



HEATSSIM – WORLD-LEADING SIMULATION OF AEROSPACE TRANSMISSIONS

Challenge

To optimise the design and simulation process for aerospace transmissions.

Solution

To identify which factors are most important, and which calculations can be run quickest and with the simplest model of the transmission, then to consider these factors earlier in the design process.

Benefits

Romax developed a unique multi-fidelity design process. The most influential, simple and fast methods are used for the initial investigation, transitioning to more detailed methods when confirming the performance of the final design. All the key performance considerations are included, and each method uses a single definition of the transmission so that all analyses are up to date at all times.

Romax Technology Limited, ANSYS and the University of Nottingham are working on a project part-funded through the UK Aerospace R&T Programme, to optimise the design and simulation process for aerospace transmissions.

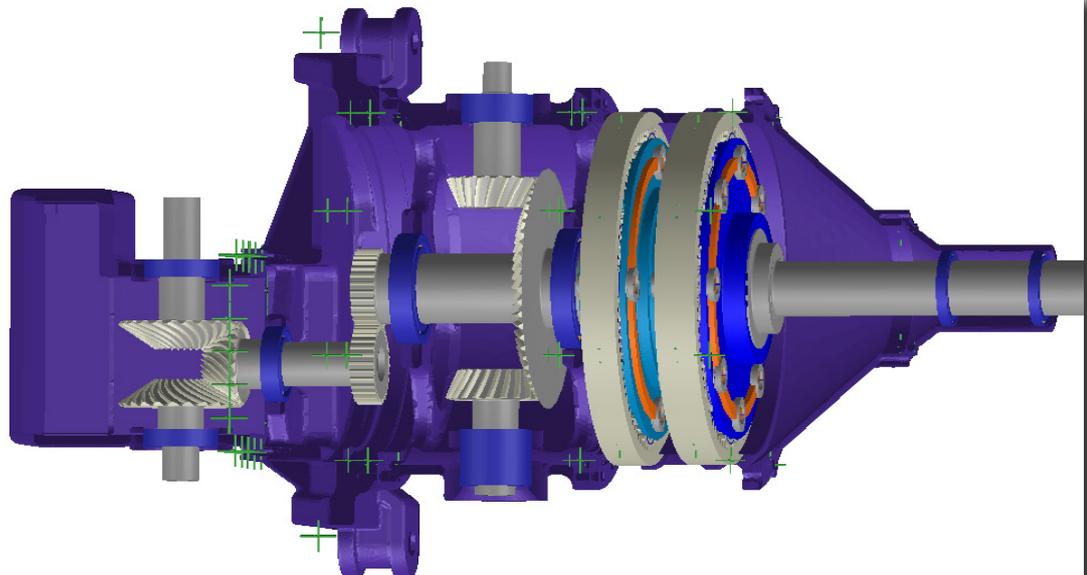
The project

Named HEATSSIM (Holistic Engineering Approach to Thermal and Structural Simulation) was a 2 ½ year, £1.0m project that looks at augmenting Romax' mechanical understanding of transmissions with the thermal/fluid capabilities of Ansys, a global leader in generalist simulation software and the specialist application knowledge provided by the University of Nottingham.

The project application was supported by major aerospace manufacturers who followed the project progress and outcome.

Transmissions are an essential sub-system in any aerospace application. The transmission system is central to the design and operation of any helicopter, either for commercial or military use, and the next generation of ultra-high bypass gas turbines for aircrafts have a transmission at the core. In engineering design, progress requires pushing the boundary of performance, yet this cannot be achieved within sensible time of cost limits through making and breaking prototypes. Simulation is the key.

Romax was able to use its simulation platform and RomaxDESIGNER to analyse how the transmission responds under different operating conditions and environments.



RomaxDESIGNER model of a helicopter transmission for multi-physical simulation.

Romax Chief Technical Officer, Barry James, "This is an exciting addition to our technology portfolio and we see excellent prospects for the future. Romax has been first to market on other technologies such as simulation of gearbox noise and this has brought in steadily rising revenue for many years. We expect this technology to have similar success and longevity."



There is a lot going on in a transmission which needs to be simulated – they deform under load, make noise, they heat up, oil gets thrown around by meshing gears; too much oil and the transmission is inefficient, too little and it overheats. The gears cannot fail, with scrupulous safety standards to adhere to in the aerospace industry.

The project was not just to simulate all the important physical behaviours, but to link them together, providing an efficient and productive process that guides the engineer to an optimised design.

By looking at the key physical behaviours of the transmission through simulation issues, can be addressed such as deflection of the transmission under load, heat generation and dissipation, noise and vibration and response to shock loads, and an overall picture of what is going on can be generated. Using this information, engineers can analyse and make big steps forward in understanding how these behaviours interact, enabling significant improvements in terms of optimising the performance of the transmission.

Central to this process is a workflow, currently being used for consultancy, developed by ANSYS which links the software products RomaxDESIGNER and ANSYS Fluent. Believed to be the first of its kind in the world, it aims to democratise the use of advanced simulation tools by allowing a greater range of engineers to carry out these tasks, reducing the burden on the experts.

In the automotive sector, where highly integrated electric drive systems are being designed, thermal management is key to achieving the high efficiency and power density demanded in electric vehicles. The transmission simulation capability developed through HEATSSIM has strong cross-over to the automotive sector to address these challenges.

Everyday, engineering is asked to tackle enormous environmental challenges of reducing CO2 across multiple industries. This project sits squarely at the centre of tackling these challenges, today and far into the future.



RomaxDESIGNER can transfer designs to ANSYS Fluent for fluid simulation) through an automated workflow

To find out more

Contact us via marketing@romaxtech.com
or visit www.romaxtech.com

UK Aerospace R&T Programme, www.ati.org.uk/funding/uk-aerospace-rt-programme/

