EAGLE Logistics Toolset
The Product Suite for Technical Documentation and Integrated Logistics Support

2010 Product Guide
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**THE MOST POWERFUL TOOLSET IN LOGISTICS SUPPORT**
Introduction

Supporting today’s complex equipment in aerospace and defense can be a daunting task. The systems can be incredibly complex and require extensive support planning to operate and maintain efficiently. That’s where the EAGLE Logistics Toolset comes in. EAGLE is a suite of software tools that enables you to support and operate your equipment throughout its lifecycle and make intelligent support decisions.

Today’s aerospace and defense community is all about supportability, maintainability and life cycle costs. Customers are concerned more than ever with long term support planning and guaranteed availability of equipment and spares. These drivers lead into performance based logistics (PBL).

However, the basics needed to support your equipment haven’t really changed. You still need to be able to create technical publications, possibly an Electronic Interactive Technical Manual or Publication (IETM/IETP). You might have to produce paper documentation or PDF’s, and you may also have to provide computer-based training for your equipment. Your customers still need to procure spares and know where to find them. They will also require updates and corrections to the technical publications and provisioning data. The EAGLE Logistics Toolset enables you to do all of this—and more! This document explains how the EAGLE Logistics Toolset can help you support, operate and maintain your equipment and delight your customer.
What is the EAGLE Logistics Toolset?

The EAGLE Logistics Toolset is a discipline-based suite of software products designed to help you efficiently create, manage and deliver your support data along with your products. EAGLE has a proven 10-year track record and is used by government agencies, prime contractors, suppliers and service companies globally. Currently there are billions of dollars of equipment and assets operating on land, sea and air that rely on EAGLE for their support data and publications.

The EAGLE Logistics Toolset is conveniently organized into five modules (Figure 1) to carry out the various Integrated Logistics Support (ILS) disciplines an organization may have as part of its support infrastructure. These disciplines are organized into the following EAGLE Toolset modules:

- Logistics Management Information (LMI) / LSAR Generation
- Interactive Electronic technical Manual (IETM) Production
- Reliability Maintainability and Testability (RM&T) Analysis
- Performance based Logistics (PBL) Program Support

Figure 1. EAGLE’s functional modules
Total Life Cycle Support with EAGLE

The Department of Defense (DoD) has mandated a Total Life Cycle approach to product development. The EAGLE Logistics Toolset is designed to support all components of the product life cycle. EAGLE LSAR and Publishing System is used during the Systems Acquisition phase to plan the support solution and design the system to maximize supportability. MMIS is used during the Sustainment phase to support the design through the operational life.

DoD Acquisition Life Cycle Management Framework

EAGLE Logistics Toolset - Components

Let’s take a closer look at the EAGLE Logistics Toolset’s components and explore some of the key features of each module.

Logistics Support Analysis (MIL-STD-1388-2B/ DEF-STAN- 00-60/GEIA-0007)
The LSA module is called EAGLE (Enhanced Automated Graphical Logistics Environment). EAGLE is a software tool that enables you to carry out the LSA processes and record your activities formally in a set of data tables know as the Logistics Support Analysis Record (LSAR).

EAGLE currently supports the following LSAR standards:

- U.S. standard MIL-STD-1388-2B
- European Standard Def Stan 00-60
- GEIA-0007

EAGLE goes beyond the specifications by adding engineering drawings, technical content, video support, integration with the EAGLE Publishing System for the generation and management of S1000D and MIL-STD-40051 technical manuals and other functions. Current 1388-2A, 1388-2B, 00-60 issues 1, 3, 4, 5 and 6 databases can easily be migrated to the EAGLE structure.
EAGLE’s Features

The EAGLE LSAR holds the project engineering data (parts information, Build of materials, RM&T analysis, task analysis), together with details of the supportability the options considered, decisions taken and supporting justification that leads to the optimized product support policy (Figure 2). It also provides the source data for the individual ILS disciplines to fully define the resources required and ultimately deliver them into service as part of the overall product support solution.

The LSAR underpins the following ILS disciplines:
- Spares (provisioning)
- Support equipment
- Technical manuals (electronic documentation)
- Facilities requirements
- Training needs
- Manpower
- Packaging, Handling, Storage, and Transportation
- LCN Maintenance
- Tasks analysis
- Report generation (standard and ad hoc)

Figure 2. Main EAGLE interface
The process starts with the set up of a dedicated project. Project defaults and selections are established at this stage to configure the user interface throughout the rest of the system functions.

A numbering system is established to break down the product into end items, systems and candidate items, used to drive the analysis process (Figure 3).

Figure 3. The LSA Number Control structure and its relationship to the technical publication standard numbering system (SNS)

The development and population of the LSAR dataset is an iterative process throughout the early phases of the product life cycle and includes a comprehensive review process by all stakeholders to ensure that operational and contractual obligations are satisfied.

A key feature unique to EAGLE is the integration of the LSA, training and technical publications data. Maintenance support resources such as spares, tools and manpower are defined in the LSAR, combined with LSAR narratives and then used to create complete S1000D data modules. No other system in the world can do this. Provisioning data and graphics are defined in the LSAR and can then be automatically extracted to produce S1000D Illustrated Parts Breakdown (IPB) data modules.
EAGLE’s product integration dramatically speeds up technical data development by keeping the LSAR and technical publication in sync (Figure 4); data is entered once and can be reused everywhere!

**Figure 4.** The LSAR Task Analysis Form in EAGLE that feeds the technical documentation. In this example a piece of support equipment identified in the LSAR will be transferred to the technical publication support resources table in the IETP.
Technical Publications (MIL-STD-40051)

The EAGLE Publishing system enables fast and efficient creation of technical documentation in MIL-STD-40051 format, which can then be viewed in the IADS viewer. The system allows users to:

- Create work packages based on LSAR Tasks
- Supports all MIL-STD-40051 work package types
- Allows viewing of work packages in table of contents format (Figure 5)
- Views work packages in IADS or PDF format (Figure 6)
- Publishes complete manual for import into IADS
- Tracks and reports percent complete metrics
- Configuration management of publication work flow

Figure 5. EAGLE Publishing System Work Package Tree View
Figure 6. EAGLE Publishing System PDF Output

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REPLACE HEATING AND VENTILATION SYSTEM TEMPERATURE SENSOR - Continued

FIGURE 22-6-8-1. REPLACE HEATING AND VENTILATION TEMPERATURE SENSOR

c. From top of helicopter, have assistant insert screws through temperature sensor.

CAUTION

Watch your head when getting in and out of the helicopter.

d. Install washers and nuts on screw. Tighten nuts.

e. Connect lower temperature sensing tube to the temperature sensor.

f. Connect heater control shaft to mixture temperature sensor and adjust control knob as follows:

1. Install slot on key in temperature sensor (Figure 22-6-8-1). Install nut and tighten.

2. On upper console in cockpit, turn heater control knob counterclockwise until it stops. Do not force knob.

3. Loosen setscrews of heater control knob and line up mark on knob with OFF position on panel.

4. Tighten setscrews.

NOTE

Keeping balance is a benefit.

g. Install two side control rods, and main control rod (PARA 26-6-74).
Technical Publications (S1000D)

The hub of any support process is the technical documentation. Without it, the best product in the world is useless. The EAGLE Publishing System (EPS) is a robust, yet intuitive environment for the management and authoring of XML data used in the production of MIL-STD-40051 or ASD S1000D Interactive Electronic Technical Manuals (IETM). EPS enables the fast and efficient creation of technical documentation using a combination of unique software features and business processes developed from 20 years of industry experience and augmented by feedback from our large, varied customer base.

The EAGLE Publishing System is an imbedded EAGLE function and can be used fully integrated with the EAGLE LSAR to generate data modules directly from logistics data. Alternately, it can operate as a stand-alone S1000D Common Source Database (CSDB) and authoring environment for the production and management of data modules and projects.

EPS is the perfect application to produce and manage technical publications either from existing logistics information or as newly authored data under the control of editing schemas and a Content Management System (CMS). The unique ability of EPS to manage projects using MIL-STD-40051 and S1000D content in the same database makes it a natural fit for customers transitioning to S1000D while maintaining legacy programs.

Some of the functions of the EAGLE Publishing System are:
- Create and manage MIL-STD-40051 and ASD S1000D projects (Figure 7)
- Customize the project Standard Numbering System (SNS) and Information Codes (Figure 8)
- Manage user access, rolls and permissions
- Allocate data modules to authors and reviewers and manage work flow
- Manage project entities (graphics and multimedia)
- Import and export data.
Figure 7. Create and manage MIL-STD-40051 and ASD S1000D projects

Figure 8. Customize the project Standard Numbering System (SNS) and Information Codes
Data Module Code

Some of the more complex elements of S1000D are the Data Module Code (DMC) and the Information Control Number (ICN) schemas. Data classification is a key part of S1000D (Figure 9).

Figure 9. DMC Schema of S1000D

EAGLE makes this numbering and classification a central part of the creation of data modules and entities in the CSDB (Figure 10) and automatically generates these codes based on the project business rules.

Figure 10. Creating a new data module in the EAGLE CSDB
EPS Plug-in for Arbortext Editor

Data modules are opened for edit in Arbortext Editor by clicking on them in the EAGLE CSDB (Figure 11).

The EAGLE Publishing System editor plug-in is used to find symbols, figures and multimedia in the CSDB and add the elements to the XML markup.

Figure 11. Editing a new data module in the EAGLE CSDB

Figure 12a. Preview of a data module with trilogiReview

Figure 12b. Preview of a data module with EPS viewer
Creating and editing XML documents can be a complex and daunting task, particularly if writers are used to word processing software.

EAGLE Publishing System automates many of the common tasks a technical writer would need to perform in their job. These include:

- Inserting figures and multimedia
- Inserting cross references, REFDM, REFTP, etc.
- Task allocation and book in/book out of work (Figure 13)
- Adding Hotspots (Figure 14)
- Data module preview
- Setting the verification of data modules (Figure 15)

Figure 13. Author checking out a data module for edit
Figure 14. EPS Plugin Hotspot Inserter

Figure 15. Setting the QA verification type
Data Generation from the EAGLE Toolset

Management data and end user documentation is extracted from the EAGLE LSAR, EAGLE Publishing System and EAGLE MMIS (Figure 16).

Figure 16. Data Generation from the EAGLE Toolset

The EAGLE Publishing System is used to allocate DMRL resources (data modules) to S1000D Publication Modules. These publication modules are then grouped together to form the IETP. Each data module code, issue number and QA status is tracked and recorded against the issue and revision of the publication module.

Once the data is organized, creating a publication is simple. A final QA is carried out before publishing to ensure that the data modules are ready to be delivered. It detects problems such as errors in XML parsing or invalid references and informs the user of any discrepancies. When the data parses cleanly, the data can be extracted from the EAGLE CSDB (Figure 17).

The EAGLE Logistics Toolset is currently used to produce a wide variety of publications, including software manuals, maintenance manuals (Figure 18), aircrew manuals, illustrated parts catalogues (Figure 19), and can output MIL-Std 40051 Work Packages ready to be viewed with the government supplied Interactive Authoring and Display System (IADS).
Figure 17. Exporting data modules from EPS

Figure 18. IETP showing Procedural Task
Maintenance Management and Performance Based Logistics (PBL)

The EAGLE Maintenance Management Information System (MMIS) is a computerized maintenance management system designed to integrate, manage and optimize all aspects of Performance Based Logistics and Contract Logistics Support programs.

MMIS has the capability to fuse data generated by OEM repair facilities, forward depots, customers, subcontractors, and field representatives by providing a common data repository which can be deployed and accessed globally.

MMIS provides the process visibility and data transparency that today’s program manager’s demand.

With easy, secure access to data over the Internet, all program personnel can view equipment status, repair status, and generate reports with nothing other than a browser. As a result, vital information is not only available from PCs in the office but from PDAs and Web enabled cell phones in the field! Data can be entered and retrieved over the Internet, and reports are generated from live, current data. A user configured dashboard provides constantly updated key data, presented in a graphical format (Figure 21).
Figure 20. OEM or Forward Depot support

MMIS Integrating the Supply System

OEM Depot
- Integrated into MMIS
- Top Level Repair Capability
- Lower Level Repair Capabilities
- Inventory Tracking
- Repair Tracking
- Configuration Management
- Forward Depot - Texas

Supplier Depot
- Integrated into MMIS
- Top Level Repair Capability
- Inventory Tracking
- Repair Tracking
- Configuration Management
- Supplier Depot - New Jersey

Customer
- Integrated into MMIS
- Year Repair Status
- Parts on Hand
- inventory
- Configuration Management
- Visit Location

Organic (DoD) Depot
- Integrated into MMIS
- Top Level Repair Capability
- Inventory Tracking
- Repair Tracking
- Configuration Management
- Forward Depot - Virginia

Figure 21. Example MMIS dashboard

MMIS provides online status and history to authorized users for virtually all program data. The major features are:

- Data maintained online by users and stakeholders
- Reports built on demand from current data
- Access to data limited by user account
- Data available via Internet at virtually any location
- Links provide access to data supported by other websites
- Integrated with Electronic Data Interchange systems
- Allows segregation of data between project and programs
Enablers of the MMIS tool set are:

- Centralized maintenance—all upgrades are made centrally on the server. No client software installation or update is necessary.
- No barriers or borders—access anywhere. All the user needs is an internet or intranet connection and a web browser.
- Uses standard http port 80 or port 443. No custom or proprietary ports need to be opened on client firewall.
- Windows XP, 2003 or UNIX can be used for application server or database.
- Uses standard ORACLE security and roles.
- All business rules are enforced on database.
- Easy data import/export and backup using fullfile import/export.

EAGLE MMIS is designed to answer questions such as:

- How many units are being repaired on a particular contract per month?
- What does the trend line look like?
- What were the top 10 defective parts last month?
- What were the top 30 defective parts last year?
- How long does it take on average to repair a particular part?
- What percentage of defects reported last year were related to vendor workmanship?
- What assets need a particular Engineering Change Proposal (ECP) incorporated?
- What is the mean time between failure (MTBF) for a particular unit?
- Is the MTBF getting better or worse?

EAGLE MMIS provides online status and history to authorized users for virtually all program data. An example is the Failure Reporting and Corrective Action System (FRACAS) used to determine and record the root cause of failures (Figure 22).

Figure 22. MMIS FRACAS screen with multiple records returned
As-Built and As-Maintained Configuration Status Accounting

MMIS configuration application allows users to create and maintain manufactured and the fielded configurations for end items specified in a PBL contract. This application tracks all serialized material removed and replaced from the assembly, maintaining an up-to-date As-Maintained configuration. This module also allows engineering changes to be tied to each configured part, which facilitates the repair depot applying authorized engineering changes. Salient configuration management features include:

- As-Built history documents breakdown of manufactured assembly
- Searchable by assembly or specific part number
- Capability to track changes to As-Built configurations during troubleshooting, repair and modification (As-Maintained)
- Integration with Work Flow Traveler and FRACAS systems
- Updates performed in near real time
- Capability to manage against approved configurations

Configuration Management – Change Tracking

MMIS Configuration Management system is a key module in support of data management. The system allows users to document ECP, deviations, waivers and engineering investigations. The changes can then be tied to Serialized Inventory or As-Maintained records. The MMIS Configuration Management system provides:

- Flexible work flow for approvals
- Links to As-Maintained and Serialized Inventory for retrofit
- Capability to track change requests for:
  - Engineering Change Orders (ECO)
  - Engineering Change Proposals (ECP)
  - Technical Information Review (TIR)

Contracts Management

The MMIS Contract Management System allows users to document contracts and contract line items. It also allows contracts to be linked to documents, inventory and repair work flows.

Inventory Management

The MMIS Inventory Management system is one of the key modules for PBL or CLS support. This provides the PBL or CLS manager supply chain and engineers serialized and nonserialized inventory availability by location and status. It provides a full view of all material by site, location and shelf/bin as well as its appropriate status (i.e. ready for issue, awaiting parts, in-repair, etc.). This inventory visibility and accountability is used along with field demands and in-process work orders to assist the program manager in determining when and how many items need to be inducted into the repair process to maintain the fill rates required by the PBL contract. Inventory Management:

- Tracks serialized and nonserialized inventory by location and contract
- Integrates with FRACAS, work flow and EDI requisitions
- Stores data about specific parts
FRACAS
The MMIS Failure Reporting, Analysis, and Corrective Action Systems (FRACAS) provide a repository for documenting failures and their analysis. It provides a closed-loop corrective action system, which enables depot and field representatives to collect, quantify, and control incoming incident/failure reports, such as test data, field data, or repair data. FRACAS ensures, through its process, that $A_o$ (Operational Availability) and product quality objectives are met. This allows program managers to exceed product readiness and availability benchmarks in their PBL contract.

The MMIS FRACAS:
- Tracks field failures
- Tracks defects and part removals
- Identifies corrective action and trends
- Integrates with As-Built and As-Maintained
- Calculates MTBF

Lessons Learned
The MMIS Lessons Learned system allows users to track field failure queries and document the resolutions. Users can then search the knowledge base for solutions.

- Task issue and responses
- Tie issues to: Documents/System/Facilities/Categories/Impacts

Parametric Test Data
The MMIS Parametric Test Data system allows users to access stored bit test data. The MMIS Parametric Test Data system:

- Allows data to be loaded from a test file
- Records actual measured values and BIT built-in test results for each LRU unit test
- Allows users to attach “raw” data files to facilitate off-site review
- Integrates with work flow and FRACAS
- Allows trend analysis over time

Workflow Tracking and Status
The MMIS workflow system allows users to manage repair actions (i.e. work orders) through the repair loop. This allows the PBL manager the visibility of receipt, inventory and repair to completion on each work order. During the repair process the technician can collect failure data that can be used for investigations to determine the course of decreases in item performance or reliability rates, which can lead to corrective engineering change. The analysis of each work order and failure reported can help maximize the MTBF by implementing engineering changes, which decreases the demand for spares and increases the end item’s $A_o$. 
Workflow provides:

- Real-time planning and status for each unit as its received, tested, investigated and repaired
- Integration with other activities
- As-Built/As-Maintained Configuration Management
- FRACAS
- Automated Inventory Status updates
- Government requisition placement and tracking
- Government CAV reporting
- Workflow updated as testing/troubleshooting progresses

Document Management

The MMIS document control provides revision control on any type of document (i.e. test procedures, drawings, etc.) and organizes them into folder-like categories. This module allows technicians and engineers to have one portal to all necessary documentation in the repair/upgrade process. Program documents are uploaded and stored online, and access is controlled by user accounts.

Procurement

MMIS procurement provides a complete system for tracking purchase orders, and request for quotes. The MMIS Procurement System:

- Links inventory and workflow
- Creates electronic Request for Quote based on usage
- Tracks estimates
- Links estimates to purchase requisitions
- Tracks receipt of purchase requisition items

Software Applications, Technology and Support

Software Architecture

The EAGLE Logistics Toolset is a client server suite of tools that runs on an ORACLE 9i (or later) RDBMS. The database can be mounted on any operating system that is supported by ORACLE. The clients are windows clients and will run on the following operating systems:

- Operating System: MS Windows XP Professional, Vista
- Processor: Intel® Pentium® processor
- Disk Space: 600 Mb of free space
- Memory: 128 Mb RAM (256 Mb recommended)
- ORACLE Client Version: ORACLE 9.2 Client
Support
We appreciate the importance of good support. Our customers know that if they have an issue then the EAGLE team is there to support them in any way we can.

Raytheon operates manned helpdesks staffed by the actual development team members. This ensures that the person you are speaking to understands both the technical nature of the enquiry and the use case scenario that the user is actually in.

Our helpdesk is manned during the following times:

USA: Monday–Friday, 8 a.m. to 4:30 p.m. (Mountain Standard Time)
The helpdesk telephone number is 520.663.6673
The helpdesk email is raytheoneagle@raytheon.com
The Raytheon EAGLE website is www.raytheoneagle.com

Further Information
Additional information about the Raytheon EAGLE products and services can be found on the EAGLE website at www.raytheoneagle.com or by contacting the helpdesk.

In addition to telephone support, you may contact the helpdesk via e-mail, fax and our support Website where customers can raise issues online and receive a tracking number for reference.
Understanding ILS is our business. Our team of analysts has hundreds of years of combined practical experience, many of them are ex-government and prime contractor employees. We are used to creating, managing and delivering technical data. We have sat in your seat! EAGLE was built on and around this experience and is designed to support established international standards.

People who use EAGLE know that they are part of a vast network of ILS professionals from all different areas of the aerospace and defense industry and that the EAGLE Logistics Toolset is the proven solution for Logistics data, MIL-STD-40051 and S1000D technical publications.

Choosing the EAGLE Logistics Toolset is not just about specification compliance. It is knowing that you have a set of tools that enable you to do your job as effectively, efficiently and quickly as possible.