

Variable Stability Flight Simulator

What is the Variable Stability Flight Simulator ?

The variable stability flight simulator is a teaching and research tool which facilitates the simulation of virtually any fixed-wing aircraft. Commencing with any given aircraft simulation, the flight behaviour of the aircraft and its response to control inputs can be modified by directly changing the aerodynamic characteristics of the simulation model in real-time. This allows engineers and students to assess the differences in behaviour between aircraft of different sizes and types. It also allows them to evaluate the effects of design modifications,

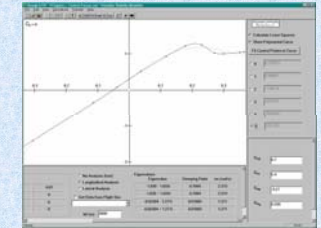


changes in flight configuration and in-flight failure or loss of critical aircraft components on the flight stability and handling of the simulated aircraft.



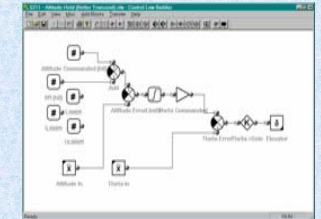
Interactive modification of flight characteristics

The variable stability module permits direct modification of aerodynamic, inertial, control and propulsion characteristics via easy to use



Graphical User

Interfaces. Changes can be downloaded to the simulation core in real-time so that the pilot can instantly feel the alterations to the aircraft behaviour.



Flight control laws can be designed, modified and implemented via a GUI in block diagram form. These can be enabled and disabled on-line so that changes in a control law design can be tested and evaluated "in-flight".

Background to the facility

The facility evolved from a collaboration with the College of Aeronautics at Cranfield University UK, involving the development of variable stability flight simulation software. In 1998 a decommissioned



Boeing 707 motion based flight simulator was acquired from the RAAF. These components have been integrated to establish a generic motion based cockpit with control force feedback and "glass-cockpit" display technology. Instrument displays are reconfigurable to enable instrument panel representations for various generic aircraft types.

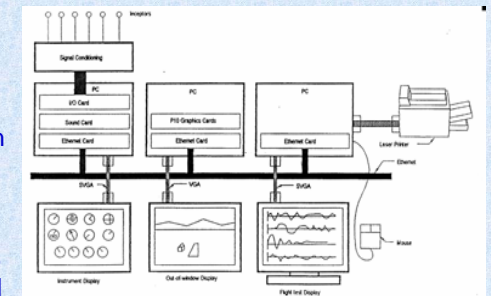
Modular design based on a distributed PC architecture

The flight simulation software comprises a number of software modules. These include:

- The flight simulation model core
- Operator/instructor station
- Variable stability module
- Flight control systems design and implementation
- Control force-feedback and motion base control
- Out-of-the-window image generation



Each of the software modules is hosted on a separate PC in an ethernet connected PC network. Each communicates with peripheral



sensors, cockpit displays, high speed image generator cards, or control input and motion base hydraulic actuators according to its function. Control, visual and motion information, together with operator commands are communicated between PC modules via the network.



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