“S1000D: Realizing the Benefits of Integrated Logistics Support”

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S3000L International Procedure Specification for LSA
S10003X Interchange Specification

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Content

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  – Overall content
  – List of Chapters
  – Overview of Select Chapters
  – Data model and data exchange

• ASD S1003X
  – Objective and Scope
  – Overview
Team S3000L

- US and European Aerospace Industries are each represented by a chairman of the working group.
- Workpackage managers are assigned for each chapter.
- ASD/AIA Advisory Board
- Industry & government representation:
• S3000L defines the processes, general requirements and related information exchange governing the performance of the LSA during the life cycle of aerospace and defense products.
  – Influence the product design relevant to maintainability, reliability, testability and optimize life cycle cost
  – Define all required resources to support the product in its intended use, during in-service operation
• May also be used for products from other industrial domains.
Purpose & Scope

- S3000L is designed to cover all processes and requirements governing the performance of the LSA.
  - Provides the rules for the establishment of the product breakdown and for the selection of LSA candidate items.
  - Describes the type and methodology of performance of the specified analyses.
  - Defines the guidelines on how to process the results of the analysis tasks.
  - Explains the interface between LSA and Engineering as well as the various ILS functions.
Milestones

• S3000L International Procedure Specification for Logistic Support Analysis (LSA)
  January 2006    Inaugural meeting (Brussels)
  March 2006      Kickoff meeting (Munich)
  June 2009       Draft Specification Release (Brussels)
  October 2009    End of official commenting phase
  November 2009   Comment review & disposition (Tampa)
                   (tentative)

• Available for download
  www.asd-stan.org/s3000L.html
• General requirements and business rules of LSA
• Comparative Analysis
• Human Factor Analysis
• System breakdown and Product configuration
• Reliability, Availability, Maintainability, Testability and Safety Analysis
• Event Driven Maintenance
  – Logistic Failure Mode and Effects Analysis; Damage Analysis; Special Event Analysis; Scheduled Maintenance Analysis (S4000M, MSG-3, RCM); Operations Analysis
• Software Support Analysis
• Level of Repair Analysis
• Maintenance Task Analysis
• Other Considerations
  – Simulation of operational scenarios
  – Training Needs Analysis (TNA)
  – Tech Data
Chapters

• 01 Introduction
• 02 General Requirements
• 03 LSA Business Process
• 04 Configuration Management
• 05 Influence on Design / RMT Interface
• 06 Human Factors Analysis
• 07 LSA FMEA
• 08 Damage and Event Analysis
• 09 Logistics Related Operations Analysis
• 10 Scheduled Maintenance Analysis
• 11 Level of Repair Analysis
• 12 Maintenance Task Analysis
• 13 Software Support Analysis
• 14 Life Cycle Costs Considerations
• 15 Obsolescence Analysis
• 16 In Service Feedback
• 17 Disposal
• 18 Interrelation to other ASD Standards
  – 18.1 Benefits of using the ASD standard suite
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  – 18.4 Interrelation to S4000M
  – 18.5 Interrelation to S5000F
• 19 Data Elements
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Chapter 3
LSA Business Process

- Establishment of Product Usage Data
- Establishment of Product Design & Performance Data
- LSA Guidance Conference
- Establishment of Breakdown according to agreed rules
- Candidate Item Selection
- Analysis activities for candidate items
- Customer Involvement
- LSA Review / Assessment Conference
- Starting Point / Interface to creation of ILS products
Chapter 7
LSA Failure Modes & Effects Analysis

- Maintenance oriented FMEA
- Based on a product breakdown, limited in depth to replaceable units
- Analyses and records failure modes, failure effects, detection means
- Aims to detect and localize without ambiguousness replaceable units that have failed
Chapter 8
Damage and Special Event Analysis

- **Product Usage**
  - Identify special event to be considered

- **Technology**
  - Identify potential damage to be considered

- Define element or part of the product concerned

- Identify Maintenance Task Requirement
• Task structure – how to document a task
  – Documentation of supporting tasks with the help of subtasks/working steps
  – Documentation of rectifying tasks with the help of referenced supporting tasks and additional subtasks and working steps respectively
  – Integration of preconditions, pre-work and post-work
Chapter 12
Maintenance Task Analysis

• Task Support Resources
  – The resources necessary to perform a maintenance task should be defined at a common level within the task itself.
  – Generally, it should be possible to identify when a resource should be available within the sequence of the task.
  – The Support Resources can be (but not limited to):
    • Personnel
    • Material (spare parts and consumables)
    • Support and test equipment
    • Facilities and infrastructure
    • Technical documentation
    • IT support
Aspects concerning the performance maintenance tasks

- Resources out of supporting task references
- Interrelationship between support resources
- Harmonization of support equipment and spare parts
- Task location aspects
- Product and system availability during maintenance performance
- Support solutions (task variants)
- Task duration and task frequency
- Parallel activities within maintenance tasks
Chapter 19
LSA Data Model & Data Elements

• Objective
  – Express a coherent (logical) S3000L data model and data element definitions for the exchange of data with related business processes.

• Key Aspects of The Data Model
  – Predicated on ISO 10303 AP239 Product Life Cycle Support (PLCS) data model
  – Documents the data from the S3000L chapters
  – Contains the data required to “build” task related S1000D Data Modules
Data Model Units of Functionality (UoF)

- **UoF Project**: Identifies the product(s)
- **UoF Breakdown Structure**: Breakdown of the product(s)
- **UoF Breakdown Element Realization**: Elements being used in the breakdown of a product and the parts that can realize the breakdown element
- **UoF Part**: Hardware and software parts that can realize elements in the breakdown structure
- **UoF Product Usage**: The conditions under which the product is to be operated and maintained
- **UoF LSA Candidate**: Selects the breakdown elements and parts that are identified as being LSA Candidates
- **UoF LSA Candidate Analytical Task Requirements**: Early recording of analytical tasks that will be refined during the Detailed maintenance task analysis
- **UoF LSA Candidate Analysis Tasks**: Identifies and records the progress of logistics support analytical tasks that are to be performed on each LSA Candidate
- **UoF Task Resources**: Identifies material, facility, and personnel resources needed for the execution of a task
- **UoF Task Usage**: Identifies time limits (intervals) and maintenance levels for a task
- **UoF Task**: Detailed definition of a task and its subtasks
• Developed by a subset of S3000L core members and representatives from the S1000D community.

• Objective: Specify data required from the Product Development and Logistic Support Analysis (LSA) activities, in order to produce task related data modules in S1000D.

• Scope:
  – S1000D Maintenance Procedure schema
  – S1000D Maintenance Planning schema
  – S1000D Applicability Cross-reference Table schema
  – S1000D Conditions Cross-reference Table schema
Key Areas

- Product Breakdowns
- Task and Task structures
- Task limits
  - Thresholds
  - Triggers
- Applicability statements
Task Hierarchy in S1000D

S1000D Maintenance Planning Information Data Module

- inspectionDefinition (500 FH)
  - taskItem
  - taskItem
  - taskItem
  - taskItem

- inspectionDefinition (1000 FH)
- inspectionDefinition (5000 FH)

S1000D Maintenance Planning Information Data Module

- taskDefinition (550 FH)
- taskDefinition (650 FH)
- taskDefinition (500 FH)
- taskDefinition (600 FH)

S1000D Procedural Data Modules

- Data Module
- Data Module
- Data Module

S1000D System/Hardware Breakdown

- Data Module
Task Hierarchy in S3000L

Scheduled maintenance package task

Product breakdown

Limit 500 FH

Rectifying tasks

Limit 600 FH

Limit 500 FH

Limit 550 FH

Limit 500 FH

Limit 750 FH
S1000D Task Scope

**Repair procedure (for equipment 401)**

- **Subtask 01** Reference on: Fault location procedure
- **Subtask 02** Remove Cover #01 (opening 4 quick fasteners)
- **Subtask 03** Reference on: Remove Cover #02
  - Working Step 01: Open 24 screws for removal of Cover #02
  - Working Step 02: Remove cover plate
  - Working Step 03: Remove sealing
- **Subtask 04** Reference on: Remove equipment 401
  - Working Step 01: Remove electrical connector E01-013
  - Working Step 02: Open safety screws S01 and S02
  - Working Step 03: Open attaching screws A01 to A07
  - Working Step 04: Remove equipment 401 from housing
- **Subtask 05** Reference on: Disassemble equipment 401
  - Working Step 01: .................
  - ................. .................
- **Subtask 06** Remove defective component 05
- **Subtask 07** Install new component 05
- **Subtask 08** Reference on: Assemble equipment 401
- **Subtask 09** Reference on: Install equipment 401
- **Subtask 10** Reference on: Test function of equipment 401
- **Subtask 11** Reference on: Install Cover #02
- **Subtask 12** Install Cover #01

Reference on: Fault location procedure
Repair procedure (for equipment 401)

Subtask 01
Reference on: Fault location procedure

Subtask 02
Remove Cover #01 (opening 4 quick fasteners)

Subtask 03
Reference on: Remove Cover #02

Subtask 04
Reference on: Remove equipment 401

Subtask 05
Reference on: Disassemble equipment 401

Subtask 06
Remove defective component 05

Subtask 07
Install new component 05

Subtask 08
Reference on: Assemble equipment 401

Subtask 09
Reference on: Install equipment 401

Subtask 10
Reference on: Test function of equipment 401

Subtask 11
Reference on: Install Cover #02

Subtask 12
Install Cover #01

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S1000D preliminary Rqmts

S1000D main Procedure

S1000D close Rqmts
Mapping Details

- S1000D Maintenance Procedure
- S1000D Maintenance Planning
  - taskDefinition
  - inspectionDefinition
  - timeLimitInfo
  - maintenanceAllocation
- S1000D Applicability
  - S1000D Applicability Cross-reference Table
  - S1000D Condition Cross-reference Table
S1000D Maintenance Procedure

- Preliminary Requirements
  - Production Maintenance Data
  - Establish Required Conditions
    - Access Panels
    - Circuit Breakers
    - Defueled
  - Main Procedure
    - S3000L Startup Subtasks
    - S3000L Core Subtasks
    - S3000L Close-up Subtasks
  - Close Requirements
    - Required Conditions Reset

S3000L Objective States
Mapping Procedural Tasks

S3000L

“Procedural” Tasks

Operational Task
Rectifying Task
Rectifying Task
Rectifying Task
Supporting Task

Product breakdown From Design

S1000D

S1000D Identification
Implicit breakdown structure

S1000D Procedural Data Modules

Data Module
Data Module
Data Module
Data Module
Data Module

MAPS ONTO
Mapping Packaged Tasks
Scheduled Maintenance

S1000D Maintenance Planning Information
Data Module

S1000D Procedural Data Modules

Product Breakdown

500FH

Packaged Task

Rectifying Task

Rectifying Task

Rectifying Task

inspectionDefinition (500 FH)

taskItem

taskItem

inspectionDefinition (1000 FH)

inspectionDefinition (5000 FH)

S1000D System/Hardware Breakdown
<table>
<thead>
<tr>
<th>S1000D Issue 4 Element Name</th>
<th>S1000D Issue 4 Element Definition</th>
<th>S3000L Element Name</th>
<th>Note</th>
<th>Mapping – How to Get from S3000L to S1000D (Business Rules)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mainProcedure</td>
<td>Contains a step in the procedure.</td>
<td>Subtask</td>
<td></td>
<td>Business rule: Create one step per S3000L 'Core' subtask.</td>
</tr>
<tr>
<td>proceduralStep@</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>independentCheck</td>
<td>The whole step or individual</td>
<td>Subtask_objective_state or Task_personell_resource_role</td>
<td>Requirement for the step/substep to be checked by e.g. supervisor</td>
<td>Can be defined as a separate Subtask in S3000L, with Subtask_objective_state set to 'Task_checked'. and/or Have a Task_personell_resource with role 'Quality_assurance'. NOTE: Includes all nested Subtask_by_reference.</td>
</tr>
<tr>
<td>proceduralStep@</td>
<td>Skill level required for the</td>
<td>Skill_level_name</td>
<td></td>
<td>The Skill_level_name for the Skill_level being associated with Task_personnel_resource. Identifies the lowest skill required that can perform the whole subtask (in practice the highest skill defined within the task). Rules related to the skill levels needs to be defined for the project. NOTE: Includes all nested Subtask_by_reference</td>
</tr>
<tr>
<td>skillLevelCode</td>
<td>whole procedure and/or for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>proceduralStep@</td>
<td>individual steps/substeps must</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>securityClassification</td>
<td>be checked by e.g. supervisor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>proceduralStep@</td>
<td>security and restrictive marking.</td>
<td>Security_class</td>
<td></td>
<td>Security classification relevant for the subtask. This could be derived from either the security classification of Breakdown_element, Part Task_requirement, Task or Subtask in S3000L. Business rule: Security classification for a breakdown element/part/software shall be propagated to the respective task being associated with the breakdown element/part.</td>
</tr>
</tbody>
</table>
S3000L to S1000D Keys

• LSA key fields cannot generate SNS
  – Project/Product Variant matches ModelIdentCode
  – Data Module Code must be created by Pub’s
  – Task Identifier must be stored as part of DMC Info to provide feedback mechanism

• Process will work better if LSA tasks align “one to one” with Procedural Modules

• S1000D defines Required States – S3000L defines Order of Subtasks to obtain Required States

• Packaged Tasks in S1000D are just another task in S3000L

• Unscheduled Tasks need better definition in S1000D – too much scheduled and planned work
• Released with S3000L for review / comment.
• Available for download

www.asd-stan.org/s3000L.html
Thank You