LOTAR International Project Report for 2022

Aircraft have very long lifecycles. There can be 80 years between the initial design for a new program and the end of life of the last one delivered. Throughout the product lifecycle, the data defined for archiving and retrieval must be provided in a standardized format that can be read and reused regardless of changes to the original IT environment. Ensuring this is the goal of LOTAR.

LOTAR is a project under the joint auspices of AIA, ASD-Stan, AFNeT, PDES, Inc. and the prostep ivip association. It aims to develop, implement, test, pilot, publish, and maintain standards for long-term archiving and retrieval of digital product and technical information. This includes CAD and PDM data, composites, wire harnesses, MBSE artifacts and CAE simulation data. The multi-part standard describes both the information content and the processes for recording, storing, managing, and accessing information. The documents are published as parts of the EN/NAS-9300 series of standards.

Focal Points & Concrete Results 2022

Basic & Common (B&C) Process Parts:

The basic and common process parts are building the foundation of LOTAR and are based on the ISO 14721 OAIS Reference model, integrating the needs of the aerospace industry. To reflect the growing scope of the project, the workgroup revised the LOTAR Structure (Part 001) and submitted the new document for publication alongside the third edition of Terms and References (Part 007)

3D Mechanical:

The 3D Mechanical CAD with Product and Manufacturing Information (PMI) Workgroup revised the common concepts for 3D mechanical CAD information (Part 100) to reflect the evolution of CAD methods and systems in recent years. The restructuring also makes it easier to reference and verify LOTAR traceability requirements during a corporate audit. A first pilot project was started on PMI at assembly level based on STEP AP242 XML.

PDM:

The team validated the STEP mappings of the product data in the "as designed" stage (Part 210) and in the "as planned" stage (Part 230) and prepared Part 210 for the external publication ballot; this is to be done in 2023. A major focus of work was coordinating requirements with other domains, e.g., CAD and MBSE. Together with the PDM IF, the workgroup finalized the description of common use cases including relationships between alternate and substitute parts, validation properties, and PDM viewer requirements.

Composites:

The workgroup defined PMI requirements for composites including limited length and application indicators (LLAI). They also discussed the need for data standards to support the use of composite data in downstream manufacturing and NC processes, and reviewed input for AP242 Edition 4.

Electrical Wire Harness:

The aim of the workgroup is to identify and maintain the data required for the definition of a wiring harness. The design and analysis processes must include both electrical (ECAD) and mechanical (MCAD) data. The group agreed on a common view of the essential information of a wire harness and defined an approach to integrate ECAD and MCAD, leveraging the AP242 Domain Model to maintain design and analysis data.

MBSE:

The focus of the team's activities is on the development of standards for general MBSE archiving (Part 500) and for the archiving of simulation/analysis models (Part 520). The use cases for archiving simulation/analysis models have been extended based on prototype results. They describe a reliable method for linking requirements to a simulation model, an improved workflow, and a formal method

for determining validation criteria. The working group has coordinated the results with other consortia such as prostep ivip association, NAFEMS, INCOSE, AFNeT, A&D PLM AG, and OMG.

Organizational / Technical Challenges

The creation of standards for long-term archiving requires both technical and archiving-specific know-how. The difficulty is that member resources are limited, and experts are often involved in more than one LOTAR workgroup. This led to delays in some working groups that slowed progress. On the technical side, challenges arose because the design methods, tools, and data for model-based approaches are often not yet mature and the corresponding target standards, such as AP242 Edition 4 or χMCF, are under development.

What is Planned for 2023

The planning of the B&C working group includes creating new versions of the LOTAR Fundamentals and Concepts (part 003) and other process parts. In the PMI area, the parts on CAD geometry data with graphical and semantic PMI and on CAD assembly structure are to be revised. In addition, the working group will begin documenting the requirements for archiving CAD assembly structures with semantic PMI as Part 126.

The PDM Working Group plans to review the diagrams and process charts for product data in the "As Planned" stage and prepare Part 230 for external publication ballot. It also intends to propose to update the Technical Specification for Validation Properties and publish it as LOTAR Part 205. The Composites WG will finalize the principles and concepts for archiving composite design data (Part 300) and make proposals for enhancing STEP AP242 Edition 4.

The Electrical Workgroup's goal for the current year is to publish a solution for archiving electrical design data in general (Part 400) for archiving physical wiring harnesses for design and construction in particular (Part 410). The MBSE WG will publish the fundamentals and concepts for MBSE long-term archiving (Part 500) and for archiving analytical models (Part 520). It also aims to demonstrate the content of MBSE archive packages and the workflow for archiving and retrieval using publicly available test models, real authoring tools, and newly developed tool prototypes.

Project Coordination Team's Statement:

The fact that face-to-face meetings were possible again this year had a significant impact on the progress of the LOTAR project. From the point of view of project coordination, it was particularly gratifying that we were able to revise and improve the procedure for coordinating LOTAR documents with AIA and ASD. This will significantly accelerate their publication as EN/NAS standards.

Project Chairs' Statement:

In the next year, we would like to revive the Engineering Analysis workgroup, which deals with archiving of CAE simulations. We hope that the project partners will provide the necessary resources. We would also like to attract new project partners who are interested in topics such as electrics & electronics, or long-term archiving of embedded software.

Participants

Europe: AFNeT, Airbus Commercial Aircraft, Airbus Defence & Space, Airbus Helicopter, Leonardo

Americas: The Boeing Company, Embraer, GE, Gulfstream, Lockheed Martin, Raytheon Technologies, Sandia National Laboratories

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