

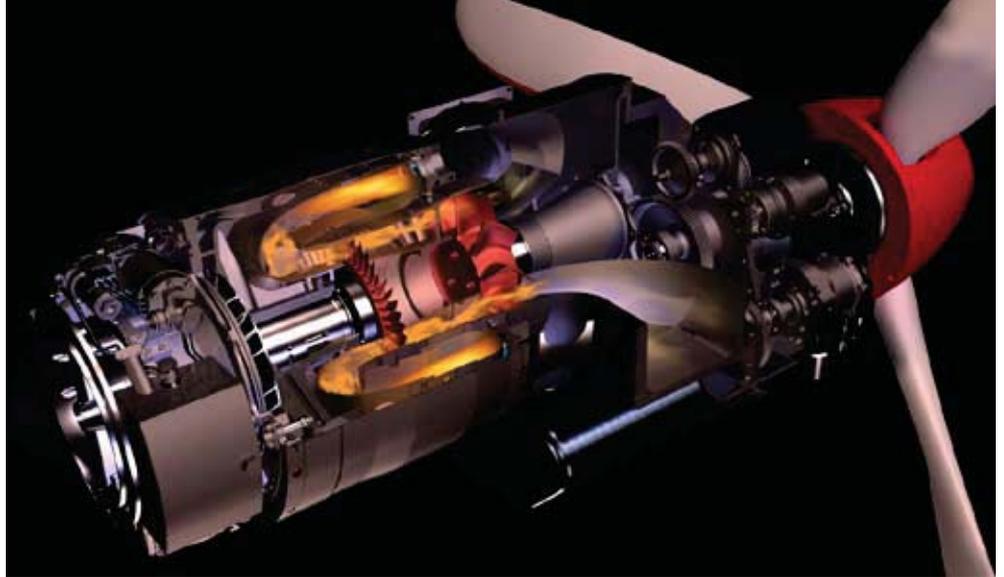
The Aeronautical Research
and Test Institute (VZLÚ)

Autodesk 3ds Max Design

“We need true visualization and animation capable of providing realistic experience to present digital prototypes, not only to aircraft experts, but also to business partners without knowledge of technical details. Autodesk 3ds Max Design has enabled us to carry on with a quality of presentation that is miles ahead.”

Ing. Radek Hýbl
Head of the Engine Division
VZLÚ

True Customer Visualization of Aircraft Engine with Autodesk 3ds Max Design



Customer

The Aeronautical Research and Test Institute (known by its Czech acronym VZLÚ) was founded in 1922, being one of the first establishments of that type on the European continent. More than 80 different aircraft types have passed through the Institute's labs to date. VZLÚ is a major centre for aeronautic research, development and testing in the Czech Republic. VZLÚ currently employs 350 professionals. The key part of VZLÚ's activity includes projects won in public competitions contracted by government administration bodies, projects contracted by the EU, and commercial activities for both private and public companies from the Czech Republic and abroad. One of the significant sections of VZLÚ is its Engine Division.

Among its many research activities, the Engine Division has been involved in a design of modern reduction gear-box for a small prop-jet aircraft engine representing a unique category in today's turbine aircraft engine global market. The engine is being constructed in co-operation with PBS Velká Bíteš, which has already developed commercially successful turbojet engine TJ 100 A. This engine, as the so-called core, forms the basis for the prop-jet engine TP 100, which is also being finalized by PBS. The new reduction gearbox has been designed for that company. První brněnská strojírna has currently manufactured a prop-jet engine demonstrator, while business communication and presentations of engine capabilities for potential customers have been in progress.

První brněnská strojírna Velká Bíteš, a.s., (PBS),

a Czech machine manufacturer, focuses on manufacturing power units, ecological devices, aviation engineering, cryogenics, precision casting, moulds for precision casting and the moulding of plastics, fixtures and special tools, galvanic surface finishing etc. The Aircraft Technology division of První brněnská strojírna Velká Bíteš, a.s. - as the only one in the Czech Republic and one of few firms in Europe - is able to manufacture Auxiliary Power Units (APU) based on a small turbine engine with an output of up to 100 kW. The division newly developed and launched into production the small turbojet engine TJ 100A with a thrust of 1100 N, which has become a basis of the TP 100 prop-jet engine. První brněnská strojírna Velká Bíteš a.s. currently employs 750 people.

Project challenges

The 4-year research program entitled TANDEM, announced by the Czech Ministry of Industry and Trade, has been finalized in 2008. The demonstrator of the propjet engine has come into existence through application of the research project results and is one of the real outputs verifying the results. Until now, the modeling phase and construction works (both in VZLÚ and PBS) have already been finished and PBS has manufactured and completed the engine demonstrator.

Autodesk®

The key constructional challenge of the small prop-jet engine project was a design of modern reduction gear-box. The engine is twin-shaft (with free turbine) - flow of hot gas generated by engine core powers the spinning free turbine whose shaft enters the reduction gear-box while spinning the airscrew shaft. The purpose of reduction gear-box is to lower high rotational speed of the free turbine to rotational speed appropriate for aircraft propellers. With regard to analysis of activities necessary for designing complex aircraft turbine engine nodes, Autodesk Inventor as a high-quality software tool became the customer's choice. This, in conjunction with highly experienced construction engineer mastering the work on CAD systems, enabled designing the reducer construction quickly and effectively. However, one of the important requirements for software was the demand for advanced visualization of the product in the pre-manufacturing phase, including various views and animation for attractive presentation to customers.

The solution

VZLU tested the Autodesk 3ds Max Design solution - the main reason for using this software lies in the unlimited capabilities of visualization, in making visual effects including fire, smoke etc. and transforming solids to surfaces. The whole scene of the aircraft engine is too complex to be set in motion in Autodesk Inventor Studio, requiring too much power from computer hardware. Inventor Studio is a perfect, intuitive tool for smaller projects, but for the purpose of more complex animation computer hardware naturally cannot set the whole scene in motion.

If the scene is transformed to surfaces, which are used by 3ds Max Design, the requirements for computer hardware are lowered and animation works perfectly. During import of data from



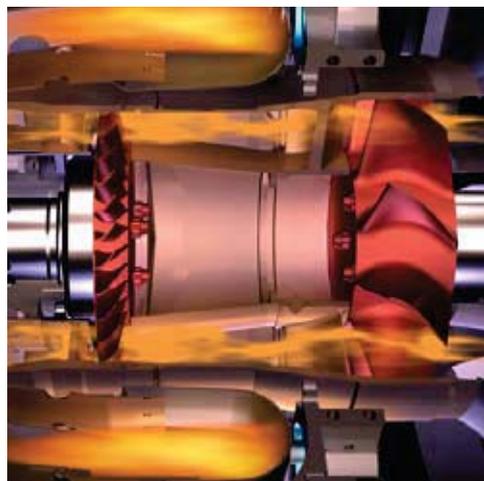
Autodesk Inventor into Autodesk 3ds Max Design, the default settings of surfaces and the import itself worked without any problem, i.e. the number of surfaces was sufficient for the complex shapes of individual engine parts. This was followed by setting the model in motion, texturing, lighting, camera setting and image and animation rendering proper.

Benefits of Autodesk 3ds Max Design

Autodesk 3ds Max Design has proved to be the fastest way to achieve required results, get better quality overall view of the aircraft engine functionality, and create materials for marketing purposes. The solution enables to create visualization and animation rapidly and effectively, and allows an optimum use of the available computing capacity.

Visual materials created in 3ds Max Design streamline communication with customer and make the presentation processes more effective.

VZLU intends to use Autodesk 3ds Max Design also for other projects, typically for presentation of aerodynamics, strength-of-structure experiments etc. For example, the institute currently works on a new concept of a combustion chamber, another task in hand is an energy project focused on designing a flexible energy system using waste heat on a jet engine basis. VZLU will also use the software for a wide range of European Union grants from the aircraft industry and space projects.



“3ds Max Design enables us to use only data describing surfaces, something like a shell, without having to include volume data. This substantially streamlines presentation of digital prototypes on an average computer and increases quality and realistic view. Moreover, in the 64bits software version, we were able to accelerate computing work by 15 %, which means dozens of hours of computing time.“

Stanislav Brařka
VZLU