Integrated Logistics Product Support for the 21st Century Program
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Submitted by:
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ESC
Logistics Engineering and Analysis Capabilities

- Team QinetiQ (Engineering Support Contract)
  - Logistics Engineering and Analysis
  - Over 144 years of combined experience via backgrounds in:
    - Commercial/industry logistics
    - Kennedy Space Center specific logistics (LSA, ILSP)
    - Army, Navy, and Air Force logistics
    - DOD logistics
Purpose

• To outline the relationships between logistics requirement documents for the 21st Century Program
• To show the relationships between the logistics tasks and the design process

Relationship Between 21CGSP Documents and GPD Organization

• 21 Century Ground Services Program
  • Currently supports SLS/ MPCV
  • Program Plan mandates compliance with NPD 7500.1
    • NPD 7500.1 only specifies minimum requirements for an integrated logistics regimen, gives 50000 foot guidance on topical content
  • Program Plan contains reference to performing a supportability analysis
    • ESC currently on contract to perform Logistics Supportability Analysis for subsystems
Relationship Between NASA Program Management and Logistics Governing Documents

- **NPR 7120.5 - Project Management Plan Drives Development Process**
  - Requires Program/ Projects to Comply with NPD 7500.1 - Program and Project Logistics Policy
  - Program Plan requires a Logistics Plan on **HOW** NPD 7500.1 requirements will be met in Program/ Project
  - Requires Programs/ Projects to comply with NPR 7123.1 - Systems Engineering Processes and Requirements

- **NPR 7123.1 - Systems Engineering and Processes Requirements drive System Engineering Process**
  - SEMP requires logistics documentation to be updated at major milestones
    - Does not specify what logistics documentation
    - Does not describe how logistics interfaces with engineering during the design process

- **NPD 7500.1 - Program and Project Logistics Policy drives logistics requirements**
  - Requires an ILS approach for all phases of a program/ project
  - Contains minimum support requirements for developing an ILS regimen for a Program or Project
  - Mandates that LSA will be performed concurrently with the system engineering process
  - Future Revisions of NPD 7500.1 will reference a handbook containing guidance on how to develop an ILSP and the expected content
    - If this handbook were available today it would provide guidance to a contractor for developing an ILSP.
The 21st Century Program (21 CGSP) is discussed, with a focus on Level II Program Plan 21 CGSP-PLN-1000, which includes Logistics Plan currently included in 21st Century Level II Program Plan.

Key points:
- **Level II Program Plan** includes Logistics Plan.
- **USAISR** and **NPR 7500.1** are referenced.
- **Integrated Logistics Support Plan** is part of the 21st Century Ground Systems Program Supportability Plan.
- **Ongoing Support Feeds back into the design process to produce a better design**.
- **Independent Logistics Assessment** is performed and updated at major milestones.

**Logistics Services Provided to Design Element**:
- Storage Coordination
- Transportation Estimates/Plans

**Design Element**
- PHS&T / Transportation Plan Requirements
- Indentured Parts List

**Heritage Resource Evaluation**
- Available Heritage Parts/Support & Test Equipment/Spare/OMI's/Support Documentation

**LSA development** ties into 7123.1 SEMP (Referenced in KNPR 8720.2) and KDP-P-2713. KDP-P-2713 states that final LSAs are due 20 days after 100% Milestone Drawings are released.

**In the context of Logistics Products and Services**, the diagram illustrates the interfaces and requirements, highlighting the integration of various logistics elements throughout the design process.
Logistics Products

- Design - by being involved in the SEMP Process
  - Infusing Supportability Considerations into the design effort though the SEMP Process
  - LSA
  - Maintenance Plan Data
  - Provisioning Conference
  - Independent Logistics Assessment

- Operational Services – by supporting Customers
  - Packaging, Handling, Shipping & Transportation
  - Supply Support
  - Spares Re-procurement
  - Support and Test Equipment
  - Technical Training
  - Logistics Information Systems
  - Facilities
  - Technical Data and Documentation
  - ETC...
Each Customer will need to define what logistics capability they would like to fund from the core logistics capability illustrated on the next page.
TOSC Contract mandates that the contractor provide an ILSP covering their operational logistics areas of responsibility DRD 7.1-1.

*Supply Support/ Property Management influenced by HQ Supply Support, Equipment management, and KNPR 4000.1 (TA procedure)

**Interfaces with Environmental Plan and TA procedure KDP-KSC-P-3716 - NASA-KSC Personnel Property Transfer/ Excess Process
**Phase F**

**Closeout**

(Disposal)

**KDP E(IV)**

**Plans**

Established for monitoring obsolescence/vendor support

- Establish and maintain an ILS capability, including spares, ground support equipment, and system maintenance and operating procedures, in accordance with the project's ILS.
- Review designs: standardization, commonality, reliability, etc.
- Verify and validate supportability requirements.

**Need**

- Preliminary ILSP @ MCR limited to approach for managing logistics documentation of considerations that may affect cost & schedule Ref. 21st Century MCR Plan/Draft 7120.5E
- Conceptual life cycle support strategies - NPR 7123.1

**Requirements Analysis**

- Preliminary ILSP @SRR, ref 21st CGSP MCR Plan/Draft 7120.5E
- Prelim. Maintenance Plan - NPR 7123.1
- Define logistics supportability requirements (Availability, Commonality, Transportability, Accessibility, Life Cycle Cost etc.)
- Define Reliability & Maintainability Requirements (MTTR, MTBF, Reliability, etc.)
- Define Maintenance Concept (repairable/non-repairable, etc.)

**Functional Analysis**

Allocate reliability and maintainability requirements

Allocate supportability factors

**System Optimization / Alternative Evaluation**

- Preliminary ILSP @PDR (Ref. Draft 7120.5E, 21st CGSP MCR Plan)
- Update logistics documentation Preliminary Maint. Plan (LSA MTOs) - NPR 7123.1 @S/MDR
- Logistics Ops con @SRR ref 7123.1

**Preliminary Design**

- Baseline ILSP @PDR (Ref. Draft 7120.5E, 21st CGSP MCR Plan)
- Update log. doc, update Life limited items list @CDR-NPR7123.1
- Prelim. LSAs @PDR (KDP-P-2713)
- Review designs: standardization, commonality, reliability, etc.

**Detailed Design**

- Update ILSP @CDR (Ref. Draft 7120.5E, 21st CGSP MCR Plan)
- Update log. doc, update Life limited items list @CDR-NPR7123.1
- Baseline LSAs @CDR (KDP-P-2713)
- Long Lead item procurement list @CDR (Ref. KDP-KSC-P-1535)
- ID Pre-ORD Spares @CDR (Ref. KDP-KSC-P-1535)
- Baseline Training Plan/Transportation Plan @CDR (KDP-P-2713)

**Production**

- Initial Provisioning of Long Lead LSA Items/Spares
- Verify and validate supportability requirements

**Vehicle Integration**

- Update ILSP/LSA
- MIL-HDBK-502 Plans
- Established for monitoring obsolescence/vendor support
- Establish and maintain an ILS capability, including spares, ground support equipment, and system maintenance and operating procedures, in accordance with the project's ILS
- Final Training Plan/Final Transportation Plan/ Final LSAs (Ref. KDP-P-2713)

**Mission Ops**

- KDP E(IV)

**Stakeholders Expectations**

- Technical Requirements Review
- Logical Decomposition Process
- Design Solution Process
- Product Realization Process
- Product Implementation Process
- Product Transition Process

**Phases**

- Concept
- Systems Engineering
- Integration
- Operations & Sustainment
- Closeout

**Disposal**
Provisioning

Conferences

Identify and prioritize:
- AetNaiidation Spares
- Post ORO spares
- Long Lead Items
- Support to Acquisition with Production

Initiate Procurements
- Support Acquisition with Production
- Act/Val Spares – with production buys post CDR (ref KDP-KSC-P-1535)
- Long lead Items post 90% review/post CDR (ref KDP-KSC-P-1535)
- Post ORD Spares – With production if funding available/post CDR

OMRSD/Maintenance Procedures

PPBE/Budget Data

Provisioning Conferences

Identify and prioritize:
- Act/Validation Spares
- Post ORD Spares
- Long Lead Items
- Support to Acquisition with Production

Fault Modes Effects Analysis (FEMA)/Critical Items List (CIL) B/L @PDR

Reliability Analysis

Drawings/Parts Lists

System Assurance Analysis (SAA)

Limited Operational Life Items List (LOLI)

Guidance Conference Define LSA Format

LSA Analysis

Level of Repair Analysis (LORA)

Indentured Parts List (IPL)

Line Replaceable Unit (LRU) List

Critical Spares List

Recommended Spares Parts List (RSPL)

Long Lead Items List (LLIL)

Standardization/Commonality Data

Heritage Hardware Assessment Maintenance Procedures/ ID available spares

Maintenance Task Outline (MTO)

Identify:
- Consumables
- Support & Test Equipment
- Skills/Training
- Support Documentation
- PHS&T Requirements*

LSA Analysis

OMRSD/Maintenance Procedures

PPBE/Budget Data

Provisioning Conferences

Identify and prioritize:
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- Post ORD Spares – With production if funding available/post CDR
## Logistics Operations Product Dependencies - ILSP Development

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (I)</td>
<td>Preliminary Critical Design Review/PRR</td>
</tr>
<tr>
<td>B (II)</td>
<td>System Requirements Review</td>
</tr>
<tr>
<td>C (III)</td>
<td>Preliminary Design Review</td>
</tr>
<tr>
<td>D (IV)</td>
<td>Critical Design Review/PPRR</td>
</tr>
<tr>
<td>E (IV)</td>
<td>System Acceptance Review</td>
</tr>
</tbody>
</table>

### Guidance Conference
- (3) Preliminary ILSP: Approach for developing an ILSP, ID Supportability Risks to Cost and Schedule
- (2) Supportability Plan: Outlines what is required in an ILSP
- (1) Guidance Conference defines product content and formats
- (4) Independent Logistics Assessment - multi-disciplined assessment of maturity of products required to build logistics infrastructure

#### ILSP Includes Plans for how the following will be accomplished:
- Maintenance
- Design Interface
- Logistics management Information
- Supply Support - Includes Distribution and Post Production Support
- Facilities
- Technical Data
- Personnel and Training
- Test and Support Equipment
- Packaging, Handling, Storage & Transportation
- System Retirement Plan
Logistics Support Documentation

- Current Logistics Paragraph in 21CGSP Program Plan
- Current Logistics Paragraph in SEMP
3.13 Logistics Plan
The Program will implement the requirements in NPD 7500.1, Program and Project Logistics Policy, to define and plan life cycle logistics support required to develop ground systems for emerging flight programs, launch site infrastructure modernization projects, and other potential government and commercial customers. Via the KSC GPD Logistics Division, it will identify requirements, planning, and implementation for: acquisition logistics; supply support; maintenance; training; maintenance documentation/procedures; Packaging, Handling, Storage and Transportation (PHS&T); and logistics information systems. The capabilities listed above will be tailored to meet specific customer requirements through developing formal and informal planning products and analyses as necessary to support the Program at KSC. The required products will be a joint responsibility of the Program Integration Division organization, Operations and Integration organization, and KSC GPD Logistics organization. KSC GPD Logistics will coordinate all logistics support needed in support of customer and stakeholder organizations. Supportability analysis will be accomplished through the application of the following Integrated Logistics Support (ILS) functions, tailored as appropriate: Design Interface (to infuse supportability considerations into the system design/development processes); Maintenance Planning (performing maintenance analyses and planning the approach to performing maintenance for the Program); maintenance and logistics workforce (labor and skill set) planning; Supply Support (identify, plan, provision, acquire, receive, store, transfer, and issue parts and items necessary to support a system and its support items [such as test equipment, shop aids, trainers, and simulators]); Support and Test Equipment; Training and Training Support; PHS&T; Logistics information systems; Facilities analysis; and Technical Data and Documentation necessary to operate, test, repair, and maintain the Program assets.
Logistics Support Analyses identify and address life cycle cost drivers and define system support needs and resources throughout the system life cycle. LSA helps to ensure that supportability requirements are considered in the design process by addressing the following objectives:

- Aids in the establishment of supportability requirements to assist in the development of a cost-effective solution for system support. Outputs include the system maintenance concept and supportability-related design criteria.
- Identifies specific logistics support resource requirements:
  - Type and quantity of support and test equipment
  - Spare and repair part requirements (for maintenance)
  - Personnel skills (maintenance)
  - Training requirements (maintenance)
  - Operations & Maintenance technical data requirements
  - Provisioning Data (spares, vendor/distributor information, etc.)
  - Test and retest requirements
  - Inventory data
  - Packaging, Handling, Storage, and Transportation (PHS&T) requirements
  - Maintenance Task Outlines, maintenance task intervals, and times.

The LSA and requirements allocation activities are interdependent and the most accurate data needs to be coordinated in order to optimize the launch availability, maintainability, and supportability of the systems. The Mean Time To Failure (MTTF), Mean Time Between Failures (MTBF), and Mean Time To Repair (MTTR) used to determine the quantitative availability of the ground system subsystems will be included when available in the LSA in order to affect sparing and sparing analysis.
Activities and Products
The Logistics Support Process product is shown in Table TBD.

**TABLE TBD: GO LOGISTICS SUPPORT PROCESS PRODUCT**

<table>
<thead>
<tr>
<th>Doc Num</th>
<th>Title</th>
<th>Owner</th>
<th>Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>Integrated Logistics Support Plan</td>
<td>GP-L</td>
<td>Updated as program matures or prior to certain program reviews</td>
</tr>
<tr>
<td>Assigned to each Subsystem</td>
<td>LSAs for each design package (housed with design packages in DDMS)</td>
<td>GP-L</td>
<td>Updated as subsystems matures</td>
</tr>
</tbody>
</table>

**Status**
The ILSP will be updated as the program matures and transitions from planning into development and then into operations. As the ILSP is matured the focus will increasingly be the identification of logistics support resources to support operations.