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Siemens PLM Software

# What's new in LMS Imagine.Lab 14 for aerospace and defense

## Accelerating model-based systems engineering

**Benefits**

- Design better products faster
- Provide a smooth user experience through all design phases
- Streamline and accelerate your simulation process
- Bring together mechanical parts and controls design
- Strengthen collaboration throughout your organization
- Leverage unique architecture-based configuration environment


**Summary**

The latest release of LMS Imagine.Lab™ software brings a broad range of enhancements aimed at ensuring a smooth user experience through all phases of the design cycle.

Major development efforts have concentrated on improving usability. New methodology guides and process-related features now allow you to design better products within a shorter timeline.

A set of the latest enhancements for controls validation, real-time simulation and central processing unit (CPU) time reduction allows you to easily address engineering challenges when designing both mechanical parts and controls.

To meet the needs of increasingly complex transverse engineering organizations, LMS Imagine.Lab 14 continues the trend toward openness, which is a key element in streamlining collaborative work. To facilitate model-based systems engineering (MBSE), the newest version of LMS Imagine.Lab provides you with an enhanced architecture-based configuration environment.

For aerospace and defense manufacturers and suppliers, Siemens PLM Software not only extends the multi-domain capabilities of LMS Imagine.Lab, but it also delivers significant improvements for advanced subsystems design and integration optimization through virtual aircraft modeling.

# What's new in LMS Imagine.Lab 14 for aerospace and defense

**Features**

- New innovative multi-domain libraries and application-oriented solutions
- Enhanced solver and numerical capabilities coupled with powerful analysis tools
- Improved usability and efficiency
- Extended openness to other simulation environments
- Integration under the umbrella of product lifecycle management

**Maximize model accuracy**

LMS Imagine.Lab Amesim™ integrates many of the new and enhanced capabilities in its transverse physical libraries.

The thermal fluids libraries have been improved with the capability to represent the variation of gas contained in the liquid along the fluid network, as well as represent the dynamic of aeration and gas dissolution, providing a great degree of model refinement for detail design of high frequency thermal-fluid systems throughout the aircraft.

LMS Amesim comes with an enhanced gas mixture library that enables you to achieve higher fidelity when modeling pneumatic circuits by representing the transport of condensate droplets in the gas. For instance, you can assess the presence of fog in ducts across heat exchangers and within cabin components in order to optimize the relative humidity that directly affects passenger comfort.

With new discrete partitioning capabilities, LMS Amesim helps you significantly reduce CPU time when dealing with complex and highly dynamic thermal-hydraulic systems.

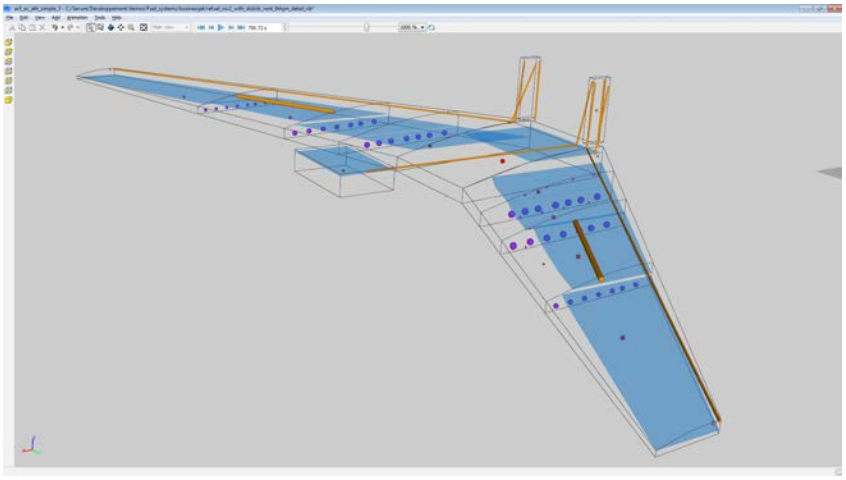
Supporting modeling across all stages of the design cycle, LMS Amesim provides you with 3D mechanical junctions for real-time simulation. For instance, it helps you perform model-in-the-loop (MiL), software-in-the-loop (SiL) and hardware-in-the-loop (HiL) simulations when dealing with complete models in which the controls, electrical and hydraulic actuation systems are connected to the complete 3D mechanism, such as landing gear with actuation and braking systems.

LMS Amesim now offers you a dedicated graphical user interface (GUI) that significantly eases data import from finite element method (FEM) software by controlling the data validity and format.

In the context of accelerated aircraft electrification, LMS Amesim provides you with precalibrated lithium-ion (Li-ion) nickel cobalt aluminum (NCA-C) battery models. Using a new demonstrator, you can easily compare different battery cell technologies and choose the most appropriate one based on battery usage. LMS Amesim enables you to rapidly model hybrid electric and full electric systems and accurately estimate the voltage and heat flow rate.

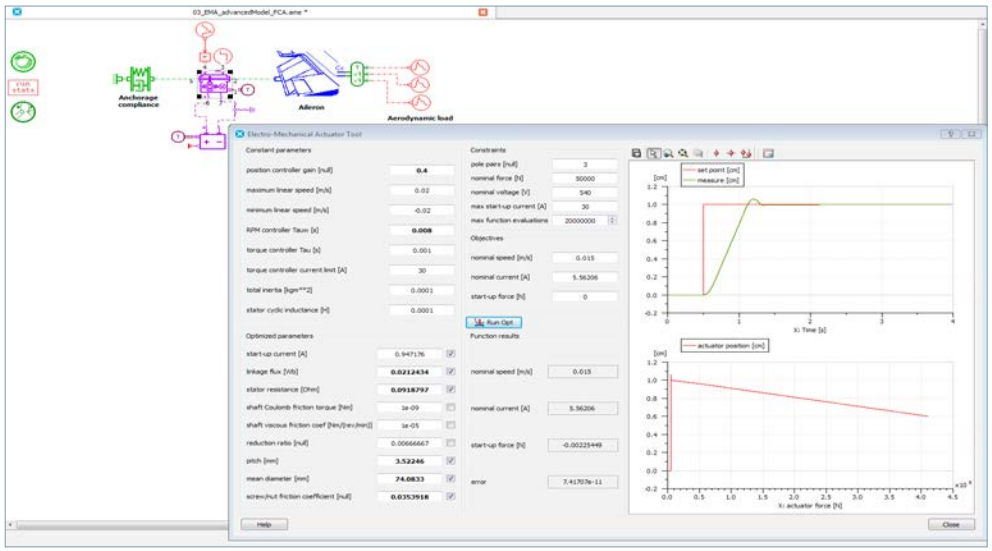
**Boost performance with virtual aircraft**

LMS Imagine.Lab Amesim has been enhanced in release 14 for advanced features to enable the performance optimization of many critical subsystems.



To design advanced fuel systems, a new 3D modeling assistant greatly enhances the usability of the solution by automatically creating the 3D scene with bi-directional parameter updates, providing the animation of results and allowing for the import of 3D objects. You will be able to more rapidly and easily model and analyze the system's behavior.

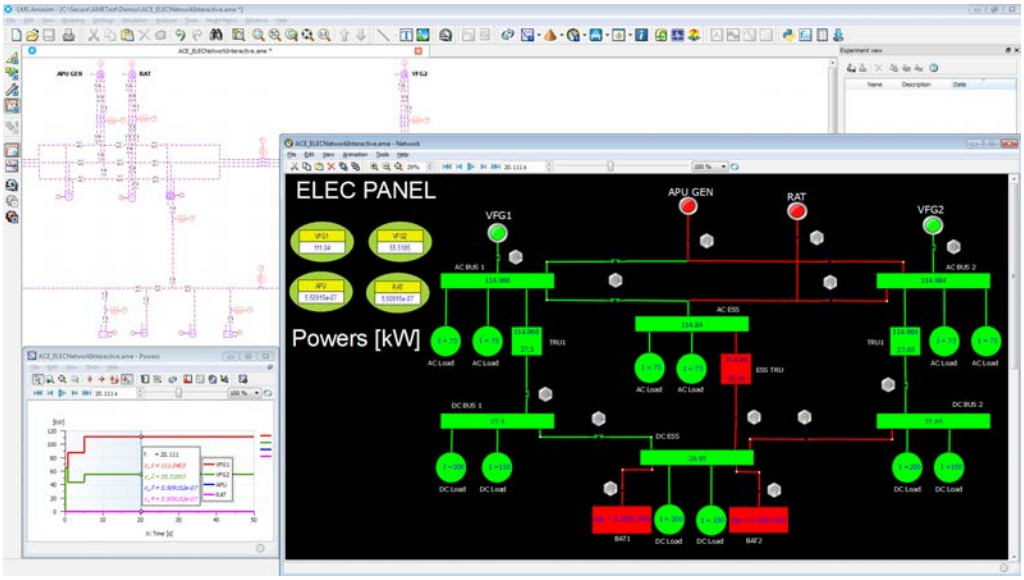
In addition, the variation of altitude and acceleration of the aircraft is accounted for in the fluid pipes to size the fluid components and validate critical design cases during fast maneuvers such as a rejected takeoff.

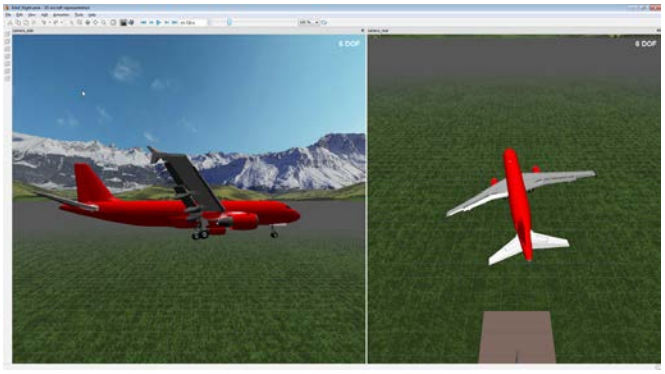


To ease the optimization and sizing of electromechanical actuators (EMA), a parameter setting tool has been developed. This easy-to-use environment permits a faster sizing of EMA for real performance assessment and rapid configuration of a complex assembly using the supplier's dataset.

Over the years, the capabilities of LMS Imagine.Lab Amesim have been strengthened to help you design the electrical network of any aircraft, supporting the more electric aircraft trend. With LMS Imagine.Lab 14, electrical network modeling tips have been implemented in the aircraft electrics library manual. You can now rapidly assess the power budget with real physical boundary conditions from other systems to electrical systems, and get an at-a-glance view of Air Transport Association (ATA) 24 integrated with power consumers.

New components in electrical switches and relays for aircraft electrical network are also in release 14 for failure case analysis and reconfiguration strategy. It enables you to assess inductive effect in relay coil, gain valuable insights into the protection system performance and run realistic reconfiguration scenarios and assess transient behavior (short circuit, etc.)





New flight dynamic components have also been added in the aeronautic and space library.  New aircraft body models account for aerodynamic loads as well as environment settings such as the effect of round earth assumptions on the flight mission. This capability allows for simulating the longitudinal performance, lateral stability or six degrees of freedom (DOF) analyses over its full mission or a particular maneuver for design and validation purposes, accounting for the variation of the environment, such as the altitude, atmospheric pressure and temperature.

In the field of propulsion systems modeling, LMS Imagine.Lab Amesim 14 brings new jet engine models of various architectures to allow for the fuel consumption analysis as well as the thermodynamic analysis for predesign of propulsion systems at aircraft level over the flight missions. In addition, the new propeller performance map generation tool based on the propeller geometry and airfoil allows for a more refined design of the propeller propulsion systems, considering aerodynamics performance and accurate effort computation on the blade for designing systems such as pitch actuation.

**Integrate model-based systems engineering in your organization**

Siemens PLM Software continues to extend its support of Modelica for LMS Amesim by offering a wider range of supported Modelica models and the possibility of handling electrics/power electronics models with diodes.

The new release supports the latest functional mockup interface version (FMI 2.0 co-simulation master) to reinforce the role of LMS Amesim as an integration platform for co-simulation of complex coupled systems.

To better answer your needs when validating plant models, driving scenarios and control logics, LMS Amesim now enables you to build more advanced statecharts and visualize your simulation results.

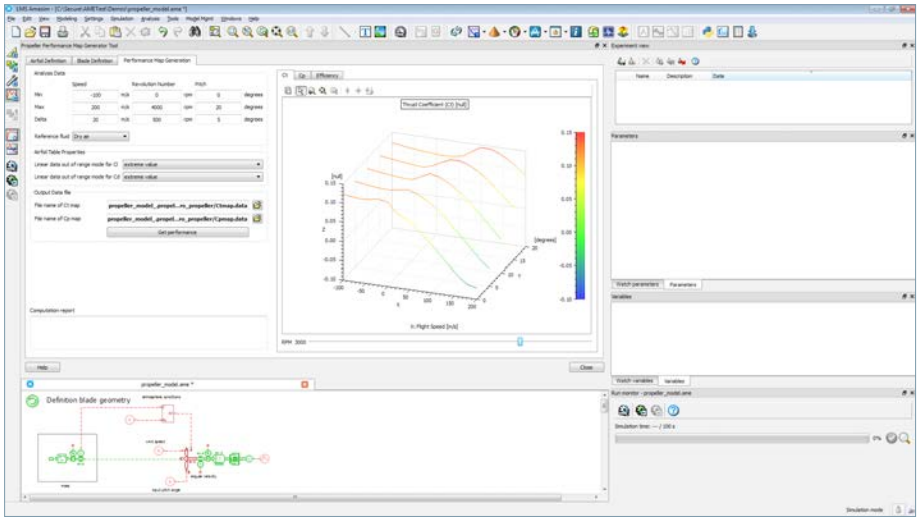
When creating, parameterizing and simulating models, LMS Amesim helps you import experimental data with the right format without using third-party middleware, easily compare simulation results with measurements and streamline your workflow even when dealing with large files.

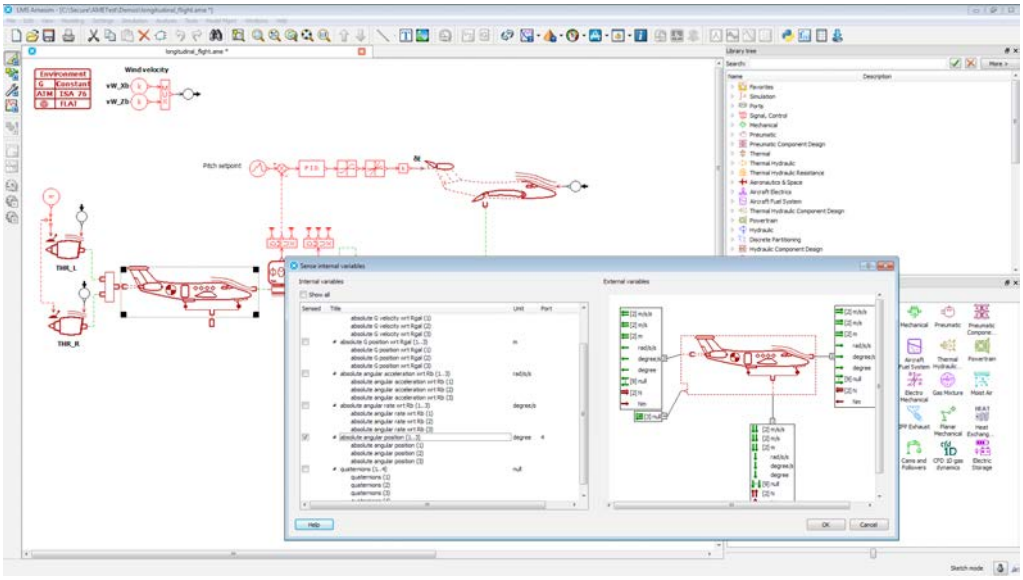
LMS Amesim enables you to detect algebraic loops directly on the sketch and then to easily simplify models, especially for faster CPU times or real-time simulation.

LMS Amesim 14 comes with the enhanced performance analyzer that allows you to understand numerical performance bottlenecks to enhance CPU time as well as to make the model optimization process easier.

You can benefit from enhanced customization and improved usability of application-dedicated plots by creating graph annotations, callbacks or plot manipulators, enabling you to use your mouse for interactive work with plots.

To boost CPU performance, LMS Amesim provides new data processing and filtering tools. You can now easily modify filter parameters and view changes in the same plot.





Even nonexperts can rapidly adapt existing components for controls or signal processing purposes by using a new user-friendly and time-saving feature, enabling engineers to sense internal variables at additional ports for connection with other LMS Amesim components or interface blocks.

The capabilities of LMS Amesim to facilitate continuity between the computer-aided design (CAD) and 1D approach have been extended. It enables you to extract geometric information to populate submodel parameters in LMS Amesim.

The process of creating an application (app) has become simpler with new menus and an enhanced Python editor.

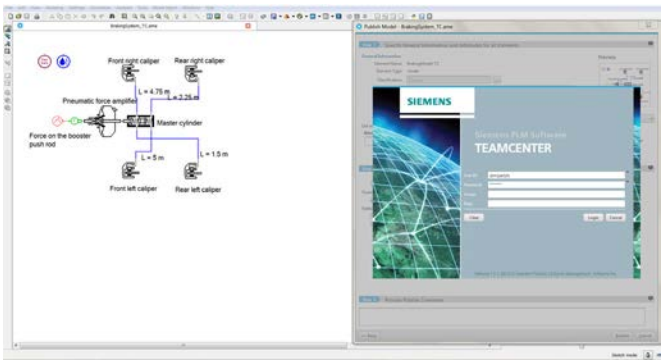
As part of LMS Imagine.Lab, LMS Imagine.Lab Sysdm software and LMS Imagine.Lab System Synthesis software also include important improvements.

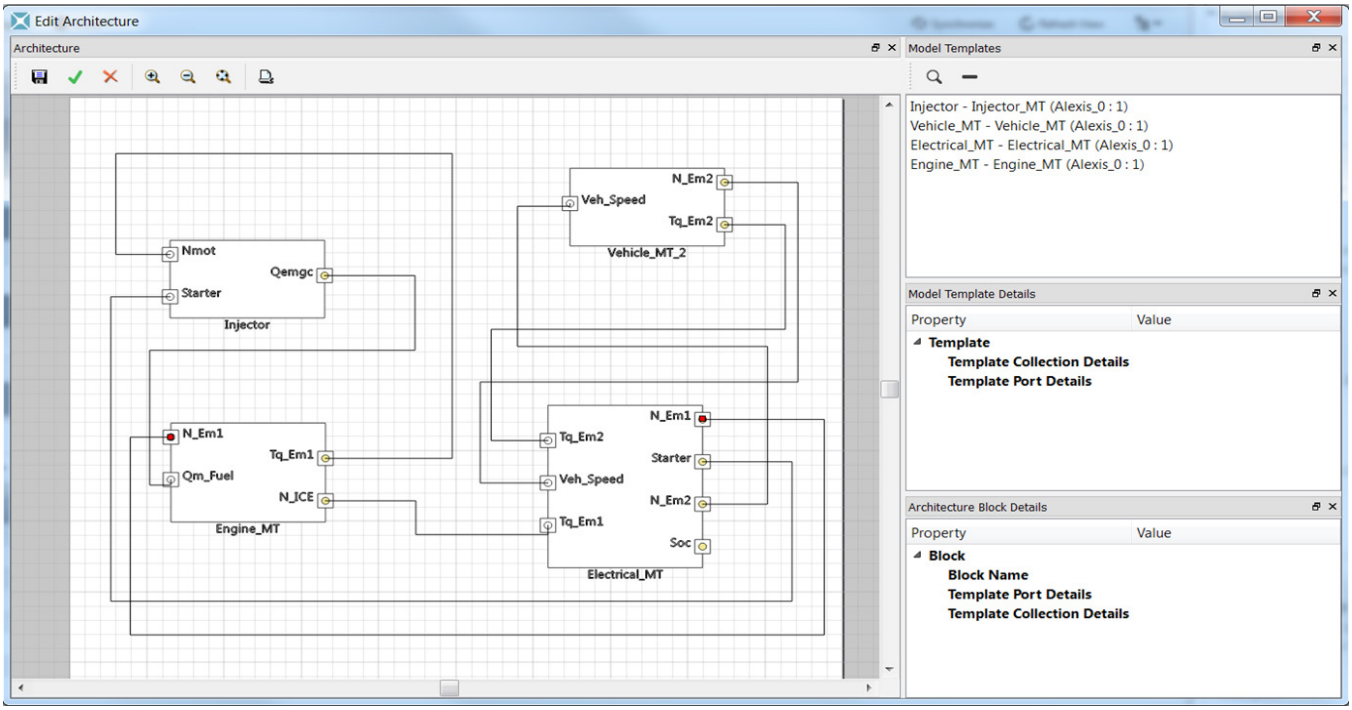
For LMS Sysdm, development efforts have focused on integrating model management in the organizational environment. LMS Sysdm provides you with a direct link from LMS Sysdm to Teamcenter® software. It enables system engineers to directly publish validated models to the Teamcenter repository while accounting for their daily activities. Thus, system simulation is integrated under the umbrella of product lifecycle management (PLM), taking into account daily versioning and branching, which are mandatory for monitoring modeling activities.

Moreover, the manage users and login features of LMS Sysdm can be synchronized with your information technology (IT) infrastructure. New users can easily be added from the company's active directory server, and the security of the LMS Sysdm login process has been significantly improved.

LMS Sysdm now ensures smarter management of the traceability of your development activities. The branching and versioning capabilities allow you to create many variants when building models. You can cut branches into versions to keep only the most important ones. At the same time, merging multiple branches enables engineers who are working concurrently to put their individual contribution into a unique branch. And when concurrent engineering is not required, you can lock a branch to secure its undesired evolution while you continue working on it.

Model import into LMS Sysdm has become easier since the tool adapts seamlessly to the model structure required by your authoring tool.






LMS System Synthesis brings MBSE to the next level with architecture-driven design capabilities. Not only can you design your reference architecture, but you can also configure it with models taken from the repository in order to create a simulation model for a given purpose. This reference architecture can be imported from a SysML description or from a LMS Amesim or Simulink® model, which is available in the LMS Sysdm repository.

One of the new capabilities in LMS System Synthesis enables users to create tool-neutral reference architectures. LMS System Synthesis 14 provides you with an embedded sketcher in which the architecture is drawn by the simulation architect. You can capitalize on your experience and product knowledge by providing fully customizable templates in the repository.

LMS System Synthesis also brings major enhancements in the field of heterogeneous configuration and co-simulation capabilities. It offers you advanced support when creating heterogeneous model configurations. For example, when using a Simulink model in combination with an LMS Amesim model, the required model interface blocks are automatically added during the configuration process. You don't need to manually create these interfaces on the model anymore, and you can re-use the same model in many different configuration scenarios.

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