PilotStation

A Pilot Interface for FLIGHTLAB® Flight Dynamics Models

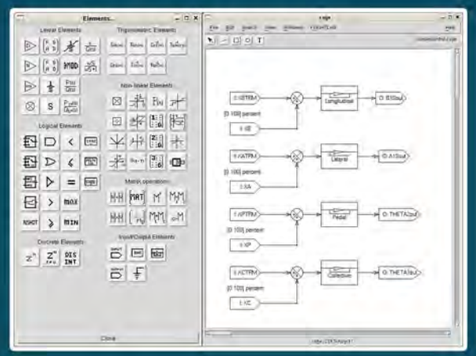
PilotStation is an add-on to the FLIGHTLAB® Development System providing a pilot interface and real-time simulation capability for Development Models. The pilot interface includes an out-the-window display, heads-up display, instrument panel, and USB joystick control. Since PilotStation is operated from the FLIGHTLAB® Development System, the user has access to the entire model via the Xanalysis command line and can therefore implement changes to model properties during the execution of the real-time simulation.

PilotStation facilitates desktop engineering evaluation and rapid model enhancement. This FLIGHTLAB® add-on allows the user to assess flyability, control response, and handling qualities prior to generating a standalone FLIGHTLAB® Run-time Model for the Run-time System, where model modifications are more limited.

PilotStation includes a custom interface to the FLIGHTGEAR Open Source image generation program. FLIGHTGEAR supports rendering of OpenFlight files for out-the-window, instrument, and external view displays. PilotStation also provides a Common Image Generation Interface (CIGI) protocol to support other image generation applications that use CIGI. PilotStation includes a generic terrain database and a generic instrument panel display for demonstration and testing purposes.

Control System Graphical Editor

The Control System Graphical Editor (CSGE) provides the capability to generate control system models with sufficient complexity to replicate aircraft on-board systems. CSGE is a block diagram control system editor, and is similar in operation to SIMULINK®. The developer selects the desired component blocks from an element library and arranges them on a canvas. Through interconnection of the control system blocks, any type of control system can be modeled including flight, engine, and fuel control systems. CSGE also provides the capability to define and connect the control system inputs and outputs with the appropriate interface variables in the FLIGHTLAB® model.



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ADVANCED ROTORCRAFT TECHNOLOGY

A LEADER IN ROTORCRAFT SIMULATION

FLIGHTLAB® Development System

Enabling the development and analysis of rotorcraft, helicopter, and other air vehicle models, including eVTOL and FLV, for engineering and simulator applications.

ART

FLIGHTLAB® Development System

The FLIGHTLAB® Development System is a computer aided engineering software tool to support modeling and analysis of flight dynamics.

The FLIGHTLAB® Development System provides a finite element based development and analysis environment for the modeling and simulation of rotorcraft, hybrid configurations, and fixed-wing aircraft. These dynamic systems are created from a library of individual, physics-based modeling components such as springs, dampers, airfoil sections, etc. The classes of components include aerodynamics, control, structure & kinematics, propulsion, etc. The modeling components are interconnected to form aircraft structures and subsystems. A robust multi-body dynamics solution is used to solve the interconnected model in a fully coupled fashion. The resulting model is termed a Development Model and is completely editable within the FLIGHTLAB® Development System.

The component-based modeling approach allows for the modeling of any desired dynamic system and the assignment of vehicle-specific values to build a wide range of vehicle configurations. The individual modeling components in the FLIGHTLAB® library have been vigorously formulated, programmed, and tested for accuracy over the span of 25 years of applications. In addition to the provided FLIGHTLAB® components, users may write their own components to accomplish specific modeling requirements.

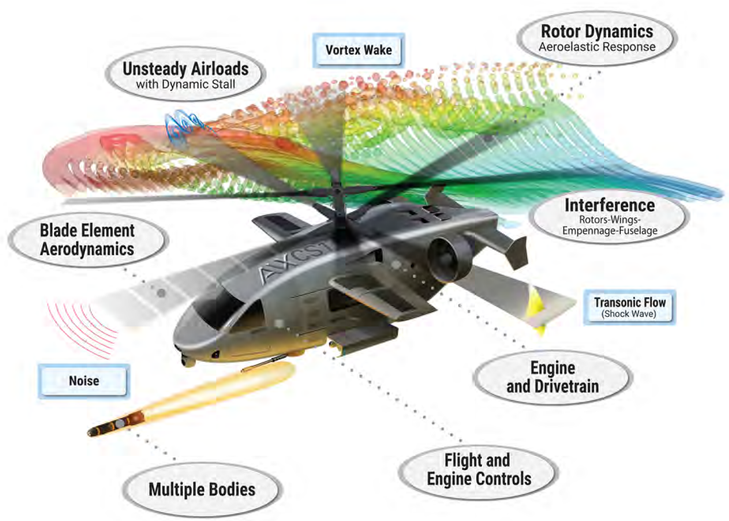
New rotorcraft configurations to support the Military Future Vertical Lift (FVL) program and to support commercial electric Vertical Takeoff and Landing (eVTOL) aircraft for air mobility, agriculture, delivery, surveillance, photography, etc. applications, require the ability to model multiple distributed rotors, ducted fans, wings and their aerodynamic interactions with each other and with the fuselage. The FLIGHTLAB® Development System has the ability to model configurations with any number of distributed rotors and wings and to model their aerodynamic interactions. Available analyses include performance, stability and control, static stability, aeroelastic stability, loads, handling qualities including ADS-33 tests, and linearization to support control design and analysis. Coupling to the Viscous Vortex Particle Method (VVPM), Computational Fluid Dynamics code(CFD) such as FUN3D and OpenFOAM, and acoustic codes such as PSU-WOP-WOP is also supported.

Development Environment

The FLIGHTLAB® development environment is based on an interpreted scripting language called SCOPE, which uses a syntax similar to MATLAB®. A built-in plot utility allows for 2D plotting of any SCOPE data. SCOPE scripts and functions are provided to perform a wide variety of analyses including setting test conditions, running to steady state, trimming the model, time-marching, nonlinear response, linearization, parameter sweeps, and more. Additionally, a user can customize any provided script or function. The modeling data, all components, and properties of a loaded FLIGHTLAB® model are directly accessible and changeable from the SCOPE command line.

Analysis

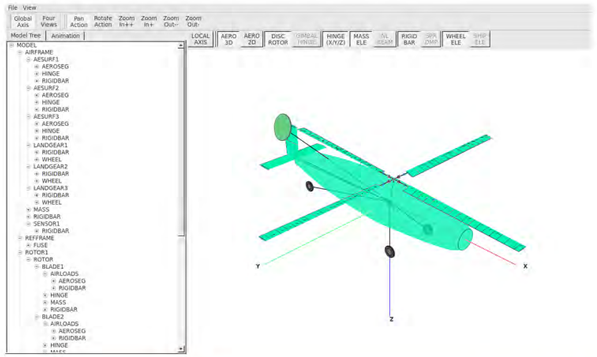
The FLIGHTLAB® Development System provides a Graphical User Interface (GUI) to support engineering evaluations including steady state trim, linearization, parameter sweeps, time and frequency response, aeroelastic stability, and loads. Also included is a set of GUI-driven utilities for simulated flight tests (performance, control, and stability) and an ADS-33 toolkit. In addition to the GUI-based analyses, users can write their own analysis routines using the SCOPE scripting language. This option allows for batch execution of complex custom analyses.

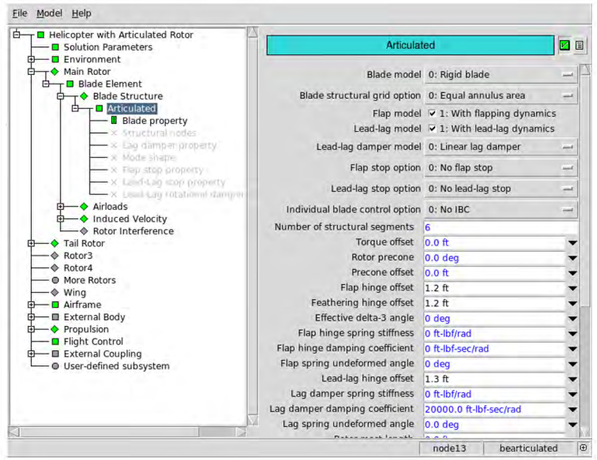


The FLIGHTLAB® Development System includes Graphical User Interfaces to facilitate modeling and analysis of the Development Model. The Development System also supports generation of Run-time Models, which can be executed in real-time and interfaced with an external simulation environment using the FLIGHTLAB® Run-time System (sold separately).

FLIGHTLAB® Model Editor

The FLIGHTLAB® Model Editor (FLME) provides a graphical interface to support model development. FLME guides the user through aircraft definition with a pre-defined hierarchical tree of model subsystems, such as rotors, airframes, propulsion systems, etc. The model developer simply selects the desired aircraft subsystem and defines the related modeling options and properties. The model editor allows for any number, location, and orientation of rotors, fans, propellers, wings, aerodynamic surfaces, etc. Once the user is satisfied with the model definition, the FLIGHTLAB® model editor can export the model script file for analysis in the FLIGHTLAB® workspace, Xanalysis.





FLIGHTLAB® Model Viewer

The FLIGHTLAB® Model Viewer (FLMV) provides a simplified graphical representation of the model, the structural and aerodynamic components in the model, and the interconnections between them. The FLMV can be used to render the model before, during, and after the analysis and is a valuable tool for verifying the model configuration and analysis response.

FLIGHTLAB® Workspace

The FLIGHTLAB® workspace, Xanalysis, provides a graphical user interface for loading and interrogating the FLIGHTLAB® model, configuring model and test conditions, and performing GUI-supported rudimentary and advanced analyses. Xanalysis also supports plotting analysis results and performing real-time desktop simulation using the PilotStation add-on.