EAGLE MMIS
Enhanced Automated Graphical Logistics Environment
Maintenance Management Information System

Raytheon
Enhanced Automated Graphical Logistics Environment (EAGLE) Maintenance Management Information System (MMIS)

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Introduction

The EAGLE Maintenance Management Information System (MMIS) is a Web Based application specifically designed to facilitate the successful accomplishment of Performance Based Logistics (PBL) and Contractor Logistics Support (CLS) contracts.

PBL is a strategy for system support that contracts a support provider to meet performance requirements in addition to the supply of goods and services. For complex U.S. Department of Defense (DoD) acquisition programs, the PBL approach is mandated as a first-choice strategy and is encouraged for less complex programs as well.

Employing a PBL strategy increases system performance and can result in cost reductions. The provider has more responsibility over constituent elements used to generate the performance results; this additional responsibility necessitates improved visibility and control.

EAGLE MMIS is a computerized maintenance management system that integrates, manages and optimizes all aspects of Performance Based Logistics (PBL) and Contractor Logistics Support (CLS) programs. It uses the LSAR data developed during the product development as the equipment baseline and facilitates the management of the product through its operational life. It has the capability to fuse data generated by repair facilities, forward depots, customers, subcontractors, and field representatives by providing a common data repository that is accessed globally.

EAGLE MMIS provides essential process visibility and data transparency with easy, secure access to data over the Internet. Information is provided in real time, which is critical to the success of the support providers. All program personnel can access information such as equipment location, serviceability status, reliability, repair loop progress and outstanding requisitions. The user can generate reports with no additional software beyond a standard browser. Vital information is available to the office as well as web enabled devices in the field, such as cell phones and tablets. EAGLE MMIS connects all program stakeholders from customers and support providers to third tier suppliers through its shared data environment, helping to avoid confusion and maximizing efficiency A user configurable dashboard provides constantly updated key data presented in graphical formats.

Since the inception of the PBL concept, there have been numerous examples of programs exceeding performance improvement expectations. In recent years, programs using EAGLE MMIS have won the coveted DoD award for notable PBL achievements.
EAGLE MMIS is part of the world-class EAGLE logistics toolset used by over 1500 logistics engineers in 60 companies throughout 20 countries. As an extension to the core EAGLE Logistics Support Analysis Record (LSAR) database, EAGLE MMIS links the real worlds of design, engineering, production and in-service support.

The following is a brief overview of the functionality provided by EAGLE MMIS and how it manages PBL programs. The modules shown on the menu can be made available or hidden from each specific user as required.
Overview

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

- Data is maintained in real time by users through web pages
- Reports are built on-demand from current data
- Access to the data is controlled by user roles and permissions
- Data is available via Intranet (or Internet) at virtually any location
- Hyperlinks provide easy access to data supported by other websites
- Integrated with Electronic Data Interchange systems
- Project and program data is securely separated
- Data access and privileges are tailored through using roles and user accounts
- System architecture enablers for EAGLE MMIS are:
  - Centralized software maintenance – all upgrades are applied to the server, no client software installation or updates are necessary
  - No barriers or borders – data is accessed from anywhere such as aboard a ship or Forward Operating Base. The only requirements are an Internet connection and a web browser
  - Uses standard http port 80 or port 443; no custom or proprietary ports need to be opened on client firewalls
  - Windows XP, 2003, 2008 or UNIX can be used for application server or database
  - Uses Oracle and EAGLE security and roles
  - Business rules are enforced on the database allowing external connectivity without any risk of data corruption
  - Easy data export, import and backup using the EAGLE Full File utilities

EAGLE MMIS answers questions such as:

- Where are the assets and consumables located and in what quantities?
- How many units are being returned for repair per month?
- What does the reliability trend line look like?
- What were the top 10 defective parts last month?
- What were the top 30 defective parts last year?
- What is the average time required to repair a particular part?
- What percentage of defects is related to supplier workmanship?
- What remaining assets need an engineering change incorporated?
- What is the measured mean time between failures (MTBF)?
- Is MTBF getting better or worse?
MMIS Functionality

Ad Hoc query of the EAGLE database

The Ad Hoc tool has the same functionality as the Ad Hoc discipline in the EAGLE Logistics Support Analysis Record (LSAR) application. It allows users to create and run queries against the complete EAGLE database and generate reports based on particular needs. User friendly screens assist in quickly producing the correct SQL query statement (without user knowledge of SQL), that can be based on any EAGLE tables and fields and includes selection and sort criteria. The query can be saved locally or to the EAGLE database for access by all users. The results can also be exported directly to spreadsheets.
As Built Physical Configuration Management

The AsBuilt module provides the ability for programs to manage and record the physical configuration of individual equipment assets including firmware and software as it was when originally installed and delivered to the user.

Allowable configurations of assets, that may include alternate parts or different software versions, are first defined in an AsBuilt Master Template. The template is then used to create instances of serialized AsBuilt assets based on a top level part containing sub-assemblies. The AsBuilt top-down breakdown can be presented in a variety of different formats.
As Maintained Physical Configuration Management and Tracking

The AsMaintained module manages and tracks changes to the physical configuration of fielded equipment including installed firmware and software resulting from maintenance, modification or upgrades. The real-time configuration of all assets can be determined from EAGLE MMIS without the need to conduct time-consuming and expensive physical audits. The AsMaintained module also prevents non-approved parts from being installed and highlights installed parts that are allowed but are not the preferred item.

The history of all changes to the asset configuration is captured and is available from the day the AsBuilt record was created.

The AsMaintained records are fully integrated with the depot level repair workflow “Traveler” and Failure Reporting and Corrective Action System (FRACAS) modules.
Contract Management

The **Contracts** module is a contract management system that allows users to document and manage contracts and contract line items. It also enables specific contracts to be linked to equipment inventory, documents and repair workflows.
Engineering Change and Investigation Management and Tracking

Configuration management is a key aspect to supporting fielded systems and equipment. The EAGLE MMIS Configuration Management module provides functions to create and manage engineering changes, deviations, waivers and investigations through the creation and approval of formal Engineering Change Proposals (ECP), Engineering Change Orders (ECO) and Technical Information Reviews (TIR).

EAGLE MMIS includes the facility to create and assign approval workflows to documents, enabling rapid document creation by all interested parties.

The Implementation of engineering changes is managed and tracked by linking change documentation to AsMaintained records and serialized inventory. The requirement to conduct engineering changes or inspections on equipment is notified to engineers and the progress is available to all MMIS users.

Document Management

The Documents module provides a convenient repository for all project documentation that needs to be accessed and shared by users. Documents can be arranged into categorized folders and can be of any file type including text, presentations, spreadsheets, photographs, scanned documents.

The finder is a powerful file search tool and allows all stakeholders to have access to project documentation through one portal. User account permissions control access to project sensitive documentation.
**Electronic Data Interchange**

EAGLE MMIS is able to interface with a variety of data processing systems through direct data interchange. The **Electronic Data Interchange** module provides management of the various Electronic Data Interchange (EDI) messages that can be received and processed by MMIS. These include requisitions for equipment and spares received directly from the US DoD or FAA. EAGLE MMIS reports open orders and orders for failed items, tracks items designated for shipment or those shipped previously. This data can update the US government WEBCAVS status.

**Failure Reporting and Corrective Action System (FRACAS)**

Reliability growth is crucial to the sustained availability of equipment to end users and the success of PBL based programs. The EAGLE MMIS **FRACAS** module supports a formal method for reporting and investigating failures and their causes as well as developing appropriate and effective actions to correct problems. These are key activities to improve Operational Availability (Ao), product quality, and safety – all of which are enablers for programs to achieve and exceed the stated PBL requirements and objectives.

FRACAS is a closed-loop corrective action system that enables test engineers, field representatives and depot personnel to collect pertinent data related to defective parts.

For front line locations, **Field FRACAS** reports allow preliminary records to be raised in MMIS. All levels of the failure investigation and resolution are added to the same FRACAS record. The result is a comprehensive report that can be reviewed at a Failure Review Board (FRB).

Reliability information can be displayed in real-time as a graphical representation on the MMIS dashboard to highlight problem areas immediately.
Global Asset Tracking, Serviceability Status and History

The MMIS Inventory Management module provides the current location and location history of all serialized and non-serialized (consumable) items, equipment and materiel from site all the way down to the shelf and storage bin.

Additionally the serviceability of each item or readiness status such as “ready for issue”, “awaiting parts” or “in repair” is reported to all users. These status categories can be tailored by the program for the desired level of granularity.

MMIS enables the program office to attain heightened levels of efficiency and responsiveness through the combination of received field demands, current asset locations and the progress of equipment through the repair loop.

The MMIS Spares Kit feature allows a range of inventory items to be nominated for tactical or deployment spares kits. MMIS, uses a template to generate a pick-list of items to be pulled from their current location and added to the spares pack.

Learning from History

The MMIS Lessons Learned Management module gives a program the ability to mine the data stored in EAGLE MMIS for a rapid resolution of current issues. Issues can also be associated with categories, documents, systems, facilities, categories and impact as part of a knowledge based system.

Associating captured BIT failure data with failed equipment

Many electronic systems and items are tested through Built-In-Test (BIT). This very detailed and informative data is often lost when the unserviceable asset is sent down the supply chain for repair.

The EAGLE MMIS Parametric Data utilities provide methods to store and interpret the BIT data generated by the item. This data supports the subsequent fault investigation and repair of the item and can be associated with workflow and FRACAS records.
Managing Parts and Obsolescence

The Part Management module provides the ability to record additional part information that is useful to the program office. Out of phase preventive maintenance tasks can be associated with serialized parts through the Preventive Management aspect of the Part Management module.

Obsolescence management is performed through the Part Obsolescence module in EAGLE MMIS which mitigates the effects of obsolescence through activities such as life-time buys and obsolescence monitoring.
Managing Scheduled Preventive Maintenance and Usage

Preventive maintenance is essential in keeping systems and equipment operating correctly and safely. Tasks are either scheduled against a calendar date or when a usage threshold is reached. The Equipment Usage module is used to capture usage data that is checked against the preventive maintenance task thresholds and any allowed extensions.

The Task Maintenance module allows all preventive maintenance tasks applicable to the fielded equipment to be created in EAGLE MMIS from design or regulator authority requirements.

Typically, collections of preventive maintenance tasks are aggregated into groups or packages of tasks that are performed at the same interval on the same item of equipment an aircraft or vehicle. The Work Package Maintenance module is used to create unique work packages consisting of groups of preventive tasks which are allocated to a specific item of equipment. The work package manages the scheduled maintenance activities and can create work cards of the task.

Setting Up MMIS for a Particular Project

The Project Setup module is used to set up the project defaults including cost accounts, stakeholder information, email groups and automatic email triggers, exchange rates, passwords, scheduling and other parameters such as:

- **DED Maintenance** – For maintaining project specific data for drop down lists
- **Contract Setup** – For creating and maintaining program contract information
- **Cost Accounts** – For maintaining cost accounts used in the EAGLE MMIS system
- **Customers** – For creating and maintaining information used by the FRACAS module
- **Delay Code Metrics** – For establishing metrics used in tracking the status of a traveler
- **Email Groups** – For creating and maintaining email group information
- **Employees** – For creating and maintaining information used in work flow tracking
- **Holiday Maintenance** – For maintaining holiday dates used for calculating metrics
- **Programs** – For maintaining details used for repair item work order creation
- **Production Scheduling** – For maintaining production schedule information
- **Report Maintenance** – For organizing and linking reports to items
- **Supply Support Code** – Allows FAA/DoD supply codes for items to be managed
- **User ID** – For creating and maintaining users in the EAGLE MMIS system
Generating Reports

The Reports module provides access to an extensive assortment of reports that are generated from the data collected and manipulated by EAGLE MMIS. Programs have the ability to create tailored reports using the Ad Hoc Reporting System. Additionally standard EAGLE MMIS reports are available for the following areas:

- AsBuilt and AsMaintained Configuration Reports
- Configuration Management Reports
- FRACAS Reports
  - FRACAS Status
  - Failed Parts
  - Failure Review Board (FRB)
  - Statistical Reports
  - Reliability Trend Reports
  - MTBF Report
- Inventory Reports
  - Demand Log Metric Report
  - Non-Serialized and Consumable Items Status and History Reports
  - Low Order Point Report
  - Serialized Items Status and Inventory Reports
  - Part Quantities Report
  - Part Obsolescence Report
- Material In Transit
  - Summary Report
  - Open Requisitions (demands)
  - Units Due In
- Preventive Maintenance
  - Preventive Maintenance Schedule
  - Preventive Maintenance Master Task List Report
  - Preventive Maintenance History Report
- Program Metrics
  - Many Program Metric Reports are available
- Program Metrics
  - Many Program Metric Reports are available
- Quality Assurance
- Technical information Review
- User Specific Reports
- Workflow (electronic job cards for repair activities)
- NAVAIR reports
**Equipment Warranties**

The **Warranties** module provides tools to track OEM warranties.

**Work Flow - Electronic Job Card and Maintenance Management**

Achieving the PBL requirements for spares availability using a lean supply and repair chain demands an optimally tuned and efficient repair loop. The EAGLE MMIS **Work Flow** system supports repair organizations in many ways. The facilitator is an electronic job card, known in the EAGLE MMIS system as a “Traveler”.

The EAGLE MMIS Traveler provides the program with a focal point for the efficient repair of assets. It lists all predefined routes and operations necessary to complete the repair activities for each type of unit. Each operation on a traveler can link directly to the appropriate electronic repair manual procedure. The date and time of when the engineer completed the operation is recorded and the unit is automatically routed to the next step in the repair process. All program personnel can monitor the progress and assist with streamlining the processes. Routes and Operations can be tailored at any time to improve efficiency or add new required steps.

Travelers are associated with serialized parts and are always available for historical records. They are also associated with FRACAS records that are populated with the root cause failure modes identified during the repair.

Subassemblies removed during the repair can have their own EAGLE MMIS Travelers associated with them to manage their repair routes. The parent and child Traveler records remain related, and together with the FRACAS record provide a complete picture of the detected failure, each step of the repair process and the root cause failure mode.

The **Work Flow** system has a number of EAGLE MMIS screens and functions including:

- **Travelers** – For creating travelers used to induct equipment into the repair loop
- **Operations Maintenance** – For creating and maintaining workflow operations
- **Route Maintenance** – For creating and maintaining operation routes
- **Proof of Receipt and Dispatch** – For creating spare parts tracking numbers
- **Labor Costs** – For tracking labor costs associated to each operation
- **Awaiting Parts** – For tracking work orders awaiting parts, by location
- **Vendor Repairs Due In** – For tracking vendor repairs due in and vendor turn-around times
- **Action Log** – An intuitive engineering notebook that associates notes with parts and allows multiple documents to be easily attached
**Unique Identification Barcode System**

DoD policy requires a Unique Identification (UID) for all serialized mission critical items. The ability of MMIS to read 2D and 3D UID bar codes and Contact Memory Buttons (CMB) is an enabler for an efficient and accurate inventory management system.

The MMIS Barcode System module manages the 2D and 3D UID bar codes and Contact memory Buttons (CMB) used by the program.

**MMIS Visual Dashboard System**

The tremendous amount of valuable data captured, processed and recorded by MMIS is only useful to the program if it can be quickly and easily interpreted. MMIS data is updated in real-time, but interpreting such a large volume of data can be difficult. This situation is solved through the use of the EAGLE MMIS Dashboard System.

Dashboard indicators can be generated and updated from the live MMIS data as a series of visual web widgets that are easy to interpret and give a global view of the key program issues, indicators and performance metrics.
Other EAGLE Products

ILS is applicable throughout the whole life of a project. The focus changes as the project progresses through the Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal (CADMID) phases of the product life-cycle. EAGLE has products that support every phase of the project. The following is a short overview of these. The specific product guides give a fuller explanation of these applications.

EAGLE Toolset Overview

The EAGLE Toolset is an interconnected suite of logistics software applications that reuse logistics data to produce logistics products (data, reports and manuals) and manage the product throughout its entire life cycle. At the core is the data in the EAGLE database, part of which contains the Logistics Support Analysis Record (LSAR) data. The data in the LSAR is shared between the applications ensuring immediate access to totally consistent data for the following functions:

- **LSA Data** – Conduct logistics analysis and generate reports with EAGLE LSAR
- **Technical Manuals** – Create IETMs using LSAR data in EAGLE Publishing System (EPS)
- **Data Review** – EAGLE LSAR data review and commenting in real-time with EAGLE Web
- **PBL Management** – Support and manage fielded equipment with EAGLE MMIS
EAGLE Logistics Support Analysis Record (LSAR)

The EAGLE LSAR is fully compliant with the published LSAR specifications MIL-STD-1388-2B, GEIA-STD-0007, MIL-PRF-49506 and DEF STAN 00-60. It also supports the latest application of ILS principles specified by the United Kingdom MOD in DEF STAN 00-600 and JSP 886 Volume 7.

The world-class EAGLE logistics toolset is used by over 1500 logistics engineers in 60 companies across 20 countries. In addition to providing functions for the analysis and reporting of logistics support decisions, it encompasses a suite of analytical tools and utilities including the automatic generation of maintenance manuals to the requirements of ASD S1000D, MIL-STD-40051 and MIL-DTL-87929C as well as enabling online data commenting by permitted reviewers through EAGLE Web.

It is built to satisfy the most stringent customer mandated requirements and is easily configured and flexible to assist the user. It is a system designed to link the real worlds of engineering, design and production and is the only fully integrated product that ties the technical manuals directly to the engineering and LSA data.

The following gives a brief overview of the EAGLE disciplines used to manage information across more than 20 current system areas. The disciplines shown on the menu can be made available or hidden from each specific user appropriate to their roles in the program.
EAGLE Web

EAGLE Web is a completely thin-client online application that gives complete access to the EAGLE LSAR data and allows editing, inserting and deleting of data as controlled by access permissions. It facilities review and commenting of data by external agencies by managing responses through a web page. It provides the capability to generate standard LSA reports and AdHoc reports from the data exactly like the EAGLE client, but without requiring any software installation. The document management facility supports the storage and recall of documents and generated reports.
EAGLE Publishing System (EPS)

EPS is a robust, yet intuitive environment for the authoring and management of XML data used in the production of ASD S1000D and MIL-STD-40051 electronic technical manuals. EPS was developed with more than a decade of expertise in the generation of electronic technical manuals directly from current LSAR data. It is the perfect application to produce and manage publications either in conjunction with logistics information or authored directly in EPS and not linked to LSAR data. Content Management System (CMS) procedures are used to manage the work flow in a collaborative environment.
Summary

EAGLE is a suite of software tools used to develop optimum logistics solutions for the operation and support of equipment throughout its lifecycle, from initial concepts to disposal.

End users are focused on availability, supportability and lifecycle costs. More than ever, long term support planning and guaranteed availability of equipment and spares is essential for deployed operations. These goals remain foremost whether support is provided organically or through contracting for Performance Based Logistics (PBL) or Contractor Logistics Support (CLS).

The original goal of Integrated Logistics Support (ILS); to support fielded equipment and the generation of the necessary ILS products has not changed. Optimum spares, tools, consumables, technical publications, facilities and training must be correctly identified and provided at minimum cost.

Equipment tracking, configuration management and timely repairs are crucial to maintaining product availability and operational effectiveness. The EAGLE products provide the tools necessary to generate all the support requirements and manage fielded equipment in a completely integrated environment. Data gathered and analyzed during design is reused to produce technical manuals as well as provide a basis to manage the equipment configuration, location, repair, reliability growth and other attributes of the equipment’s operational life.

More Information

Additional information about Raytheon EAGLE products and services can be found on the EAGLE website at www.raytheoneagle.com.

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