

## MTU Aero Engines AG

Featured Standard: **ASAM ODS**

### ASAM ODS Used in Multi-National Development of the Turboprop Engines for the Airbus A400M

#### SUMMARY

The Airbus A400M is a European joint project to develop and produce a military transport aircraft for tactical airlift operations. The maiden flight of the A400M was in December 2010 and the first aircrafts are being delivered to France in 2013 and Germany in 2014. The technologies used in the A400M are considered to be a bridge to the next generation of civilian aircrafts. This is specifically true for the advanced TP400-D6 turboprop engine. With a maximum output of 8,203 kW, it is currently the most powerful single-rotation turboprop engine in the western world. Despite its power, it is very fuel efficient for its class.

The TP400-D6 turboprop engine is developed by Europrop International GmbH, a joint-venture of MTU Aero Engines, Snecma, Rolls-Royce and Industria de Turbo Propulsores. The TP400-D6 is a complete new design developed from scratch. To enable the partnering companies to carry out this collaborative development project, they had to set up processes and data exchange methods that allows efficient cooperation in this ambitious project. ASAM ODS turned out to be an important part of this endeavor.

#### SITUATION

The construction of an engine starts with finite-element models and calculations of the solidness and stability of the construction. Tests with prototype engines have to be carried out to optimize the engine design, to validate the calculated robustness of the construction and to ensure that limits are not exceeded. A significant portion of this are NVH-tests that require to dynamically measure acceleration, vibration speed, strain and pressure. Sample rates reach up to 102 kHz. The amount of data produced in such tests is enormous and easily reach terabytes of size.

The joint-venture companies were soon confronted with the question how to exchange test data among each other. Each partner uses its own types of sensors, measurement systems and data storage formats, provided by different tool suppliers. Furthermore, tests are carried out at different locations. The resulting test data then has to be transported to other

locations for post-processing and evaluation. The involved companies had to come to an agreement how to share and exchange the data in an efficient way to keep this project manageable. Since each company works with proprietary systems, there was no obvious answer to this question.

#### SUCCESS STRATEGY

From the beginning of the project, MTU Aero Engines and its tool supplier Müller-BBM VibroAkustik Systeme proposed to use ASAM ODS for exchanging test data. The standard offers two essential components that are needed by all partners:

- an NVH application model, which provides a semantic definition for the test data
- an XML-based file format (ATFX) for data serialization and file-based data exchange

The tools from Müller-BBM are aware of the ASAM ODS NVH application model and have an importer and exporter for the ATFX-file format. Since all other system suppliers agreed to the ASAM ODS, the partners settled on ASAM ODS as the standard for test data exchange. The most important reasons for their decision were:

- long-term stability of the standard: no frequent changes of file formats, which would jeopardize interoperability of tools and potentially causes loss of data
- public standard: fully documented file format and tool-vendor independence
- availability of tools: sufficient support of the standard by COTS products

Based on this decision to use ASAM ODS, the partners made further internal agreements to exchange raw, time-series data and to use a specific catalog of units. Since every company required additional data to be stored along with measured raw data, the ASAM ODS NVH application model was extended by each company with their specific meta data. Data exchange between the four partnering companies now had a solid foundation.

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**CHALLENGES DURING THE PROJECT**

Once the decision was made for using ASAM ODS, it still took about a year to develop ATFX importers and exporters for all tools used by the joint-venture companies. Software engineers engaged in the development of the tools mentioned that the standard is quite complex and not easily understandable, but also acknowledged that it is a solid and well-thought-out standard. Once this challenge was overcome and the tools were developed, data exchange worked seamless between the involved companies.

As expected at the beginning of the project, the amount of data produced for testing the TP400-D6 turboprop engine was enormous. MTU Aero Engines produced about 10 terabytes of NVH test data throughout the project. This amount of data could not be transported via the Internet for cost and security reasons. The data was stored in ATFX-files of 2 to 10GB of size, saved on hard disks and then sent via express mail to the other partners for further use.

**BUSINESS BENEFITS**

This seemingly low-tech method worked flawless and proves that big technical challenges between companies can actually be solved once they agree on the use of common standards. The joint-venture companies continue to use internal and proprietary databases within their own companies. But with the agreement on using ASAM ODS, they were actually able to exchange test data between them without having to spend major efforts in data conversion or maintaining data quality. Without using a public standard such as ASAM ODS, the companies would have to develop their own standard for their joint-venture project and would probably be still negotiating the technical details until today, when the project is almost finished. ASAM ODS significantly accelerated this process and allowed to implement a data exchange infrastructure that was ready in time when it was actually needed.

**OUTLOOK**

The initial effort to introduce a data exchange format in the European aircraft engines industry is done.

*“The multi-national European project TP400-D6 turboprop engine forced us to find a common standard for test data exchange. ASAM ODS was the right standard to help us solve this problem. The standard enabled us to implement a test data exchange infrastructure between the joint-venture companies just in time when it was needed.”*



Aero Engine TP400-D6



EPI Europrop International GmbH was created by four leading European aero-engine companies to manage the TP400 engine program.

From the perspective of MTU Aero Engines, it would just make sense to continue to use ASAM ODS on a European scale and to further benefit from the established data exchange infrastructure. MTU Aero Engines also plans to use ASAM ODS as an internal standard for data exchange and intends to propose the use of ASAM ODS with his business partners Pratt & Whitney and GE in the US to gain the same benefits.