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LMS Imagine.Lab for aircraft engines

Studying the dynamic behavior and performance of jet engines and their equipment

Benefits

- Assess jet engine performance
- Optimize overall energy consumption by accounting for engine equipment interaction with the jet engine
- Study dynamic behavior of fuel systems by investigating pressure surge analysis and thermal coupling with the lubrication circuit
- Access multiple design levels, from components to complete systems with control strategies
- Assess tradeoffs between hydraulic and electrical thrust reversers
- Significantly reduce development time and costs by anticipating potential integration issues

Summary
LMS Imagine.Lab™ software for aircraft engines allows you to define the exact boundary conditions for aircraft systems such as electrical power generation, bleed systems, fuel systems and flight dynamics. You can assess the jet engine's performance including various equipment impacting its efficiency (bleed system) or making it run safely (lubrication circuit).

With access to more realistic boundary conditions for every onboard power network, you will be able to assess the overall efficiency of the integrated aircraft in various conditions. You can study the impact of aircraft mission requirements in terms of thrust, available power and fuel consumption.

Not only does the solution help you predict the behavior of jet engines, it also supports the design of engine components and systems including fuel systems, starters, bleed systems and their controls, and engine control actuators.

The solution is based on the LMS Imagine.Lab Amesim™ multi-domain system simulation approach. It provides dedicated thermal hydraulics libraries with customizable components that, when connected together, represent either the fuel system or the lubrication circuit of the jet engine. The aerospace fluids database of standard and customizable components is based on aeronautics standards and ensures model accuracy.

Finally, the solution helps you improve design quality, while reducing development time and associated risks on the core engine and all its equipment.

Combustion
Using the functional engine representation, you can also carry out high-level analyses to assess combustion phenomena and pollutant emissions.

Fuel system
The solution is perfectly adapted for early fuel system design and allows you to accurately represent components such as pumps, high-pressure shut-off valves or the complete fuel metering unit. It offers you the possibility to study the fuel system under a wide range of operating conditions (including failure cases) when performing metering robustness analysis and pressure pulsation analysis to ensure a constant flow to the combustors.

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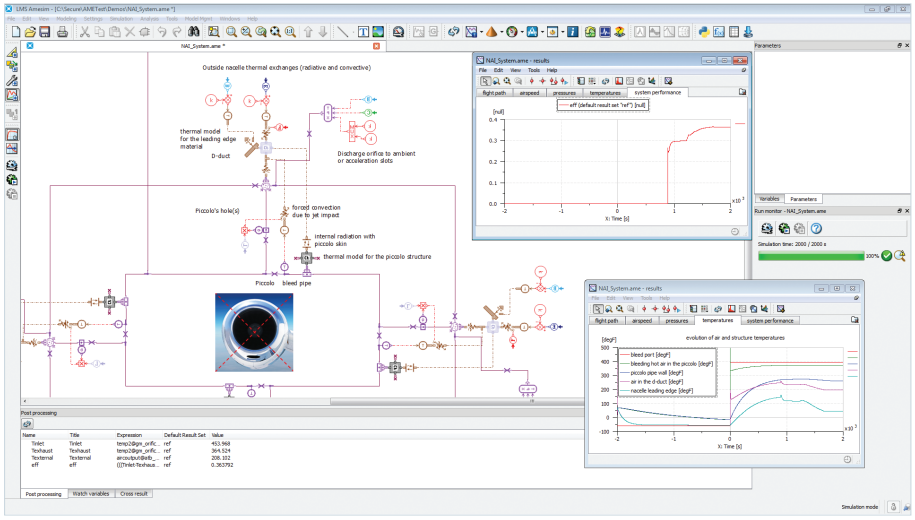
Features

- Advanced thermal hydraulic components including variable air/gas content and their dynamics as well as large fluids database
- Representation of heat exchangers, turbines, compressors and valves
- Multi-level and multi-domain modeling of components (mechanics, thermal, electrical and thermodynamics) for valves or actuators
- Pressure, flow and temperature evolutions through engine equipment
- Advanced analysis tools, Simulink® interface and S-function export

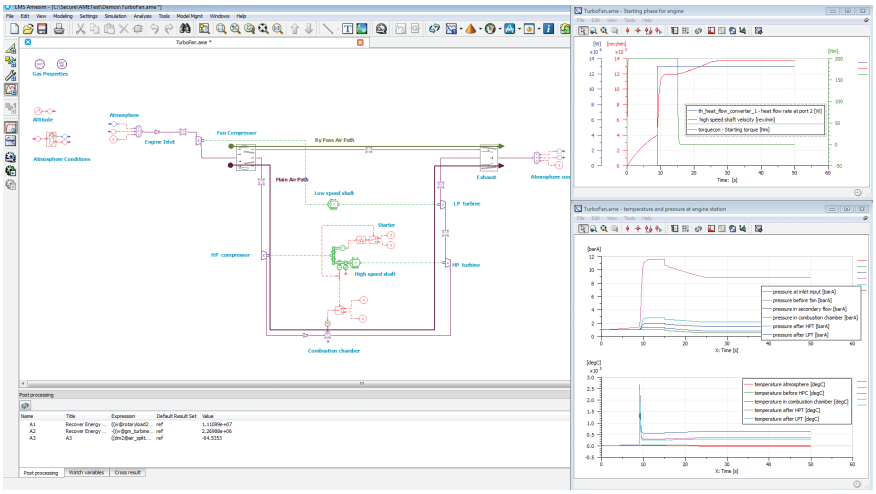


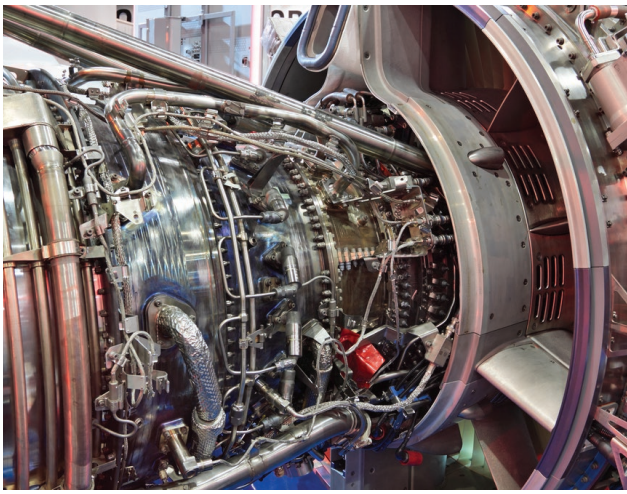
Thrust reverser

The solution also helps you ensure aircraft safety by assessing thrust reverser behavior under various operating conditions. It simplifies trade-off analysis to investigate electrical and hydraulic solutions, for example. Other protection systems such as fire protection systems or nacelle leading edge anti-icing systems can be designed as well.

Nacelle ventilation

Taking into account various scenarios (even abnormal events such as a burst duct event), the solution allows you to assess engine bleeding system efficiency, including consumers like environmental control systems and anti-icing systems. In order to increase fuel efficiency and decrease drag, the solution helps you correctly size the bleeding system and obtain input for the analysis of thermal stress on bleed piping.



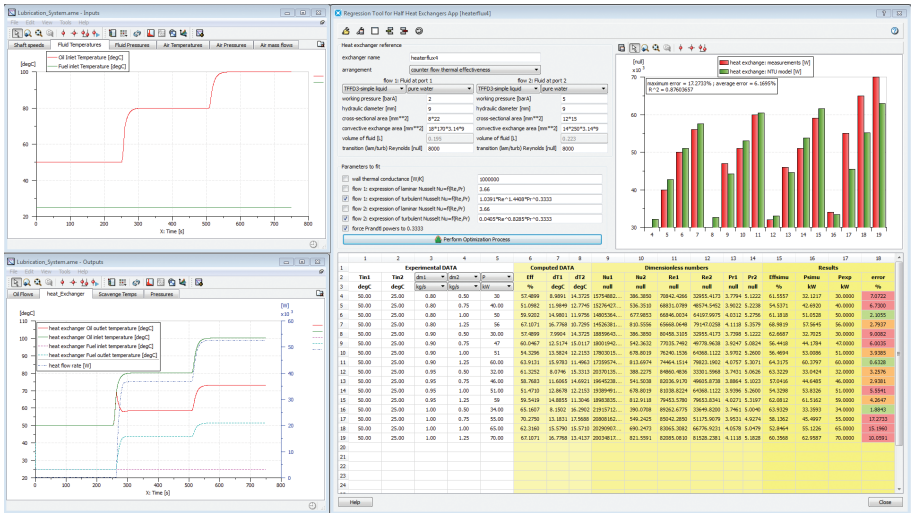


Bleed air

To maximize aircraft fuel efficiency and foresee potential integration issues, the aircraft engine solution helps you perform pneumatic circuit and component design for bleed air network and actuator modeling. You can also identify and solve instabilities due to interactions between actuators and the circuit, and optimize the design of valves working at high temperatures.

Lubrication system and engine thermal management

Finally, the aircraft engine solution supports a global representation of the engine lubrication system, as well as the transient thermo-hydraulic analysis of the oil system. It enables you to study heat exchanges in the fuel-cooled oil cooler during various flight phases as well as the bearing outlet temperature in order to avoid degradation issues.



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