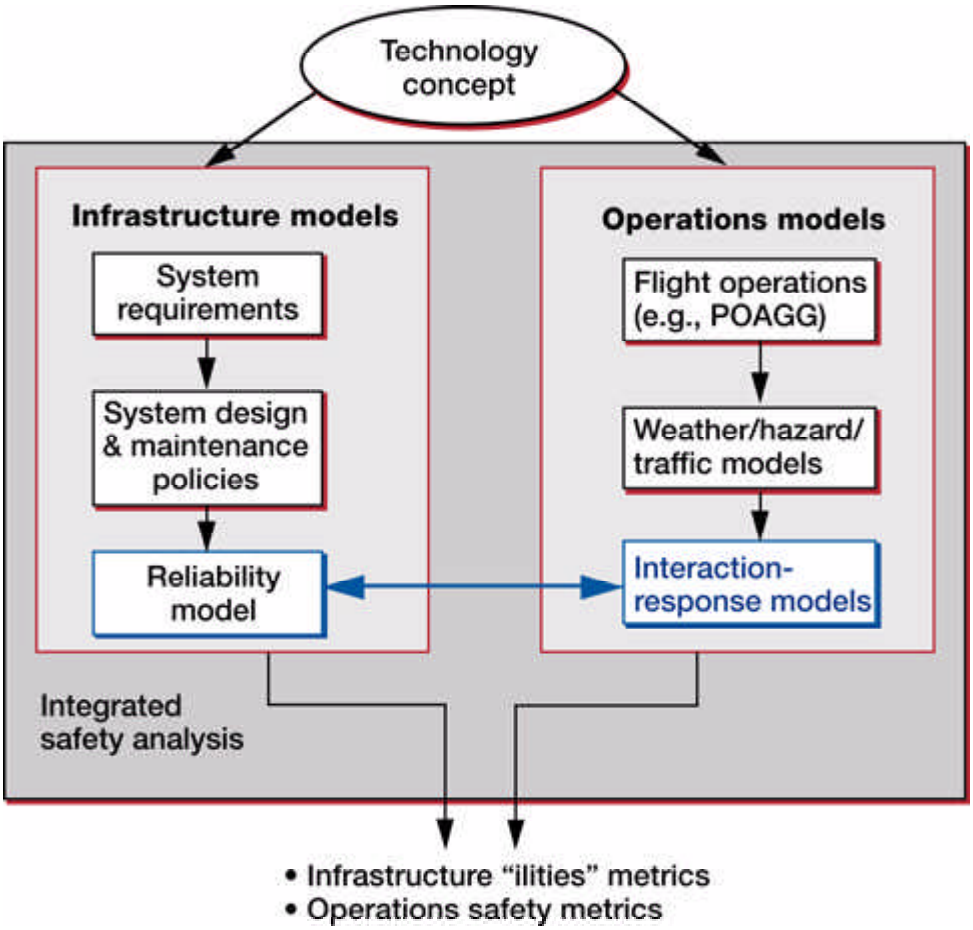
Preliminary Integrated Safety Analysis of Synthetic Vision Conducted

The goal of the NASA Aviation Safety Program is to develop and demonstrate technologies that could help reduce the aviation fatal accident rate by a factor of 5 by the year 2007 and by a factor of 10 by the year 2022. Integrated safety analysis of day-to-day operations and risks within those operations will provide an understanding of the Aviation Safety Program portfolio beyond what is now available. Synthetic vision is the first of the Aviation Safety Program technologies that has been analyzed by the Logistics Management Institute under a contract with the NASA Glenn Research Center. These synthetic vision analyses include both a reliability analysis and a computer simulation model.



Integrated safety analysis ("ilities" refers to reliability and availability).

Long description

An integrated safety analysis must be able to estimate the safety benefits from competing technologies for existing operations and to investigate the safety implications of using new technologies to enable higher-capacity operations. The flow diagram depicts the

methodology of an integrated safety analysis.

The reliability and interaction-response models are the two principal analytic components of the integrated safety analysis. These models are used to develop the safety statistics necessary to determine whether the system meets acceptable safety levels.

A combination of reliability modeling plus simulation provides significant computational benefits over either method alone. Reliability models have difficulty addressing dynamic parameters such as pilot response and changing environment, whereas the simulation of low-probability failures leads to an impractical number of computer runs. Using reliability models to estimate equipment failure rates and simulations to estimate the results when those failures occur adds dynamics to the reliability analysis and makes the simulation computationally tractable.

Synthetic vision presents computer-generated views of the external environment to the pilot. The presentation is completely artificial. Typically it is based on a geographical and cultural database, supplemented by dynamic traffic information. Several systems in addition to the synthetic vision equipment are necessary for synthetic vision operation, and these were included in the reliability analysis.

The simulation model is used to determine the probability of an accident given the existence of a system failure. Simulation is also the primary tool for investigating the impact of human response to equipment failure and the impact of human-initiated error. Two reliability scenarios were analyzed: terrain avoidance and traffic avoidance.

The Logistics Management Institute is continuing the analyses of synthetic vision. Other Aviation Safety Program technologies that are being analyzed include

- Weather accident prevention technologies, including Aviation Weather Information (AWIN) and turbulence detection
- System-wide accident prevention technologies, including human performance and maintenance technologies

The simulation models will allow users to change input--such as the flight path, terrain, aircraft speed and location, equipment, and human factors. The output of the models will show how the new technologies affect the system risk and, ultimately, the probability of an accident. All reliability models and computer simulation models are scheduled to be complete by December 2002.

Find out more about this research:
NASA Aviation Safety Program (http://avsp.larc.nasa.gov/)
Glenn's Aviation Safety Program (http://www.grc.nasa.gov/WWW/avsp/)
Logistics Management Institute (http://www.lmi.org/)

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