

The Aircraft Control Toolbox

The Aircraft Control Toolbox, for use with MATLAB®, provides you with all of the tools needed to design and test control systems for aircraft—all within the MATLAB environment.

Key Features

The Aircraft Control Toolbox provides a comprehensive set of functions including:

- aircraft dynamics modeling including flexibility, actuator, sensor and engine dynamics,
- nonlinear models for military and commercial aircraft including subsonic and supersonic aircraft with all data contained in a convenient database format,
- aircraft control system design and analysis including classical, eigenstructure assignment, output feedback and many other design methodologies,
- atmospheric modeling including disturbances such as wind gusts,
- gas turbine engine models.

Prototype Systems Quickly

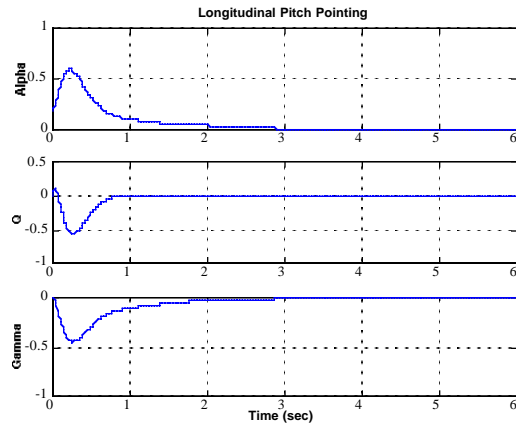
The Aircraft Control Toolbox allows you to design and test control systems in a matter of hours, not days or weeks. You can simulate any kind of aircraft. Changes are easy to make and you have excellent visibility into the resulting software.

Prototyping your control systems and simulation models will reduce both development time and cost. MATLAB frees you from the expensive edit/compile/link cycle because it is interpretive and fully interactive.

Control Design

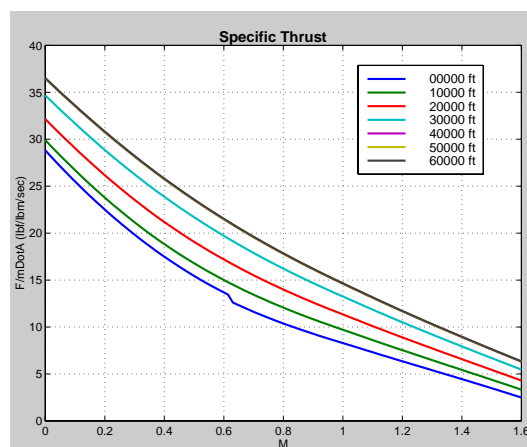
The toolbox provides a variety of design tools including frequency domain, eigenstructure, output feedback and linear quadratic design functions. For example, the plot below shows longitudinal pitch pointing for a Control

Configured Vehicle (CCV) type aircraft with a controller realized using eigenstructure assignment.



Gas Turbine Models

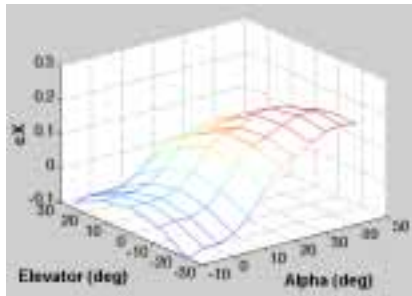
The Aircraft Control Toolbox now includes complete gas turbine analysis and performance tools. Models for ramjets, turbofans, turbojets and turboprops are included. These models can be used to generate performance information for aircraft simulations in the toolbox or independently for engine design and analysis.



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Built-In Aircraft

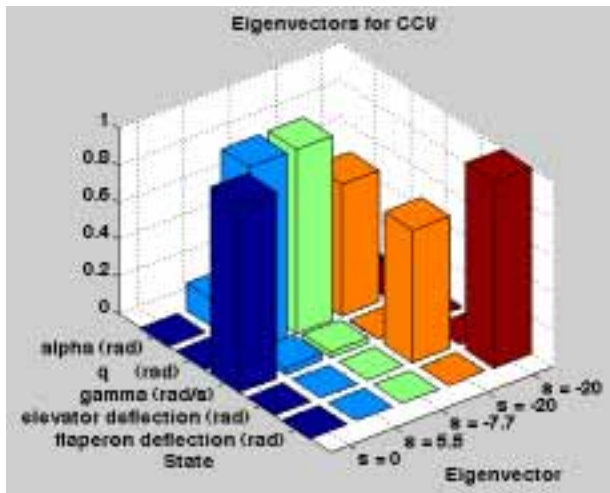
Aircraft properties are easily accessible to speed your design work. The following plot shows the x-axis aerodynamic force coefficient for an F-16 model obtained by typing `F16('cx coeff')`:



A linearized CCV type aircraft model is also included. If you type

`CCV`

you will get a plot of the eigenstructure, a singular value plot and step responses (only the first is shown.) This plot gives you a quick view of the level of interaction between the different states. Notice that each state is labeled, a fea-

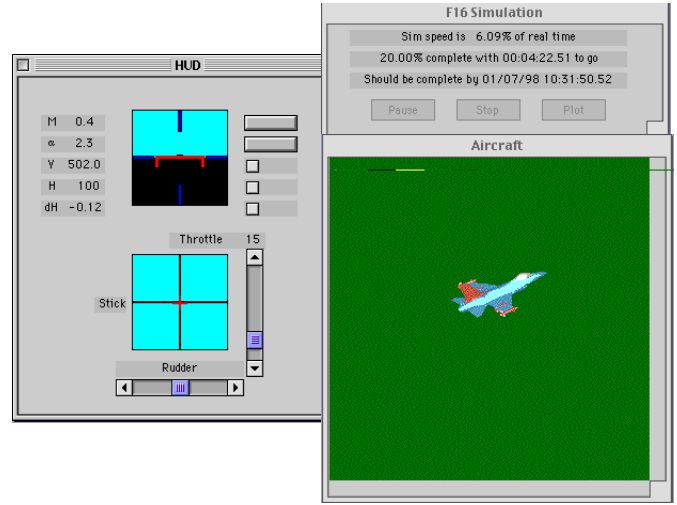


ture of the state space class that is included with the toolbox.

Graphics and Simulation

The toolbox allows you fly any of your designs using its graphical user interface. The interface is shown below.

Using the controls, you can fly your aircraft like any other flight simulator. The nonlinear simulation allows you to add flexible aircraft components, sensor and actuator dynamics, engine dynamics and disturbance dynamics. States for inertia, mass and center-of-gravity are included



for vehicles in which the mass properties change significantly. The simulation uses an ellipsoidal earth model so you can simulate aircraft from the ground up into space.

The simulation function also will automatically linearize the nonlinear dynamics and generate a state space model. In addition, a trimming algorithm is included which can trim you aircraft in a variety of flight modes.

Compatibility

The toolbox is compatible with MATLAB v5.2 through 6.0, Windows NT/2000, UNIX and MacOS 9 and X.

For More Information

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