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Report on Evaluation of IGES, PDES/STEP and JCALS Relationships

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Joint
Computer-aided Acquisition
and Logistic Support (JCALS)
CALS Technology Center (CTC)

REPORT ON
EVALUATION OF
IGES, PDES/STEP, and JCALS RELATIONSHIPS

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Prepared by:

Department of the Army
PM JCALS

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The views, opinions, and findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless designated by other documentation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

This report provides an introduction to the two data exchange standards, the Initial Graphic Exchange System (IGES) and the Standard for the Exchange of Product Model Data (STEP), and recommends the necessary transition strategy for Program Manager Joint Computer-aided Acquisition and Logistic Support (PM JCALS) to achieve a smooth transition and unification of standards for both the short term and long term solutions.

A major goal of the Joint CALS Program is the transition from paper-intensive acquisition and logistic processes to a highly integrated computer-intensive mode of operation for the entire life cycle of weapon systems. This undertaking dictates the development and implementation of such enablers as data and process integration, digital data exchange standards, and concurrent engineering. Both IGES and STEP are examples of enabling technologies; they are digital data exchange standards which were established at different times and for different purposes.

IGES defines the data required to describe and communicate essential engineering characteristics. It was initially designed as an intermediate format for representing engineering drawings between different Computer-Aided Design (CAD) systems. Due to the limited scope and technical deficiencies inherent in the IGES definitions a much broader standard, the Standard for Exchange of Product Data (STEP), was created to replace IGES with a rigorous product data modeling method.

The scope of STEP is larger than that of IGES. While the IGES Standard only addresses the data exchange of engineering design data, the STEP Standard will include information on product data from the "cradle-to-grave" of the product life-cycle. Since it is ultimately necessary for the DoD to support the full exchange of technical information throughout the life cycle of a weapon system, the goal of STEP is to precisely match requirements with the appropriate DoD Standards.

Some major weapon systems (e.g., the F-22 airplane and nuclear-powered ships) are planning to use the STEP development method as it is currently available. The completion schedule for the JCALS integrated weapon system data base (IWSDB) implementation may not meet the near-term needs for such programs. It is the goal of JCALS to ensure that all weapon system data bases will be compatible with the DoD-wide multiple weapon system IWSDB. Detailed transition strategies need to be worked out for the possible overall interface problems between the non-STEP compliant data and the STEP data, which must co-exist in the IWSDB.

Long term planning and coordination is needed to upgrade related military standards, handbooks, etc. to incorporate support for the emerging STEP standard and to provide a transition from existing data standards. MIL-D-28000 (IGES) needs to contain the IGES to STEP conversion guidance. MIL-HDBK-59A (CALS Program Implementation Guide) and MIL-T-31000 (Technical Data Packages [TDP]) need to include the STEP standard for TDPs.

Logistic Support Analysis (LSA) activities defined in MIL-STD-1388-2A/B also need to be interfaced with the product data via the STEP development method. A review of all current CALS standards and military standards related to CALS is required to ensure that as STEP evolves, support for it is incorporated into the appropriate documents.

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SECTION 1

INTRODUCTION

1.1 Background

A major goal of the Joint Computer-aided Acquisition and Logistic Support (JCALS) Program is the transition from paper-intensive acquisition and logistic processes to a highly integrated computer-intensive mode of operation for the entire life cycle of weapon systems. It focuses on the creation, management, and use of technical data associated with a weapon system. This data includes engineering drawings, product definition and logistic support analysis data, technical manuals, training materials, technical plans and reports, and operational feedback data. JCALS will facilitate data integration, exchange, and access among government-maintained and industry-maintained data bases and eliminate the development of duplicate data. JCALS provides the framework to integrate existing systems within the Department of Defense (DoD) and industry into an efficient network of resources to address the demanding requirements of product development and support in the 1990's and beyond. This undertaking dictates the development and implementation of such enablers as data and process integration, digital data exchange standards, and concurrent engineering. The Initial Graphic Exchange Specification (IGES) and the Standard for Exchange of Product Model Data (STEP) are examples of enabling technologies; they are digital data exchange standards established at different times and for different purposes.

IGES was first created in the late 1970s to address the need for vector graphic data transfer between dissimilar Computer-Aided Design (CAD) systems. Since that time, it has become an accepted national standard published by the National Bureau of Standards (NBS) and administrated by the National Institute of Standards and Technology (NIST). IGES forms the basis for standards used to exchange geometric definition data for design and manufacturing. It has become the most widely accepted and comprehensive standard that has been designed to address the majority of geometric and structural data objects within the various Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) systems prevalent in industry today. Yet, there remains some problems with its use which has resulted in a reluctance by the government and industry to rely strictly on IGES for data transfer. There are recognized technical deficiencies inherent in the IGES definitions that have prompted the new IGES/Product Data Exchange using STEP (PDES) Organization (IPO) to seek replacement of IGES with a product data modeling method having a better file structure, better entity set, and a more rigorous standard.

The IGES/PDES Organization (IPO) is composed of volunteers from industry, government, and academia who are dedicated to the development and implementation of world-wide Standards for the Exchange of Product Model Data (STEP). The two work items of the IPO are the coordination of IGES and PDES activities. The IGES activity is tasked with developing and maintaining IGES by defining a neutral data format that allows for the digital exchange of information among CAD systems. PDES is the U.S.

development activity in support of the international standard known as STEP; STEP is the definition of a neutral mechanism capable of completely representing all product data throughout the life cycle of a product. For example, the IPO is defining the functional requirements for STEP to ensure access to drawing and graphics data. The IPO strategy provides for access to, and population of, STEP products and meta-data by using electronic drawings and graphics as content sources for inclusion, manipulation, and reference.

The scope of PDES/STEP is larger than that of IGES. The IGES Standard only addresses the data exchange of engineering design data, while the PDES/STEP Standard will include information on product data from the "cradle-to-grave" of the product life-cycle. Since it is ultimately necessary for DoD to support the full exchange of technical information throughout the life cycle of a weapon system, the goal of PDES/STEP is to precisely match requirements with appropriate DoD Standards.

1.2 Purpose

The purpose of this document is to provide an introduction to the two data exchange standards, IGES and STEP, to describe a transition strategy that would allow PM JCALS to achieve a smooth transition, and to describe the unification of standards necessary for the short-term and long-term objectives in the transition from IGES to PDES.

1.3 Scope

The scope of this report will:

- provide a summary of the current IGES and PDES/STEP status;
- suggest actions to bridge between the two standards in a time-phased fashion;
- serve as a general guideline for follow-on activities that are recommended;
- identify the need for a JCALS IGES/STEP strategy based on a business perspective;
- investigate current and planned prototyping activities using PDES/STEP within the JCALS and CALS community; and
- present recommendations to PM JCALS for consideration and appropriate action.

SECTION 2

IGES STANDARD

2.1 IGES Background

IGES was developed by the IGES Organization and standardized as the American Society of Mechanical Engineers (ASME) Y14.26M. In June 1992, the IGES Standard body was officially transferred to the IPO. The IGES Standard represents graphics in vector form and was initially designed as a non-proprietary format for exchanging/ transferring engineering drawings between different CAD/CAM systems.

IGES initially became an American National Standards Institute (ANSI) standard in 1981 at version 1.0 and currently is at version 5.1. The DoD adopted a subset of IGES version 4.0 as Military Specification MIL-D-28000 in 1987. The current revision of the specification is MIL-D-28000A (1992) and is one of the CALS standards. IGES supports the objectives of the CALS program to improve development and delivery cycles, reduce costs, and improve the quality of engineering data; however, it lacks the capability to exchange and share additional product definition data.

2.2 IGES Overview

The Standard defines the data required to describe and communicate essential engineering characteristics, and is a standard format for the representation of vector graphics. The basic concept is that any set of entities represented digitally, such as lines, circles, surfaces, etc., can be represented in a digital file as text and used by any separate process, program, or graphics routine. Any system such as a Numerically Controlled (NC) workstation or an analysis package having the ability to convert its information to and from the IGES format would be able to access any IGES data or make its own data available to any process with similar capabilities independent of the internal nature of the participating systems. If an NC workstation needs a model of a part, it could take the IGES representation generated by a separate and different CAD system and translate it into its own internal format. At this point, data transfer can be accomplished by existing electronic file transfer protocols, such as that described by MIL-STD-1840.

IGES as a specification document defines a text file structure and the language format by which geometric and non-geometric product definition data are represented in that structure. IGES specifies a representation of this information only, and is completely independent of the means by which it was created or transferred.

2.2.1 IGES Entities

IGES treats the product definition as a file of entities. The entities provided are forms common to the CAD/CAM industry. The entity is the fundamental unit of data and all product information is represented by a set of entities. The IGES entities are used to express geometry, topology, and other properties of physical objects. The entity set consists of associativity, property, view, drawing, transformation matrix, and macro entities.

The IGES entities are general purpose in nature, and can be combined to create constructs needed for product data transfer -- such as a circuit in an electrical application. However, IGES does not rigorously define how this is done. Only the basic data is translated, not the information needed to translate all of the product data for the application.

Generally, geometric entities can be defined independently of one another. However, some entities must often reference other entities which were used to create it. Each entity is assigned a type number. Some entities also have a form number to further define or classify its specific type. For instance, the conic arc type 104 has 4 forms: form 0 indicates that the form of the parent quadratic must be determined from the general equation; with form 1 the parent conic curve is an ellipse, with form 2 the parent curve is a hyperbola, while form 3's parent curve is a parabola.

The set of entities include provisions for associativities and properties. The associative entity allows for the logical grouping of entities, such as views, in a drawing or dimensions of a circle. It provides a mechanism to establish relationships among entities and to define the meaning of the relationship. Property entities allow properties to be attached to an entity such as a name, tabular data, or drawing size. It also allows specific characteristics, such as color and line, to be assigned to an entity or collection of entities.

2.2.2 IGES Classification

The IGES discrete subsets and/or application protocols are identified by class according to the application for which the digital data was prepared. MIL-D-28000A is the military specification for the digital representation of product definition data using IGES version 4.0 application subsets and application protocols. MIL-D-28000A organizes IGES entities into five classes by application areas:

Class I	Technical Illustrations Subset;
Class II	Engineering Drawing Subset;
Class III	Electrical/Electronics Applications Subset;

Class IV Geometry for Numerical Control (NC) Manufacturing Subset; and

Class V 3 Dimensional Piping Application Protocol.

The first four classes of MIL-D-28000A are application subsets. The MIL-D-28000A application subsets specify the entities allowed in that class. Restrictions on the entities are given through notes. Limited rules are also given for the entity construction. Guidance is provided for MIL-D-28000A file construction for each section (start section, global section, directory entry section, parameter data section, and terminate section) of an IGES file for each class.

The first class of MIL-D-28000A, the Technical Illustration Subset, addresses entities that support the exchange of figures and illustrations normally found in a two dimensional technical publication.

The second class, Engineering Drawing Subset, includes entities that represent geometry and text annotation for engineering drawing applications. Extensive use is made of dimensions, sectioned areas, text notes, and feature control symbols. Non-geometric information, in the form of color, line weight, line font, and level, are included as well.

The third class, Electrical/Electronics Applications Subset, addresses the representation and exchange of data for electrical and electronic products, including printed wiring boards, printed wiring assemblies, cables, hybrid microassemblies, flexible printed wiring harnesses, and conventional wiring harnesses. This subset supports both the physical view and the logical view of the product. The physical view includes product representations (e.g., the assembly placement, the etch artwork, and pad layouts). The logical view information includes netlist, wirelist, schematic, etc.

The fourth class, NC Manufacturing Subset, directly supports the geometry data needs of process planning and numerically controlled cutter path generation for the purposes of manufacturing by numerically controlled tools. Geometry data are used to describe the nominal shape of the product either as a 2-D wire framed or as a 3-D wire framed model with surfaces. Non-geometric information in the form of color, line weight, line font, and level are also included. Text annotation is used to describe material specifications and administrative data.

The fifth class of MIL-D-28000A is the 3-D Piping Application Protocol (AP). An AP is a way to transfer defined application product data through IGES. An AP provides a documented link between the application's data requirements and the IGES entities in the AP. APs are the way that IGES will transfer application specific product data until PDES/STEP is available and stable.

2.2.3 IGES Application Protocols

The IGES specification is very broad; it is difficult to accomplish successful data transfer without some set of defining rules. An AP provides a set of rules for a specific

discipline. Currently there are three IGES APs under development. The Navy/Industry Digital Data Exchange Steering Committee (NIDDESC) is the principal project sponsor. The three IGES APs are:

- engineering drawings,
- 3-D piping, and
- hybrid microcircuits.

The 3-D Piping AP is used for the exchange of product data for 3-D piping system models, but it does not support piping engineering drawings. A user wishing to transfer an engineering drawing of a piping system would have to use an Engineering Drawing AP (currently under development). Also, only CAD/CAM systems with piping applications software are able to correctly use the 3-D Piping AP. APs will provide increased information transfer, but with a much more defined scope in the type of information that is transferred. The 3-D Piping AP is composed of a scope and requirements, an Application Reference Model (ARM) that explains what is covered in the application and how the AP elements relate to one another, an Application Interpreted Model (AIM) that shows how the information is mapped into IGES entities, and conformance requirements and abstract test purposes.

One of the major advantages of the AP concept is that it simplifies the process of testing the implementations, as APs contain conformance criteria and abstract test purposes for testing. Thus, an AP file can be tested more rigorously than a subset file. The other major advantages of the AP concept over the application subset are that it is easier to test the conformance of AP implementations than that of application subset implementations.

APs are not the complete answer, however, as they still contain some of the problems of subsets. APs have a rigorously defined scope in order to address the problems their application is meant to address, but they do not go beyond this point (i.e., they are not general purpose). APs are also self contained so there is no interaction explicitly defined between different APs.

2.3 IGES Status

The evolution from IGES version 1.0 to version 5.1 (1981-1992) included adding IGES subsets and AP development. IGES is currently supported by numerous CAD/CAM vendors, at varying levels.

2.3.1 Support for Standards

IGES was nominated as a FIPS Standard in 1992. Although it is a national standard, it has been adopted by other industrial countries and has been implemented in industrial activities (e.g., British Aerospace, European Automotive Industrial, Sweden/Norway

Joint IGES Center). The CAD/CAM Data Exchange Center in the United Kingdom also provides a conformance testing service for IGES implementations.

IGES is currently supported by most CAD/CAM vendors and is installed throughout the defense contractor systems as well as government facilities. The CALS Test Network (CTN) has conducted conformance tests for some IGES subsets between government agencies and contractors. IGES is being successfully used by many companies doing exactly what it was intended to do: support exchange, archive, and application-sharing of CAD system data via a standardized intermediate format. However, it is not completely portable across different vendors, platforms, and applications.

2.3.2 Other Standards

There are other competing drawing interchange standards such as SET and DXF which provide similar capabilities as IGES. Most PC-based CAD packages import and export AutoDesk's drawing interchange (DXF) format. Because of AutoCAD's ubiquitous presence, DXF is considered a *de facto* standard for PC-based CAD software.

SECTION 3

PDES/STEP STANDARD

3.1 PDES/STEP Background

Due to the limited scope and technical deficiencies inherent in the IGES definitions, a much broader standard - (STEP was created to replace IGES), STEP includes a formal, rigorous product data modeling method. In December 1983, ISO initiated Technical Committee 184 on Industrial Automation Systems and Integration to develop STEP, with the ISO-assigned number of ISO-10303. STEP is an international standard for the computer-interpretable representation and exchange of product information. The objective of this international standard is to provide a mechanism which is capable of describing product data throughout the life of a product, independent of any particular computer system. The nature of this description enables mechanisms to be defined for physical file exchange, data base implementation, and direct access to product data by application programs. The product data description is developed using a formal method to define all of the ideas and concepts uniquely and consistently. EXPRESS, the modeling language supporting the method, is also a part of the standard.

Concurrently, Subcommittee 4 (SC4) was formed to work in the area of representation and exchange of digital product data. Product data denotes the totality of data elements which completely define a product for all applications over its expected life cycle. It includes the geometry, topology, tolerances, relationships, attributes, and features necessary to completely define a component part or an assembly of parts for the purposes of design, analysis, manufacture, test, inspection, and product support. The product model is intended to be informationally complete for purposes such as generating manufacturing process instructions, directing quality control testing, and performing product support functions.

The information generated during the design, building, and utilization of products is used for many purposes. The ability to exchange product data files among a variety of different vendor systems is critical to both a company's internal plans for integration and its external relationships with contractors and customers. This fact has been recognized by designers and users throughout the industrialized world and has given impetus to several national projects which are being coordinated through the ISO to develop a single world standard for data exchange. Figure 3-1 represents a conceptual view of STEP.

Unanimous agreement exists on the need for creating a single ISO Standard which defines a neutral form for the capture of information representing a computer-ready product model; completeness and integrity of information is captured and kept up to

date throughout the life cycle of the product. In other words, STEP focuses on the

representation and exchange of product models with sufficient information content as to be interpreted directly by advanced application programs with little need for human interaction.

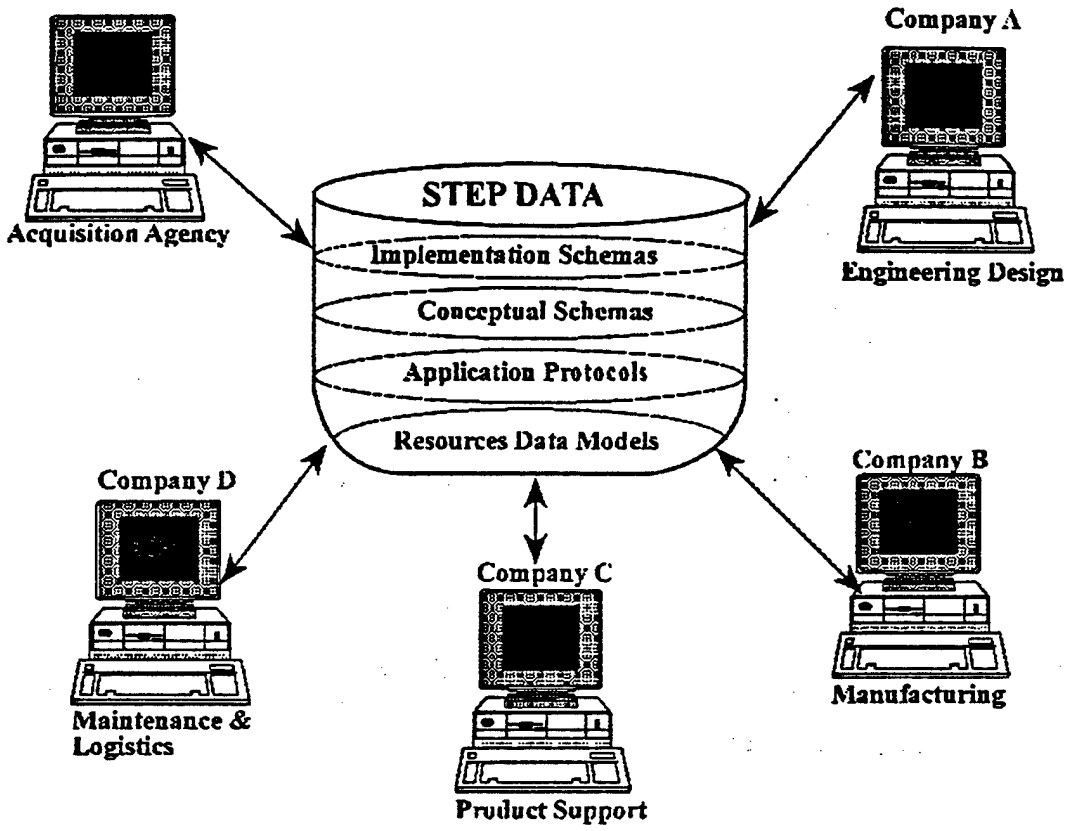

Figure 3-1. Conceptual View of STEP.

3.2 STEP Development Methodology

3.2.1 Description Language

STEP is being developed in a formal data specification language called EXPRESS; STEP files are in ASCII text file format and thus both human-readable and computer-interpretable. EXPRESS provides a consistent, unambiguous definition that ensures precise human understanding of the standard and offers prospects for automating the implementation of the standard. Prototype implementations have already proven this latter concept for transfer of product information through the Physical File Format and for the creation of data base schema directly from the EXPRESS language.

3.2.2 Information Modeling

The representation of product information in the STEP schema specified by EXPRESS is referred to as a product data model. The product data model is expected to be informationally complete to support applications such as generating manufacturing process instructions, directing quality control testing, and performing product support functions.

The STEP product data models fall into three categories:

- data models,
- resource models, and
- application protocols.

Data models contain the data definitions required for a general purpose functional area (e.g., shape representation) and are the lowest STEP level. Next are the resource models, which add specialized applications-related data (e.g., kinematics) for the data model. At the highest level are the APs, containing the data required for a specific application domain (e.g., ship building). APs draw their data definitions from the Resource Models. The issue of AP integration is also a major concern among the AP developers and within the STEP community.

3.2.3 Application Protocol (AP)

The use of the STEP to support a particular application domain is based on the concept of the Application Protocol. The STEP AP provides a complete and explicit statement of product data representation required to meet the specific needs of a particular application and may specify the implementation method or methods to be used. It defines the scope and context of the application.

The definition of an AP includes the definitions listed below.

- Application Activity Model (AAM) - The AAM is used to clarify the process and data flows involved, including any data and functions that are beyond the scope of the application.
- Application Reference Model (ARM) - The ARM is used to describe the information requirements and constraints of the application. The ARM uses application-specific terminology and rules specific to the particular application.

- Application Interpreted Model (AIM) - The AIM specifies the constructs selected from the integrated resource models interpreted to meet the needs of the particular application.

A mapping between the ARM and the AIM is included to show how the needs of the application are satisfied. The AP also includes a set of conformance requirements and tests which may be used for conformance testing.

3.2.4 Graphical Presentation in STEP

The graphical presentation of product data to illustrate normative data definitions is informative in all cases. The four types of models within STEP that use graphical presentations are:

- integrated resources,
- activity models,
- application reference models, and
- application interpreted models.

Graphical presentations are provided to aid in understanding the part. Different graphical presentations used within STEP include:

- EXPRESS-G - The graphical representation of EXPRESS which diagrammatically maps the EXPRESS schema as described in Annex B of ISO-10303-11;
- IDEF0 - An activity modelling notation used for application activity models within application protocols;
- IDEF1X - The graphical representation for the IDEF1X information modelling method; and
- NIAM - The graphical representation used within the Nijssen Information Analysis Modelling (NIAM) method.

3.2.5 Conformance Testing

Conformance of an implementation to STEP is specified only in terms of the conformance requirements specified in an application protocol. Conformance testing ensures that the test results are consistent, comparable, and suitable for auditing.

A complete set of tests, called an abstract test suite, is defined for each application protocol. When associated with an implementation method, these tests are sufficient to determine if an implementation is in conformance with the requirements in the application protocol. The scope of conformance testing of a specific implementation is the combination of the mandatory requirements for all implementations, the optional requirements selected, and the implementation methods used.

3.2.6 STEP Data Base Implementation Concepts

A STEP data base implementation is defined by a mapping to the associated conceptual STEP product data model schema. The mapping is independent of the application protocol being implemented. The result of the mapping is expressed in a formal notation. Thus, the resulting STEP exchange files are accessible across dissimilar systems in a predictable manner. At least four implementation methods for this International Standard have been identified:

- Level 1 - physical file exchange (ASCII text files);
- Level 2 - direct access (structured data in memory);
- Level 3 - shared data base access (persistent DBMS); and
- Level 4 - knowledge-base access.

The Level 1 exchange files allow for data sharing between systems or applications, using the corresponding EXPRESS models, without standard requirements for query languages, navigation control, data access methodology, or configuration change control.

In Level 2, common binary files called working forms are shared by both systems. Different applications may access and change the data, according to standard requirements for navigation, data access, and configuration control, without actually moving the data around, as in Level 1. A STEP exchange file is used to load and unload the working form. The STEP Data Access Interface (SDAI) is the STEP standard being developed for Level 2 data.

Level 3 data sharing uses a data base management system (DBMS) to store the data. Applications use standard DBMS languages such as SQL or standard interfaces such as SDAI for data access. A PDES/STEP Data Base (PSDB) is an implementation of STEP in an integrated Level 3 environment. Level 3 allows for a multi-user/multi-vendor global DBMS environment.

Level 4 is data sharing in a Knowledge-base Management System (KBMS). KBMSs represent the use of a technology which will provide advanced tools for implementing systems which use STEP.

Levels 2 and 3 are under development; Level 1 is the currently implemented method used for data sharing in the STEP environment. Level 4 is slated for future development.

3.3 PDES/STEP Organizations

PDES/STEP activities are supported by a consortium of industrial corporations and government agencies. Key organizations working on the PDES/STEP Standard include ISO, the IPO, PDES, Inc., NIST, National Initiative for Product Data Exchange (NIPDE), and the DoD Computer-aided Acquisition and Logistics Support (CALS) Office.

3.3.1 ISO Organization

The ISO SC4 Committee is responsible for the development of three international standards dealing with the use of digital product data. The first, STEP ISO-10303, forms the basis for representation of product information. The second is closely aligned with STEP and is aimed at developing a mechanism for the representation of part library information as needed to support engineering design where access is needed to large numbers of other component parts. The third work item, initiated in 1991, deals with industrial manufacturing management data. The ISO work of SC4 is being accomplished by approximately 300 experts from 15 countries organized into eight working groups (WGs) and three advisory groups:

Strategic Planning Advisory Group;
Project Management Advisory Group;
Editing Committee;
WG-2 Part Libraries;
WG-3 Product Modeling;
WG-4 Qualification and Integration;
WG-5 STEP Development Methods;
WG-6 Conformance Testing Procedures;
WG-7 Implementation Specifications;
WG-8 Industrial Manufacturing Mangagement Data; and
WG-9 Electrical/Electronic Applications.

WG conveners can subdivide the technical work into logical tasks, each under the direction of a Project Leader. The WG convener usually serves as a Project Leader but is additionally responsible for coordinating the work of other Project Leaders in the WG as well. Thirty-seven projects are active at this time.

3.3.2 IGES/PDES Organization

The IPO is a working committee representing the U.S.A. activities in support of ISO STEP development. The IPO is a body of volunteers from industry, government, and academia dedicated to the development and implementation of ISO-10303 as a national and an international standard. The IPO Reference Manual describes their detailed operations and procedures.

3.3.3 PDES, Inc.

PDES, Inc. is a joint industrial/government effort whose goal is to accelerate the development and implementation of PDES/STEP. It was incorporated in April 1988 by several major technology companies and currently is headquartered in Charleston, SC. Member companies have direct input, and influence the STEP standard and the development priorities and strategies of PDES/STEP software products. There are two levels of membership in PDES, Inc. for industry, each with different rights and privileges. Class I requires $100,000 in dues and two staff-years of technical effort each year; Class II requires $50,000 and one staff-year of technical effort per year. Government Associate membership requires two staff-years of technical effort per year. Currently, PDES, Inc. focuses on the mechanical products, sheet metal, material composites, architectural, engineering, and construction areas.

3.3.4 The National PDES Testbed

The National PDES Testbed was established at NIST in 1988 and is funded through the CALS Program. It is organized into four major areas: The Standards Testing Center, The Applications Prototype Center, The Information Services Center, and the Program Coordination Office.

The National PDES Testbed has developed an EXPRESS Language parser that is available in the public domain. They are preparing a PDES Test Network which is scheduled to start serving STEP users in 1993.

3.4 PDES/STEP Status

A Working Draft of STEP Version 1.0 was finalized in November 1988 and sent to the ISO Central Secretariat for registration as a Draft Proposal. The 2000 page document was circulated to SC4 for ballot in early 1989. Failing to gain consensus, the ballot comments were used to improve the draft and to break the one large document into parts. The Parts with numbers assigned, listed below, have been defined. These parts contain an overview, methods used to present the standard, application architectures, conformance testing procedures, the STEP resource information models, and application protocols. The Parts identified as PL in the following list are still in the planning stage. A listing of the various STEP parts follows.

	Part	STEP Part Title
Overview & Methods:	1	Overview & Fundamental Principles
	11	EXPRESS Language
	21	Clear Text Encoding of the Exchange Structure
	31	Conformance Testing - General Concepts
	32	Conformance Testing - Test Lab Requirements
	33	Conformance Testing - Abstract Test Suites
	34	Conformance Testing - Abstract Test Methods
Generic Resources:	41	Product Description and Support
	42	Shape Representation
	43	Representation Structures
	44	Product Structure Configuration
	45	Materials
	46	Visual Presentation
	47	Shape Tolerances
	48	Form Features
Application Resources:	101	Draughting Resources
	102	Ship Structures
	104	Finite Element Analysis
	105	Kinematics
Application Protocols:	201	Explicit Draughting
	202	Associative Draughting
	203	Configuration Controlled Design
	204	Mechanical Design Using Boundary Representation
	205	Mechanical Design Using Surface Representation
	206	Mechanical Design Using Wireframe Representation
	207	Sheet Metal Dies and Blocks
	208	Life Cycle Product Change Process
	209	Design through Analysis of Composite & Metallic Structures
	210	Electronic Printed Circuit Assembly, Design and Manufacture
	211	Electronic Test Diagnostics and Remanufacture
	212	Electronic Plants
Planned Application Protocols:	PL	Automotive Design
	PL	Composites
	PL	Electric/Electronic
	PL	Product Life Cycle
	PL	Manufacturing Process Plans
	PL	Polymer Testing
	PL	Sheet Metal
	PL	ShipBuilding
	PL	Life Cycle Management

Part	STEP Part Title Continued
PL	NC Process Plan for Machine Parts
PL	Electronic Printed Assembly, Design and Manufacture
PL	Product Operation
PL	Product Procurement
PL	Ships Electrical Systems
PL	Ship HVAC Systems
PL	Ships Library Parts
PL	Ships Outfit & Furnishing
PL	Ships 3-D Piping Systems
PL	Ships Structural Systems

All these documents are proceeding through an extensive process of qualification, integration, editing and approval before they are ready for a formal CD balloting by the SC4 committee. Each document is being tracked by a Configuration Management system.

The work of SC4 to develop a comprehensive International Standard for digital product information is proceeding quite well. Progress to date has been good, but major technical and many editorial reviews lie ahead as the Committee Drafts begin the long process of ISO consensus building. The work effort has come a long way, and the committee has become the world focus for the development of digital product data technology. It has attracted a capable team of international experts.

Part 11 (EXPRESS), Part 21 (Physical File Structure), and Part 31 (General Concepts for Conformance Testing) have been approved at the committee level and were registered with ISO as Draft International Standards in August 1992. All other Parts for the first release of STEP will be ready for their second round of Committee Draft (CD) balloting in September 1992. This ambitious schedule anticipates a total of ten part documents being balloted upon during calendar year 1992. The planned version 1.0 release includes Parts 1, 11, 21, 31, 41, 42, 43, 44, 46, 101, 201, and 203.

Several other documents have been produced recently to help organize the work of SC4's six Working Groups, three Advisory Groups, and 37 project teams. The SC4 Policy and Procedures Manual contains detailed procedures for development and approval of STEP Parts, guidelines for part documentation, model qualification and application protocol development, and specific responsibilities of conveners and project leaders.

SECTION 4

RELATIONSHIPS BETWEEN IGES AND PDES/STEP

4.1 Comparison by Characteristics

IGES is an ANSI Standard which was developed to exchange graphics-oriented and engineering drawing information between CAD/CAM systems, with a focus on part geometry. IGES handles only individual piece parts, not assemblies, and uses ASCII text files in its data representation. IGES does not support formal data modeling, machine interpretable forms, or standard programming interfaces. IGES is currently available and supported by many systems.

STEP is an ISO Standard which is being developed to exchange and share product information, including part geometry. It supports both piece parts and assemblies. Data models are defined in machine interpretable EXPRESS format. STEP data may exist in text, binary, or data base format and are supported by standard programming interfaces. STEP has well-defined implementation requirements, including conformance specifications and testing as a planned part of the standard. STEP is currently under development; only prototype implementations are now available.

4.2 Integration Between the Two Standards

The IGES and STEP are both file exchange standards. Yet, it is quite possible that the two standards may never become fully integrated. The IPO has proposed a transition scenario which will lead to the integration of IGES functionality into STEP as STEP becomes a viable standard. It is discussed in the next section.

4.3 Transition

IGES has been used for more than ten years as an American National Standard and also in countries all over the world as an intermediate format for the production exchange of CAD-based product data. At present, IGES related deliverables form the solitary products of the IPO. There are approximately 100 CAD vendors currently offering IGES translators with their CAD products. These CAD products have an estimated installed base of three fourths of one million systems.

In the IPO White Paper *Some Alternatives for the Long Term Relationship Within the IGES/PDES Organization* (Draft 2.1, May 1992), the IPO presented three alternatives for the transition from IGES to PDES/STEP.

1. The IGES Development Alternative. This alternative proposes that the IGES work continue and be regarded as self-standing work. High level coordination with STEP would be maintained for common Application Protocols. The overall work approach and the IGES Project Committee structure would remain essentially as they are today. If, in the pursuit of ANSI standardization, IGES and STEP were to be perceived as competing standards, then the IPO would give priority to STEP, and would consider that the burden for demonstrating that the standards are, in fact, not competing, would rest with the IGES work.

2. The IGES Maintenance Alternative. This alternative proposes that a top-down decision be made for IGES development work on the Specification and on Application Protocols to cease as soon as is practical. Beyond a certain well-defined point, IGES work on the Specification would consist of maintenance only, which would continue for as long as is required.

3. The IGES Transition Alternative. This alternative proposes a transition of development emphasis away from IGES and towards PDES/STEP. Following the transition, IGES maintenance work would continue for as long as required. Completion of the transition would be based on the measurements of three metrics, which gauge from three important perspectives, whether or not STEP is equivalent to IGES. STEP, even though it may achieve international standard status in the interim, would not be supported by the IPO as an ANSI standard until equivalence is indicated by the metrics.

At the IPO Quarterly Meeting in June 1992, the IPO approved the White Paper and decided to pursue the IGES Transition Alternative.

The transition from IGES to STEP will most likely be gradual, allowing for lessons learned from the transition to be shared throughout the IPO and CALS communities. IGES and STEP AP commonality will be an important factor for translating MIL-D-28000A Class V (and other AP) data files from IGES to STEP. In cases such as the IGES Engineering Drawings AP, where IGES and STEP APs have exactly the same ARMs, the mapping from IGES APs to STEP APs will be relatively forthright. The 3-D Piping AP transition will be more involved, as the STEP Shipbuilding Piping AP has not yet been completed.

The influence of the DoD CALS Office will have a strong bearing on the direction of the IPO and the transition from IGES to STEP. Current plans call for the replacement of the MIL-D-28000 CALS IGES Standard with the MIL-T-31000 CALS Technical Data Package Standard in the mid 1990s. The MIL-T-31000 Standard Amendments will incorporate the transition strategy from IGES to STEP.

The IPO is the ANSI Standard body for IGES. A coordinated strategy for evolving from IGES to STEP is being developed to expand the capability to exchange additional product definition data for integrated enterprise systems. As a part of this strategy, the IGES to STEP transition plan will be included in future MIL-D-28000 updates. Transition strategies which have been suggested are listed below.

1) A guideline needs to be incorporated into MIL-D-28000 and MIL-HDBK-59 for the gradual transition from IGES to STEP, based on the data exchange needs of the various weapon system programs. This would allow for the lessons learned from the transition to be shared throughout the CALS program, increasing the ease and efficiency of later transitions from IGES to STEP.

2) The MIL-D-28000 Classes I, II, and IV should be replaced by the following STEP APs:

   - Part 201 - Explicit Draughting,
   - Part 202 - Associate Draughting, and
   - Part 203 - Configuration Controlled Design.

   During the transition period, the MIL-D-28000 Classes I, II, and IV may evolve into the IGES Engineering Drawing AP, which is easily replaceable by STEP APs.

3) The MIL-D-28000 Class III should be replaced by the STEP Electric/Electronic APs, which are currently under development by the IGES/PDES Organization. In the meantime, the MIL-D-28000 Class III can use EDIF-based information Models which will evolve into STEP APs.

4) The MIL-D-28000 Class V, IGES 3-D Piping Application Protocol, should be replaced by the STEP AP for Ship 3-D Piping Systems.

The IPO Steering Committee has adopted the following policy on the future of IGES development, based on the maturity of IGES' functional content, a strong commitment to the emerging STEP standards and the impending registration of STEP parts as Draft International Standards.

1) Additions to the IGES specification will be completed in accordance with the version six (V6) work plan which will be implemented around the end of 1993. Subsequent versions may be published to make needed corrections to the specification including codification of existing "gray page" entities into the main body of the standard.

2) IGES application protocol development is limited to the three currently authorized projects. A decision is pending concerning publication of these three application protocols as normative specifications.

3) Recommended practices will continue to be developed and published as required.

4) Work on IGES testing and relationships with the National IGES User Group will continue.

SECTION 5

DATA IN THE JCALS ENVIRONMENT

5.1 Background

A major objective of the CALS initiative is the cooperative recognition, by government and industry, that requirements must drive technology and result in the development of standards to enable an efficient transition from current paper processing systems to electronic systems that exchange digital information. To this extent, the JCALS Project Office must remain cognizant of how the CALS standards relate to current and emerging technologies and to the data types utilized in JCALS.

5.2 CALS Data Standards

Data in the JCALS environment is heterogeneous in nature and exists in many different forms. The CALS standards for the various data types specify neutral formats, to encourage the free exchange of data between different organizations and environments. However, each standard covers only a subset of the total data in the CALS environment, and none is comprehensive enough to cover all of the various types of data. In addition, the interrelationships among this data are not covered by any of the standards. These interrelationships, which are critical for establishing an integrated environment, such as an Integrated Weapon System Data Base (IWSDB), should be expressed in a standard manner to facilitate data exchange across heterogeneous systems.

STEP attempts to address these issues and provide a mechanism to express all of the data about a product in a standard, vendor-independent manner. The existing CALS standards deal CALS data as individual pieces of information; STEP will provide an integrated approach to deal with this data. A list of product data utilization by various DoD weapon systems compiled by the Office of the Secretary of Defense (OSD) is located in Appendix A.

5.3 CALS Data Types

The various types of data associated with CALS, along with the corresponding CALS Standards, are depicted in Table 1.

Table 1. CALS Data Types and Associated CALS Standards

	Data Type	Standard(s)
1	Engineering Drawings, Electrical Design, Applications Manufacturing, CAD/CAM	MIL-D-28000 (IGES)
2	Text	MIL-M-28001 (SGML)
3	Raster Graphics	MIL-M-28002 (CCITT Group IV)
4	Technical Illustrations	MIL-D-28003 (CGM)
5	Logistics, Maintenance, Support, Personnel, Equipment, Training, Provisions, Etc.	MIL-STD-1388 (LSA/LSAR)

The first data type, Engineering drawings, electrical design, applications manufacturing, and CAD/CAM has been covered in the IGES and PDES/STEP sections of this report.

The second data type is text, for which the Standard Generalized Markup Language (SGML) standard is used in the CALS environment. The IPO Technical Publications Technical Committee has been defining the issue of representing text documents in STEP. The current view is to adopt SGML for the tagging of the documents, but also to have well defined relationships between some SGML tags and related product information (e.g., engineering drawings). The concept of having a solid integration between a document and its underlying technical information will contribute greatly towards improving the quality, accuracy, and timeliness of technical documents.

The third data type is raster graphics, a type used mainly to store legacy data. Most of the legacy data was created before the advent of digital data creation and storage. Since a large volume of legacy data exists in the form of paper documents, the most simplistic solution for storing this data on computers is to scan those documents and store them as raster images. The major drawback to this methodology is that raster data cannot be directly interpreted by machines. Also, this data type will eventually become obsolete. It may be desirable to convert a significant portion of the existing legacy raster data to vector representations such as IGES or STEP by developing automated tools. As this technology matures, it may become economical for the government to convert the existing raster drawings in repositories like DSREDS, EDCARS, and EDMICS to STEP representations.

The fourth data type is technical illustrations. Computer Graphics Metafile (CGM) is the recommended CALS Standard for technical illustrations. CGM is a standard for two-dimensional vector graphics which also supports mixed vector and raster graphics. Although both CGM and IGES are vector graphics standards, CGM is more limited in scope and suited mainly for graphics appearing in technical manuals (as opposed to graphics in product design and engineering). CGM could eventually be replaced by STEP, when a more solid integration between technical documents and the underlying technical information is achieved. (Note that CGM doesn't support entities to any extent and this causes conversion problems.)

The fifth data type is the Logistics Support Analysis Record (LSA/LSAR) and supporting data as defined in MIL-STD-1388. This data type covers logistic support information about products and includes information on maintenance, support, parts, personnel, equipment, training, facilities, inventory, shipping, provisions, reliability, etc. Since the goal of STEP is to include data covering the entire life cycle of a product, the data described in MIL-STD-1388 very clearly falls within the scope of STEP. The IPO Product Life Cycle Support Technical Committee is in the process of defining STEP APs for the representation of logistics data.

SECTION 6

RECOMMENDATIONS

6.1 PDES/STEP AND JCALS

The following recommendations are made based on the overall assessment of the maturity of the PDES/STEP technology, as well as the need for this technology in the JCALS Program.

1. An AP evaluation should be conducted against the JCALS architecture to identify missing APs and to identify those APs that are critical to the development of the JCALS IWSDB. The existing PDES/STEP AP framework was produced in an ad-hoc fashion by international committees. The CALS Technology Center (CTC) could coordinate with the IGES/PDES Organization and serve as a technology center for JCALS in the evaluation and development of such APs. Correlation of schedules for PDES/ STEP AP development and implementation will be affected by the overall JCALS Program. Priorities for AP development should be given to those APs which are needed for IWSDB development to support joint functional areas as they are defined. The CTC could provide resources and expertise as required.

2. A pilot conversion of IGES to PDES/STEP should be conducted using existing weapon system data. A test for the verification of the converted data against original design parameters will assure the compatibility and exchangeability between the two standards. CAD/CAM tools could be utilized for the data verification test, as well as the visual representation of the two types of physical data files.

3. An update of the MIL-D-28000 and MIL-T-31000 standards are needed to ensure inclusion of all of the required support for the transition of IGES data and Technical Data Packages (TDP) into the PDES/STEP Standard. MIL-HDBK-59 needs to be updated as well. STEP will expand the capability to exchange additional product definition data and add data sharing capability for integrated enterprise systems. A coordinated strategy for evolving from IGES data into STEP needs to be addressed in MIL-D-28000. MIL-T-31000 needs to be updated to use the STEP Standard for the TDP.

4. A closer coordination should be developed between the JCALS project and the Air Force's F-22 data base development effort. This will benefit both groups. The Air Force F-22 System Program Office (SPO) has a need to develop a data base to support Integrated Weapon System Management (IWSM) for the development of the F-22 airplane. The

completion schedule of the JCALS' IWSDB implementation cannot meet the near-term needs of the F-22 program. The Digital Data Package (DDP) of the F-22 data base is planning to use the PDES/STEP development method, as it is currently available, and will deal in an empirical way with some of the issues before JCALS faces them. The lessons learned would be applicable to JCALS. The CTC could serve as a focus for interoperability testing between the F-22 data base and JCALS. For years to come, the F-22 data base and the JCALS IWSDB will undergo concurrent development. Some JCALS data that the F-22 data base will rely on, such as the CALS Data Dictionary/Directory Services, will evolve as the JCALS program progresses. The CTC can be used to test the interface between the two systems, both in terms of system and data interoperability.

5. The JCALS Program should work closely with the IPO AP development efforts and perhaps participate in the development of some of the relevant APs. The current Version 1.0 of the PDES/STEP Standard, to be published in January 1993, does not have any APs to address logistics and support (including Technical Information). Some logistics and support related APs are in the planning stages and are not scheduled to be completed until 1996 and beyond. An accelerated schedule for the completion of these APs is necessary in order to meet the needs of the JCALS IWSDBs. Such APs identified by the IPO include:

   - Product Life Cycle Support,
   - Product Life Cycle Support Data Element Exchange,
   - Life Cycle Product Change Process,
   - Life Cycle Management,
   - Product Procurement,
   - Product Operation,
   - Product Maintenance, and
   - Technical Publications (include TMs/TOs and IETMs).

   The scope of the above APs, as currently defined by the IPO, need to be reviewed against the MIL-STD-1388-2B Logistics Support Analysis (LSA) requirements before the implementation of these data models.

6. A pilot IWSDB development, using the PDES/STEP methodology, should be conducted in order to experiment with the usage of the PDES/STEP Standard. The resources of the CTC facilities could be used in identifying requirements, performing prototyping, integrating logistics, and support related APs.

7. PM JCALS could join PDES, Inc. as a consortium member. As a member of PDES Inc., it will be easier to track the correlation of schedules for PDES/STEP AP development and implementation with the overall JCALS Program schedule. Priorities for AP development could be given to those APs that are needed for IWSDB development.

SECTION 7

CONCLUSIONS

7.1 IGES/PDES/JCALS

1. STEP technology and standards represent a tremendous potential contribution, not only to JCALS but to the overall U.S. industrial competitiveness. The STEP development methodology and related tools will help the JCALS Program achieve its goal of migration from paper-intensive acquisition and logistic processes to a highly integrated computer-intensive mode of operation for the complete life cycle of new weapon systems.

2. The STEP development method, with its neutral data format, has been adapted by many commercial enterprises and is planned for future military IWSM Systems, such as the F-22 Program. JCALS is responsible for implementing the DoD-wide IWSDB of multiple weapon systems data bases. The STEP Standard, which provides the ability to access, share, and exchange CAD/CAM engineering data and other product functional information via a knowledge-base, offers an excellent opportunity for government, industry, and academia to work together towards a common, mutually beneficial goal which will coincide with the JCALS responsibilities and objectives.

3. IGES is the current active CALS and ANSI standard for exchange of geometric and graphic data between CAD/CAM systems. STEP expands this capability by providing the means to exchange additional product definition data and to add data sharing capabilities for integrated enterprise systems. A coordinated strategy for evolving from IGES into STEP needs to be addressed in MIL-D-28000 and MIL-T-31000 needs to be updated so it can use the STEP standard for Technical Data Packages (TDP). MIL-HDBK-59 needs to be updated to include STEP. A step-by-step transition plan needs to be established by PM JCALS to lead the data management and acceptance procedures for all weapon systems.

4. The JCALS Program needs to actively participate in the progress of the ISO/IPO, PDES Inc, and the National PDES Testbed in the development of the STEP standard to ensure that the schedules and requirements of STEP will be correlated and effected by the overall JCALS Program. Priorities of AP development should be given to those APs that are needed for the IWSDB development.

SECTION 8

GLOSSARY OF TERMS AND ACRONYMS

AAM	Application Activity Model
AIM	Application Interpreted Model
ANSI	American National Standards Institute
AP	Application Protocol
ARM	Application Reference Model
ASME	American Society of Mechanical Engineers
CAD	Computer-Aided Design
CALS	Computer-aided Acquisition and Logistic Support
CAM	Computer-Aided Manufacturing
CD	Committee Draft
CGM	Computer Graphics Metafile
CTC	CALS Technology Center
CTN	CALS Test Network
DBMS	Data Base Management System
DoD	Department of Defense
IGES	Initial Graphic Exchange Specification
IPO	IGES/PDES Organization
ISO	International Standards Organization
IWSDB	Integrated Weapon System Data Base
IWSM	Integrated Weapon System Management
JCALS	Joint Computer-aided Acquisition and Logistic Support
KBMS	Knowledgebase Management System
LSA/LSAR	Logistic Support Analysis/Logistic Support Analysis Record
NBS	National Bureau of Standards
NC	Numerical Control
NIDDESC	Navy/Industry Digital Data Exchange Steering Committee
NIPDE	National Initiative for Product Data Exchange
NIST	National Institute of Standards and Technology
OSD	Office of the Secretary of Defense
PDES	Product Data Exchange using STEP
PSDB	PDES/STEP Data Base
SDAI	STEP Data Access Interface
SGML	Standard Generalized Markup Language
SPO	System Program Office
STEP	Standard for Exchange of Product Model Data
TDP	Technical Data Package
WG	Working Groups

SECTION 9

LIST OF REFERENCES

Guidelines for the Development and Approval of STEP Application Protocols. Version 1.0. ISO TC184/SC4/WG4 N34 (P5), February 20, 1992.

EXPRESS Usage Guide. ISO TC 184/ SC 4/ WG5 N32, November 11, 1991.

U.S. Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH. *ICAM Architecture, Part II, Volume IV - Function Modeling Manual (IDEF0)*. Report number AFAWL-TR-81-4023, June 1981.

U.S. Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH. *Integrated Information Support System (IISS), Volume V - Common data model subsystem, Part 4 - Information Modeling Manual - IDEF1 Extended*. Report number AFAWL-TR-86-4006, November 1985.

Nijssen, G.M. and Halpin, T.A. *Conceptual Schema and Relational Data Base Design: A Fact Oriented Approach*. Prentice Hall, New York, 1989.

International Standards Organization. *STEP Part 1 - Overview and Fundamental Principals*. ISO 10303 TC4/SC4/WG PMAG, Document N50, December 1991.

National Institute of Standards and Technology. *Product Data Exchange: The PDES Project - Status and Objectives*. NISTIR 89-4165, September 1989.

National Institute of Standards and Technology. *White Paper: Some Alternatives for the Long Term Relationship Within the IGES/PDES Organization Between IGES and STEP*. Draft 2.1, April 1992.

MIL-D-28000A, *Military Specification Digital Representation for Communication of Product Data: IGES Application Subsets and IGES Application Protocols*, February 1992.

MIL-M-28001B, *Military Specification Mark up Requirements and Generic Style Specification For Electronic Printed Output and Exchange of Text*, October 1991.

MIL-R-28002, *Military Specification Raster Graphics Representation in Binary Format, Requirement for*, October 1989.

MIL-D-28003A, *Military Specification Digital Representation for Communication of Illustrated Data, Computer Graphics Metafile (CGM) Application Profile*, November 1991.

MIL-HDBK-59, *Military Handbook Computer-aided Acquisition and Logistic Support (CALS) Program Implementation Guide*, December 1988.

MIL-STD-1388-2B, *Military Standard DoD Requirements for a Logistic Support Analysis Record*, March 1991.

MIL-T-31000, *Military Specification Technical Data Packages, General Specification*, December 1989.

Digital Equipment Corporation. *Product Data Sharing Using STEP Technologies.* February 1992.

Kiggins, B. PDES Inc. *Advanced Data Exchange Standards.* CALS Briefing International. January 1990.

National Computer Graphics Association. *IGES/PDES Reference Manual.* July 1992.

APPENDIX A
LIST OF PRODUCT DATA UTILIZATION BY VARIOUS DOD WEAPON SYSTEMS

F22

SPONSOR: AIR FORCE
DESCRIPTION: AIR SUPERIORITY FIGHTER AIRCRAFT
SCHEDULE: MS II ENGINEERING & MANUFACTURING DEVELOPMENT SUMMER 1991
MS III PRODUCTION & DEPLOYMENT - 1998/99
MS IV OPERATION & SUPPORT - 1999-???

PRODUCT DATA REQUIREMENTS:

REQUIREMENT		TIME NEEDED
CALS STANDARDS		
IGES - MIL-D-28000		NOW
SGML - MIL-M-28001		NOW
RASTER - MIL-R-28002		NOW
CGM - MIL-D-28003		NOW
FILE INTERCHANGE - MIL-STD-1840		NOW
STEP		
AP 201	EXPLICIT DRAUGHTING	WHEN AVAILABLE
AP 202	ASSOCIATIVE DRAUGHTING	WHEN AVAILABLE
AP 203	CONFIGURATION CONTROLLED DESIGN	WHEN AVAILABLE
AP 204	MECHANICAL DESIGN	WHEN AVAILABLE
AP 205	MECHANICAL DESIGN	WHEN AVAILABLE
AP 209	COMPOSITE ANALYSIS	WHEN AVAILABLE
AP 2XX	COMPOSITE MANUFACTURING	WHEN AVAILABLE
AP 2XX	COMPOSITE SUPPORT	WHEN AVAILABLE
AP 211	ELECTRICAL APPLICATIONS	WHEN AVAILABLE

AIR FORCE TAKING LEAD IN DEVELOPING PDES APPLICATION PROTOCOL SUITE - COMPOSITES (PAS-C) AND PDES APPLICATION PROTOCOL - ELECTRONICS (PAP-E) AS LISTED BELOW:

	AP COMPLETE/CAPABILITY DEMO	
AP 209 COMPOSITE ANALYSIS	JUL 93	JUL 95
AP 2XX COMPOSITE MANUFACTURING	NOV 93	JUL 95
AP 2XX COMPOSITE SUPPORT	MAR 94	JUL 95
AP 211 ELECTRICAL APPLICATIONS		SEP 95

POCS

PAS-C	JOHN BARNES	(513) 255-7371	DSN 785-7371
PAP-E	WILLIAM RUSSELL	(513) 255-7371	DSN 785-7371
F22	CPT ULRICH	(513) 255-5785	DSN 785-5785
F22	IWSDB DAVE GUNNING	(513) 255-5785	DSN 785-5785

C17

SPONSOR: AIR FORCE
DESCRIPTION: AIRLIFT AIRCRAFT TO SATISFY AIR FORCE, ARMY, AND MARINE REQUIREMENTS. C17 DELIVERS MILITARY FORCES AND THEIR EQUIPMENT DIRECTLY TO AIRFIELDS NEAR TO BATTLE AREA ELIMINATING THE TRANSSHIPMENT POINT.
SCHEDULE: RFP - 1980
MDD/DAC WINS DESIGN COMPETITION - 1981
C17 ENTERS FSED - 1985
PRODUCTION BEGINS - 1987
ASSEMBLY BEGINS - 1988
DELIVERY - 1991-2000
MS III - PRODUCTION AND DEPLOYMENT 1991
PHASE IV - OPERATION AND SUPPORT 1991
PRODUCT DATA REQUIREMENTS:

POCS

GREG SCHOETTMER AF CALS PROGRAM OFFICE (513) 257-3085 #241
TO PROVIDE INFO WEEK OF 24 AUG

B2

SPONSOR: AIR FORCE
DESCRIPTION: STEALTH BOMBER
SCHEDULE: MS III - PRODUCTION AND DEPLOYMENT
PHASE IV - OPERATION AND SUPPORT
PRODUCT DATA REQUIREMENTS:

POCS

GREG SCHOETTMER AF CALS PROGRAM OFFICE (513) 257-3085 #241
TO PROVIDE INFO WEEK OF 24 AUG

SSN-21 SEA WOLF

SPONSOR: NAVY/NAVSEA

DESCRIPTION: SEA WOLF SUBMARINE IDENTIFIED NEEDED ENHANCEMENTS TO MIL-D-28000 FOR IGES IMPLEMENTATION. THESE ENHANCEMENTS RESULTED IN AN AP DEVELOPED FOR CLASS V 3-D PIPING AND AN AP BEING DEVELOPED FOR CLASS II ENGINEERING DRAWINGS. ALSO IDENTIFIED THE SIX SHIPBUILDING STEP APs.

SCHEDULE: MS III - PRODUCTION AND DEPLOYMENT
PHASE IV - OPERATION AND SUPPORT

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
IGES ENHANCEMENTS	
3-D PIPING AP (CLASS V)	AVAILABLE NOW IN MIL-D-28000A
ENGINEERING DRAWING AP (CLASS II)	WHEN AVAILABLE - TECH COMPLETE SPRING 1993 - MIL-D-28000 APPROVAL??
STEP SHIP BUILDING APs	
STRUCTURAL SYSTEMS	WHEN AVAILABLE
PIPING SYSTEMS	WHEN AVAILABLE
HEATING VENTILATION/AIR CONDITIONING SYSTEMS	WHEN AVAILABLE
ELECTRICAL DISTRIBUTION	WHEN AVAILABLE
OUTFIT AND FURNISHINGS	WHEN AVAILABLE
LIBRARY PART TRANSFER	WHEN AVAILABLE

POCS

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JIM MURPHY, NIDDESC, (703) 602-7660
CLIFF GEIGER, NAVSEA, (703) 602-1020
GREG MOREA, GENERAL DYNAMICS CLASS II AP, (203) 433-3403

DDG51

SPONSOR: NAVY/NAVSEA

DESCRIPTION: DDG51 IS NAVAL DESTROYER. FIRST SHIP DEPLOYED JUL 91 AND SECOND TO BE DEPLOYED DEC 92. EIGHT SHIPS CURRENTLY UNDER CONSTRUCTION. ORIGINALLY, 49 SHIP WERE PLANNED, BUT DUE TO BUDGET CUTS, FEWER WILL BE MADE; EXACT NUMBER CURRENTLY UNKNOWN. DDG51 DESTROYER IDENTIFIED NEEDED ENHANCEMENTS TO MIL-D-28000 FOR IGES IMPLEMENTATION. THESE ENHANCEMENTS RESULTED IN AN AP DEVELOPED FOR CLASS V 3-D PIPING AND AN AP BEING DEVELOPED FOR CLASS II ENGINEERING DRAWINGS. HOWEVER, NAVY DEVELOPED THEIR OWN 3-D TRANSLATOR INSTEAD OF WAITING FOR THE CLASS V AP.

SCHEDULE: MS III - PRODUCTION AND DEPLOYMENT - JUL 91-??
PHASE IV - OPERATION AND SUPPORT - JUL 91-??
EXPECTED LIFE CYCLE FOR EACH SHIP IS 40 YEARS AFTER DEPLOYMENT.

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
IGES	
2-D REQUIREMENT REMOVED DUE TO LACK OF NEED MID 1992.	
3-D TRANSLATOR DEVELOPED AND OPERATIONAL 1992. THIS TRANSLATOR WILL BECOME A SUBSET OF THE 3-D PIPING AP (CLASS V).	

POCS

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JOANNE OUILLETTE, (703) 602-3476

688 CLASS SUBMARINES

SPONSOR: NAVY/NAVSEA
DESCRIPTION: NAVAL SUBMARINES
SCHEDULE: MS III - PRODUCTION AND DEPLOYMENT
PHASE IV - OPERATION AND SUPPORT
PRODUCT DATA REQUIREMENTS: NEEDED TO CONVERT PAPER LEGACY DATA TO DIGITAL FORMAT FOR STORAGE IN REPOSITORY

REQUIREMENT		TIME NEEDED
IGES		
	3-D PIPING	AVAILABLE NOW IN MIL-D-28000A
	ENGINEERING DRAWINGS	WHEN AVAILABLE - TECH COMPLETE SPRING 1993 - MIL-D-28000 APPROVAL ??
STEP	SHIP BUILDING APs	
	STRUCTURAL SYSTEMS	WHEN AVAILABLE
	PIPING SYSTEMS	WHEN AVAILABLE
	HEATING VENTILATION/AIR CONDITIONING SYSTEMS	WHEN AVAILABLE
	ELECTRICAL DISTRIBUTION	WHEN AVAILABLE
	OUTFIT AND FURNISHINGS	WHEN AVAILABLE
	LIBRARY PART TRANSFER	WHEN AVAILABLE

POCS

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AX

SPONSOR: NAVY/NAVAIR
DESCRIPTION: MEDIUM ATTACK AIRCRAFT TO REPLACE THE A6.
JOINT PROGRAM WITH THE AIR FORCE
SCHEDULE: CURRENTLY IN CONCEPT EXPLORATION PHASE
FIVE CONTRACTORS PERFORMING TECHNICAL STUDIES
MS I - DEMONSTRATION AND VALIDATION
SCHEDULED FOR SPRING 1993
IOC - SCHEDULED FOR 2005
PHASE IV - OPERATION AND SUPPORT 2005-2025

PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	TIME NEEDED
IGES MIL-D-28000 ENGINEERING DRAWINGS	WHEN AVAILABLE - TECH COMPLETE SPRING 1993 - MIL-D-28000 APPROVAL??
AIR FORCE STEP APs BEING CONSIDERED PAS-C COMPOSITES PAP-E ELECTRICAL	WHEN AVAILABLE

POCS

LISA DEEDS, DTRC, (301) 227-1355
BOB FERRIS, NAVAIR, 692-4915
RAY LEBAU, DTRC, (301) 227-1372
RICK SEYMORE, AX PROGRAM OFFICE, 692-2027
CHARLES SUTHERS, (IGES DID), (804) 444-8922

LX

SPONSOR: NAVSEA
DESCRIPTION: NEW GENERATION AIRCRAFT HELICOPTER CARRIER
SCHEDULE: MS 0 -
MS I - PRELIMINARY DESIGN

PRODUCT DATA REQUIREMENTS:

REQUIREMENTS		TIME NEEDED
IGES	MIL-D-28000	
	3-D PIPING	AVAILABLE NOW IN MIL-D-28000A
	ENGINEERING DRAWINGS	WHEN AVAILABLE - TECH COMPLETE SPRING 1993 - MIL-D-28000 APPROVAL ??
STEP	SHIP BUILDING APs	
	STRUCTURAL SYSTEMS	WHEN AVAILABLE
	PIPING SYSTEMS	WHEN AVAILABLE
	HEATING VENTILATION/AIR CONDITIONING SYSTEMS	WHEN AVAILABLE
	ELECTRICAL DISTRIBUTION	WHEN AVAILABLE
	OUTFIT AND FURNISHINGS	WHEN AVAILABLE
	LIBRARY PART TRANSFER	WHEN AVAILABLE

POCS

BEN CASSEL, DTRC, (317) 226-5656

CAD II

SPONSOR: NAVY

DESCRIPTION: THIS IS A FIVE YEAR INITIATIVE PROVIDING CONTRACTS TO PROCURE CAD SYSTEMS TO SUPPORT WEAPON SYSTEMS DEVELOPMENT. THERE ARE FOUR CONTRACTS, ONE SUPPORTING EACH OF THE FOLLOWING:

- NAVAL SUPPLY (NAVSUP)
- NAVAL AIR (NAVAIR)
- NAVAL SEA (NAVSEA)
- NAVAL FACILITIES (NAVFAC)

SCHEDULE: ALL BUT THE NAVAIR CONTRACT HAVE BEEN AWARDED (1992). THE NAVAIR CONTRACT IS SCHEDULED TO BE AWARDED SEP 92.

PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	TIME NEEDED
IGES	
AS SPECIFIED IN MIL-D-28000 3-D PIPING AP (CLASS V)	NOW
ENGINEERING DRAWING AP (CLASS II)	WHEN AVAILABLE
STEP	
STEP COMPLIANT TRANSLATORS SUPPORTING ALL ISO APPROVED PARTS OF STEP	9 MOS AFTER ISO APPROVAL

POSSIBLE 3-D MECHANICAL PARTS PRODUCT MODEL ASSOCIATED WITH STEP TDP AP BEING CONSIDERED FOR DEVELOPMENT BY NAVSUP

LOOKING TO SHORTEN APPROVAL PROCESS OR ESTABLISH SOME PROCEDURES TO APPROVE AND UTILIZE INTERIM STANDARDS, ESPECIALLY FOR THE 6 NIDDESC STEP APs.

POCS

JIM MURPHY, NIDDESC, (703) 602-7660
PAM RUSH, NAVSEA, (703) 602-1060/61
CRAIG CARLSON, NAVSEA, (703) 602-8735
JIM MAYES, NAVSUP
LISA DEEDS, DTRC, (301) 227-1355

NAVY

SPONSOR: NAVSEA

DESCRIPTION: PRODUCT DATA REQUIREMENTS TO BE USED IN SHIP BUILDING. NOT NECESSARILY TARGET FOR ANY ONE DoD WEAPON SYSTEM. THE STEP APs HAVE BEEN UNDER DEVELOPMENT FOR 7 YEARS AND WERE ORIGINALLY COMPLETED IN 1990. DUE TO NEW AP METHODOLOGY DOCUMENTATION, THESE APs ARE BEING REVISED. INTERNATIONAL RESISTANCE TO THESE APs BECAUSE EUROPE IS DEVELOPING THEIR OWN MARITIME APs AND WANT TO ADD THEIR REQUIREMENTS PRIOR TO SUBMITTING THE NAVY APs FOR 150 APPROVAL.

PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	STATUS
IGES	
3-D PIPING	AVAILABLE NOW IN MIL-D-28000A
ENGINEERING DRAWINGS	WHEN AVAILABLE - TECH COMPLETE SPRING 1993 - MIL-D-28000 APPROVAL ??
STEP SHIP BUILDING APs	
STRUCTURAL SYSTEMS	SPRING 1993
PIPING SYSTEMS	SPRING 1993
HEATING VENTILATION/AIR CONDITIONING SYSTEMS	SPRING 1993
ELECTRICAL DISTRIBUTION	SPRING 1993
OUTFIT AND FURNISHINGS	SPRING 1993
LIBRARY PART TRANSFER	SPRING 1993

POSSIBLE 3-D MECHANICAL PARTS PRODUCT MODEL ASSOCIATED WITH PROPOSED STEP TDP AP BEING CONSIDERED FOR DEVELOPMENT BY NAVSUP

POCS

JIM MURPHY, NIDDESC, (703) 602-7660

APACHE

SPONSOR: ARMY
DESCRIPTION: ATTACK HELICOPTER - TANK KILLER
LONGBOW MODERNIZATION PROGRAM
SCHEDULE: PRODUCTION AND DEPLOYMENT
OPERATION AND SUPPORT
REVISED LONGBOW SCHEDULE
PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	WHEN NEEDED
IGES	
MIL-D-28000	

POCS

HAROLD STEWART, AVSCOM, (314) 263-9081, DSN 693-9081

BLACKHAWK

SPONSOR: ARMY
DESCRIPTION: UTILITY HELICOPTER USED BY ALL BRANCHES OF SERVICE CONSIDERING MAJOR CALS INVOLVEMENT TARGETED CALS COMPLIANCE WITH CONVERSION OF TECHNICAL MANUALS USING
SGML
CGM
MAYBE IGES
SCHEDULE: OPERATION AND SUPPORT
PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	WHEN NEEDED
IGES	
MIL-D-28000	
SGML	
MIL-M 28001	
CGM	
MIL-D-28003	

POCS

HAROLD STEWART, AVSCOM, DSN 693-9081, (314) 263-9081

COMMANCHE

SPONSOR: ARMY
DESCRIPTION: ATTACK HELICOPTER - REPLACEMENT FOR THE APACHE
ARMY LEAD CALS WEAPON SYSTEM FOR DIGITAL TECHNICAL INFORMATION
SCHEDULE:
PRODUCT DATA REQUIREMENTS:

REQUIREMENTS	WHEN NEEDED
IGES	
MIL-D-28000	

POCS

HAROLD STEWART, AVSCOM, DSN 693-9081, (314) 263-9081

M1

SPONSOR: ARMY
DESCRIPTION: ABRAMS ARMORED TANK
M1-A1 FIRST MAJOR MODERNIZATION
SCHEDULE: OPERATIONS AND SUPPORT
PRODUCT DATA REQUIREMENTS:

POCS

BILL LEWIS, TACOM, DSN 786-8279

M2

SPONSOR: ARMY
DESCRIPTION: BRADLEY ARMORED PERSONNEL CARRIER'
SCHEDULE: OPERATIONS AND SUPPORT
PRODUCT DATA REQUIREMENTS:

POCS

BILL LEWIS, TACOM, DSN 786-8279

MISSILES

SPONSOR: ARMY
DESCRIPTION: THE ARMY HAS 52 DIFFERENT MISSILES TO INCLUDE THE MLRS AND THE PATRIOT
NONE OF THE 52 CURRENTLY CONTRACTUALLY REQUIRE IGES OR STEP. HOWEVER, THE CONTRACTOR LPV CAN DELIVER TECHNICAL INFORMATION IN IGES FORMAT FOR THE MLRS AND OTHERS, BUT THE ARMY CONVERTS TO RASTER FOR STORAGE IN DSREDS. TECHNICAL DATA PACKAGES ARE REQUIRED IN RASTER. NO FUTURE PLANS TO CONVERT LEGACY DATA TO IGES OR STEP.

POCS

MARK MOE, MICOM, DSN 788-2673

MLRS

SPONSOR: ARMY
DESCRIPTION: MULTIPLE LAUNCH ROCKET SYSTEM
SCHEDULE:
PRODUCT DATA REQUIREMENTS:

PATRIOT

SPONSOR: ARMY
DESCRIPTION: GROUND TO AIR MISSILE DESTROYER
SCHEDULE:
PRODUCT DATA REQUIREMENTS:

FCIM/RAMP

SPONSOR: ARMY/NAVY
DESCRIPTION: FCIM - FLEXIBLE COMPUTER INTEGRATED MANUFACTURING THE PRIMARY END PRODUCT OF FCIM IS A NETWORK OF MODULES LINKING MICPs, CONFIGURATION MANAGEMENT SITES, AND MANUFACTURING SITES. THE PRIMARY SERVICE IS A PARTS ON DEMAND CAPABILITY WHICH WILL BE ABLE TO MANUFACTURE PARTS WITH HIGH RELIABILITY AND QUALITY AT A COMPETITIVE PRICE WITHIN 30 WORKING DAYS. APPLY CURRENT TECHNOLOGY BASED ON BUSINESS CASE/MISSION NEEDS USINF RAMP/COMMERCIAL SYSTEMS.

DESCRIPTION: RAMP - RAPID ACQUISITION AND MANUFACTURED PARTS. PRODUCT DATA DRIVEN MANUFACTURING. DEMONSTRATION OF GENERIC FCIM ARCHITECTURE CAPABILITIES WITH TWO SITES TO BE OPERATIONAL FY93.
NAVAL AIR WARFARE - PRINTED WIRING ASSEMBLY CELL
CHARLESTON SC - MACHINE PART CELL

FCIM SCHEDULE: ESTABLISHED IFMS BUSINESS PLAN - FEB 91
ESTABLISHED IFMS MINI FACTORY FOR MECHANICAL PARTS - JUN 91
DEVELOP ENABLING TECHNOLOGIES - SEP 91 - SEP 95
DEVELOP RAPID MANUFACTURING METHODS/PROCESSES
SEP 91-SEP 95
FACILITIZE OTHER SITES DEC 92-SEP 98

DESIGN AND IMPLEMENT MECHANICAL MFG SITES
OCT 91-JUN 94
WATERVLIET ARSENAL - ENHANCED FEB 93
ANNISTON ARMY DEPOT - IOC OCT 93
ROCK ISLAND ARSENAL - IOC OCT 93
DESIGN AND IMPLEMENT ELECTRONIC MFG SITE
APR 91-MAR 94

TOBYHANNA ARMY DEPOT - IOC APR 94
OTHER FCIM IMPLEMENTATIONS
LETTERKENNY ARMY DEPOT - IOC APR 95

RAMP SCHEDULE: CURRENTLY DEPLOYING TWO PROTOTYPE CELLS TO BE OPERATIONAL FY 93
PRINTED WIRING ASSEMBLIES CELL - NAVAL AIR WARFARE
INITIAL DESIGN/DEVELOPMENT AND SITE INSTALLATION - OCT 89-JAN 93
RAMP PDES TRANSLATION SYSTEM NSWC JUL 92
PWA AT NAWC INDIANAPOLIS OCT 92
PWA TRAINING AT NAWC INDIANAPOLIS JAN 93
MAINTENANCE AND ENHANCEMENT OF STANDARD SYSTEM - JAN 93-SEP 95
SMALL MANUFACTURED PARTS CELL - CHARLESTON, SC
INITIAL DESIGN/DEVELOPMENT/TEST/EVALUATION AND PHASED INSTALLATION - OCT 89-JUN 93
PROTOTYPE RAMP PDES TRANSLATION SYSTEM APR 90
SMP PHASE I CHERRY POINT - JUL 90
ENGINE BLADE/VANE REPAIR CHERRY POINY - MAR 91
RAMP PDES TRANSLATION SYSTEM LOUISVILLE MAR 92
SMP PHASE I CHARLESTON JUN 92
SMP PHASE II CHERRY POINT FEB 93
SMP PHASE II CHARLESTON MAY 93

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
IGES 3-D GEOMETRIC MODELS FOR MECHANICAL PART PRINTED WIRE ASSEMBLIES (CLASS IV)	NOW
EDIF SCHEMATIC DATA	NOW
IPC 350 PRINTED WIRING BOARDS	NOW
BCL (BINARY CUTTER LOCATION FILE)	NOW
RASTER MIL-R-28002	NOW

VHDL (VERY HIGH SPEED INTEGRATED CIRCUIT HARDWARE DESCRIPTIVE LANGUAGE) DESIGN DOCUMENTATION — NOW

FILE INTERCHANGE - MIL-STD 1840A — NOW

STEP

- IGPM — NOW
- AP PLANNING PROJECT - MANUFACTURING PROCESS
  - AP - NUMERICAL CONTROL CODE — WHEN AVAILABLE
  - AP - MANUFACTURING PROCESS PLANNING — WHEN AVAILABLE
  - AP PLANNING PROJECT - ELECTRICAL/ELECTRONIC
    - ALL APs — WHEN AVAILABLE

NEED TO BUNDLE IGES/RASTER/DRAFT STEP FILES UNDER 1840A FOR USE AT MACHINE CELL SITES.

NEED TO BUNDLE IGES/RASTER/EDIF/IPC/VHDL FILES UNDER 1840A FOR USE AT PRINTED WIRING ASSEMBLY SITES.

POCS

LORNA ESTEP, FCIM/RAMP, (703) 607-1355/56
CHARLESTON SC, (803) 760-4342
JIM MAZE, FCIM/RAMP, (703) 607-1355/56
JIM BRUEN, DTRC, (309) 782-7822, DSN 793-6521???

SPARES/BLC

SPONSOR: AIR FORCE

DESCRIPTION: SPARES - SPARE PARTS PRODUCTION AND REPROCUREMENT SUPPORT SYSTEM - PRODUCE/DELIVER SPARE PARTS FASTER THROUGH ENHANCED INFORMATION AND PROCESS FLOW. DEMONSTRATE MANUFACTURING OF MECHANICAL FAMILY OF PARTS. DEVELOP TECH DATA PACKAGE FOR COMPETITIVE PROCUREMENT OR ORGANIC MANUFACTURING OF SPARE PARTS. INTEGRATION OF STATE-OF-THE-ART TECHNOLOGY AND LEGACY SYSTEMS

DESCRIPTION: BCL - BINARY CUTTER LOCATION - DEVELOP PRODUCTIVITY ENHANCING PROJECTS TO LINK PRODUCT DEFINITION DATA TO AUTOMATED MANUFACTURING SYSTEMS.

SCHEDULE: SPARES

PHASE I - NEEDS/REQUIREMENTS JAN 91-JAN 92
PHASE II - PRELIMINARY DESIGN JUN 92-SEP 92
PHASE III - INCREMENTAL IMPLEMENTATIONS OCT 92-JAN 95
PHASE IV - FINAL INTEGRATION JAN 95-SEP 95

SCHEDULE: BCL

PHASE I - DESIGN PROTOTYPE INSTALLATION
DEMONSTRATE BINARY CUTTER LOCATION AT THREE DEPOTS JUN 91-NOV 92
OGDEN
WARNER-ROBINS
SACRAMENTO
PHASE II - COMMANDWIDE IMPLEMENTATION
DESIGN PROTOTYPE INSTALLATION JAN 92-FEB 93
SAN ANTONIO
OKLAHOMA CITY
COMMAND INSTALLATION FEB 93-FEB 94

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	WHEN NEEDED
IGES MIL-D-28000	
RASTER MIL-R-28002	
EDI STEP	

POCS

BRUCE RASMUSSEN, AF MANTECH, DSN 785-7371, (513) 225-7371
JOHN BARNES, AF MANTECH, DSN 785-7371, (513) 225-7371
BILL BILLIARD, OSD\CALS\FSD, (703) 756-5684

IDS

SPONSOR: AIR FORCE

DESCRIPTION: INTEGRATED DATA STRATEGY - AIR FORCE MATERIAL COMMAND CALS INITIATIVE TO CAPTURE AND MANAGE DIGITAL TECHNICAL INFORMATION ACROSS THE LIFE CYCLE OF A WEAPON SYSTEM. THE PROGRAM IS DEFINING, VALIDATING, AND REFINING USER REQUIREMENTS FOR TECHNICAL DATA AND SYSTEMS REQUIREMENTS FOR AN INTEGRATED, INFORMATION MANAGEMENT CAPABILITY WITHIN THE AIR FORCE INTEGRATED WEAPON SYSTEMS MANAGEMENT ENVIRONMENT. IT IS ALSO A MECHANISM TO CAPTURE AND VALIDATE STEP STANDARDS

SCHEDULE: PHASE I REQMNTS DEFINITION & VALIDATION AT ALCs FY91-FY98
PROTOTYPE PHASE COMPLETE 1992 - CONSTRUCTING PROTOTYPE SOFTWARE TO ACQUIRE, STORE, MANAGE, USE, AND DISTRIBUTE ENGINEERING/TECHNICAL INFORMATION DIGITALLY FOR EXISTING AS WELL AS FUTURE WEAPON SYSTEMS

PHASE II ALF DEVELOPMENT & SUPPORT FY91-FY95
PILOT PHASE BEGINNING - TO BE DEVELOPED AT AIR FORCE LOGISTICS FACILITIES.
PILOTS WILL INCLUDE B-1/E4, F5, F15, F11, F16.

PHASE III JCALS TECHNOLOGY DEPLOYMENT FY93-FY96
IDS/JCALS TEST SITES

PHASE IV REQMNTS DEFINITION & VALIDATION AT PRODUCT CENTERS FY 93-FY98 F22 PROGRAM

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
PDCM (STEP IGPM)	AVAILABLE NOW FOR PILOT IMPLEMENTATIONS

IDS IDENTIFIED THE NEED FOR SEVERAL STEP APs NOT DIRECTLY NEEDED BY THE IDS PROGRAM. THESE APs ARE AS FOLLOWS:

AP PLANNING PROJECT - PRODUCT LIFE CYCLE
AP 208 LIFE CYCLE PRODUCT PROCESS
AP 2XX LIFE CYCLE MANAGEMENT
AP SUITE - POST PRODUCTION PRODUCT SUPPORT DATA ELEMENT EXCHANGE SUITE
AP 2XX PRODUCT PROCUREMENT
AP 2XX PRODUCT OPERATION
AP 2XX PRODUCT MAINTENANCE

POCS

NICK BERNSTEIN IDS PM (513) 257-5941
RICK BSHARRH ROCKWELL (310) 647-6915

JCALS

SPONSOR: OSD

DESCRIPTION: JOINT COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT SYSTEM WAS DEVELOPED FROM THE ARMY CALS (ACALS) PROGRAM. JCALS WILL PROVIDE SUPPORT CAPABILITIES TO LOGISTICS SUPPORT ANALYSIS IN THE AREAS OF ACQUISITION, PROCESSING, AND DISTRIBUTION OF DIGITAL TECHNICAL INFORMATION. JCALS HAS BEEN STRUCTURED TO IMPLEMENT JOINT SERVICE FUNCTIONAL REQUIREMENT-FOR DIGITAL DATA SUPPORT. THE FIRST FUNCTIONAL AREA TO BE ADDRESSED IS TECHNICAL MANUALS. THE INITIAL INCREMENT OF JCALS IS THE DEVELOPMENT AND DEPLOYMENT OF A BASIC CAPABILITY MODULE. THE SECOND INCREMENT IS A LONG-TERM ENHANCEMENT OR PREPLANNED PRODUCT IMPROVEMENT PROGRAM TO INCLUDE TECHNOLOGY REFRESHMENTS AND ADDITIONAL FUNCTIONALITY. THE PRIMARY END USER COMMUNITIES OF JCALS ARE THE LOGISTICS ENGINEERS, PROCUREMENT PERSONNEL, TRAINERS, MAINTAINERS, AND PROVISIONING PERSONNEL. THE LEAD WEAPON SYSTEM FOR THE JCALS PROGRAM IS THE BLACKHAWK HELICOPTER PROGRAM DESIGNATED BY THE ARMY MATERIAL COMMAND IN APR 92.

SCHEDULE: MILESTONE O - ACALS ARMY - OCT 87 OSD - MAY 88
ACALS ARCHITECTURE CONTRACT AWARD - AUG 89
ACALS COMPETITIVE DEMONSTRATION - JUL 91
ACALS BECOMES JCALS - SEP 91
FINAL CONTRACT AWARD - CSC DEC 91
MILESTONE II IPR - SEP 92

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
IGES	
STEP	WHEN AVAILABLE

(CONCURRENT ENGINEERING PROCESS VIEWS HAVE BEEN DEFINED AND DOCUMENTED BUT NOT RELATED TO SPECIFIC IGES CLASSES OR STEP APs.)

POCS

KIN CHAN, JCALS PM, (908) 532-0405, DSN 992-0405
ALTON FAIRWEATHER, JCALS PM, (908) 532-0414, DSN 922-0414
ED DLUGOSZ, JCALS PM, (908) 542-6262, FAX (908) 542-6562
HOWARD CHYATT, PM JCALS, (908) 544-2180

JEDMICS

SPONSOR: OSD

DESCRIPTION: JOINT ENGINEERING DATA MANAGEMENT SYSTEM - REPOSITORY TO DIGITALLY STORE AND MANAGE ENGINEERING DRAWINGS. ITS PURPOSE IS TO STORE DRAWINGS AS RECEIVED AND FORWARD TO USERS IN SAME FORMAT. JEDMICS DOES NOT CONVERT OR TRANSLATE FROM ONE FORMAT TO ANOTHER FORMAT. CURRENTLY SUPPORTS RASTER, CGM, AND IGES. WILL MOVE TO SUPPORT THE STORAGE OF STEP INFORMATION UPON REQUEST OF USERS. THE SUPPORT TO STORE AND FORWARD STEP INFORMATION IS A RECOGNIZED FUTURE REQUIREMENT. WILL MATCH SUPPORT NEEDED BY CUSTOMERS. MAJOR CURRENT REQUIREMENT IS RASTER, LOWEST COMMON DENOMINATOR, PLUS ANY OTHER REQUIRED BY USERS.

SCHEDULE: MILESTONE III-DEVELOPMENT AND DEPLOYMENT MAY 91
DLA 4 SITES REQUIRED - 1 RUNNING, 1 BEING INSTALLED
NAVY 47 SITES REQUIRED - 2 RUNNING
AIR FORCE 5 SITES REQUIRED - REQUIRED 1995
ARMY 15 SITES REQUIRED - 8 REQUIRED IMMEDIATELY, 7 REQUIRED 1995
DELIVERY OF SITES EXPECTED TO CONTINUE THROUGH 1997
LIFE CYCLE OF SYSTEM TO CONTINUE UNTIL 2005

PRODUCT DATA REQUIREMENTS:

REQUIREMENT	TIME NEEDED
RASTER	
MIL-R-28002	NOW
CGM	
MIL-D-28003	NOW
2D AND 3D ENGINEERING DATA BASE FILES PER ONE OF THE FOLLOWING:	
IGES	
MIL-D-28000	NOW
EDIF	NOW
VHDL	NOW
IPC	NOW

POCS

DAVE KYLE, JEDMICS PM OFFICE, 692-5565