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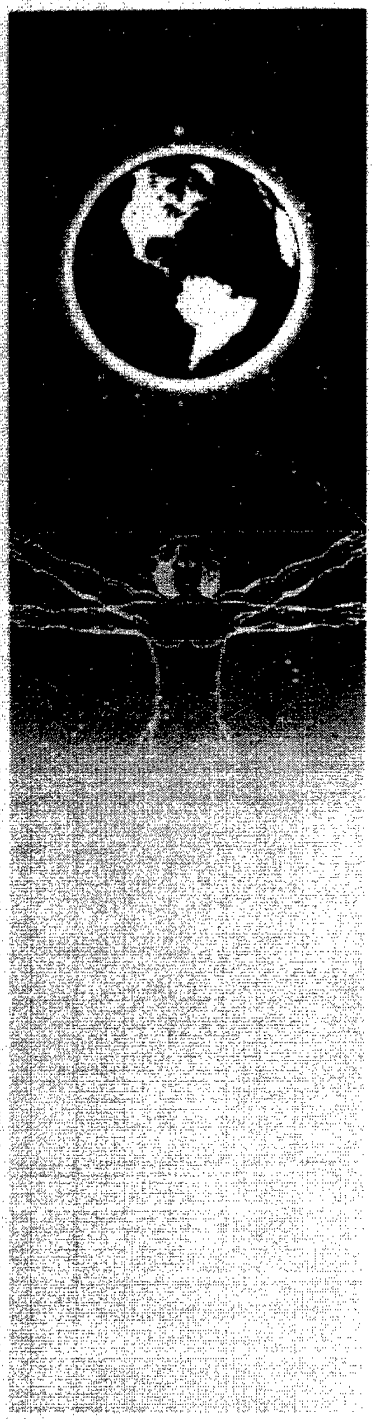

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Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations

Lonna Dumouchel

Synergy, Inc.
1763 Columbia Road, NW
Washington, DC 20009

Randy P. Allen
Air Force Research Laboratory

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Human Effectiveness Directorate
Deployment and Sustainment Division
Sustainment Logistics Branch
2698 G Street
Wright-Patterson AFB OH 45433-7604

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FOR THE COMMANDER

//signed//
MARK M. HOFFMAN
Deputy Chief
Deployment and Sustainment Division
Air Force Research Laboratory

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The purpose of this research was to collect, analyze, and define high-level needs and features of the Virtual Space Logistics Readiness Center (VSLRC). It focuses on the capabilities needed by the stakeholders and targeted users, and why those needs exist. The VSLRC is an interactive system that increases support to the space systems warfighter by providing access to near real-time system operational and equipment status, and linking logistics data to it's impact on operational readiness. The VSLRC will integrate all necessary logistics, maintenance, and operations data into a single system that decision-makers can use to identify, diagnose, and take corrective actions to solve logistics issues in the space systems' supply chains. VSLRC is a web-based system, and will operate within a portal-like environment that adheres to Air Force and Department of Defense (DoD) interoperability standards. Initially, the VSLRC will be housed in a secure environment (i.e., Secure Internet Protocol Network (SIPRNET), but will eventually transfer information between classified and unclassified environments for ease of use.

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PREFACE

The research documented in this technical report for the Virtual Space Logistics Readiness Center (VSLRC) program sponsored by the Air Force Research Laboratory, Human Effectiveness Directorate, Sustainment Logistics Branch (AFRL/HESS), Wright-Patterson Air Force Base, OH. Synergy, Inc. performed the work under Delivery Order #21 of the Technology for Readiness and Sustainment (TRS) contract F33615-99-D-6001. Lt. Randy P. Allen (AFRL/HESS) was the program manager for the effort.

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1 Purpose

The purpose of this Technical Report - Concept of Operations (CONOPs) is to collect, analyze and define high-level needs and features of the Virtual Space Logistics Readiness Center (VSLRC). It focuses on the capabilities needed by the stakeholders and targeted users, and why those needs exist. The specific details of how the VSLRC fulfils those needs are described in the use case and software requirements specifications.

1.1 System Overview

The VSLRC is an interactive system that increases support to the space systems warfighter by providing access to near real-time system operational and equipment status, and linking logistics data to its impact on operational readiness. The VSLRC will integrate all necessary logistics, maintenance, and operations data into a single system that decision-makers can use to identify, diagnose, and take corrective actions to solve logistics issues in the space systems' supply chains.

The VSLRC description contained in this document is based upon initial research conducted by the Space and Missile System Center/Detachment 11 AP (SMC/Det 11) and findings described in a VSLRC concept paper. The Air Force Research Laboratory (AFRL) and Synergy, Inc. gathered additional information through interviews with various Headquarters Air Force Space Command, Space and Missile System Center/Detachment 11 (HQ AFSPC, SMC/Det 11), and Ogden-Air Logistic Center (OO-ALC) organizations.

1.1.1 General Nature of System

VSLRC is a web-based system, and will operate within a portal-like environment that adheres to Air Force and Department of Defense (DoD) interoperability standards. Initially, the VSLRC will be housed in a secure environment (i.e., Secure Internet Protocol Network (SIPRNET)), but will eventually transfer information between classified and unclassified environments for ease of use.

1.1.2 Development Background

VSLRC development is broken into four phases:

- Phase 1 – SMC Det 11/AP develops a limited capability web site that pulls together available and relevant operations and logistics information about space systems
- Phase 2 – The AFRL funds VSLRC requirements and technology feasibility study conducted by Synergy, Inc. that includes a Return On Investment (ROI) analysis and a concept demonstration

- Phase 3 – Additional Top Ten Supply Drivers methodologies for all space programs and provide development on an Interactive Concept Demonstration
- Phase 4 – Depending on the outcome of Phase 2, iterative spiral development for the VSLRC begins

These CONOPs is developed as part of Phase 2 of this effort. To collect this information as well as a set of initial software requirements and use cases, Synergy Inc. participated in interviews and data collection sessions with SMC Det 11/AP, Headquarters Air Force Space Command/LZ (HQ AFSPC/LZ), System Sustainment Managers (SSMs), OO-ALC/LHJ, 14th AF/A4 and Aerospace Operations Center (AOC), 50th Space Wing, and the 21st Space Wing.

1.1.3 Identification of Key Participants

Several organizations are involved in the development of the VSLRC. Key participants include:

- Project Champion: SMC Det 11/AP
- Project Sponsor: AFRL (Technology and Feasibility Study)
- Users: Everyone involved in the space systems supply chain to include but not be limited to the following:

  - HQ AFSPC
  - 14 AF
  - SMC Det 11
  - Electronic System Center (ESC) Det 5
  - OO-ALC/LH
  - Others
- Developers: Synergy, Inc. and the University of Dayton Research Institute (UDRI)
- Support Agencies: None

1.1.4 Current and Planned Operating Sites

Although users of the VSLRC are widely geographically dispersed, the initial operating site will be at the Centralized Integration Support Facility (CISF), Peterson AFB.

1.1.5 Assumptions and Constraints

Each of these factors affects the requirements stated in the CONOPs, use case, and software requirements specifications. These factors are not design constraints on the software, but any changes to them can affect requirements.

- Continued access to required data systems and data
- Continued access to subject matter experts and user representatives

1.2 Document Overview

This document depicts the various user and stakeholder requirements and a concept for how the VSLRC will meet those needs. Various other data sources and systems are also reported in order to best understand the existence of similar, disparate systems, interface requirements, the utilization of various tools, and the need for consolidation of some systems and requirements.

2 Problem Statement

2.1 Description of the Problem

The Air Force Space community currently has no near real-time, secure, web-enabled means for data exchange and display. Visibility and status of space system assets is critical for accurate decision-making and reporting, but the current method of obtaining this information is manually intensive and disjointed. Organizations must often access several disparate information systems or hardcopy reports to determine the status of space systems, and often time's data collection is duplicated across the supply chain. In addition, not everyone has access to the information needed, or the information they do have is suspect, out of date, and/or inconsistent with what others are seeing. Not only is it difficult for SSMs and others to determine the overall long-term health of space systems, but those focused on solving day-to-day logistics and sustainment problems issues are often forced to be reactive instead of proactive.

2.2 Opportunity for New System

The VSLRC will solve these problems by providing three primary functions:

- Report screens that display operational, equipment, and communications equipment status simultaneously for space systems
- Informational/diagnostic screens that integrate data from multiple Air Force, contractor, and other DoD legacy information and analytical systems
- Automated messaging for early identification of potential problems

These functions provide all members of the supply chain with a consistent view of the health and status of space systems, in addition to simultaneous notification of problems and a common picture of the information required for timely resolution.

2.3 Existing Systems

Several data sources and tools exist today that will contribute to the VSLRC. Some systems contain data that the VSLRC must collect, process, analyze and report, while others contain functionality that may be integrated into the VSLRC. Interface linkages may also exist between various systems and the VSLRC. These are described below. No single system exists today that provides all of the capabilities required by the VSLRC.

System- Tools	Name	Description
LOCIS	Logistics Control and Information Support	The Logistics Control and Information Support (LOCIS) program is researching and developing information technologies to enhance the ability of the logistics community to effectively manage logistics resources and assimilate logistics information for decision-making in an Expeditionary Air Force/Agile Combat Support Command and Control environment.
LASAR	Logistics Analysis Supportability Assessment Resource	Logistics Analysis Supportability Assessment Resource (LASAR) focuses the weapon system analysis on a series of key metrics indicating the weapon system's overall health or readiness. These metrics include identifying diminishing manufacture sources, mission capability rates, trends and limiting components, personnel limitations, component mean time between failure, logistics/supply chain throughput (both Air Force (AF) and Defense Logistic Agency (DLA)) and critical wartime spares analysis.
PIN	Parts Information Network	Parts Information Network (PIN) is an interactive system, designed to assist its users in supporting the E-3 aircraft Programmed Depot Maintenance (PDM) process by reducing Awaiting Parts (AWP) time for DLA-managed parts, reducing the need for Phased Depot Maintenance (PDM) delays, and thereby increasing supportability to the warfighter.
PSA	Predictive Support Awareness	Predictive Support Awareness (PSA) will provide a comprehensive link between sustainment planning and operations. PSA, through source sustainment analysis, will provide decision-makers with the ability to predict shortages and determine resource alternatives to avoid logistics barriers.
D087P	Pipeline Performance Analysis System (PPAS)	The Weapons System Management Information Systems (WSMIS/PPAS) modernization environment includes 1) Pipeline analysis for the following: base repair, retrograde repair, Logistics Response Time (LRT), contract repair and depot repair. 2) An initiative to provide visibility into customer wait time (CWT). CWT measures the time it takes from order to receipt when customer requirements are satisfied, from wholesale and

System- Tools	Name	Description
		retail transactions as well as other arrangements. This capability will allow Air Force logisticians to identify and analyze problems in the CWT pipeline in order to make decisions based on performance. Specifically, CWT is a metric that measures the total elapsed time between when a customer's documented requirement is established and when that customer acknowledges receipt of the material requested.
LRT-AF	Logistics Response Time - Air Force	Logistics Response Time-Air Force (LRT-AF) is wholesale pipeline activity for the Air Force. It tracks the average time from when a requisition is submitted (by individual requisition and by unit) until the requisitioned item is actually received. There are four logistics response time segments (01-04): 01. base requisition segment, 02. ICP process segment, 03. DLA process segment and 04. transit segment.
WSAP	Weapon System Analysis Program	Weapon System Analysis Program (WSAP) organically developed and maintained system within AFSPC/LGS that performs metrics calculations on various weapon system data.
SENSORNET	Sensor Network	Sensor Network (SENSORNET) is a nationwide real-time detection, identification, and assessment system of Chemical, Biological, Radiological, and Nuclear (CBRN) threats.
D087T	TRACKER	TRACKER provides comprehensive supply, transportation, acquisition, and maintenance information to support the various functions of the logistics support office, with the primary focus being pipeline performance analysis and transportation billing validation. TRACKER's data warehouse allows individual requisitions / shipments to be tracked via the worldwide web, with emphasis on flightline, base-level requirements. TRACKER provides key functional capabilities into the consolidated database / web enabled WSMIS / decision support environment.
SBMCS – Logbook,	Space Battle Management Core System	Space Battle Management Core System (SBMCS) combines all status and outage information for the ground/control and space segments. Logbook to be incorporated into Mission Critical Reporting System (MCRS) ~Jul 03.
MCRS	Mission Critical Reporting System	Mission Critical Reporting System (MCRS) displays status and outage information for all satellite constellations.
VARD	Variance Analysis Reporting Database	Variance Analysis Reporting Database (VARD) Air Force Material Command (AFMC) Mission Impaired Capability Awaiting Parts (MICAP) sent from Tobyhanna to OO-ALC IMs for review of SORs and causes.
BSC	Balanced Scorecard	Balanced Scorecard (BCS) is a management system which integrates an organization's strategic operating objectives with balanced performance

System- Tools	Name	Description
		measures to drive achievement of the strategy throughout the organization. OO-ALC/LHJ initiative to use BSC (Global Positioning Satellite (GPS) Ground Segment as pilot) against specified metrics in an effort to normalize the potential framework.
DSS	Decision Support System	Decision Support System (DSS) is a web-based program which allows users to assess the sustainability of the sensor sites by helping them monitor important system metrics and make proactive decisions to support the sites.
MERLIN	Multi-Echelon Resource and Logistics Information Network	Multi-Echelon Resource and Logistics Information Network (MERLIN) is tool used to generate the System Executive Management Report (SEMR) via SIPRNET.
ORA	Operational Readiness Analysis System	Tool developed at OO-ALC to identify performance by shop Production to include induction, constraints, open MICAPs, MICAP hours, MICAP incidents, MICAP Hours comparison, MICAP incidents comparison, weapon system comparisons, backorders, requisitions, etc. Data is put on screen in web browser in bar graph, and can be downloaded to Excel, or ppt presentation. Data sources include, but are not limited to, D165B, D087X, D035K and D200.
RAMES	Reliability, Availability and Maintainability Engineering System	Reliability, Availability and Maintainability Engineering System (RAMES) identifies reliability and maintainability trends at all level, identifies bad actors, supports "what if" and "many to one replacement", and ROI analyses, and can be used to validate Modernization Planning Process (MPP)/ Program Objective Memorandum (POM) inputs to support both the warfighter and sustainment communities.
VICP	Virtual Networking System (VINES) Internet Control Protocol (VICP)	Virtual Networking System (VINES) Internet Control Protocol (VICP) is used to notify errors and changes in network topology. VICP frames may contain parameters on Cost and Communication Error.
WICAP (DLA)	Worldwide Industrial Capabilities Assessment Program	Worldwide Industrial Capabilities Assessment Program (WICAP) is used for procurement, retooling, etc., to show procurement history to decrease lead-time and lower prices to the Government.
SMART	Systems Metric and Reporting Tool	Systems Metric and Reporting Tool (SMART) is a Program Manager's Command and Control Tool that replaces program reporting with information

System- Tools	Name	Description
		access. SMART replaces current Defense Acquisition Circular (DAC), Program Executive Officer (PEO), and Service Acquisition Executive (SAE) program reviews with access to current program information.
D002A	Standard Base Supply System (SBSS)	The Standard Base Supply System (SBSS) is a unified management system that provides inventory control, workload/material management actions and accommodates various funds control actions for all base (retail) level supplies/equipment for automated material management and system users. SBSS operates through the collective interactions of supply procedures, service procedures, internal and external system interfaces, processing routines, and the SBSS computer terminals.
G054	Core Automated Maintenance System (CAMS)	Core Automated Maintenance System (CAM) is the Air Force standard, production-oriented, base-level automated maintenance information management system. The system supports all aircraft, communications-electronics, and support equipment maintenance activities at 93 worldwide main/host operating bases, 118 Air National Guard/Air Force Reserve sites, and selected North Atlantic Treaty Organization (NATO) locations. CAMS replaced manual maintenance data collection and maintenance work order systems by providing on-line remote terminals connected to the Standard Base-Level Computer (SBLC) system throughout the maintenance complexes. CAMS automate aircraft history, aircraft scheduling and aircrew debriefing processes to provide a common interface for entering base-level maintenance data into other standard logistics management systems.
G099	Reliability and Maintainability Information System (REMIS)	Reliability and Maintainability Information System (REMIS) will receive selected weapons system maintenance information in detailed and summary format from the Core Automated Maintenance System (CAMS), CAMS for airlift (G081), Integrated Maintenance Data System (IMDS), and depot and contractor technology repair centers by direct on-line input and file transfer protocol (FTP) via the defense information system network. Data elements collected and reported will be those pertaining to aerospace vehicle, trainer, and automated test equipment (ATE) inventory, status and utilization; maintenance data documentation (MDD) on all reportable types of equipment; actual and approved configuration data; time change and inspection data, and time compliance technical order data. Additionally, REMIS will establish selected on-line edit and validation tables to be maintained by designated Air Force personnel to

System- Tools	Name	Description
		ensure data accuracy. Frequency of data transmission will be in accordance with established and approved interface control documents between all systems.
WARRS - D035K	Wholesale and Retail Receiving and Shipping	Wholesale and Retail Receiving and Shipping (WARRS) is a legacy mainframe D035 subsystem that provides retail customer support including bit-and-piece parts and end-item support to depot maintenance. Maintains historical data for all accountable depot retail transactions and for Air Force receipts into the depot and for shipments out of the depot.
SORAP	Source of Repair Assignment Process	Source of Repair Assignment Process (SORAP) is the primary method by which depot maintenance posturing decisions for both hardware and software are made. It applies to both new acquisition and fielded programs. It is designed to ensure compliance with all applicable factors, including public law, that merit consideration in achieving a best value depot maintenance source of repair. For new acquisitions, the System Managers (SMs) should initiate the SORAP as soon as feasible in the acquisition process. For fielded systems, a SORAP is required for all workload shifts, modifications, and workloads proposed to be accomplished in an overseas arena.
D200	Requirements Data Bank (RDB)	The Requirements Data Bank (RDB) system comprises a set of major logistics processes and models integrated by a large relational database. RDB automates and integrates the Air Force materiel requirements determination processes which compute procurement and repair requirements for spares, repair parts and major equipment items. RDB uses a planning period of 38 quarters and recomputed quarterly. The relational database is the repository of detailed information showing the indentured application of every individual part of each particular aircraft type or end item. Within this structure the system holds the historical and planning data needed to support computation of quantities for buy and repair. The data includes: past and projected weapon system operating programs; future readiness goals; maintenance and modification schedules; item failure rates and condemnations. Data query, modeling and management report generation are on-line.
EDW	Enterprise Data Warehouse	Enterprise Data Warehouse (EDW) stores aircraft information previously located on several computer systems. Integrates this information, provides enhanced access, and analytical query capabilities to produce tailored reports.
D087H – REALM	Requirements/Execution Availability Logistics Module	D087H-Requirements/Execution Availability Logistics Module (REALM) computes depth of spares requirements for Readiness Spares

System- Tools	Name	Description
		Packages (RSPs).
Tobyhanna MS Access DB	N/A	Tobyhanna creates an access database comprised of AFMC MICAPS, which they then send to OO-ALC/LH for further analysis and reporting requirements.
GIDEP	Government/Industry Data Exchange Program	Government/Industry Data Exchange Program (GIDEP) a cooperative effort to exchange research, development, design, testing, acquisition, and logistics information among Government and industry participants. GIDEP seeks to reduce or eliminate expenditures of time and money and to improve the total quality and reliability of systems and components during the formulation and implementation processes of program and project management. Informs subscribers when a vanishing vendor decides they may stop producing an asset.
WSSP	Weapon System Support Program	The DLA Weapon System Support Program (WSSP) was established to enable the services to identify to DLA those common consumable parts required to ensure adequate supply posture in support of organizational readiness objectives. It enhances the readiness and sustainability of the military services by providing the maximum practical level of support for DLA-managed items with weapon system application. The DLA WSSP enables DLA to develop an investment strategy that is geared to the criticality of the weapon system end items as registered in the WSSP and the essentiality of their component parts. The information provided to the DLA WSSP drives DLA support for weapon systems. DLA uses the WSSP to establish funding priorities, make personnel assignments, initiate procurement actions, tailor business arrangements, and focus attention on national stock numbers (NSNs) degrading mission capability of the military services' materiel requirements.
EDW	Enterprise Data Warehouse	Enterprise Data Warehouse (EDW) stores aircraft information previously located on several computer systems. Integrates this information, provides enhanced access, and analytical query capabilities to produce tailored reports.
Space Ops Center Portal	N/A	SMC Det 11/AP has developed a limited capability web site that pulls together available and relevant ops and logistics information about space systems.

2.3.1 LOCIS Evaluation – In Work

LOCIS is a 3-year proof of concept Advance Technology Demonstration being developed by AFRL/ HESR and officially sponsored by the Agile Combat Support Division in the Air Force Command and Control Intelligence, Surveillance, Reconnaissance Center (AFC2ISRC/LG). The LOCIS program is

researching and developing information technologies to enhance the ability of the US Air Force C2 and logistics community to effectively manage resources and assimilate information to support decision-making in an Expeditionary Air Force/Agile Combat Support Command and Control Environment.

This evaluation is based on the review of Spiral 2 software not including an Entity Relationship Diagram (ERD) and a Technical Interchange Meeting (TIM) on Thursday, 29 May 2003 with BAE Systems, the developers of Spiral 2 and 3 of the LOCIS System. Therefore, representative information will require a more thorough analysis and is only based on information presented to Synergy, to date. Results may change, depending upon further analysis of the LOCIS source code, software application and receipt of appropriate documentation.

The following stakeholder requirements were presented to BAE Systems:

1. Visibility of operational, equipment and comm. Status
2. Visibility of logistics and maintenance impact on operational readiness
3. Collection of maintenance and logistics data that support metrics calculation
4. Instant notification of critical logistics problem
5. Visibility of item status, location, and disposition
6. Drill-down from equipment status to underlying causes
7. Integration with Balanced Scorecard
8. Produce MICAP Reports
9. Determine overall equipment status based on status of system components
10. Identify top maintenance and supply drivers
11. Conduct single point failure (SPF) analysis

- BAE Systems believes that the LOCIS current design would be able to support all but stakeholder requirements 3, 7, and 11
- Requirement 3 requires that the database hold historical data. LOCIS was designed only to contain current data
- Requirement 7 deals with the integration with Balanced Scorecard. BAE was unfamiliar with this system

- BAE Systems said that they are not currently providing an analysis specific to Single Point Failure (SPF) analysis; however, they have experience in doing similar analyses (he believes) and BAE Systems could incorporate this capability

2.3.1.1 Front-end

LOCIS is principally a system consisting of an applet front-end communicating to servlets on the middle-tier, which in turn communicate with the database. According to BAE Systems, the applet (and LOCIS framework) may provide the best opportunity for applicability and reuse in the implementation of VSLRC without any (or much) rework. BAE Systems discussed some objects used in the applet that could probably be incorporated in the VSLRC, including a Grid object for displaying tables and providing primary and secondary sorting and a Scheduler object that graphically displayed much like a Gantt chart. Further discussions, however, indicated that the front-end is still tightly coupled with the middle-tier servlets. An example of this is the Tail ID that is used everywhere.

Another concern is that the VSLRC requirements, thus far, have not required the use of an applet. It is believed that all of the storyboard screens designed thus far can be easily developed with Java Server Pages (JSPs.)

2.3.1.2 Middle-tier

Servlets are fairly well geared toward supporting the front-end applet, rather than developed in a more object oriented and web-service oriented approach.

2.3.1.3 Database

The database is primarily designed with Aircraft in mind. BAE systems investigated and developed a more maintenance/logistics oriented schema. However, this schema has not been incorporated as the changes would likely ripple and require changes to middle-tier and front-end components.

There may be some opportunity in reuse of processes being used to obtain data from other systems. LOCIS is using a product called *Info Connect* to do some 'screen scraping' to legacy systems like CAMS and G081. It also uses a sophisticated tool referred to as the Text Based Parser. This tool would take FTP files and, based on a properties file, would parse the FTP files appropriately.

BAE Systems discussed the investigation of Agent technologies for their source data. The problem lies with the fact that your agents need to communicate with agents on the other end and none of the source systems have agents with which to communicate. With the evolvement of EDW, this capability to incorporate this technology, message oriented adapters, etc., may be possible.

2.3.1.4 Architecture

LOCIS is currently built upon a fairly simple web application architecture. It does not currently use alerts via messaging systems. Alerts are currently generated by polling the data store. BAE Systems would like to re-design using Oracle's triggers to generate alerts. They also indicated that they would like to explore the use of JMS or other to better implement an event oriented system including alerts.

2.3.1.5 Re-usable Components

This area will be further examined and reported in VSLRC Phase II.

2.3.1.6 Web Application

Spiral 3 has been re-organized into the more standardized Web Application directory structure and now includes a web.xml file. This was largely done as part of the port to Web Logic Application Server. Still, the LOCIS does not take advantage of an application servers hooks for authentication and security protection. The authentication is currently handled within the applet. The system currently does not use connection pooling nor does it get its data source from Java and Naming Directory Interface (JNDI).

2.3.2 Possible Integration of Predictive Support Awareness (PSA) with VSLRC

Synergy, Inc. was asked to review both PSA and VSLRC and identify potential areas for system integration. The following are data points relative to the possible integration of both PSA and VSRLC concepts:

- Enterprise-wide reach to capture and disseminate critical information
- Visible impact to logistics operations/processes, Command and Control (C2) functions and requirements/metrics
  - Marriage of operational and logistics information
- Alerts and triggers
  - Alerts those affected when changes occur within AFMC and AFSPC that affect asset status and require analysis
  - Assists in take action efforts
  - Automatic updates to senior management briefings
- Real-time monitoring of inventories and parts management
  - Inventory management focused on providing parts to keep weapon systems and space systems fully mission capable

- Focus on achieving desired operational effects

- Statistical Analysis
  - Metrics
  - Time Trends via historical data
- Stoplight charting
  - Red – Non-Mission Capable (NMC), Amber – Partial Mission Capable (PMC), Green – Fully Mission Capable (FMC)
  - Drill down detail of "bad actors," driving requirements and critical constraints
    - Map-based interface for data visualization
    - Complements the AF portal environment
- Identification of other ongoing AFMC and AFSPC scientific technological efforts

PSA is currently a prototype system and has many capabilities and potential functionality. While reviewing the key stakeholder and user needs identified in Paragraph 3.3, it is foreseen that the functionality of the PSA prototype can meet all but the following requirements:

- Integration with Balanced Scorecard
- Conduct Single Point Failure (SPF) analysis
- Produce Unit, Wing, and NAF SITREPs

However, these requirements can be integrated with further iterations of development.

3 Stakeholder and User Descriptions

3.1 Summary of Stakeholders and Users

Air Force Space Command consists of a headquarters element located at Peterson AFB, the 14th Air Force at Vandenberg AFB, and the 20th Air Force at F.E. Warren AFB. Wings supporting the 14th Air Force are responsible for operating and maintaining all space systems and ground segments, while the 20th is responsible for Intercontinental Ballistic Missiles (ICBM). The Space and Missile Systems Center (SMC) at Los Angeles AFB is home to the space system program offices, and is responsible for acquisition, logistics, and sustainment. SMC Detachment 11, located at Peterson AFB, is responsible for logistics readiness, infrastructure support, and sustainment of space systems, and is home to the space system SSMs.

The Supply Chain Manager for Space Systems is located at the Ogden Air Logistics Center (OO-ALC). OO-ALC/LHJ, the Space Systems Support Division provides wholesale item management, production management, and sustainment support to the SSMs and System Program Directors (SPDs) for space ground, satellite, and ground communication equipment.

Although organizationally separate from AFSPC, the Electronic Systems Center (ESC) Detachment 5 (Det 5) will also be a user of the VSLRC. ESC Det 5 provides support to the Integrated Tactical Warning and Attack Assessment network to North American Aerospace Defense Command (NORAD), United States Space Command (USSPACECOM), and United States Strategic Command (USSTRATCOM).

Private contractors and other DoD services also play important roles in space systems management, and at a minimum will serve as data sources to the VSLRC.

3.2 Stakeholder and User Identification

Stakeholders and users of the VSLRC are described in the table below. The role, office symbol, overall description, and responsibilities as they pertain to the VSLRC are provided.

Role	Office Symbol(s)	Description	Responsibility
Commander, CISF	SMC Det 11	Commander responsible for logistics readiness, infrastructure support, and sustainment of space systems	Facilitates weekly Production Work Group meetings Participates in quarterly briefings to Chief Sustainment Officer Provide initial funding for VSLRC
SSM	SMC Det 11 CWS, CID, CWD, CZG, MCL, MTL	Responsible for overall long-term system health	Presents at weekly Production Work Group meetings Presents at quarterly CSO briefings Presents yearly SEMR
SSM Support Staff	SMC Det 11 4-digits under SSMs	Responsible for supporting SSM by monitoring weekly and monthly sustainment issues	Collect supply and maintenance data daily Present weekly reports on system status and issues Recommend corrective action for short- and mid-term problems Support Wings in daily operations when necessary
Numbered Air Force (NAF) A4	Example: 14th AF A4	Responsible for support and management of logistics and	Create daily and weekly MICAP reports Produce daily and

Role	Office Symbol(s)	Description	Responsibility
		sustainment activities to Wings, interface with the AOC	weekly AOC briefing (Intel report) containing operations and logistics status
NAF Air Operations Center (AOC)	Example: 14h AF AOC	Responsible for reach back to theater; single point of contact for anything related to Space systems; focused on daily problems	Collect and report detailed logistics status from space systems operators on a daily basis
Wing-Level Operator	Example: 50th Wg/ OG/OGV	Responsible for operating space systems, providing capability to warfighter	Will provide real-time operational status
Wing-Level Maintenance Officer	Example: 50 WG/ 850 SCS/SCO or 21 MX Ops Flight	Responsible for 1st and 2nd levels of maintenance on space systems	Will provide real-time maintenance information to CAMS and other organizations
Wing-Level Logistics Readiness Officer	Example: Petersen AFB Supply	Responsible for retail supply, transportation, and other readiness functions	Will provide MICAP information to CAMS and other organizations
Supply Chain Manager	Example: OO-ALC/LHJ	Provides administration, program, technical, engineering, inventory and production expertise and support to Space and C3I System Support Managers	Provide input to CSO briefings, sustainment working groups, SEMR, and Det 11 on organic sustainment support to Space Systems
Item Manager	Example: OO-ALC/LHPJB	Focal point for all inventory management functions	Oversee and manage requisitions for Space systems; review and upgrade/downgrade Backorders and MICAPS
Logistics Management Specialist	Example: OO-ALC/LHPJB	Plans, manages, and coordinates supply chain and logistics support for a major weapon system	Provide input to CSO Briefings, SEMR, and Det 11 on maintenance and sustainment issues; Review and comment on quarterly Supply Drivers and Bad Actors
Equipment Specialist	Example: OO-ALC/LHPJC	Establishes maintenance schedules, plans and requirements, such as selection and utilization of support equipment, levels at which repair will be performed for weapon systems, and work to be	Review technical problems and determines and initiates corrective action; communicates with SSM and units on system modifications

Role	Office Symbol(s)	Description	Responsibility
		accomplished as a result of modification projects	
Production Management Specialist	Example: OO-ALC/LHPJC	Reviews negotiated schedules, material supportability listings, material shortage reports, labor and material plans, production orders and work requests, to determine if manpower, material, facilities, test equipment and technical data are available and sufficient to accomplish work load in keeping with negotiated schedules	Expedite repair for MICAPS, review repair status of items with on and off-site repair shops
HQ Operations Center	Example – Space Operations Center	Plan, monitor and assess the execution of space assets and systems worldwide	Providing integrated real-time weapon system status reporting for entire AF Space Command
HQ System Support / Logistics Readiness Officer and Analyst	Example – HQ AFSPC/LCRPC and LCN	Report daily system status; drive expedited maintenance or supply actions; view monthly system health metrics	Regular analysis of Space system health, Troubleshoot and resolve equipment issues based on system/asset visibility

3.3 Key Stakeholder and User Needs

Need	Current Solution	Proposed Solution
Visibility of operational, equipment and comm. status	Collect data and manually manipulate into Power Point presentations	Automatically pull near real-time information and display on a single screen (one per system)
Visibility of logistics and maintenance impact on operational readiness	Collect data manually from Situation Reports (SITREPS), phone calls, or CAMS Equipment Status Reports (ESRs), and enter into spreadsheets, reports, and/or PowerPoint presentations	Link operational readiness indicator to detailed logistics and maintenance information via data integration and interactive drill-down capability
Collection of maintenance and logistics data that support metrics calculation	Information is contained in disparate system databases and manually integrated when needed	Pull data from the EDW or outside systems via adaptors (contractor/other service)
Instant notification of critical logistics problem	Notification is not instant; those that need to know	Produce messages and alerts to which system users can subscribe

Need	Current Solution	Proposed Solution
	must wait for reports or make phone calls	
Visibility of item status, location, and disposition	Access several systems to research	Pull key information from different systems into a single screen
Drill-down from equipment status to underlying causes	Must manually research in CAMS	Select equipment status for a particular system and automatically retrieve causal details
Integration with Balanced Scorecard	No current solution exists	Balanced Scorecard (BSC) is a separate but related effort to VSLRC. BSC will report systems' status and metrics to senior management through stoplight charting. It is anticipated that the VSLRC will provide supporting data and analytical capability to the BSC
Produce MICAP Reports	Manually produced using some automated data collection, manual data collection, Excel and Power Point charts	Establish interfaces with SBSS, CAMS, and D165B to produce an automated report of MICAPS and operational impacts
Determine overall equipment status based on status of system components	No current solution exists	Methodology to be built into CAMS and reported through the VSLRC
Identify top maintenance and supply drivers	Manually produced with no consistent methodology	Use tailored business rules to define and automatically identify
Conduct single point failure (SPF) analysis	Manually produced with no consistent methodology	Use tailored business rules to define and automatically identify
Produce Unit, Wing, and NAF SITREPs	Manually produced and distributed; phone calls often needed for clarification	Produce SITREPS from real-time data, and use business rules to roll-up and consolidate based upon organization and echelon
Track and store actions being taken to solve logistics problems as they pertain to systems, components, items, etc.	Manually stored in stove-piped systems or individual offices if and when recorded	Record "Actions Taken" comments, and permanently associate with systems and assets until resolution has been reached; store history for reference purposes
Inform theater commanders of critical operations and logistics outages that could impact operations	Commanders informed on-the-fly and in ad-hoc fashion via phone calls or email	Produce automated alerts that inform all theater command stakeholders of potential impacts to combat operations

3.4 Use Case Identification

Several use cases will be developed to describe how the VSLRC will support user needs. These use cases include, but are not limited to:

- View Current System Status
- View Quarterly Top-10 Space Supply Drivers List
- Alert Supply Chain of Critical Logistics Problem
- View MICAPS
- Research Item
- Conduct Trend Analysis of System Performance Measures

Data sources relative to specific functions within the use case are identified within the use case.

3.4.1 View Current System Status

Brief Description

Decision-makers in the GPS supply chain need to know the real-time operational, ground equipment, and communications equipment status of existing GPS systems. They also need to know underlying causes of the system status, so they can determine what steps should be taken to make systems fully-mission capable.

Flow of Events

Basic Flow

Use Case Start

This use case starts when the 14th AF AOC (or NAF AOC) Officer accesses the VSLRC to see current status of the GPS systems. The user then selects GPS from the list of space systems.

Display Current System Status

The VSLRC returns the following information in stoplight/color-coded fashion:

- For each system - the Operational Status, Ground Equipment Status, and Communications Equipment Status
  - Status will be either fully mission capable (FMC), Partially Mission Capable (PMC), or Non-Mission Capable (NMC)
  - FMC will be green, PMC amber, NMC red

- For each system whether or not it is scheduled to be in-use at the current time
  - Those systems that are not scheduled to be in-use at the current point in time will still have the appropriate color code, but will be noted as not-scheduled (possibly with an X through the applicable status box)
  - Systems that are not scheduled to be in-use will be undergoing scheduled modifications, maintenance, or testing
- Please refer to Figure 3.1 for a depiction of the "systems" that need to be displayed for the GPS

Show Additional Detail

The AOC Officer will be able to select the system status designation, and in doing so request more detail. It is presumed that he/she will only select an "amber" or "red" system. After the selection has been made, the user will see the following information about that portion of the system:

- Reason for the status
- What is the operational impact
- Subsystems or components impacting the status
- Estimated Time to Return to Operations
- Whether or not a MICAP exists
  - If a MICAP does exist, who is working on getting the part, from where will the part come, when is it expected

Create Report

The AOC Officer may wish to create a report for the GPS system status. The VSLRC can print the report, or it can save it in an electronic format that is easily exportable to MS Power Point or MS Excel.

Use Case End

At this point, the user may go back to viewing the status for other systems and the use case is complete.

Alternate Flow

- The AOC Officer must contact the Wing or the Unit for further information about the system status - The user may choose to call via phone and enter the required information into the

VSLRC at this point - Or, he/she may send an alert using the VSLRC to the intended person requesting that they enter information directly into the VSLRC at the Unit or Wing

- The user is the 14th AF A4, and wants additional information about a particular system after looking at current system status and status detail - He/she would like to see historical information to see if there is a trend developing for a particular system that needs to be addressed
- The user is the GPS SSM, and instead of selecting the GPS from a list of systems, he/she wants the default view to contain only status on the GPS

Special Requirements

Handling of Classified Information

The information handled by this use case is normally considered Classified – Secret. The VSLRC must ensure the information is not compromised.

- Pre-conditions
  - VSLRC access to real-time CAMS Data
  - VSLRC access to real-time LogBook
  - Business rules exist in VSLRC to determine FMC, PMC, NMC
  - VSLRC access to real-time SBSS
  - VSLRC access to real-time D035K
  - Other actors have access to VSLRC (Unit, Wing, SCM)
- Post-conditions
  - VSLRC saves added information
  - VSLRC alerts other actors that additional information is needed
- Extension Points
  - Establish User Account
  - User accesses the VSLRC

The following figure (Figure 3-1 VSLRC GPS Control Segment Core Screen) is an example screen of a possible solution to the above use cases.

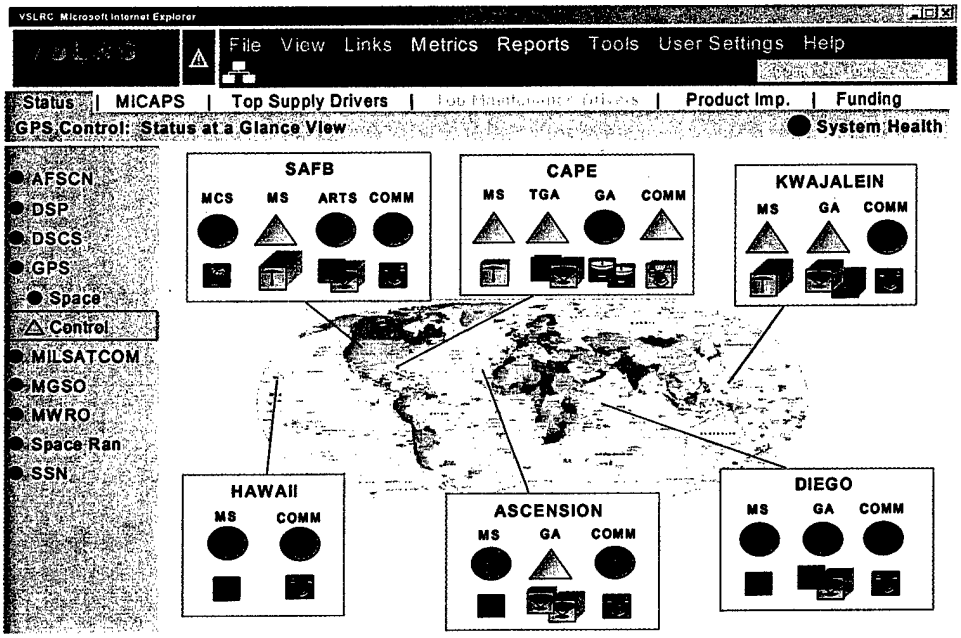

Figure 3-1. VSLRC GPS Control Segment Core Screen

3.4.2 View Quarterly Space Supply Drivers List

Brief Description

HQ AFSPC/LCR, OO-ALC/LHJ, and the Space SSMs (Det 11) are required to report and manage a list of top Space Supply Drivers (NSNs). The VSLRC will apply a pre-defined methodology to produce a baseline list of candidate top supply drivers, provide the user with the capability to analyze the baseline list, and then modify the list based on the analysis.

Flow of Events

Basic Flow

Use Case Start

This Use Case starts when the SSM chooses to look at the current list of quarterly Supply Drivers for his/her system. The user has already specified his/her role (SSM), and system (for this example, the GPS)

Flow of Events

Basic Flow

Use Case Start

This Use Case starts when the SSM chooses to look at the current list of quarterly Supply Drivers for his/her system. The user has already specified his/her role (SSM), and system (for this example, the GPS) via the Establish User Account use case. The user has also already logged into the VSLRC before choosing the option to view the Supply Drivers.

Calculate

By selecting the option to view the top Supply Drivers list for the GPS, the SSM asks the VSLRC to identify the candidate items based on current (near real-time) data for the most recent completed Fiscal Year (FY) quarter. The VSLRC uses the following methodology to identify the candidate items:

(Note – this methodology will probably change over time)

1) Identify NSNs, by system, for which wholesale requisitions have been placed during the last whole fiscal year quarter. Fiscal year quarters are defined as:
   - 1 Oct – 31 Dec (FYxxxx Q1)
   - 1 Jan – 31 Mar (FYxxxx Q2)
   - 1 Apr – 30 Jun (FYxxxx Q3)
   - 1 Jul – 30 Sep (FYxxxx Q4)
2) For this list of NSNs, the VSLRC will assign the following weights:
   a) MICAP Score
      i) NSN had 0 MICAPS during the quarter, score = 0
      ii) NSN had 1 or more MICAPS during the quarter, score = .5 + (.5 * number of MICAPS incidents for the NSN during the quarter)
      iii) Score cannot be > 2.5
   b) Hits Score
      i) Score = .1 * number of hits during the quarter
      ii) Score cannot be > 2
   c) Single Point Failure item (SPF) Score

i) If the NSN is classified as a Single Point Failure item, score = 2.0

ii) Otherwise, score = 0

d) Vanishing Vendor (V/V) Score

i) If the NSN is classified as a Vanishing Vendor item, score = 1.5

ii) Otherwise, score = 0

e) Backorder Score

i) If the NSN has any open backorders against it on the last day of the quarter, score = .2

ii) Otherwise, score = 0

f) Overall Score = MICAP Score + Hits Score + SPF Score + V/V Score + Backorder Score

g) Rank

i) The number one ranking item (i.e., the number one supply driver) is the NSN with the highest overall score

Note – as of 9 July 2003 these business rules were under review for possible revision. A new algorithm may be developed that considers MICAP hours, backorder duration, and possible Issue Effectiveness.

Return List of Top 20

Once the calculation is complete, the VSLRC will return as a default the candidate list of items for the system as a whole, regardless of the item's source of supply or repair (SOS/SOR) (as opposed to only the candidate items that are managed by OO-ALC for example). The list of items is sorted by Rank in ascending order for items with Rank value of 1 – 20. In addition to showing the NSN and the Rank, the VSLRC will also show the following information at this point:

- Noun (for the NSN)
- SOS (for the NSN)
- Overall Score
- MICAP Score
- Hits Score
- SPF Score
- V/V Score

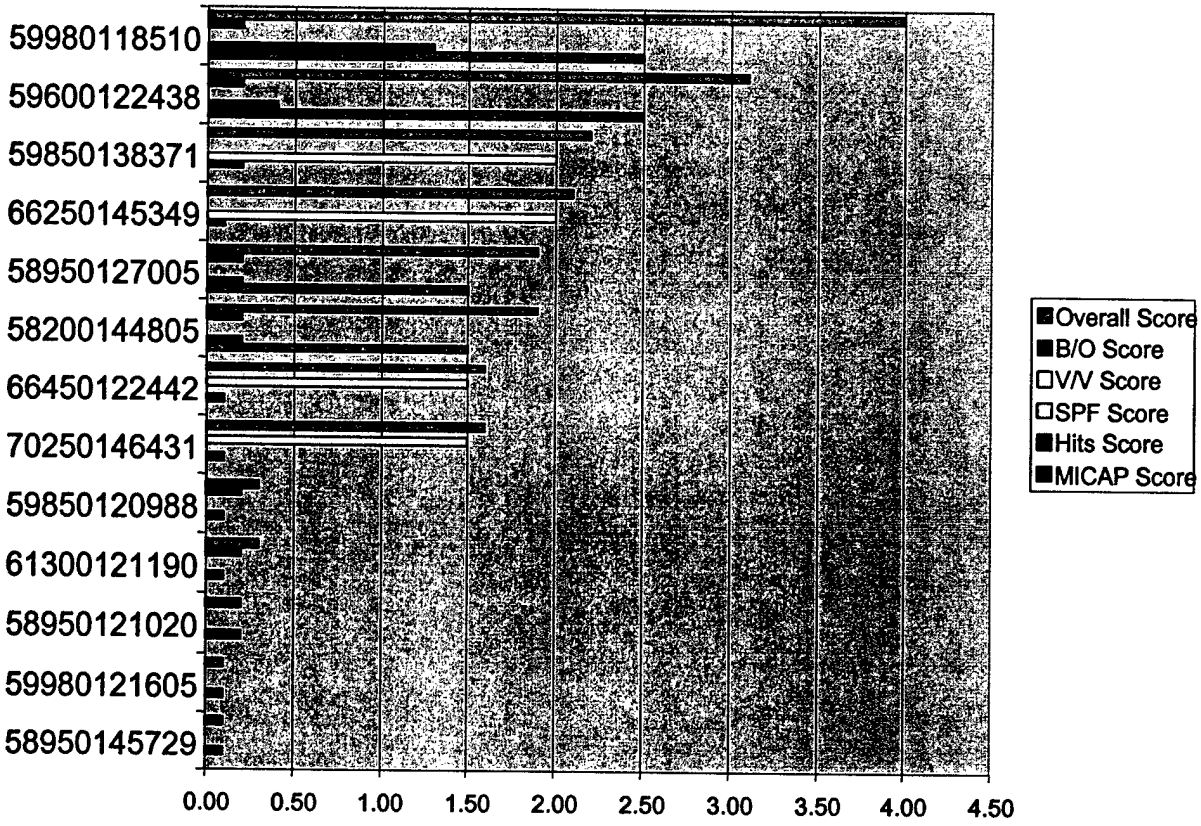

Figure 3-2. Supply Drivers

Provide Additional Detail

The SSM may then decide to ask for additional detail on one item, several items, or the entire list of items. Once selecting additional detail, the VSLRC will return the following information in addition to what is already shown on the screen (Reference Figure 3-3 Top Ten Additional Detail):

- Number of MICAP incidents and hours over the past quarter
- Number of requisitions over the past quarter
- Number of backorders over the past quarter
- A way to link to the Research Item information (see Research Item use case – this will be "raw" that includes actual asset positions and levels, authorized levels, current requisition and backorder detail, and various NSN catalogue information like Interchangeable and Substitution Group (I&SG), Expendability, Recoverability, Reparability Code ((ERRC), etc.)

backorder detail, and various NSN catalogue information like Interchangeable and Substitution Group (I&SG), Expendability, Recoverability, Reparability Code ((ERRC), etc.)

Quarter	NSN	Noun	Total Hits	MICAPScd	HitsScore	SPFScore	VVScore	BOScore	OverallScd	Rank
Apr02-Jun02	5998011851071	ELECTRONIC COMPONEN	13	2.50	1.30	0.00	0.00	0.20	4.00	1
Oct02-Dec02	5998011851071	ELECTRONIC COMPONEN	1	0.00	0.10	0.00	0.00	0.00	0.10	10
Apr02-Jun02	6130012119006	POWER SUPPLY	1	0.00	0.10	0.00	0.00	0.20	0.30	10
Jul02-Sep02	6130012119006	POWER SUPPLY	1	1.00	0.10	0.00	0.00	0.20	1.30	4
Jul02-Sep02	6140012171462	BATTERY ASSEMBLY	1	0.00	0.10	0.00	0.00	0.00	0.10	9
Oct02-Dec02	6140012171462	BATTERY ASSEMBLY	1	0.00	0.10	0.00	0.00	0.00	0.10	9
Apr02-Jun02	6645012244265	TRANSLATOR,TIME COD	1	0.00	0.10	0.00	1.50	0.00	1.60	7
Jul02-Sep02	6645012244265	TRANSLATOR,TIME COD	2	1.50	0.20	0.00	1.50	0.00	3.20	2
Apr02-Jun02	5895012700524	MODEM,COMMUNICATION	2	1.50	0.20	0.00	0.00	0.20	1.90	5
Oct02-Dec02	5895012700524	MODEM,COMMUNICATION	1	0.00	0.10	0.00	0.00	0.20	0.30	7
Apr02-Jun02	5985013837186	PROGRAMMER,ANTENNA	2	0.00	0.20	2.00	0.00	0.00	2.20	3
Jul02-Sep02	5985013837186	PROGRAMMER,ANTENNA	3	2.00	0.30	2.00	0.00	0.20	4.50	1

Figure 3-3. Top Ten Additional Detail

Defer Item and/or Add Working Detail

After reviewing the list, the SSM may decide that one or more NSNs do not really warrant being on the list of supply drivers. This will be based on that user's expert determination after reviewing all of the supply information available in the VSLRC about the item(s) in question. For each of these items, the SSM will tell the VSLRC that he/she wishes to "defer" the item from the list. He/she must then tell the VSLRC why and for how long the item should be deferred. The VSLRC will save this information, and make it available to any other VSLRC user who is requesting information about that NSN.

For any of the items (deferred or not), the SSM may wish to add comments about what he/she/others are doing to take action to get the NSN off of the list. The VSLRC will save this information as well, and make it available to other VSLRC users who are researching that item.

Use Case End

This use case ends when the SSM tells the VSLRC it is done reviewing the candidate list. Upon request, the VSLRC will notify others who wish to see the GPS supply drivers list (regardless of selection criteria) that the SSM has reviewed and finalized the list.

Alternate Flow

- View "Current" list of supply drivers where user specifies a date (i.e., over past week or 2 months, etc.) vs. the last complete FY quarter - Users have said that the supply drivers list isn't of much use if done more frequently than quarterly, but there was some discussion about being able to access data that is more current and therefore "predictive"
- Look at NSNs that have been on the supply drivers list for more than one FY quarter in the past 2 years

- View historical trends for NSNs on the supply drivers list (i.e., MICAP information for the past 2 years) (Reference Figure 3-4 Top Ten Historical Trends)
- Add comments regarding Acton Taken to the Historical Trends chart (Figure 3-4)
- View only the deferred items, along with their deferment history
- Look at Top 10 list according to criteria:
  - Entire system
  - Sorted by SOS
  - Sorted by MAJCOM
- Role-based changes
  - If role is GPS Log Mgt Spec (LMS), then will default to list for LHJ-managed items
  - If role is AFSPC/LCR, then will default to list for AFSPC

NSN	Noun	Quarter	Rank	Trend	Causes
5998011851071	ELECTRONIC COMPONENT	FY2002 Q3 FY2003 Q1	1 10	⇧	All MICAPS & B/O were filled. # of hits decreased from 13 to 1.
6130012119006	POWER SUPPLY	FY2002 Q3 FY2002 Q4	10 4	⇩	# of MICAPS increased
6140012171462	BATTERY ASSEMBLY	FY2002 Q4 FY2003 Q1	9 9		No changes
6645012244265	TRANSLATOR,TIME COD	FY2002 Q3 FY2002 Q4	7 2	⇩	# of MICAPS and # of hits increased
5895012700524	MODEM,COMMUNICATION	FY2002 Q2 FY2003 Q1	5 7	⇧	All MICAPS were filled, # of hits decreased
5985013837186	PROGRAMMER,ANTENNA	FY2002 Q3 FY2002 Q4	3 1	⇩	# of MICAPS, hits, and B/O increased

Figure 3-4. Top Ten Historical Trends

Special Requirements

- Pre-conditions
  - None
- Post-conditions
  - VSLRC saves information that was added about the NSN (i.e., in deferment)
  - VSLRC alerts other users that the quarterly list has been reviewed by the SSM

Extension Points

- Establish User Account
- User accesses the VSLRC

Alert Supply Chain of Critical Logistics Problem

There are several situations that will trigger the VSLRC to send instant notifications or "alerts" to VSLRC users. Alerts will notify users that a condition exists that may require immediate or fast attention, and are meant to inform as well as promote action. There are three potential ways in which the VSLRC will know which users to send alerts to and when:

- **Users subscribe** to receive certain types of alerts (e.g., a user requests that the VSLRC notify him/her when a performance measure breaches a particular threshold)
- The **system automatically subscribes the user to alerts based on his/her role** (e.g., SSM Support Staff will always receive alerts of critical logistics problems that happen out of the SITREP cycle)
- **One user will set up a subscription for another user** (e.g., a user requests that specific individuals receive an alert on a weekly basis when a custom report is created)

While more extensive requirements research and analysis needs to be conducted to identify all possible alerts and their role associations, the following list summarizes the alerts identified to-date:

- Alerts of specific conditions:
  - Critical outage for a Space system has occurred (can be operational or logistics/equipment)
  - MICAP exists that is driving a critical outage
  - Performance measure just breached a critical threshold and warrants attention
  - MICAP exists for items classified as, but not being used as, support equipment
  - Critical spare has been retrograded to SOR, but has not yet been inducted into maintenance
  - Due-out exists with no corresponding Due-in
- Alerts that reports are ready for review:
  - Top-10 Supply and/or Maintenance Drivers

- SITREPS
- MICAPS
- System Status
- Custom-created Reports for regular distribution (e.g., weekly GPS report created by SSM)

- Directly from the VSLRC – the user will be alerted while logged into and using the VSLRC
  - Alert messages will appear on the user's screen, regardless of what he/she is doing in the VSLRC (e.g., a message will appear at the bottom of the screen stating the user has 3 new alerts)
  - Alert messages will be accessible via an alerts page (or screen) that will contain all of the user's active alerts – read or unread. This page will contain the following information for each active alert:
    - ✓ Description of the alert
    - ✓ If it has been read or if it is new/unread
    - ✓ Original date of the alert
    - ✓ Number of days it has been active
    - ✓ Other information TBD
    - ✓ A link to view additional detail about the alert
- Via email – the user can be alerted via email *in addition to* directly from the VSLRC
  - If the alert is a simple text message, it will appear in the email
  - If the alert contains a report or graphics that the VSLRC generated, these can be embedded in the email, or the email can contain a link to that report/graphic
- Other – the VSLRC may also be able to alert users via cell phones, pagers, and other hand-held devices *in addition to* directly from the VSLRC

It is important to note that one alert may be sent to multiple VSLRC users. A notional depiction (Figure 3-5. Alert Detail) of an Alerts page and subsequent Alert detail is provided at the end of this use case for example purposes only. While an alert is active, the user can view it and all associated information. Users can also make note of and track the actions being taken to resolve the alert. For example, if a critical outage exists because of a MICAP problem, the Item Manager can make note that he/she is seeking an

Once a user has received an alert, he/she must normally take action to resolve it. In the case of a report, the user must simply view the report before the alert is removed from the user's list of active alerts. In the case of a condition, the alert will not become inactive until the condition that prompted the alert has been resolved.

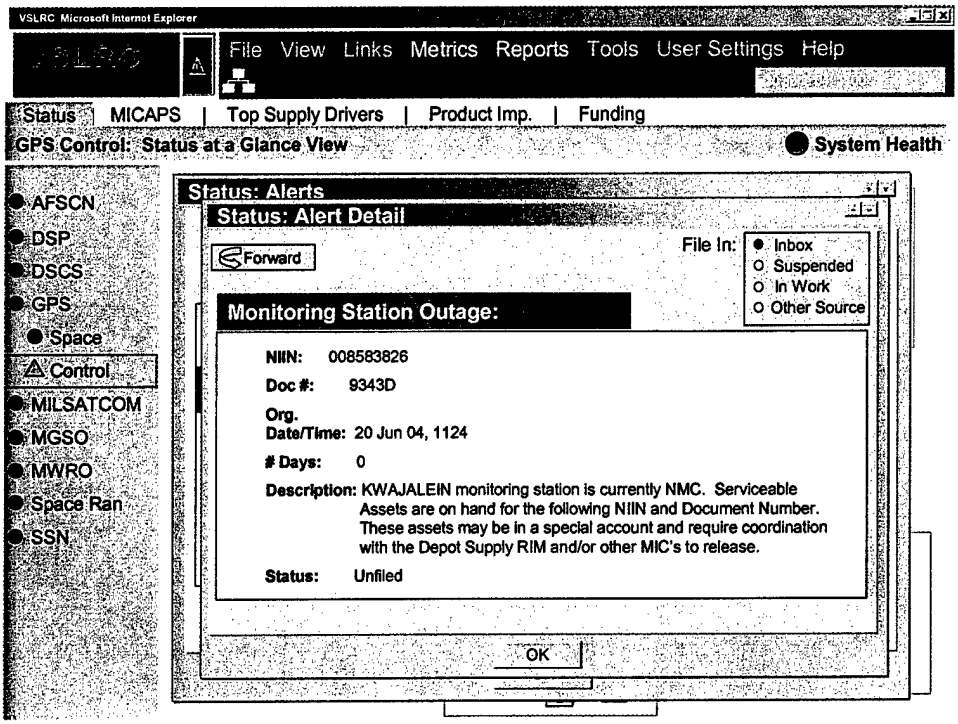

Figure 3-5. Alert Detail

3.4.3 View MICAPS

Brief Description

The 14th AF AOC Officer is required to present a list of current AF Space system MICAPS and their respective status to their commander and to HQ AFSPC, because MICAPS may have an impact on a space system's operational capability. They are particularly interested in knowing if a MICAP is causing a system to have a non-mission capable Operational Status (Ops Cap "Red"), and what action is being taken to correct ("fill") the MICAP.

Flow of Events

Basic Flow

Use Case Start

This use case begins when the AOC Officer actor asks the VSLRC to display current MICAPS for AF Space Command. The AOC Officer will want to see all current/active MICAPS on a daily basis, by each AF Space system:

- Defense Support Program (DSP) Ground Segment
- Mars Global Surveyor (MGS)
- Missile Warning Radar
- GPS
- Military Satellite Communications MILSATCOM Ground Station Segment
- Deep Space Tracking System (DSCS)
- Air Force Satellite Control Network (AFSCN)
- Space Range
- Space Surveillance Network

The View MICAP Information

For the AOC Officer, the VSLRC will provide the following information for MICAPs for each system:

- System Name (i.e., GPS)
- System Site
- System Identifier (not sure what this or if it's needed)
- System Status (see use case for View System Status)
- MICAP Item Name (i.e., NSN noun)
- Item Quantity
- MICAP Start Date
- MICAP Hours To Date
- MICAP Status and Location (e.g., is it on contract through OO-ALC, on backorder at WR-ALC, in repair at OO-ALC, in-transit from contractor, etc.)
- Estimated Time of Return to Operations

Within each system, the default sort order will be from newest MICAP to oldest. The VSLRC will also tell the 14th AOC user which MICAPS are new.

It is possible that another user (from the Wing, Unit, SSM, SCM, etc.) has entered comments into the VSLRC about this MICAP (e.g., what other steps are they taking to solve the problem, is there a similar problem elsewhere, etc.). If that is the case, the VSLRC will make this known to the AOC user, and he/she will be able to view the comment(s).

Enter Additional Detail

At times, the AOC Officer user may need additional detail about one or more MICAPS. The VSLRC will provide the AOC user with contact information, and he/she can contact the appropriate person (by phone, email, etc.). Once they have collected the additional detail, the 14th AOC user will be able to enter the information into the VSLRC. That information will be saved in the VSLRC, and will be displayed on the list of MICAPS.

Produce MICAP Report

The AOC user may wish to produce a report based on the current list of MICAPS. This report may be in the form of a PowerPoint presentation, with one slide for each system, or in a format easily exportable to other MS Office products (Word, Excel, etc.). The user may wish to report only on those MICAPS that are associated with a system having an Ops status of Red or Amber, and the VSLRC will filter out the other MICAPS.

Use Case End

This use case ends when the AOC user is done reviewing the list of MICAPS and either navigates to another VSLRC screen, or ends his/her session with the system.

Alternate Flow

Wing as Actor

The Wing will be primarily interested in MICAPS associated with their particular systems and sites, as opposed to all systems and all sites. Even though the Wing will be able to view all MICAP information, the default starting point for the Wing will be a report showing only that Wing's information.

In addition, the Wing-level user will want to help take corrective action to solve the MICAP issue. To do this, he/she may need detailed current information about the item (NSN) including worldwide asset position, the current MICAP requisition detail, and the number and status of backorders if any exist. To do this, the VSLRC will provide a link from the MICAP information to the Research Item page for that item (see Research Item Use Case).

Based on this information, the Wing user may wish to enter in comments about the MICAP, and the action being taken to solve the problem. If other users have added any comments, he/she will need to see that information as well.

Supply Chain Manager, Item Manager, or Logistics Management Specialist as Actor

Similar to the Wing, this user will only be interested in MICAPS that fall under his/her management scope, so the default list of MICAPS will be filtered accordingly. The VSLRC will also provide a link to the Research Item page for each MICAP, and will give the Supply Chain Manager the ability to view/enter comments.

14th AF/A4

The 14th AF may wish to see, in addition to the list of current MICAPS, a MICAP history by system and by item. They may wish to see trends going back 1 – 2 years.

Special Requirements

Some of this information, particularly the current Ops Status may be classified, while some will be unclassified. All data must be handled according to the security classification requirements.

- Pre-conditions
  - None
- Post-conditions

VSLRC saves information that was added about the MICAP.

- Extension Points
  - Establish User Account
  - User accesses the VSLRC
  - Research Item

3.4.4 Research Item

3.4.4.1 Research Item for GPS

Brief Description

The AF Space community often has the need to know information about items or National Stock Numbers that can impact the decisions they make about supporting Space systems. This includes individuals within the Supply Chain Management organization (e.g., OO-ALC/LHJ), the SSM

organization, at the HQ level, at the 14th AF, and even at the Wing Level and below. To adequately research a particular item, information from several disparate data systems must be fused to provide a cohesive and accurate picture for the decision-maker (reference Figure 3-6 Research Item Screen – Notional Example).

Flow of Events

Basic Flow

Use Case Start

This Use Case starts when the Item Manager receives a MICAP requisition for a GPS item, and tells the VSLRC that he needs to research the item by choosing that NSN from a pull-down list.

View Research Screen

The VSLRC returns a research screen that incorporates key information available about that item, including the following:

- The NSN (or National Item Identification Number NIIN), Noun, Part Number, Commercial and Government Entity (CAGE), and past deleted Part Numbers
- Item's Source of Supply, Expendability, Recoverability, Reparability Code (ERRC), Acquisition Advice Code, Unit of Issue, Item Manager Code, Equipment Specialist, and Demand Level
- Whether or not the item is classified as a V/V or SPF item
- SOR, alternate SORs, SORs that have been used in the past
- The item's I&SG family
- Outstanding Document Numbers, to include the quantity, priority, Required Delivery Date (RDD), project code, need date, and record date
- Outstanding Requisitions, to include requisition number, suffix, quantity, status, Estimated delivery Date (EDD)
- The item's Reorder Point (ROP), Price, Acquisition Lead Time, and Production Lead Time
- Any existing Purchase Requests (PR), to include PR numbers, quantities, and RDD
- Past purchase/contracting history for the item

- Others TBD[1]

A notional Research Item screen has been included at the end of this use case for example purposes.

View Backorder Information

If the item has been backordered, the user will be able to view backorder information, to include:

- NSN (or NIIN)
- Total number of backorders
- Total AWP
- Total Joint Chief of Staff (JCS)- War Readiness Material (WRM)
- Total backordered MICAPS
- Total in Priority Group 1 (Pri 1 – 3)
- Total in Priority Group 2 (Pri 4 – 6)
- Total Routine backorders
- Total WRM
- Total yearly backorder quantity

Include Note

If the Item Manager knows some information about this item that is not depicted on this screen, or that he/she can ascertain by looking at the information on this screen, the user can include a note that will be saved by the VSLRC along with this item.

Use Case End

This use case ends when the user navigates away from the Research Item screen.

Alternate Flow

None at this time

Special Requirements

- Pre-conditions

---

[1] Note – due to time constraints, the exact requirements for the Research Item page were not specified during this effort. Further interviews and research must be done with members of the AF Space community to determine the exact requirements for this screen.

- Post-conditions
  - VSLRC saves information that was added about the NSN and makes that information available to all other VSLRC users who are looking at that NSN
- Extension Points
  - Establish User Account
  - User Accesses the VSLRC

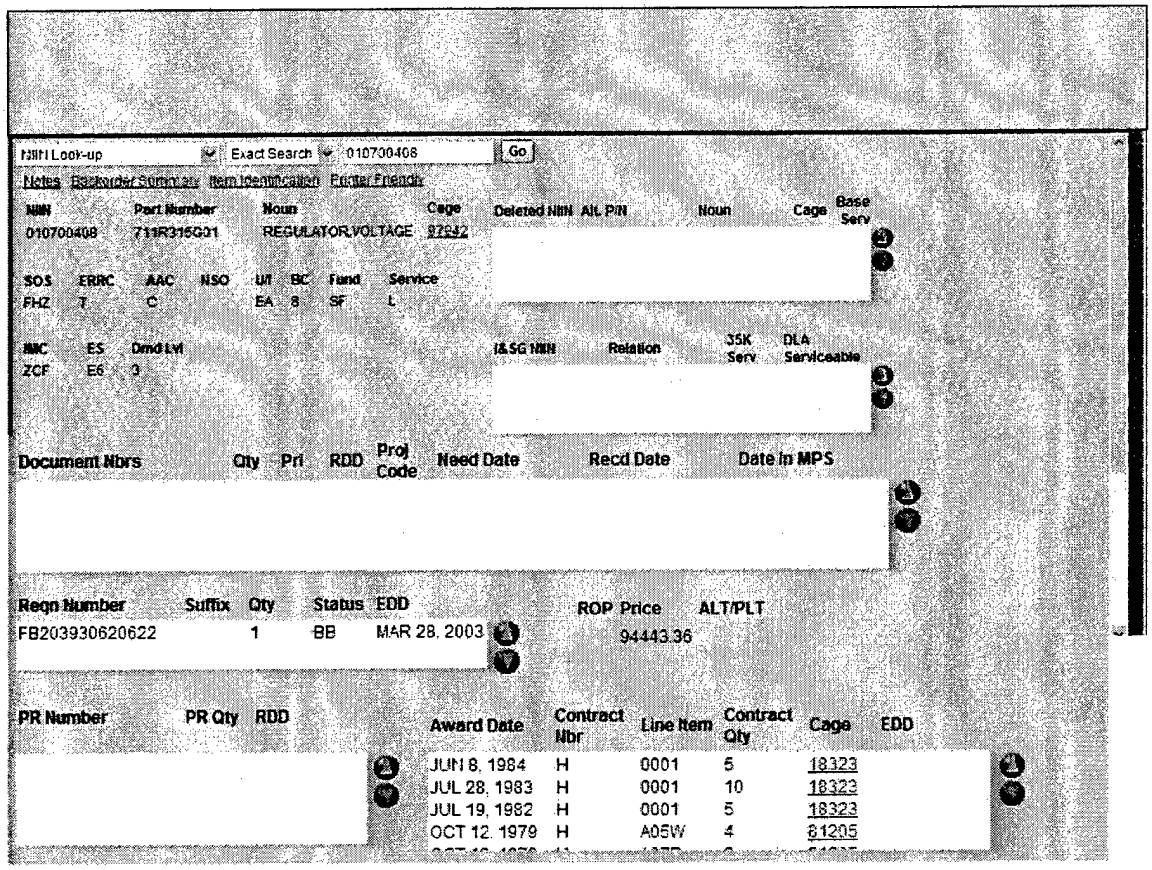

Figure 3-6. Research Item Screen – Notional Example

3.4.5 Conduct Trend Analysis of System Performance Measures

3.4.5.1 Trend Analysis and Reporting

Brief Description

The GPS SSM and support staffs conduct time-series analyses of various GPS performance indicators on a weekly basis. The purpose of the trend analyses is to determine if action needs to be taken to solve a problem that is, or could become, a long-term issue. The VSLRC will support this requirement by calculating and displaying a series of metrics in time-series format (graphical and or text-based) for the GPS that allows the user to "drill-down" into underlying, supporting, and perhaps causal detailed information (Reference Figures 3-7 – 3-13).

Flow of Events

Basic Flow

Use Case Start

This Use Case starts when the actor, GPS SSM, tells the VSLRC that he wants to see trends for GPS performance measures.

Select Metrics, Display Format and Time Frame

The VSLRC presents a list of performance measures available for the GPS.

NOTE: Refer to Appendix A: Metrics Matrix for GPS metrics

The actor chooses the following measures:

- Operator Control Station (OCS) Mission Effectiveness
- Scheduled/Unscheduled OCS RED Time
- Reasons for Unscheduled RED Time
- Reasons for Scheduled RED Time
- Satellite Contact Summary
- OCS Operational Status

The VSLRC then presents the actor with a choice of display formats: 1) to see each measure on its own "page", or 2) to see up to 4 measures on a single page at one time. The actor chooses the following:

- OCS Mission Effectiveness (on its own page)
- Together on one page:

- Scheduled/Unscheduled OCS RED Time
- Reasons for Unscheduled RED Time
- Reasons for Scheduled RED Time
- Satellite Contact Summary

- OCS Operational Status (on its own page)

The VSLRC also asks that the actor specify a date range and frequency for these measures, and the actor specifies that he wishes to see the series in weekly increments for the past five weeks. The VSLRC then generates the requested time-series metrics.

View and Analyze Performance Measures

The actor can choose to view the time-series data for each metric in tabular format, or in a variety of graphical formats (bar charts, column charts, line charts, etc.) to help him best understand the information.

In this case, the actor wishes to see more detail about the unscheduled outages that are caused by Automated Data Processing Equipment (ADPE). He selects the bar on the Reasons for Unscheduled RED Time chart for ADPE, and the VSLRC provides the following tabular information for those outages:

- Start Time (in MM/DD/YYYY HH:MM format)
- Stop Time (in MM/DD/YYYY HH:MM format)
- Site
- Duration (in hours and minutes HH:MM format)
- Reason
- Description

The actor can see the same detail for Scheduled RED Time, and similar information for Satellite Contact Summary.

While viewing this detailed information, the actor can record notes and observations about the outages that can be saved for future use and also viewed by others.

Save and Post Report

The actor can save the pages, notes, and detail he is viewing in a report format that can be easily viewed by others. He can also include the notes he has taken as a result of his analysis that describe recommendations for action, or further descriptions of the issues. Once the report has been saved, he

specifies those VSLRC users he wishes to send it to, and how he wants them to access it – either by viewing reports through the VSLRC, or by email. The VSLRC posts the report and alerts the appropriate users that the report is ready. A sample report is provided for example purposes only at the end of this use case.

Use Case End

This use case ends once the report has been posted.

Alternate Flow

The actor may not want to create a report at this time, but only view measures and conduct analysis. The actor may also select a different set of metrics to report, different display formats, different time series, etc.

Special Requirements

Some performance measures may contain classified/secret information. In this case, the VSLRC must take the appropriate security measures to ensure safe handling of information.

- Pre-conditions
  - None
- Post-conditions
  - VSLRC saves the report for users to access at future dates
- Extension Points
  - Establish User Account
  - User Accesses the VSLRC
    - Save GPS Report Parameters (i.e., use this to access a report with the same metrics and formatting in the future, only refreshed with recent data)

Data Sources

Data needed to support this use case include:

- CAMS (possibly through the EDW)
- Satellite Contact Summary Sheet (may only be available in hard-copy format)

Data needed but not available to support this use case include:

- Information from Defense Information Systems Agency (DISA) regarding the number, type, frequency, duration of communications equipment outages

```
General:  The two long-term outage issues (the TGA at the Cape and the Cape
Monitor Station) are still being worked.  There was less than 20 hours of
unscheduled downtime recorded across the OCS with no sites recording less
than 86% mission effectiveness.


Remote Sites:

   Cape TGA:  The TGA went through operational tests yesterday with 2 SOPS
deciding to switch back to the Cape GA as the operational resource at the
Cape when the TGA had troubles with uplink signal bleeding over to the
downlink and slow uploads.  More testing is being planned.

Cape MS:  The MS is still AMBER awaiting a replacement HP5071 cesium atomic
frequency standard (CAFS).  It was ordered MICAP and the published estimated
delivery date is 23 May.  The MS is functional but in OPSCAP AMBER due to
loss of redundancy.



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Jeffrey S. Wong, Project Engineer
The Aerospace Corporation
Det 11, Space and Missile Systems Center (AFSPC)

CZG & CZS/NOSO Support
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Figure 3-7. SSM Technical Representative Summary Status Via E-mail

OCS Summary Graphs/Charts

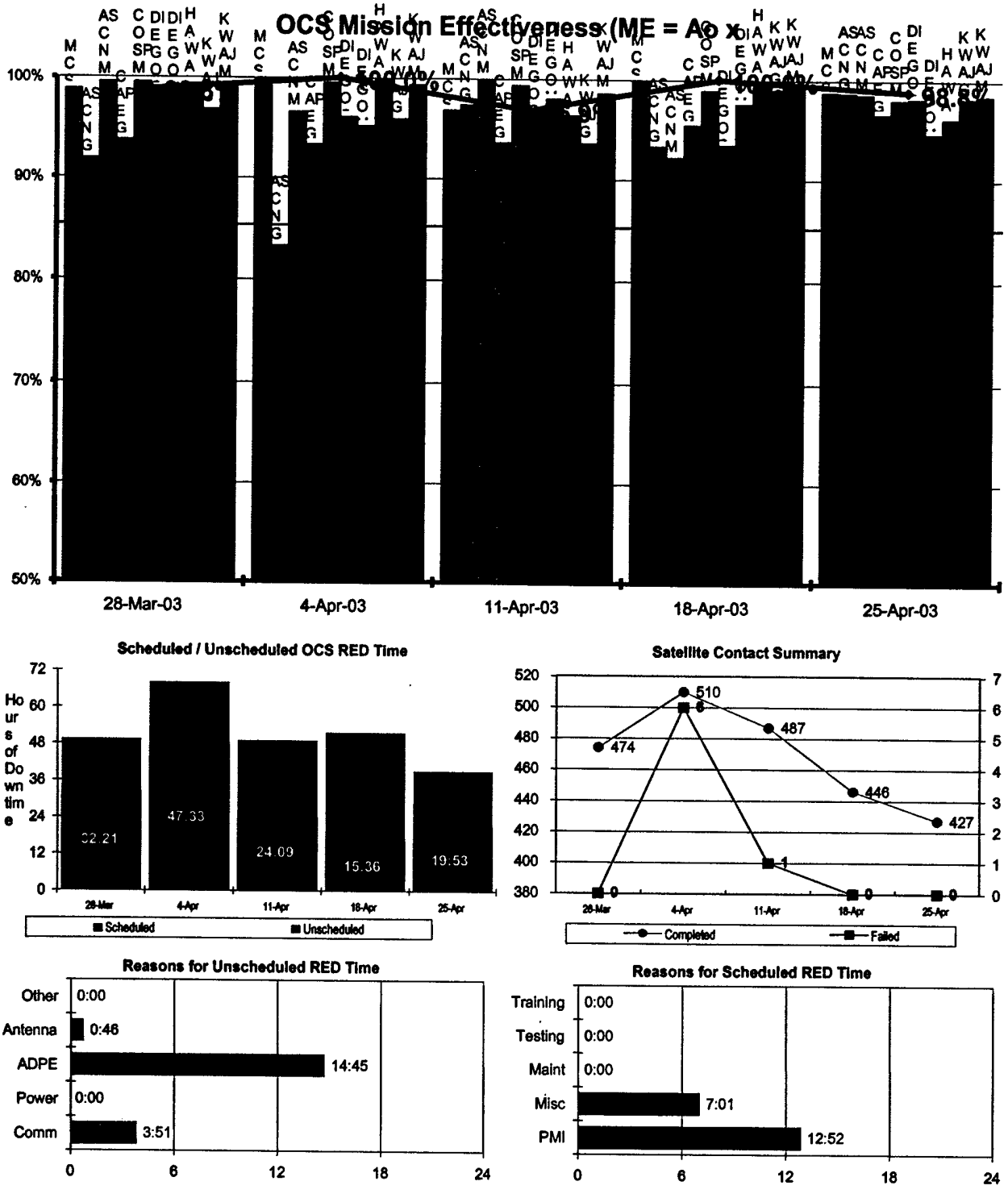


Figure 3-8. OCS Summary Graphs/Charts

Details of UNSCHEDULED					
Start Time	Stop Time	Site	Duration	Comm, Power, ADPE, Antenna, Other	Description
4/29/2003 15:00	4/29/2003 17:15	ASCNG	2:15	PMI	
4/28/2003 8:30	4/28/2003 9:15	CAPEM	0:45	ADPE	LOC - Ops performed stop/start of comm gateway to clear
4/28/2003 14:30	4/28/2003 14:45	CAPEM	0:15	ADPE	Loss of PRs - CBI
4/29/2003 12:45	4/29/2003 13:30	CAPEM	0:45	ADPE	Loss of PRs - CBI
4/29/2003 14:15	4/29/2003 14:30	CAPEM	0:15	ADPE	Missed K-points - CBI
4/30/2003 20:45	4/30/2003 21:00	CAPEM	0:15	ADPE	Missed K-points - CBI
4/28/2003 12:26	4/28/2003 15:05	CAPEG	2:39	PMI	
4/29/2003 12:05	4/29/2003 15:06	CAPEG	3:01	PMI	
5/1/2003 0:27	5/1/2003 3:45	COSPM	3:18	Misc	MS is RED for scheduled software migration from external to internal servers. - complete
4/28/2003 0:00	4/28/2003 2:15	DIEGOG	2:15	PMI	
4/28/2003 0:00	4/28/2003 2:00	DIEGOM	2:00	PMI	
4/28/2003 18:32	4/28/2003 21:15	HAWAM	2:43	Misc	MS is RED for scheduled software migration from external to internal servers. - complete
4/25/2003 21:03	4/25/2003 21:35	KWAJG	0:32	PMI	
4/28/2003 20:10	4/28/2003 20:35	KWAJG	0:25	PMI	
5/1/2003 19:15	5/1/2003 21:15	KWAJG	2:00	PMI	
4/25/2003 16:30	4/25/2003 17:30	MCS	1:00	Misc	Scheduled downtime for warmstart - complete

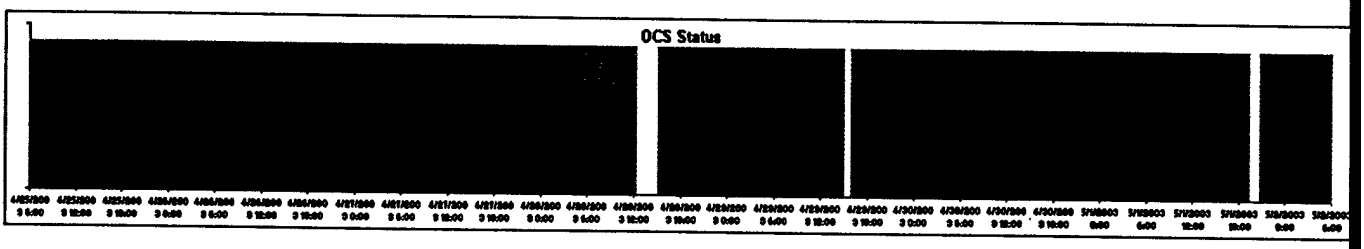
Figure 3-9. Details of Unscheluded Outages

Details of SCHEDULED OUTAGES					
Start Time	Stop Time	Site	Duration	Maint, Misc, PMI, Testing, Training	Description
4/29/2003 15:00	4/29/2003 17:15	ASCNG	2:15	PMI	
4/28/2003 8:30	4/28/2003 9:15	CAPEM	0:45	ADPE	LOC - Ops performed stop/start of comm gateway to clear
4/28/2003 14:30	4/28/2003 14:45	CAPEM	0:15	ADPE	Loss of PRs - CBI
4/29/2003 12:45	4/29/2003 13:30	CAPEM	0:45	ADPE	Loss of PRs - CBI
4/29/2003 14:15	4/29/2003 14:30	CAPEM	0:15	ADPE	Missed K-points - CBI
4/30/2003 20:45	4/30/2003 21:00	CAPEM	0:15	ADPE	Missed K-points - CBI
4/28/2003 12:26	4/28/2003 15:05	CAPEG	2:39	PMI	
4/29/2003 12:05	4/29/2003 15:06	CAPEG	3:01	PMI	
5/1/2003 0:27	5/1/2003 3:45	COSPM	3:18	Misc	MS is RED for scheduled software migration from external to internal servers. - complete
4/28/2003 0:00	4/28/2003 2:15	DIEGOG	2:15	PMI	
4/28/2003 0:00	4/28/2003 2:00	DIEGOM	2:00	PMI	
4/28/2003 18:32	4/28/2003 21:15	HAWAM	2:43	Misc	MS is RED for scheduled software migration from external to internal servers. - complete
4/25/2003 21:03	4/25/2003 21:35	KWAJG	0:32	PMI	
4/28/2003 20:10	4/28/2003 20:35	KWAJG	0:25	PMI	
5/1/2003 19:15	5/1/2003 21:15	KWAJG	2:00	PMI	
4/25/2003 16:30	4/25/2003 17:30	MCS	1:00	Misc	Scheduled downtime for warmstart - complete

Figure 3-10. Details of Scheduled Outages

SATELLITE CONTACT SUMMARY					
Day	Date	Completed	Failed	Total	Description of Failed Supports
Fri	25-Apr-03	56	0	56	
Sat	26-Apr-03	57	0	57	
Sun	27-Apr-03	62	0	62	
Mon	28-Apr-03	60	0	60	
Tue	29-Apr-03	61	0	61	
Wed	30-Apr-03	71	0	71	
Thur	1-May-03	60	0	60	Estimate - data unavailable

Figure 3-11. Satellite Contact Summary



OCS Operational Status for the week is 91.81%, with 1.19% OCS RED time and 2.68% OCS AMBER time

Figure 3-12. OCS Operation Status

3.5 Use Case Data Map

The following is a list of data sources that meet one or more stakeholder needs and their associated use case.

Measure/Function/Calculation		CAMS	REMIS*	SBSS*	D035K*	D165B*	AFCA	D043*	AVCOM	GIDEP	D087T*	D087P*	DLA Systems	Satellite Contact Summary	Manual Entry
View Current System Status	Operational, Equipment, Comm Status	x													
	Additional logistics detail	x		x											
	Operational impact	x													x
View Quarterly Top-10 Space Supply Drivers List	Number of requisitions				x										
	MICAP Incidents			x		x									
	Single Point Failure designation						x								
	Vanishing Vendor designation							x	x	x					
	Open Backorders				x										
	Capture additional working detail														x
View MICAPS	Provide basic MICAP information			x		x					x	x			
	Operational impact of MICAP	x													x
Research Item	Comprehensive Item information	x		x	x	x		x	x	x	x	x	x		
	Backorder detail				x							x			
Conduct Trend Analysis of System Performance Measures	Mission Effectiveness	x													
	Scheduled & Unscheduled outages	x													
	Operational status and satellite contact													x	
* Indicates system is or is likely to be integrated into the Air Force Enterprise Data Warehouse															

Figure 3-13. Use Case Data Map

4 Process Flow Diagrams

Note: Color codes are representative of user role (e.g., unit, wing, 14th, etc.)

4.1 Notification of System Outages (Current)

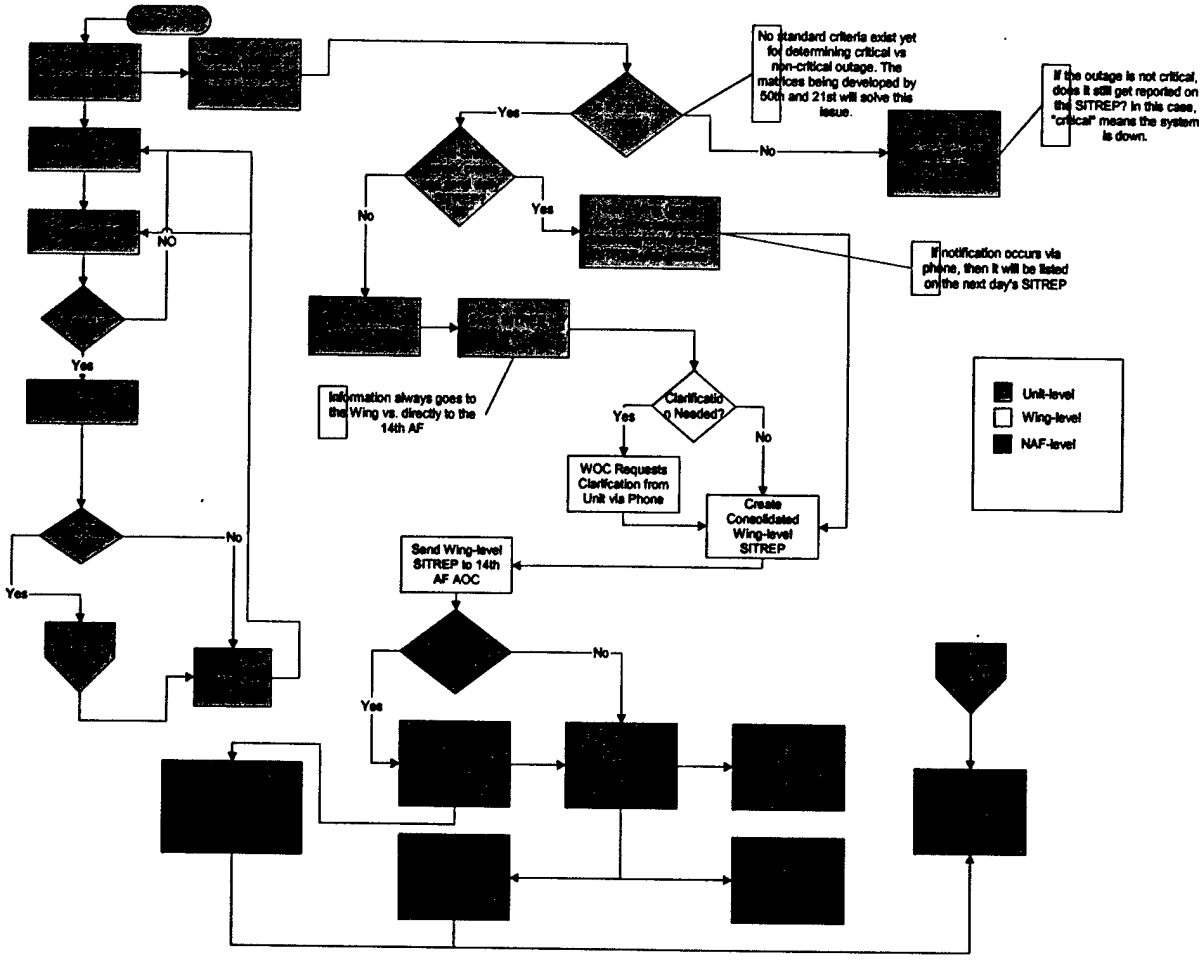


Figure 4-1. Notification of System Outages (Current)

4.2 Notification of System Outages (VSLRC)

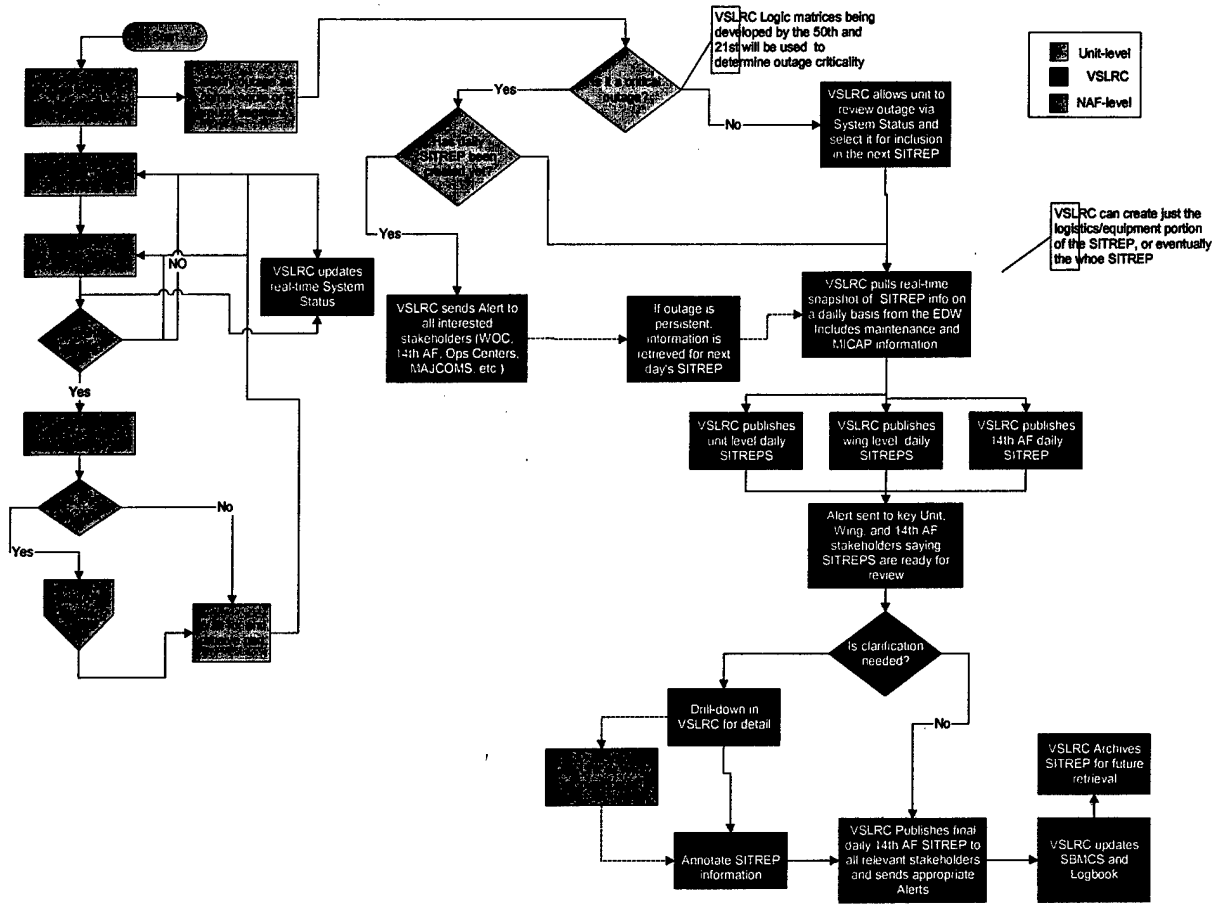


Figure 4-2. Notification of System Outages (VSLRC)

4.3 MICAP Reporting/Research (Current)

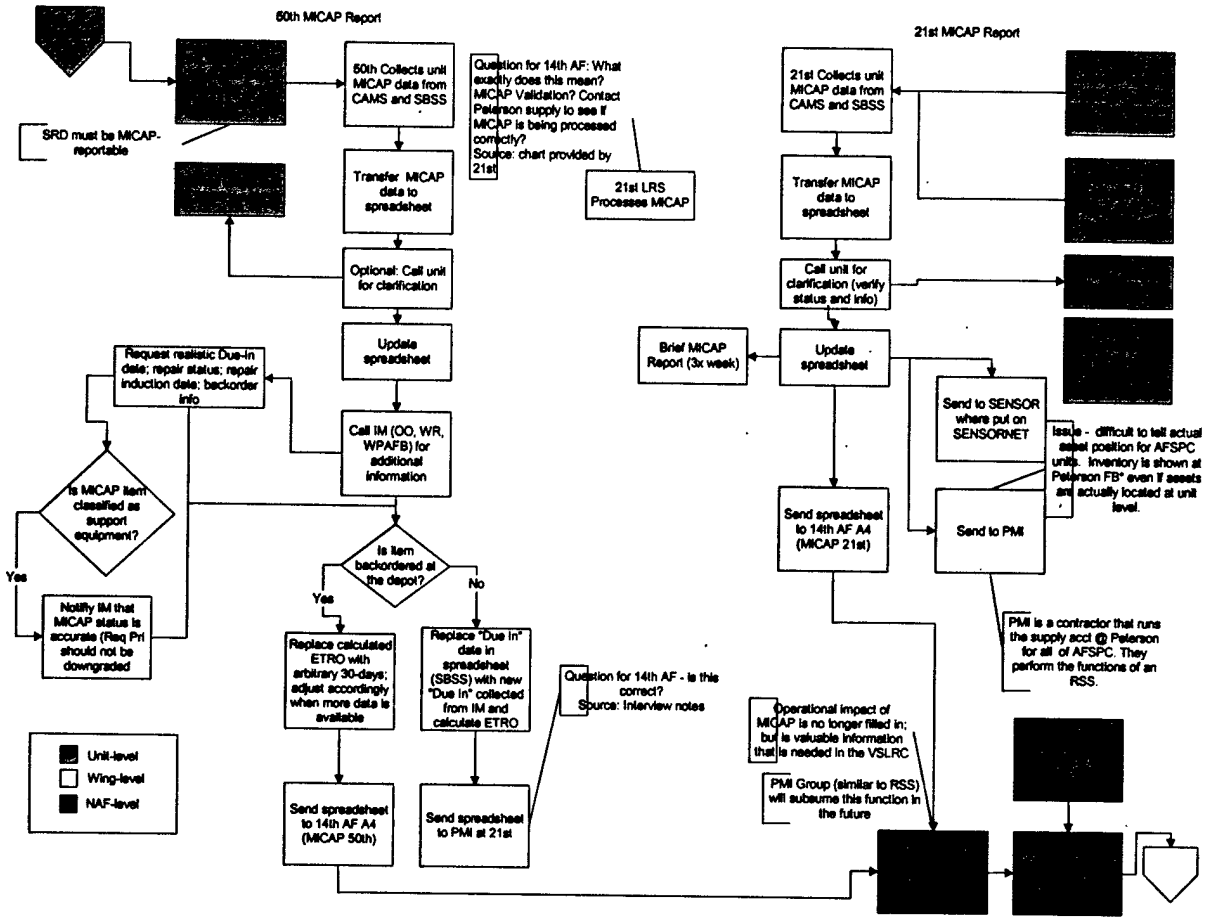


Figure 4-3. MICAP Reporting/Research (Current)

4.4 MICAP Reporting/Research (VSLRC)

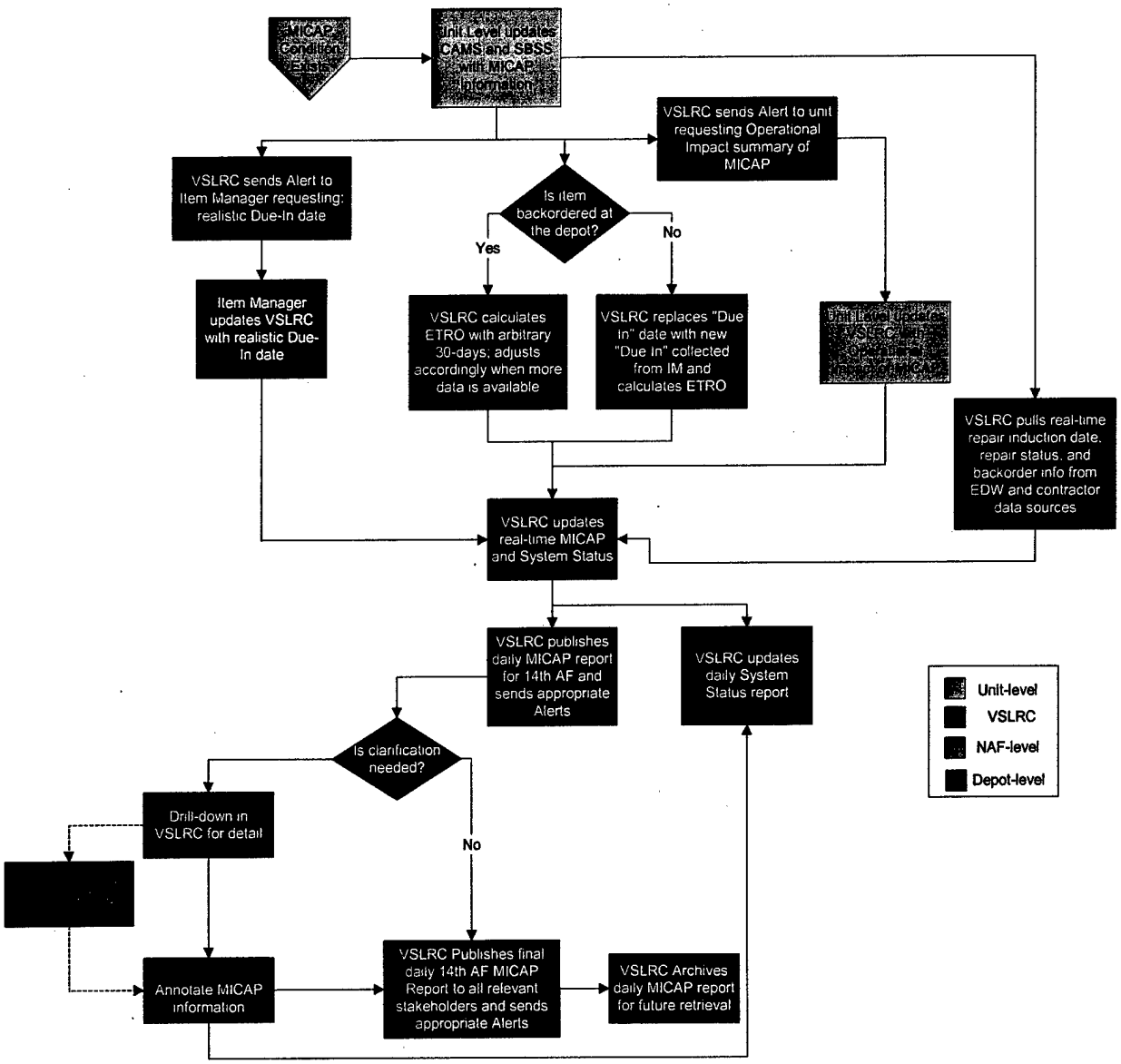


Figure 4-4. MICAP Reporting/Research (VSLRC)

5 Return on Investment (ROI)

The Air Force Space Command logistics processes are comprised of doctrine, training, personnel, organizations, tools, and processes. Currently, these components do not act together in an integrated fashion to enable an effective, efficient method to ensure the optimum operational rates are maintained. Modern business reengineering techniques and information technologies are available to provide a robust, rationalized, integrated solution. Skillful application of these technologies and techniques is necessary to achieve these optimum operational rates. A web portal is part of the answer, but the portal needs to be complemented by solid process analysis and direct linkages between the process analysis and the applications available. If designed correctly, the information system component of the Air Force Space Command logistics processes can lead to appropriate decision-making, resulting in higher operational rates.

This paper has described a vision of the future Air Force Space Command logistics processes and attempted to bring that vision to life with a description of many of the features needed in the VSLRC. There is still much work to do. Process models need to be developed and fully coordinated. The entire Air Force Space Command logistics process has to be evaluated in order to produce the necessary changes. Design of tools based on the perspective of a subset of the stakeholders will yield fragmented solutions that could be unresponsive to the Air Force Space Command enterprise goals. The priorities for building tools and the scope of the tools (inputs, outputs, and players) need to be specified in concert with the to-be process. A solid detailed vision is a necessity, but not sufficient condition, for change.

The application of enabling technologies such as a web portal, a distributed component-based software architecture, and Message Oriented Middleware (MOM) must be guided by a To-Be process model conceived from an entire systems perspective. Without a direct linkage between a To-Be process and information system engineering efforts, the Air Force Space Command is destined to continue to expend resources on new technologies without addressing underlying problems with the total Air Force Space Command logistics process. Fragmented information system efforts cannot solve these issues, and choosing new technologies - even the right technologies - alone will not be sufficient. Each process needs to be defined in terms of inputs, outputs, and players to ensure all tasks contribute to the overall goal of the process - efficient and timely application of Air Force resources to the Air Force Space Command mission.

Achieving the vision will be a difficult task. Integration techniques used for complex commercial enterprises have proven it is possible. Even though legacy systems do not always work together

cohesively, many offer critical capabilities that must be leveraged, or at least maintained, during transition periods.

Some of the Functional Improvements achieved in a fully developed VSLRC include:

- Resupply becomes more efficient because requirements are identified uniformly among all players with a stake in the mission
- Decision support allows quick determination of conflicting demands for the same resources across multiple military operations
- Tradeoffs can be made by the appropriate stakeholders having access to the applicable data to allow them to de-commit current resources to higher priority efforts and reduce the amount of report generation
- Details for all operations will be consistent and readily available to all stakeholders, depending on their role and responsibility
- Historical data can be kept to feed subsequent decision-making processes
- Users can become proactive by being given the required/allowed information by using the Role-Based Controls - Supplying resources will be based on the overall corporate view of requirements versus available assets
- Supplying resources will be based on visibility of other commitments and available capabilities because taskings are tracked through the entire logistics process

6 Technological Environment

6.1 Description

Today's successful application is characterized by several complementary key factors. It is one that is Web-based, supports disparate databases, is not a stove-pipe system, but rather, a loosely coupled application that cooperates with other applications to provide an enterprise system, provides role-based security to components, provides a customizable front-end, and can support a rapidly changing environment.

The system needs to be **Web-based** so that clients can access the application with minimal client software footprint. Among other things, this thin-client architecture translates to lower maintenance costs, in both deployment and updates. Web-based applications also have the advantage of being highly portable across heterogeneous hardware platforms. If the client hardware supports a web-browser, the application has a high probability of being operated at that site.

The system needs to support **disparate databases**. VSLRC will undoubtedly require the development of its own database to store some data to support trend analysis and alerts. However, the source of the majority of its data will be taken from a multitude of other application and legacy databases. The architecture that the VSLRC resides must be one that can easily interface with these disparate databases and yet be flexible enough to obtain its data from other sources, such as the Enterprise Data Warehouse (EDW), as required.

The system needs to be developed as a component of a larger enterprise application, one that works with other **interoperable components**. The employment of Message Oriented Middleware (MOM) and the Publish/Subscribe paradigm enables applications to eliminate organizational stovepipes and operate as a streamlined, cohesive enterprise.

The system needs to provide robust **web-centric security** including **role-based control** of system components. These security related features are some of the common features of today's **Portal** environment, an environment that provides user customization and an environment that is expected by today's consumers. This will be an important feature to the VSLRC, as there will be a plethora of diverse roles accessing the VSLRC for a variety of reasons.

To successfully deliver an application with the above stated features and maximize system response times and efficiencies, it is imperative to apply the appropriate programming standards. Perhaps the most important standard is the Java 2 Enterprise Edition (J2EE). Using Commercial off the shelf (COTS) applications (such as TIBCO and Web Logic) to enhance the utilization of these standards increases the stability and effectiveness of an application and makes the VSLRC an operationally responsive system to meet customer requirements.

6.1.1 Web-Based

With the emergence of the World Wide Web, virtually everyone in the civilized world is now aware of the power of the Internet in delivering a vast array of information to a worldwide community of users with disparate computer and communications systems. Explosive growth of Air Force and Joint Systems using electronic commerce over the Internet are becoming the "norm".

For the most part, building Web pages today is largely a matter of using Hyper Text Markup Language (HTML). HTML is suitable for allowing users to find and read documents and link from one document to another. However, developing meaningful and robust applications for the Internet requires the use of other languages and techniques.

The Web can be leveraged for enterprise computing by creation of a web portal.

6.1.2 Disparate Databases

There are many data sources and tools used by personnel throughout Air Force Space Command. Many of these will contribute to the VSLRC. Some systems contain data that the VSLRC must collect, process, analyze and report, while others contain functionality that may be integrated into the VSLRC. Interface linkages will be created between various systems and the VSLRC. No single system exists today that provides all of the capabilities required by the VSLRC and many of the existing systems cannot "talk" to each other. Some data sources may use Oracle while others use Access or other tools for their databases. Developing a standardized source for all the needed data and a standardized "Suite of Tools" to be used will vastly increase the availability and accuracy of the needed information.

6.1.3 Interoperable Components – Message Oriented Middleware

In the past, the dominant method for integrating functional "stove-pipe" systems has been to develop a single integrated database. Some progress has been made in merging some conglomerations of "stove-pipe" systems into larger systems, but the complexity of the integration grows exponentially as the size of the integration grows. Generally, large integration efforts of this type have failed due to underestimation of the complexity of the required database and the amount of effort required to recode business logic to replace legacy systems. More recently an alternative integration concept has emerged in large commercial enterprises. This strategy is focused on defining the business transactions required across the enterprise and using MOM to ensure appropriately formatted messages are broadcast to network nodes as business events occur. The best MOM supports event driven "server push", or real-time broadcast of information and has a number of advanced capabilities, including subject-based addressing, self-describing data, and delivery services that include certified messaging, fault-tolerance, and distributed queues. Since MOM uses subject-based-addressing, rather than conventional point-to-point sockets and IP addresses, it allows the designer to think in terms of a "logical architecture of connectivity," in which the MOM acts as a pipe between any two systems. External/legacy system integration is accomplished by encapsulating events in messages through the use of an adapter. The events can be "subscribed to" by each downstream stakeholder in the process. Adapters exist for databases such as Oracle, so it is possible to enable the information bus with these events quickly. The high level architecture for Legacy Systems Integration solutions (Figure 6-1) is as follows:

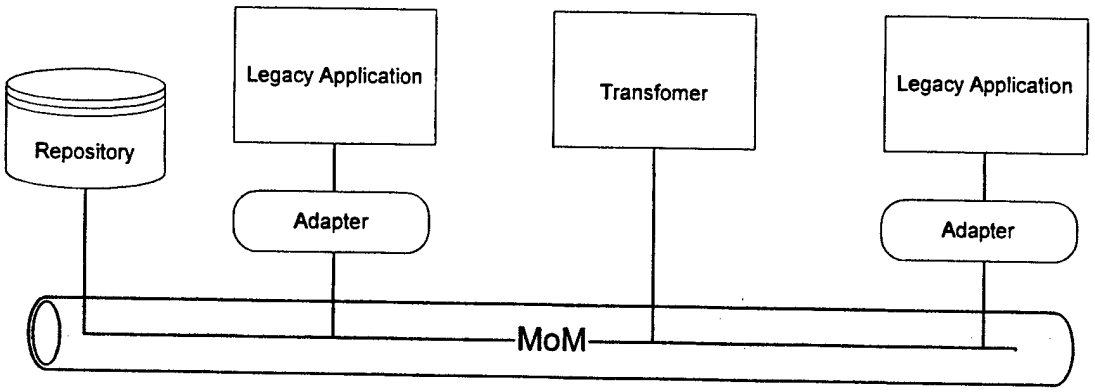


Figure 6-1. Legacy Integration with MOM

This diagram (reference Figure 6-1 Legacy Integration with MOM) shows two legacy applications, each of which have a adapter which creates messages on the bus. In the middle is a transformer which is used to convert the business objects which appear on the left-hand adapter over to the business object expected on the right-hand adapter. The adapters and the transformer use information located in the repository to the right.

MOM techniques have yielded some astounding successes in leveraging investment in legacy systems while moving enterprises to an event-driven model. However, this technique is not a panacea. Some distributed components in complex enterprises require tighter coupling than can be accomplished through messaging and can best be achieved using a distributed component model as described above. However, many processes can be quickly and significantly improved while leveraging legacy systems using MOM. MOM can also be very useful for transition periods while migrating away from legacy systems. MOM is also very useful for interfacing with external systems. Regardless of the size of an integration effort, interaction with external systems is likely to be required. MOM is especially well suited to the integration of legacy systems. As outsourcing and privatization increases, there will be an increasing need for event-driven communication between the Air Force Space Command systems and systems belonging to suppliers of key services and materiel. Commercial examples of using this design include linkage of Enterprise Resource Planning (ERP) systems to legacy systems. Furthermore, the Business-to-Business (B2B) paradigm could be adapted to allow the flow of requirements from government to business and the flow of resource information back to Government, completing a Government-to-Business-to-Government (G2B2G) cycle.

There are competing products in the MOM market. The best produces a vast array of useful features that leverage the messaging layer and allow message management, message-based interaction between the components, and adapters that integrate various third-party software systems and transform message

formats so they can be used by disparate systems, integrate with web portals, enable workflow management, distributed monitoring plan, some MOM vendors provide a flexible system and application monitoring facility. This enables applications to send status notifications, and monitoring tools to subscribe to such messages and provide monitoring and alerting.

6.1.4 Role-Based Control

Considering the physical separations and the varying responsibilities of the personnel throughout Air Force Space Command and its user community, developing a Role-Based Control system will be very beneficial. At the risk of over simplification, several examples of potential roles would include the SSMs and their staff, who would need access to the data required to give them the overall long-term system health picture; NAF Users, who require access to data and tools allowing easy creation of MICAP Reports and AOC Briefings; and Wing Level Operators, who are responsible for providing real-time operational status. Creating access to the data and tools directly related to an individual's role eliminates their need to extrapolate the needed information from volumes of data and standardizes the data source and currency for everyone. This will inherently give a more accurate picture of current system status.

6.1.5 Portal Environment

A well-implemented portal is essentially a web site that:

- Allows easy access to all content associated with an enterprise
- Creates a sense of community among the enterprise stakeholders
- Allows users to customize their interface or "home page" based on personal preferences and organizational role
- Displays real-time information, alerts, and "business monitors"
- Controls access based on user identification

6.1.6 Notional Infrastructure

In an effort to begin using an enterprise component approach to system development that reuses key components, data elements, calculations, etc. from various other systems and capitalizes off those investments and opportunities, the notional infrastructure as described in Figure 6-2 is suggested. This infrastructure would provide the most cohesive workflow management enterprise to meet the various stakeholder needs, instead of a stovepipe or independent development approach that subsequently requires endless interface considerations.

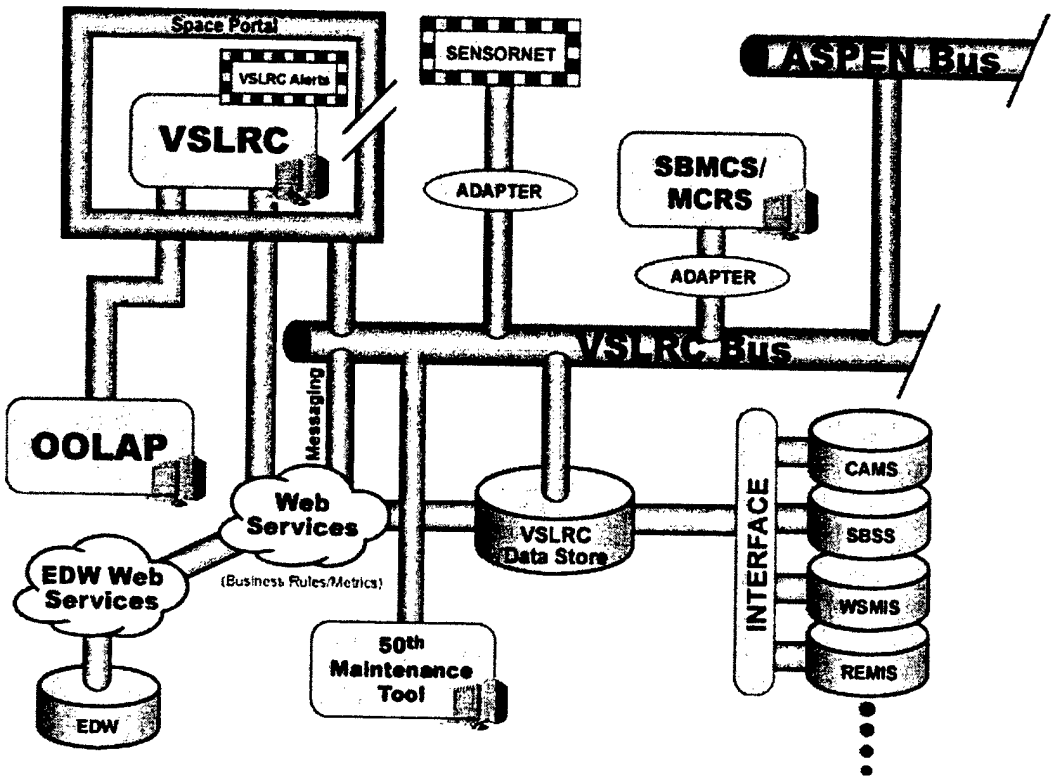


Figure 6-2. Notional VSLRC Technological Infrastructure

6.2 Standards

- AFI 10-602 Determining Mission Capability and Supportability Requirements, 30 Sep 02
- Global Command Support System (GCSS) Standards
- GRID-Centric Enterprise Services Standards
- AFI 10-202

6.3 Assumptions and Constraints

With any system integration effort there exists data "gaps" where data owned and/or provided by contractor or other services is difficult to obtain or integrate within the foundation of an existing system. The VSLRC will depend on key data elements from contractor other services and legacy systems, which may require contract modifications or additional communication tiers to gather the necessary data. Transition between classified and unclassified environments and any C2 guards or other mechanisms for providing this data will need to be explored.

Access to Government-owned data sources (e.g., CAMS, EDW, SBSS, etc) will also be required. Therefore, it is necessary that the VSLRC obtain the appropriate access to such data in real time status in order to provide the user with the most accurate and updated information as possible.

Business rules must be established for the identification of Operations Capability (OPSCAP), Systems Capability (SYSCAP), FMC, PMC, and NMC in order for the VSLRC to calculate and identify the appropriate status to the various echelons of the AFSPC.

7 Conclusion and Recommendation

It is apparent from the requirements research and analysis that a VSLRC will help the entire AF Space community employ, manage and sustain Space assets more efficiently and effectively. If implemented, the VSLRC will:

- Align the AF Space Community's understanding of the real-time status and long-term health of Space systems worldwide
- Eliminate duplication in analysis, data entry and reporting
- Alert members of the supply chain – all the way to the system user – of logistics problems that may impact operations
- Streamline logistics support and sustainment by integrating information from disparate information systems and alerting key individuals to disconnects within the logistics system

Conduct further requirements research and analysis to validate functional requirements and based on this assessment, recommendations for further action regarding the development of a VSLRC are:

- Obtain senior-level buy in from HQ AFSPC, Det 11, SMC, Det 5, 14th AF, and OO-ALC/LH for the VSLRC concept
- Finalize and present the VSLRC Conceptual Demonstration based on known system requirements outside of the Navigation Satellite Timing and Ranging (NAVSTAR) GPS community
- Integrate functionality from existing, useful software tools and systems where cost effective and feasible (e.g., LOCIS, 50th Maintenance Group Web Site, ORA, etc.)
- Conduct a detailed review of LOCIS to determine which components may be modified and re-used in the VSLRC
- Further define the VSLRC architecture based on validated requirements and the LOCIS review

- Develop a migration strategy that will transition the VSLRC from the concept stage, to the development phase, and through to deployment and sustainment
- Identify specific data elements and sources, which will populate function points and lead towards a phased development of a VSLRC

8 Acronym List

ADPE	Automated Data Processing Equipment
AOC	Aerospace Operations Center
ATE	Automated Test Equipment
AF	Air Force
AFMC	Air Force Material Command
AFSCN	Air Force Satellite Control Network
AFSPC	Air Force Space Command
AFRL	Air Force Research Lab
AWP	Awaiting Parts
B2B	Business-to-Business
BCS	Balanced Scorecard
C2	Command and Control
CAGE	Commercial and Government Entity
CAMS	Core Automated Maintenance System
CBRN	Chemical, Biological, Radiological, and Nuclear
CISF	Centralized Integration Support Facility
CONOPs	Concept of Operations
COTS	Commercial off the shelf
CSO	Chief Sustainment Officer
CWT	Customer Wait Time
DAC	Defense Acquisition Circular
Det	Detachment
DISA	Defense Information Systems Agency
DLA	Defense Logistic Agency
DoD	Department of Defense
DSP	Defense Support Program
DSS	Decision Support System
DSCS	Deep Space Tracking System
EDD	Estimated delivery Date
EDW	Enterprise Data Warehouse
ESC	Electronic System Center
ESR	Equipment Status report
ERRC	Expendability, Recoverability, Reparability Code

FMC	Fully Mission Capable
FTP	File Transfer Protocol
FY	Fiscal Year
G2B2G	Government-to-Business-to-Government
GIDEP	Government/Industry Data Exchange Program
GPS	Global Positioning Satellite
HQ	Headquarters
HTML	Hyper Text Markup Language
I&SG	Interchangeable and Substitution Group
ICBM	Intercontinental Ballistic Missiles
IMDS	Integrated Maintenance Data System
JCS	Joint Chief of Staff
JNDI	Java and Naming Directory Interface
JSP	Java Server Page
LASAR	Logistics Analysis Supportability Assessment Resource
LMS	Log Mgt Spec
LRT-AF	Logistics Response Time-Air Force
MCRS	Mission Critical Reporting System
MDD	Maintenance Data Documentation
MERLIN	Multi-Echelon Resource and Logistics Information Network
MGS	Mars Global Surveyor
MICAP	Mission Impaired Capability Awaiting Parts
MILSATCOM	Military Satellite Communications
MOM	Message Oriented Middleware
MPP	Modernization Planning Process
NAF	Numbered Air Force
NATO	North Atlantic Treaty Organization
NAVSTAR	Navigation Satellite Timing and Ranging
NMC	Non-Mission capable
NORAD	North American Aerospace Defense Command
NSN	National Stock Numbers
OCS	Operator Control Station
OO-ALC	Ogden-Air Logistics Center
ORA	Operational Readiness Analysis system
OPSCAP	Operations Capability
PDM	Programmed Depot Maintenance
PEO	Program Executive Officer
PIN	Parts Information Network
PMC	Partial Mission Capable
POM	Program Objective Memorandum
PPAS	Pipeline Performance Analysis System

PSA	Predictive Support Awareness
RAMES	Reliability, Availability and Maintainability Engineering System
RDB	Requirements Data Bank
RDD	Required Delivery Date
REALM	Requirements/Execution Availability Logistics Module
REMIS	Reliability and Maintainability Information System
ROI	Return on Investment
SAE	Service Acquisition Executive
SBLC	Standard Base-Level Computer
SBMCS	Space Battle Management Core System
SBSS	Standard Base Supply System
SEMR	System Executive Management Report
SENSORNET	Sensor Network
SIPRNET	Secure Internet Protocol Network
SITREPS	Situation Report
SMART	Systems Metric and Reporting Tool
SMC	Space and Missile System Center
SOR	Source of Repair
SORAP	Source of Repair Assignment Process
SOS	Source of Supply
SSM	System Support Manager
SPD	System Program Directors
SPF	Single Point Failure item
SYSCAP	Systems Capability
UDRI	University of Dayton Research Institute
USSPACECOM	United States Space Command
USSTRATCOM	United States Strategic Command
V/V	Vanishing Vendor
VARD	Variance Analysis Reporting
VICP	Virtual Networking System (VINES) Internet Control Protocol
VSLRC	Virtual Space Logistics Readiness Center
WARRS	Wholesale and Retail Receiving and Shipping
WICAP	Worldwide Industrial Capabilities Assessment Program
WRM	War readiness Material
WSAP	Weapon System Analysis Program
WSMIS	Weapons System Management Information Systems
WSSP	Weapon System Support Program

Appendix A

Metrics Matrix

Systems				
Metrics	**SLRS**	**GPS**	**AFSCN**	**AF Ground Sys Spt Sat Ops**
Operational Availability (Ao)	MTBDE/MTBDE+MDT	MTBDE/MTBDE+MTTRS Total Hours of Satellite Uptime/Total Hours ME=(Do)(Ao)	MTBDE/MTBDE+MDT	MTBDE/MTBDE+MDT
Operational Dependability (Do)		MRBCF/MTBCF+MTTRF		MRBCF/MTBCF+MTTRF
Mean Time Between Failures (MTBF)	Uptime/# of Failures		Uptime/# of Failures	Uptime/# of Failures
MeanTime Between Downtime Events (MTBDE)		Uptime/# of Failures OCS Operating Hours/Total # of Downing Events		Total Uptime/Number of Downing Events
Mean Time Between Critical Failures (MTBCF)	Uptime/# of Critical Failu	Total Operating Hours/Total # of Critical Failures	Total Uptime/Number of Critical Failures	Total Uptime/Number of Critical Failures
Mean Down Time	Total Downtime/Number of Downing Events		Total Downtime/Number of Downing Events	Total Downtime/Number of Downing Events
MeanTime to Restore Function		MTTRF=Total OCS Critical Repair Time/Number of Critical Failures MTTRS=Total OCS Down Time/Total Number of Downing Events	MRT=Total Repair Time/Number of Failures	MTTRF = Total Critical Failure Time/Number of Critical Failures MRT = Total Repair Time/Number of Failures
MeanTime to Troubleshoot		MTTT = Total amount of time required to locate faults/ total Number of Faults		
Mean Mission Duration				Total Mission Time/Number of Missions
Mean Maintenance Time			Total Maintenance Time/Number of Maintenance Events	Total Maintenance Time/Number of Maintenance Events
Maintenance Man-Hours				Total Maintenance Man-Hours/Number of Maintenance Events
Mean Time Between Maintenance			Uptime/Number of Maintenance Events	Total Up Time/ Number of Maintenance Events
Unscheduled Depot Level Maint				
Emergency Depot Level Main				

Depot MICAPs			Depot MICAPS: Depot Level Indicators: Total Number Per 12 mo (x) Green if: x <= 84 Yellow if: 84 < x <= 92 Red if: x > 92 Depot Level Indicators: Average Duration (Days) (y) Green if: y <= 10 Yellow if: 10 < y <= 20 Red if: y > 20 Depot Level Indicators: MICAPs/NSN Per 12 mo (Z) Green if: z <= 4 Yellow if: 4 < z <= 6 Red if: z > 6	
Depot MICAP Process Time				
Lateral MICAPs			Lateral MICAPs: Total Number Per 12 mo (x) Green if: x <= 60 Yellow if: 60 < x <= 63 Red if: x > 63 Lateral MICAPs: MICAPs/NSN Per 12 mo (Z) Green if: z <= 7 Yellow if: z = 8 Red if: z > 8	

Other MICAPs			All Other MICAPS: Total Number Per 12 mo (x) Green if: x <= 54 Yellow if: 54 < x <= 57 Red if: x > 57 All Other MICAPS: Average Duration (Days) (y) Green if: y <= 10 Yellow if: 10 < y <= 20 Red if: y > 20 All Other MICAPS: MICAPs/NSN Per 12 mo (Z) Green if: z <= 2 Yellow if: 2 < z <= 4 Red if: z > 4	
Quality Deficiencies	QR = [1- (# of PDQRs/Total # depot Level Repairs complete	Computed as (Quality Ratio): QR = # of PQDRs/Total # of Depot level Repairs Completed		
Product Resporsiveness	Average Repair Time = total process Time - Depot MICAP Process Time/Total Items - Depot MICAP Items		Average Repair Time = total process Time - depot MICAP Process Time/Total Items - Depot MICAP Items x = Avg Repair Time: y = MICAps/NSN: Green x <= 80 and y <= 1 orx <= 80 and 1 < y <= 3 or x >= 80 and y >= 3 or 80 < x <= 120 and y <= 1 or x > 120 and y <= 1 x = Avg Repair Time: y = MICAps/NSN: Yellow 80 < x <= 120 and 1 < y <= 3 or 80 < x <= 120 and y > 3 or x > 120 and 1 < y <= 3 x = Avg Repair Time: y = MICAps/NSN: Red x >120 and y >3	

Failure Categories				
Failure Types				
Scheduled Downtime Percentage		SDP = Total Hours of Scheduled Down Time/Total Test Hours		
Integrated Diagnostic Capabilities		CND Rate = Total Number of Unconfirmed BITIndicated failures/Total Number of BIT Indications (excluding false alarms) x 100%		
		False alarm rate = Total Number of Unconfirmed BIT Indicated Failures/Total Number of BIT Indications x		
		FI = Total Number of correct BI isolations/ Total Number of detection's via all method x 100%		
		FD = Total Number of correct BIT detections/ Total Number of detection's via all methods x 100%		
		RTOK Rate = number of Units (LRUs,SRUs) that RTOK at a Higher Maintenance Level/ Number of Units (LRUs,SRUs) tested at a higher maintenance		
Control Segment Logistics Reliability and Maintainability Terms				
Contact Success Rate			Number of Successful Contacts/Total Number of Contacts	
Mission Reliabilty			e –(MMD/MTBCF)	e -(MMD/MTBCF)
Percent Utilization			(CUE Hours/Ops Ratio) x 100%	
Ops Ratio			[20.143 hours/day] x [period (days)] x {no. of RTS sides available]	

Mission Success Rate				Total Successful Missions/Number of Missions
Administrative and Logistic Delay Time			MALDT=Total ALDT/Number of Failures	Total Administrative and Logistic Delay Times/Number of Failures
Turnaround Time				
Utilization			Utilization = (Total Operational Usage Time/Possessed Time) x 100	Utilization = (Total Operational Usage Time/Possessed Time) x 100
Total Process Time				
Product Resporsiveness				The number of MICAPs occurring on the same National Stock Number (NSN) during a given period and the historical average repair time for routine repairs of like items. The average repair time starts when the component is received at the depot facility and ends when the item is shipped from the depot facility. Average Repair Time=Total Process Time-Depot MICAP Process Time/Total Items-Depot MICAP Items
Quality Ratio				QR=1-(No of PQDRs/Total No. of Depot Level LRU Repairs Completed)
Equipment Level Metrics (see Mean Time)				
Current Comba: Readiness			Contact Success Rate (CSR) = Total Successful Contacts/Number of Contacts	
UDLM				Total UDLMs/Reporting Period

Unscheduled Depot Level Maintenance; Nodes System Performance			Total Number Per 12 mo (x) Green if: x <= 5 Yellow if: 5 < x <= 10 Red if: x > 10	
			Number Per Site Per 12 Mo (y) Green if: y <= 3 Yellow if: 3 < y <= 7 Red if: y > 7	
			Number of Major End Items Per 12 mo (Z) Green if: z <= 2 Yellow if: 2 < z <= 4 Red if: z > 4	
Unscheduled Depot Level Maintenance; RTS System Performance			Total Number Per 12 mo (x) Green if: x <= 24 Yellow if: 24 < x <= 36 Red if: x > 36	
			Number Per Site Per 12 Mo (y) Green if: y <= 2 Yellow if: 2 < y <= 5 Red if: y > 5	
			Number of Major End Items Per 12 mo (Z) Green if: z <= 2 Yellow if: 2 < z <= 4 Red if: z > 4	
Unscheduled Depot Level Maintenance; DLT System Performance			Total Number Per 12 mo (x) Green if: x <= 5 Yellow if: 5 < x <= 10 Red if: x > 10	
			Number Per Site Per 12 Mo (y) Green if: y <= 3 Yellow if: 3 < y <= 7 Red if: y > 7	
			Number of Major End Items Per 12 mo (Z) Green if: z <= 2 Yellow if: 2 < z <= 4 Red if: z > 4	