
IS UNDER WAY!***



CALS PHASE 1.2 - "IGES VALIDATION"

THE IGES TESTING PROJECT

- **VERIFICATION**
- **APPLICATION VALIDATION**
- **USER ACCEPTANCE**

ALL WITH TEST CASE SUPPORT



CALS PHASE 1.2 - "IGES VALIDATION"

CALS TESTING TERMS: (IGES)

- **DEVELOPMENTAL**
- **CONFORMANCE
APPLICATION VALIDATION**
- **APPLICATION/USER
APPLICATION VALIDATION
USER ACCEPTANCE**
- **ACCEPTANCE**

WHERE DOES VERIFICATION FIT?



CALS PHASE 1.2 - "IGES VALIDATION"

YET ANOTHER SET OF TERMS:

- **ACCEPTANCE TESTING**
- **CONFORMANCE TESTING**
- **FITNESS TESTING**
- **PERFORMANCE TESTING**
- **ROBUSTNESS TESTING**



CALS PHASE I.2 - "IGES VALIDATION"

VERIFICATION TESTING:

- BASED ON VENDOR MAPPING CLAIMS
- CONDUCTED BY INDEPENDENT, THIRD PARTY
- SINGLE TRANSLATOR
- DRAFT METHODOLOGY IN PLACE
- TEST OF METHODOLOGY UNDER WAY
- TEST CASE INTENSIVE
- NO PASS-FAIL OR GOOD-BAD



CALS PHASE I.2 - "IGES VALIDATION"

APPLICATION VALIDATION TESTING:

- BASED ON AN INFORMATION MODEL
- INTRODUCES THE CONCEPT OF AN APPLICATION PROTOCOL RATHER THAN A SUBSET
- PARALLELS MIL-D-28000 IN CONTENT
- CAN BE BASIS FOR CONFORMANCE TESTING
- DESCRIBED IN NISTIR 88-3846
- NO APPLICATION PROTOCOLS YET COMPLETE
- CAN BE APPLIED BY IMPLEMENTOR OR USER
- EXTENDS BEYOND IGES TO PDES/STEP



CALS PHASE 1.2 - "IGES VALIDATION"

ACCEPTANCE TESTING:

- END-TO-END DATA EXCHANGE
- USER ENVIRONMENT DRIVEN
- METHODOLOGY AND TEST CASE DEVELOPMENT STRATEGY IN USABLE, DRAFT FORM
- "SUCCESSFUL" TESTING *WILL NOT* GUARANTEE "APPLIANCE TECHNOLOGY"
- AVAILABLE THROUGH IGES/PDES ORGANIZATION USER INFORMATION COMMITTEE



CALS PHASE 1.2 - "IGES VALIDATION"

WHERE ARE WE?

- NOTHING TODAY
- A FORMAL VERIFICATION PROGRAM
START DATE _____
- A METHODOLOGY FITTING CALS REQUIREMENTS MORE CLOSELY AND EXTENSIBLE TO NEWER STANDARDS THAN IGES IS MOVING TOWARD A USABLE STATE
- SOME HELP FOR THE END USER



CALS PHASE 1.2 - "IGES VALIDATION"

WHAT'S TO BE DONE?

- **UNTIL BETTER COMES ALONG, THE VERIFICATION PROGRAM TESTED, MODIFIED, AND IMPLEMENTED**
- **CONFORMANCE REQUIREMENTS ADDED TO IGES (VERSION 5.0)**
- **APPLICATION PROTOCOLS TO MATCH MIL-D-28000 VALIDATED**
- **CALS COMMUNITY MADE AWARE OF IGES/PDES TESTING PROGRESS**

1989 CALS STANDARDS



PHASE I.2

Mr. Bruce Lepisto

1989 CALS STANDARDS OVERVIEW

DEVELOPMENT OF STANDARDS

- ELECTRONIC DATA INTERCHANGE
- COMPUTER AIDED DESIGN DATA
- LOGISTIC SUPPORT ANALYSIS DATA
- TECHNICAL MANUAL PUBLISHING, ELECTRONIC DISTRIBUTION

DEFINITION OF FUNCTIONAL REQUIREMENTS

- CONTRACTOR INTEGRATED TECHNICAL INFORMATION SERVICE
- RISK ASSESSMENT , OR SYSTEM / DATA PROTECTION AND SECURITY

TESTING OF STANDARDS

- STANDARDS DEVELOPMENT TESTING
- PRODUCT CONFORMANCE TESTING
- USER APPLICATION TESTING
- DATA ACCEPTANCE TESTING

CURRENT CALS STANDARDS

<u>DoD STANDARD</u>	<u>DATE</u>	<u>NAT'L/INT'L STANDARD</u>	<u>APPLICATIONS</u>
MIL-STD-1840A	DEC 87	-	DATA INTERCHANGE/FILE MANAGEMENT
MIL-D-28000	DEC 87	IGES	CAD, VECTOR GRAPHICS - ENG DRAWINGS - TM ILLUSTRATIONS - NC MACHINING
MIL-M-28001	FEB 88	SGML	AUTOMATED PUBLISHING - TECHNICAL MANUALS
MIL-R-28002	DEC 88	CCITT 4	RASTER SCANNED IMAGES - ENG DRAWINGS - TM ILLUSTRATIONS
MIL-D-28003	DEC 88	CGM	VECTOR GRAPHICS - TM ILLUSTRATIONS
MIL-HDBK-59	DEC 88	-	IMPLEMENTATION GUIDE - MODEL SOWs, CDRLs

1989 CALS STANDARDS

ELECTRONIC DATA INTERCHANGE

DoD COMMITMENT TO A DIGITAL COMMERCIAL ENVIRONMENT

- CALS -- TECHNICAL DATA
- EDI -- BUSINESS DATA

INTEGRATION OF CALS AND EDI

- EDI TRANSACTION SETS TO ORDER AND ACCESS TECHNICAL DATA
- EDI ENVELOPES TO TRANSMIT TECHNICAL DATA PACKAGES ACROSS INDUSTRIAL NETWORKS

MIL-STD-1840A AND ANSI X12

- PROPOSED TRANSACTION SET 839 - "TECHNICAL INFORMATION, NON-PARAMETRIC"
- TECHNICAL SPECIFICATION DRAFT - JULY 1989

1989 CALS STANDARDS

COMPUTER AIDED DESIGN DATA

STANDARDS FOR ELECTRONICS PRODUCTS - INTEGRATED CIRCUITS, PRINTED CIRCUIT BOARDS, ETC.

- APPLICATION DOMAINS FOR EDIF, IGES, IPC, VHDL
- EIA COMMITTEE RECOMMENDATIONS
- DEFINE REQUIREMENTS IN MIL-STD-1840A AND MIL-HDBK-59 - MAY 1989
- FUTURE MILITARY SPECIFICATIONS TO IMPLEMENT EVOLVING INDUSTRY PROTOCOLS

MIL-D-28000, AMENDMENT 2

- CLASS 5 SUBSET - 3-D PIPING AND TUBING
- APPLICATION PROTOCOL DEVELOPMENT
- SSN-21 SEAWOLF, NIDDESC, IGES AEC
- DRAFT AMENDMENT 2 - SEPTEMBER 1989

1989 CALS STANDARDS

LOGISTIC SUPPORT ANALYSIS DATA

MIL-STD-1388-2B, LSA RECORD REQUIREMENTS

- FROM FLAT FILE BATCH PROCESSING TO RELATIONAL DATA BASE MANAGEMENT CAPABILITY

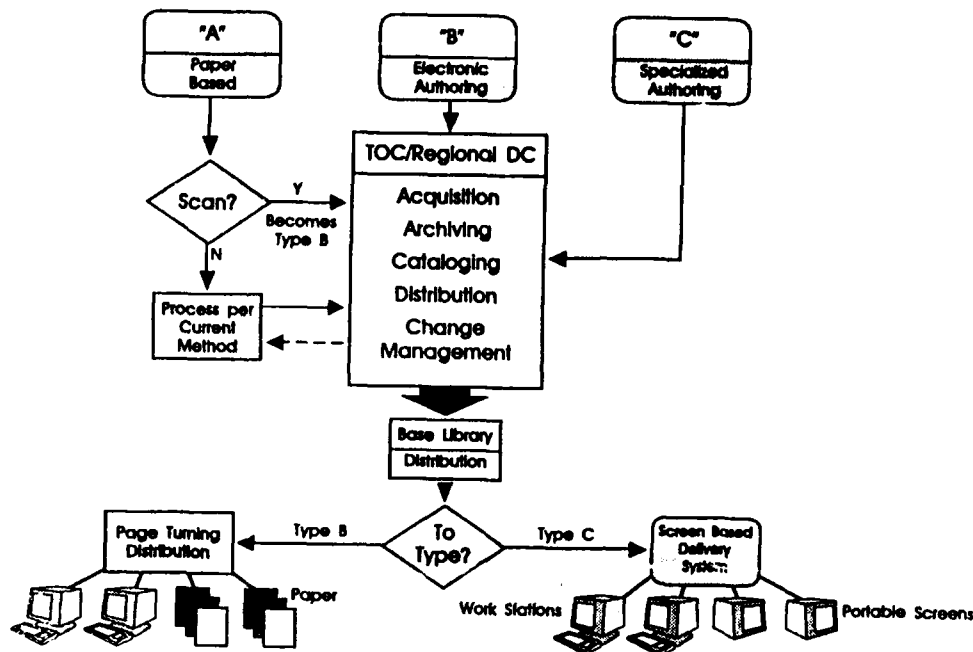
DEVELOPMENT PROCESS

- FORMAL IDEF1x DATA MODELING
- TABLE DEFINITION FOR MIL-STD-1388-2B
- SQL IMPLEMENTATION TOOLS

DEVELOPMENT SCHEDULE

- MIL-STD-1388-2B - MAY 1989 DRAFT, DECEMBER 1989 PUBLICATION
- IDEF1x MODEL AND SQL - JUNE 1989 TECHNICAL REPORT, SEPTEMBER 1989 DRAFT SPECIFICATION
- GOVERNMENT DBMS SOFTWARE - JANUARY 1990

1989 CALS STANDARDS
TECHNICAL MANUALS



1989 CALS STANDARDS
PAGE-ORIENTED TECHNICAL MANUALS

CURRENT PROGRAM REQUIREMENTS

- EXISTING TMSS SPECIFICATIONS AND STANDARDS
- SERVICE-DEVELOPED DTD's, OS's IAW MIL-M-28001
- DTD REGISTRATION THROUGH TMSS PROGRAM

FUTURE PROGRAM REQUIREMENTS

- JOINT-SERVICE TMSS SPEC CONSOLIDATION
 - MIL-STD-361, MIL-M-63008
- CALS-DEVELOPED FAMILY OF JOINT-SERVICE DTD's, OS's TO BE INCORPORATED IN MIL-M-28001
 - 15-20 DTD's DEVELOPED OVER 2-3 YEARS
 - SERVICE-ESTABLISHED PRIORITIES
 - BUILD FROM WORK UNDERTAKEN TO MEET CURRENT PROGRAM REQUIREMENTS (eg, AFTOMS)

1989 CALS STANDARDS
MIL-M-28001 FOR AUTOMATED PUBLISHING

MIL-M-28001A

- REORGANIZED TO SIMPLIFY FUTURE EXTENSIONS
- DTD REVISION BASED ON TESTING, VENDOR IMPLEMENTATION
- DECLARATION SUBSETS FOR APPLICATION TO OTHER TMSS SPECIFICATIONS
- OUTPUT SPECIFICATION TEMPLATE, APPLICATION INSTANCE (FOSI) FOR MIL-M-38784 MANUALS
- JULY 1989 DRAFT, DECEMBER 1989 PUBLICATION

MIL-M-28001A, AMENDMENT 1

- EXTEND APPLICATION BASED ON AFTOMS DTD DEVELOPMENT
- COMPATIBLE WITH MIL-STD-361 OBJECTIVES
- 1990 PUBLICATION

1989 CALS STANDARDS
PAGELESS TECHNICAL MANUALS

INDUSTRY-DoD PTM COMMITTEE

- CONCEPTS AND REQUIREMENTS FOR AUTHORIZING SYSTEMS, DATA INTERCHANGE, DELIVERY SYSTEMS
- TECHNICAL ADVISORY GROUP FOR DoD FOLLOW-ON SPECIFICATION DEVELOPMENT

JOINT-SERVICE REQUIREMENTS FOR A-12, ATF

- DRAFT SPECIFICATIONS - MARCH 1990
- INTEGRATED FAMILY OF SPECIFICATIONS
 - CONTENT, STYLE, FORMAT REQUIREMENTS
 - REVISABLE SOURCE DATA
 - EXTRACTION AND DISPLAY FORMATTING
 - PRESENTATION SYSTEMS
 - QUALITY ASSURANCE
- A-12, ATF PROTOTYPES, DoD-WIDE APPLICATION

1989 CALS STANDARDS
OTHER GUIDANCE

MIL-R-28002, CHANGE NOTICE 1

- CLARIFICATION ON GROUP 4 RASTER BIT / BYTE ENCODING SEQUENCE
- JUNE 1989 PUBLICATION

MIL-HDBK-59, AMENDMENT 1

- EXECUTIVE SUMMARY FOR PROGRAM MANAGERS
- STANDARDS FOR ELECTRONICS PRODUCTS
- LOGISTIC SUPPORT ANALYSIS DATA
- CITIS, PAGELESS TECHNICAL MANUALS, EDI
- DATA PROTECTION, COMMUNICATIONS
- SEPTEMBER 1989 DRAFT, MAY 1990 PUBLICATION

1989 CALS STANDARDS
SUMMARY OF 1989 INCREMENT

- MIL-HDBK-59
 - PROGRAM MANAGER'S EXECUTIVE SUMMARY
 - EXTENSIONS FOR 1989 STANDARDS
 - MIL-STD-1840A
 - ELECTRONIC DATA INTERCHANGE
 - EDIF, IPC, VHDL REQUIREMENTS
 - MIL-D-28000
 - CLASS V SUBSET, PIPING & TUBING
 - MIL-M-28001
 - EXPANDED APPLICATION, OUTPUT SPEC
 - MIL-R-28002
 - TECHNICAL CLARIFICATION
 - MIL-STD-1388-2A
 - REVISION FOR RELATIONAL DBMS TABLES
- PLUS
- DEVELOPMENT WORK FOR 1990 INCREMENT

STANDARDS REVIEW PROCESS

INCREMENTAL RELEASES THROUGHOUT 1989

BASIC TIMETABLE

RELEASE DRAFT FOR COMMENTS

BEGIN REVIEW AND CONSOLIDATION - 3 MONTHS

RECONCILIATION DRAFT FOR COORD - 6 MONTHS

PUBLISH - 8 MONTHS

CITIS FUNCTIONAL REQUIREMENTS

DEFINE FUNCTIONAL REQUIREMENTS FOR CONTRACTOR INTEGRATED TECHNICAL INFORMATION SERVICES

- ESTABLISH BASELINE - CURRENT, ANTICIPATED CONTRACTOR CAPABILITIES
- DOCUMENT DoD REQUIREMENTS
- DEFINE IMPLEMENTATION STRATEGY

CALS ISG TECHNICAL ADVISORY GROUP

- ASSIST IN DEFINING ISSUES AND PRIORITIES
- VALIDATE ASSUMPTIONS, REVIEW TASK PRODUCTS

DRAFT FUNCTIONAL REQ'TS SPECIFICATION (JUNE 1990)

- MINIMUM INTEGRATION REQUIREMENTS
- DATA ACCESS, ACCEPTANCE PROCEDURES
- DISPLACEMENT OF DATA DELIVERABLES
- FUNCTIONAL CAPABILITIES
- APPLICATION DURING FSD, PRODUCTION PHASES

GENERIC RISK ASSESSMENT

GENERIC ASSESSMENT OF SYSTEM / DATA RISK IN A CALS DIGITAL ENVIRONMENT

- REFERENCE MODEL FOR USE IN PREPARING SITUATION-SPECIFIC RISK ASSESSMENTS
- NEAR-TERM FILE INTERCHANGE, LONGER-TERM INDUSTRIAL NETWORKS
- CLASSIFIED AND SENSITIVE UNCLASSIFIED DATA
- THREATS AND VULNERABILITIES
- POTENTIAL COUNTERMEASURES

CALS ISG TECHNICAL ADVISORY GROUP

- ISSUES, PRIORITIES, ASSUMPTIONS, REVIEW

GENERIC RISK ASSESSMENT (JUNE 1990)

- INCLUDING PROPOSED AGENDA FOR TECHNOLOGY DEVELOPMENT, DEMONSTRATION, STANDARDIZATION

TESTING RESPONSIBILITIES

STANDARDS DEVELOPMENT TESTING

- ACCOMPLISHED BY DEVELOPMENT SITES, SUPPORT ACTIVITIES - eg, NATIONAL PDES TESTBED

PRODUCT CONFORMANCE TESTING

- DEVELOPED BY NIST, PROTOTYPED BY CTN
- IMPLEMENTED BY GOV'T, INDUSTRY TESTING LABS

USER APPLICATION TESTING

- CONDUCTED BY CALS TEST NETWORK
- FOCUS ON TARGET CAPABILITIES, SUCH AS DIGITAL DELIVERY TO DoD REPOSITORIES

DATA ACCEPTANCE TESTING

- DEVELOPED BY DoD AND NIST, PROTOTYPED BY CTN
- PROCESS QUALIFICATION TO MINIMIZE THE REQUIREMENT FOR DATA INSPECTION

1989 CALS STANDARDS

CALS TESTING PROGRAM AT NIST

IGES TESTING (MIL-D-28000)

- TEST CASE DEVELOPMENT AND SOFTWARE TOOLS
- INITIAL TESTS ON MAJOR CAD SYSTEMS
- SUPPORT FOR SAE NATIONAL TESTING PROGRAM

SGML TESTING (MIL-M-28001)

- CONFORMANCE TEST STRATEGY (Incl OS's)
- NIST REFERENCE PARSER

RASTER TESTING (MIL-R-28002)

- REQUIREMENTS, PROCEDURES TO ADAPT NCS TESTING PROGRAM TO MIL-R-28002 REQ'TS

CGM TESTING (MIL-D-28003)

- CONFORMANCE TEST REQUIREMENTS
- EXPEDITE VALIDATION ROUTINE DEVELOPMENT

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CALS TESTING PROGRAM AT NIST

PDES NATIONAL TESTBED

- SUPPORT FOR THE IGES-PDES ORGANIZATION
- SUPPORT FOR PDES, INC.

REQUIREMENTS, STRATEGY FOR IRDS TESTING

OTHER TESTING ACTIVITIES AT NIST

- PROPOSED FEDERAL INFORMATION PROCESSING STANDARD ON CONFORMANCE TESTING
- CERTIFICATION REQUIREMENTS FOR TESTING LABORATORIES

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CALS TEST NETWORK (CTN)

AIR FORCE LEAD SERVICE ACTIVITY

- COORDINATE GOVERNMENT-INDUSTRY TESTBEDS
 - LEAD TESTBED CENTERS OF EXPERTISE
 - GOVERNMENT CTN REVIEW BOARD
 - INDUSTRY CTN ADVISORY BOARD
- CONDUCT USER APPLICATION TESTING
- PROTOTYPE CONFORMANCE, DATA ACCEPTANCE TESTS

TARGET CAPABILITY PRIORITIES

- DELIVERY OF MIL-R-28002 ENGINEERING DATA TO DoD REPOSITORIES
- DELIVERY OF MIL-M-28001 TECHNICAL MANUAL TEXT AND GRAPHICS
- DELIVERY OF MIL-D-28000 CAD DATA
- ASSESSMENT OF NEEDS - SECURITY, INTEGRATED WEAPON SYSTEM DATA, EXCHANGE METHODOLOGY

1989 CALS STANDARDS
SUMMARY

STANDARDS IN PROCESS TO PROVIDE

- EXTENDED TECHNICAL CAPABILITY
- INCREASED FUNCTIONALITY
- BROADER APPLICATION

FUNCTIONAL REQUIREMENTS BEING DEFINED FOR

- INTEGRATION OF TECHNICAL INFORMATION CAPABILITIES
- RISK ASSESSMENT IN CALS ENVIRONMENT

TESTING CAPABILITY EVOLVING TO

- STRENGTHEN STANDARDS
- SUPPORT PRODUCT IMPLEMENTATION
- FACILITATE ROUTINE USE

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