

MTU AERO ENGINES AG IMPLEMENTS A MODEL- BASED ENTERPRISE AS A MAJOR STEP TOWARDS DIGITAL CONTINUITY

Capgemini Invent supports MTU Aero Engines AG in building up a continuous model-based value chain by establishing a single-source-of-truth data model along the entire product lifecycle

A leader in the aviation industry

MTU Aero Engines is Germany's leading engine manufacturer and an expert in the development, production and maintenance of civil and military engines. Their innovative engine solutions have been shaping the aviation industry for more than 85 years.

A model-based way of working will be crucial for MTU's entire value chain in the long term. Starting from their own development and production, it is expected to be the standard for collaboration with partners and suppliers in future aerospace programs.

Overview

Client: MTU Aero Engines

Industry: Aerospace & Defense

Region: Global

Client Challenge:

The siloed implementation of data and processes based on 2D drawings increasingly resulted in numerous discontinuities along MTU's value chain. To remain competitive and manage the rising complexity, MTU wanted to change their strategy on how to design, manufacture as well as inspect and control their products in the future.

Solution:

Capgemini Invent supported MTU Aero Engines AG with a strategic paradigm shift, replacing today's 2D-drawings with a full 3D digital master as a single-source-of-truth with connected data along the entire value chain.

Benefits:

- Development of an end-to-end model based process with multiple use cases
- Extensive proof-of-concepts and business cases for each use case
- Ongoing implementation by means of a scaled agile framework based on SAFE
- Remarkable efficiency increase for prioritized use cases through enhanced data continuity
- Model-based value chain improves communication and avoids data transfer errors

Shifting to a model-based value chain

Like most of today's manufacturers, MTU was facing major challenges regarding rising product and program complexity, shorter development times and costs as well as increasing collaboration with partners and suppliers. At the same time, the rising number of IT enterprise systems on the one hand and manual processes on the other hand caused a high amount of system and media breaks as well as data redundancies which affect overall efficiency and costs.

To reduce this complexity and accelerate product development, it was crucial for MTU to build up a unique authoritative and consistent stream of information running across their product life cycle – a so called model-based value chain.

From use case selection to implementation

Together with Capgemini Invent, MTU identified the model-based value chain as the first step towards a digital twin. The model-based value chain implements a 3D digital master as a single-source-of-truth with digitally connectable data along the entire value chain. This 3D digital master is also called the model-based definition (MBD).

The project started by selecting a reference product to develop the first MBD for. The analysis of the legacy end-to-end processes of the reference product involved internal stakeholders and experts, which resulted in the identification of media breaks in the value chain. With support from Siemens Digital Industries Software (Siemens) and BCT Technology as both software providers, multiple model-based use cases have been verified for technical feasibility. In parallel, business cases were calculated in close cooperation with management.

After a successful validation with both internal stakeholders as well as partners and suppliers, the productive implementation is currently ongoing within MTU's large PLM transformation program INTEGRATE. By means of a scaled agile framework, the prioritized use cases are translated into features and functionalities which are continuously delivered within 3-month cycles.

The new way of working is a comprehensive paradigm shift for MTU. To guarantee the acceptance of this, a fundamental change management concept has also been elaborated. In combination with regular reviews from end users and management, a core team of experts has been selected to function as multipliers of the technology in the organization.

Optimized communication and high-quality data

Within the current implementation, MTU has already achieved major milestones to enable a model-based value chain. It is expected that MTU can activate efficiency increases in the overall process chain, with validated and prioritized use cases being implemented. Once created in the design phase, data and specifications defining the MBD can be reused downstream in all processes and no duplicates are created. Therefore, the main levers for MTU so far are better internal as well as external collaboration and communication, avoidance of data transfer errors as well as partial automation of processes due to processing of machine-readable information.

The MBD was created in the early design phase within MTU's established CAD system NX from Siemens. Together with all related data and specifications, so called product and manufacturing information (PMI), the MBD is directly synchronized to the PLM backbone system Teamcenter after creation. Within Teamcenter, all these PMIs are directly linked to and visible on the MBD. At the same time each PMI is assigned its own independent lifecycle in Teamcenter and can be consumed in downstream processes and workflows to ensure information consistency and avoid data redundancy.

Driving aerospace innovation together

The cooperation between MTU and Capgemini Invent as well as Siemens and BCT Technology will continue within the joint PLM transformation program INTEGRATE. The main scope for the next phase is focusing on further use cases with the highest possible

benefits. This means leveraging the closed loop manufacturing process, and validating results with partners and suppliers from major aerospace programs.



The model-based value chain is a key enabler in improving our overall efficiency and quality. It allows us to further cooperate with all partners and suppliers along the value chain, in order to build the next generation of sustainable engines for the future aviation.

Dr. Frank Rick
Head of Design,
MTU Aero Engines

About MTU Aero Engines

MTU Aero Engines AG is Germany's leading engine manufacturer. The company is a technological leader in low-pressure turbines, high-pressure compressors, turbine center frames as well as manufacturing processes and repair techniques. In the commercial OEM business, the company plays a key role in the development, manufacturing and marketing of high-tech components together with international partners. Some 30 percent of today's active aircraft in service worldwide have MTU components on board. In the commercial maintenance sector the company ranks among the top 3 service providers for commercial aircraft engines and industrial gas turbines. The activities are combined under the roof of MTU Maintenance. In the military arena, MTU Aero Engines is Germany's industrial lead company for practically all engines operated by the country's military. MTU operates a network of locations around the globe; Munich is home to its corporate headquarters. In fiscal 2022, the company had a workforce of more than 11,000 employees and posted consolidated sales of 5.3 billion euros.

About Capgemini Invent

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