“S1000D: Realizing the Benefits of Integrated Logistics Support”

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How ILS can be leveraged to reduce costs and increase operational efficiency

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Ian is responsible for supporting the S1000D and ILS products for the Arbortext US Federal, Aerospace and Defense (FA&D) business unit at PTC.

Ian has been involved in S1000D for almost 10 years, initially working in the European aerospace sector, Ian has spent the last three years living and working in the US helping to support early adopters of the S1000D specification on programs such as:

- VH71 Presidential Helicopter
- NLOS-LS
- AMRAAM Missile
- CH148 Cyclone Helicopter
- FIREFINDER Radar
- DCGS

Ian firmly believes the future of S1000D lies as part of a wider set of integrated international standards that address the total lifecycle management needs of complex platforms and systems.
Introduction

In this presentation, we will discuss how the different disciplines and data streams of traditional ILS processes such as Logistics Support Analysis (LSA), Technical Publications, Provisioning and Training can be integrated and shared to:

• Increase operational efficiency on a project
• Increase data reuse between departments and deliverables
• Reduce data redundancy
• Reduce cycle times to delivery

Using case studies from existing S1000D programs we will discuss some successes and lessons learned, where good synergy exists between existing specifications to facilitate this reuse, as well as some gaps in the existing standards that were exposed by this process.
Agenda

• The origins of ILS
• Why do we need to do ILS?
• ILS as it is practiced today
• Programs that have adopted this approach
• Shortcomings in existing ILS specifications
• Future ILS specifications that enable better integration
• TLCSM – The future of ILS
• Summary and Q&A
Origins of ILS
A long time ago in a cube far far away…
The first LSA standards

**Mil std – 1388-1 (1973)**

- The concept for Logistics Support Analysis was originally set forth in MIL-STD-1388-1 published in October 1973.
- MIL-STD-1388-1A overcomes many shortcomings that were identified with the original military standard.

**Mil std – 1388-2A (1984)**

- MIL-STD-1388-2A, DOD Requirements for a Logistic Support Analysis Record (LSAR). This document describes the data elements, definitions, and input data records for the DOD standard LSAR.
- File based (no database)
- Used in Europe early on for the Eurofighter program
- Used in US on F14 and other aircraft programs
The first attempt at an ILS standard

Mil Std 13882B (1991)

- Introduced standard relational database
- Multi discipline/multi process
- Enabled maintenance tasks to be used as source data for technical publications and provisioning (via reports like the 019 and the 036)
- Used on many programs in service today
- In the US, 2B is still the most widely used LSAR standard.
The first true ILS standard

Def Stan 0060 (UK)

- Modification of MIL-STD-1388-2B
- Multi service profiling for air, land and sea
- Multi currency/Metric units (2b was $ and Imperial measurements)
- Included Technical publications (S1000D) mapping guidelines
- Addresses the whole product life cycle
- Still in use today (issue 6)
Figure 2  ILS Process Diagram
The current standards

GEIA-0007

- Re work of 13882B with introduction of XML as an output format from the LSAR
- Defined maintenances task data exchange model for XML
- Designed with tech pubs/LSA integration in mind
- Allows transformation of exchange files to S1000D via XSL
Future Standards – more on this later…

The “S” series standards

PLCS
As technology and computing power have evolved so have ILS standards…
Why do we need ILS?
Doing more with less…
Why now more than ever ILS is critical

“The age of exquisite systems is over” – General James E Cartwright, Vice Chair Joints Chiefs when he addressed the AIA PSC in May of 2009.

- I think the general was saying that the days of pumping billions of dollars into super capable systems that you might never need are over.
- Fixed price contracts based on availability and lifecycle cost
- We need to develop cheaper systems that are fit for purpose.
- We need to keep those existing system that are currently fulfilling their mission operational for longer than originally designed and operate them more cost effectively. (B52 service life = 80 years)

Essentially we need to do more with less!
Doing more with less – Taking an integrated approach to product development and support.

- It’s about different teams of people making their contribution to a common dataset in support of a product.

The same data can be repurposed for different deliverables:

- Engineering data can be used for LSA reliability calculations
- CAD Data can be used for Illustrations
- LSA data can be used for provisioning
- Tech pubs can be used for training content
- Training multimedia can be used in IETP production

Bottom Line:

- If we can do more work with less people for less money we can support our platforms and systems more efficiently!
ILS as it is done today
Well... by some anyway...
Example of a tri-stream ILS process – as described in DS-0060

**Common Numbering System**
- Define LCN Structure
- Link LCNs to Document Codes

**Define Project Numbering System Structure**
- Assign IP Figure Numbers
- IP Figure Compilation

**Link LCNs to Document Codes**
- DMC’s generated on DMRL
- Add additional DMC’s to DMRL

**Define LCN Structure**
- Link DMC to Task

**Identify Support Resources**
- Author Tasks

**Draft Initial Provisioning**
- Spares Range defined by Maintenance Plan

**Release Draft Procedural Data Modules**
- Complete Task and Resource Definitions

**Release Formal IPD Data Modules**
- Master Initial Provisioning

**Release Formal Procedural Data Modules**
- **Initial Provisioning**

**Master Initial Provisioning**
- Draft Initial Provisioning

**Common Source Database**
- IP Figure Compilation

**Logistics Support Analysis Record**
- Define Maintenance Tasks
- Define Support Resources

**Complete Task and Resource Definitions**
- **Publish**
What the data reuse offered by ILS actually means

- Multiple deliverables from a single source
  - S1000D/SCORM/IPC
- Reuse of content
  - CAD to S1000D
  - CAD to LSA
  - LSA to S1000D
  - LSA (H) to S2000M and S1000D
Example programs that have implemented an ILS solution
S1000D Programs that incorporate ILS processes

- Pilatus PC21
- Sikorsky/GDC CH148
- AW UK Apache
- UK ASTOR project
- UK Eurofighter Typhoon
- A400M
- AMRAAM
- NLOS LS
- DDG1000
- VH71
Problems with existing specifications
Problems with existing specifications

• The main problem with the existing specifications is they were all created standalone.
  • 13882B was done for LSA
  • S1000D was done for tech pubs
  • SCORM was done for training
  • Etc..

• What we need is an overarching standard that ties them all together and specifies how they will interoperate.
Example of incompatibility of legacy standards

- Programs - VH71 and CH148
- Problem – Use of 920 (Replace) tasks in S1000D publications
- Customer requirement – separate 520 (remove) and 720 (install) data modules required.
- Cause – LSAR was the source of the maintenance task definition
- Replace tasks are used to roll up H Data (Provisioning) for inclusion in initial provisioning report. Keys of H tasks in LSAR
- If ‘Remove’ and ‘Fit’ tasks are used in the LSAR task definitions it bypasses the inclusion of the supplies data in this report.
- Solution – Custom LSA Task split feature added to LSAR (not part of any existing LSA spec). Problem solved but requires proprietary software solution.
Future specifications that enable better integration
Future Specifications/Specs in development

- The closest thing we have is the “S” series standards from ASD.
- These do not address product data
  - PLCS does to some degree but does not go far enough (too much variance in product data).
- Perhaps we need to merge/harmonize ‘S’ series with PLCS for a TLCSM standard?
Total Life Cycle Systems Management (TLCSM)
The future of ILS
What is TLCSM?

Total LifeCycle Systems Management is an evolution of LSA, ILS and PBL (Performance Based Logistics)

It encompasses two main initiatives:

- Product development
- Product sustainment

The key to a true TLCSM solution is joining these processes together in a single, closed loop, configuration managed environment where the business of managing a product over its entire life cycle is easily achieved.
**A&D Mega-Initiative:** Total Lifecycle Systems Management

**TLCSM**  “Program Management oversight of all lifecycle activities associated with acquisition, development, production, fielding, sustainment, and disposal of a weapon system”

“Translating user-specified performance requirements into deliverable capabilities representing system readiness, availability, and logistics supportability”

**A Systems Engineering Approach to Product Development**

*Designing for Support & Supporting the Design*
The A&D Process Landscape

Integrated Defense Acquisition, Technology, & Logistics Lifecycle Framework

Management
- Portfolio Management
- Program Management
- Project Management
- Proposal Response
- Change & Configuration Management
- Quality Management
- Requirements Capture & Management
- Concept Development

Engineering
- System Design
- Electro-Mechanical Detail Design
- Variant Design & Generation
- Electro-Mechanical Design Validation
- Design Outsourcing
- Early Sourcing & Procurement
- Component & Supplier Management

Procurement
- Manufacturing Process Management
- Manufacturing Outsourcing

Manufacturing
- Logistics Support Analysis
- Provisioning
- Technical Publications (S1000D)
- Training & eLearning (SCORM)
- MRO/Equipment Management
- Performance Analysis

Support

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Engineering>Analytics>Approval>Data Release and Re use

As designed BoM

Technical Data Re use (DMRL)

**LSAR LCN Structure**

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**Associativity Between BoM/LCN/SNS/DMRL/CAD/2D/3D**
PTC’s Product Lifecycle Management System

**BOM Analytics**
- Reliability Analysis
- Maintainability Analysis
- Availability Analysis
- Lifecycle Cost Analysis

**Logistics Support Analysis**
- FMECA, RCMA, FMEA

**Engineering Data**
- Engineering BOM
- CAD
- Specifications
- Designs

**Provisioning**
- Spares stocking
- Serviceable BOM
- Spare parts list
- Maintenance task definition
- Spares requirements

**Tech Pubs**
- IPC / IPD
- Maintenance Manual
- Operators Manual
- IETM / IETP
- Maintenance Procedures
- Maintenance Tasks

**Training**
- Training courses
- Valid configurations
- Actual service procedures
- As Maintained BOM Mgt
- Job cards / Work orders
- Service Records
- Utilization

**MRO**
- Resource Scheduling
- Scheduling & Execution

**Performance Management**
- Recommended Service Interval/Plan
- Manpower & Skill Sets
- Facilities, Packaging & Transport
- Support & Test Equipment
- Supply Support & Spares reqts
- Level of Repair/Economic LORA

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Summary

We need to practice ILS on our projects now more than ever.

• Systems have much longer operational lives than intended (B52 service life of 80 years)

• Project Life cycle cost will be the overriding factor for DoD/MoD contracts

• Undertaking deliberate ILS processes and using ILS friendly tools and standards will enable companies to produce their deliverables with less people in less time

• Technology and standards are the key to unlocking these potential cost savings

• As a community of LSP’s lets stop thinking about tech pubs, start thinking about product data!
Q&A