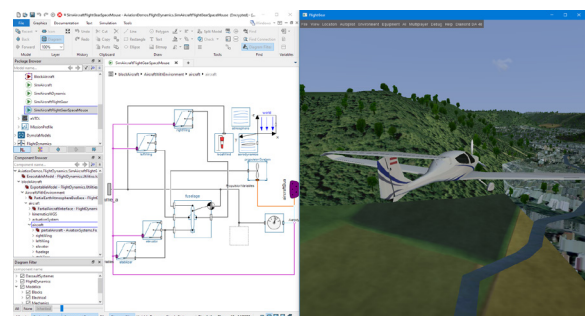


AVIATION SYSTEMS LIBRARY MODEL THE AERODYNAMIC BEHAVIOR OF AIRCRAFT AND DRONES



SIMULATE YOUR AIRCRAFT SYSTEM ARCHITECTURE AT FLIGHT CONDITIONS

The Aviation Systems Library (ASL) offers models for the aerodynamic behavior of aircraft like airplanes or multi-copters/drones. Developers and researcher can easily build digital twins of drones and airplanes in order to run dynamic simulations and evaluate their performance in a virtual environment. Define mission planning to assess propulsion systems performances considering effects of the flight mission e.g. to investigate energy consumption and optimize flight paths.



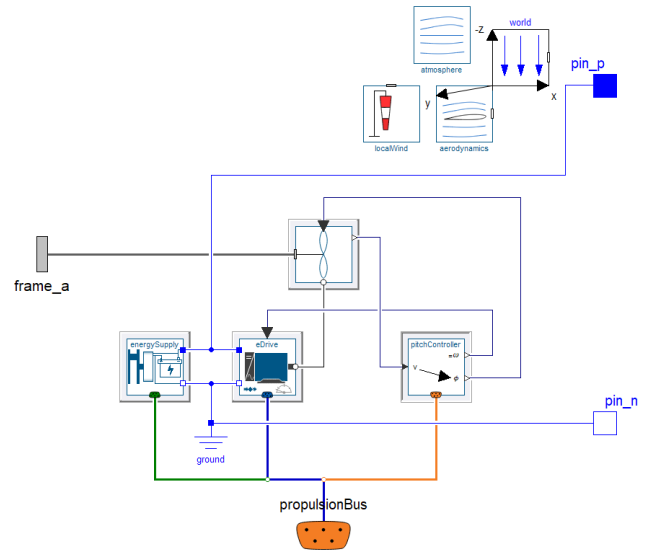
Visualization of the Aviation Systems aircraft model using the FlightGear interface of the FlightDynamics library

APPLICATION

The ASL allows a wide range of applications generally aimed at the dynamics of aircraft, not being limited to specific types of simulations. This allows engineers to analyze the drone or aircraft dynamics and evaluate system architectures prior to building prototypes. Typical example use-cases include energy consumption analysis, geometrical optimization and response dynamics studies optionally including controller design for full flight missions including take-off, landing and external effects like wind.

To allow that generality, the ASL is based on the open Modelica Standard Library (MSL) enabling user-created extensions e.g. for the design of propulsion systems as well as utilizing commercial offerings. Additionally, models of the ASL are compatible to the FlightDynamics library. This allows simulating a flight mission in a World Geodetic System and connecting to Flight Gear for visualization.

The aerodynamic forces of wings or propeller blades are calculated by table-based profile polar curves. A simple tire model allows take-off from ground and landing. A Wind model enables testing controllers or assessing additional energy requirements.



BENEFITS

- **FLEXIBILITY:** Easily connect with others Modelica libraries like Electrified Powertrain or Hydrogen and Battery Libraries
- **INTERFACING:** Models of the ASL are compatible to the MSL and FlightDynamics library
- **CONSISTENCY:** One model-base covering physical effects as well as control strategy

EXAMPLE USE CASES

- Design and dimensioning of a hybrid electrical propulsion system (e. g. Battery and Fuel Cell) including control strategy
- Develop and test aircraft and drone controllers
- Power demand estimation of a flight mission
- Derive the aerodynamic behavior of aircraft from geometrical arrangement of wings and control surfaces

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