

LOTAR International Project Report for 2023

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 the aerospace industry association AIA and ASD, as well as PDES, Inc. and prostep ivip. 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 2023

Basic & Common (B&C) Process Parts:

The B&C Workgroup successfully published new versions of the LOTAR Standard Structure (Part 001) as well as the Terms and References (Part 007) and has submitted the Fundamentals and Concepts (Part 003) for external ballot to ASD and AIA. Progress has slowed down due to limited availability of resources and expertise, which can only be recovered by inclusion of external contributors.

3D Mechanical:

The 3D Mechanical CAD with Product and Manufacturing Information (PMI) Workgroup started revising the Explicit CAD Assembly Structure (Part 115). In close collaboration with the Cx-IF, which is part of the MBx Interoperability Forum jointly hosted by AFNeT, PDES, Inc., and prostep ivip, a second pilot project commenced on PMI at assembly level based on STEP AP242 XML, with the goal to update the recommended practices.

PDM:

The PDM Workgroup prepared the first edition of the LOTAR standard for Product Data in the "as planned" Stage (Part 230) and reviewed the comments from the external publication ballot of Product Data in the "as designed" Stage (Part 210). The workgroup continued the definition of common use cases with the PDM-IF (Interoperability Forum).

Composites:

The Composites-Workgroup supported development of AP242 Ed.4 to include limited length and application indicators (LLAI). They also supported the launch of a project supporting the use of composite data in downstream manufacturing and NC processes, and refined the long-term archiving needs for related composite data. The team relaunched the efforts to publish the Principles and Concepts for Long-term Archiving Requirements for Composite Data (Part 300).

Electrical Wire Harness:

The aim of the Electrical 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 team primarily concentrated on the Electrical Harness contents of the AP242 Domain Model and supported the activities of the Interoperability Forum for Electrical Wiring Interconnection Systems (EWIS-IF).

MBSE:

The MBSE Workgroup focused on the finalization of the standard for general MBSE archiving (Part 500) and progressing on archiving of simulation/analysis models (Part 520). The team has

developed a strong connection to the INCOSE community, representing the LOTAR specifications at the INCOSE International Workshop and Symposium. The team supported the MBSE stream at the Global Product Data Interoperability Summit (GPDIS). A paper demonstrating the LOTAR MBSE Results was produced and presented in the 15th Modelica Conference. The working group has coordinated the results with other consortia such as prostep ivip, NAFEMS, Modelica, INCOSE, 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 impacts the progress in some working groups.

The different editorial requirements for LOTAR standards in Europe and America are still a challenge, but progress has been made with ASD and AIA to resolve those. The 3rd Quarter Workshop took place in conjunction with the GPDIS conference, which provided opportunities for promoting LOTAR but resulted in a condensed schedule with limited time for team meetings.

What is Planned for 2024

A lot of detailed work awaits the working groups in the current year. For example, the B&C team will prepare the overview of the data flow for external ballot and revise the documents on authentication and verification, data preparation, and ingest. The PMI team will revise the documents for geometry data with graphical and semantic PMI and for the CAD structure, and start documenting the requirements for archiving CAD assembly structures with semantic PMI.

In addition to the publication of Part 210 and the coordination of Part 230, the PDM workgroup will prepare the update of the validation properties for product data together with the PDM-IF. The Composites workgroup has set itself the goal of submitting proposals for improving the composites data model in STEP AP242 Ed. 5. The electrics team plans to finalize the basics and concepts for archiving electrical signing data and define requirements for archiving physical wire harnesses for signing and design purposes.

The MBSE working group plans to finalize and publish the basics and concepts for MBSE long-term archiving as well as the elaboration of the specific parts for archiving analysis models and requirements. These parts include documentation, schema formalization (XSD/OWL) as well as model examples and implementations of tool prototypes for archiving and retrieval. Finally, the team plans to reuse the MBSE model integration solutions for archiving and retrieval collaboration.

Project Coordination Team's Statement:

In 2023, we presented LOTAR's progress at several major conferences, including the prostep ivip Symposium and GPDIS. This allowed us to attract the interest of potential new members. Closer interaction with the user groups within the MBx-IF has also enabled us to align the aviation industry's requirements for long-term archiving with the engineering requirements of other industries.

Project Chairs' Statement:

Next year, we want to reactivate the "Engineering Analysis & Simulation" workgroup together with sponsors and participants from industry. We expect the project partners to provide the necessary resources to complete the further development of the standards in this area. We would also like to attract new participants who are interested in topics such as electronics, software (e.g. avionics, flight control) and metrology.

Participants

Europe: Airbus Commercial Aircraft, Airbus Defence & Space, Airbus Helicopters, Leonardo

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

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