2011 Highlights

Advanced Simulation Research at NASA Ames

The Simulation Laboratories (SimLabs) at NASA Ames support a wide range of research in aerospace vehicles, aerospace systems and operations, human factors, and aviation safety. Our state-of-the-art simulation facilities are available to develop your future concepts and technologies.

Celebrating Over 30 Years of Astronaut Training

2011 marked over 30 years of astronaut training at the Vertical Motion Simulator (VMS). Periodic training with motion simulation familiarizes astronauts with vehicle handling during approach, landing, and rollout under normal operating conditions, as well as off-nominal and failure conditions. In addition to training, the VMS was also used to evaluate the effect of engineering and operational changes on Shuttle approach and landing.

"Only the VMS allows crews to safely practice potentially hazardous landing tasks."
- Astronaut Karol "Bo" Bobko

Next Generation Air Traffic Management Technology

The seventh and final human-in-the-loop simulation of the Efficient Descent Advisor (EDA) was successfully completed at the Crew-Vehicle Systems Research Facility (CVSRF) as part of the Three-Dimensional Path Arrival Management (3DPAM) technology-transition effort. The EDA aims to reduce fuel burn and decrease controller workload. The simulation was attended by government and industry stakeholders, including the FAA, Boeing, MITRE and Volpe.

NASA SimLabs News

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FutureFlight Central (FFC)

The FFC facility offers immersive, 360-degree, full-scale, real-time simulation capability with a customizable, modular layout.

SARDA: The Spot And Runway Departure Advisor (SARDA) research team continues with algorithmic, human factors, and simulator enhancements in preparation for testing in FY2012. The SARDA airport scheduler consists of two tools that provide efficient taxi advisories. The Spot Release Planner (SRP) aims to reduce taxi delay from the spot to the departure queue, and provides sequence and timing advisories to the ground controller. The Runway Scheduler (RS) maximizes runway usage and displays advisories to the local controller, knitting departures with arrival runway-crossing traffic. Algorithmic changes include scheduling refinement to arrival traffic. Human factors research looks at designing the user interface, allowing controllers to interact with the scheduler. Simulator upgrades include integration with the FFC's 360-degree tower simulator and the use of electronic flight strips containing SARDA advisories.
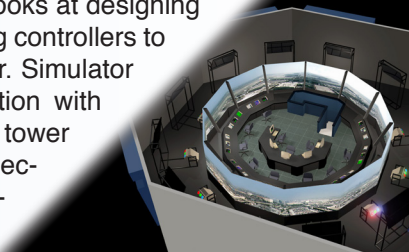
Vertical Motion Simulator (VMS)

The VMS provides researchers with advanced tools to explore, define, and solve issues in aircraft and spacecraft design.

LCTR: Collaborative NASA/US Army studies of the Large Civil Tilt-Rotor (LCTR) continued on the VMS to investigate flight control design and handling quality issues of large (similar in size to a Boeing 737) tilt-rotor aircraft. Modified rotorcraft handling quality tasks were used to develop the flight control systems that will enable the LCTR to help revolutionize civilian air travel.

CAPIO: A NASA-developed Control Allocation for the reduction of Pilot-Induced Oscillation (CAPIO) controller was tested at the VMS in FY2011. Seven experienced test pilots evaluated the system in a total of 647 data runs, using maneuvers designed to expose any Pilot Induced Oscillation (PIO) tendencies in the system in a controlled and repeatable manner. The CAPIO controller exhibited the potential to greatly reduce PIO tendencies in aircraft with rate-limited actuators.
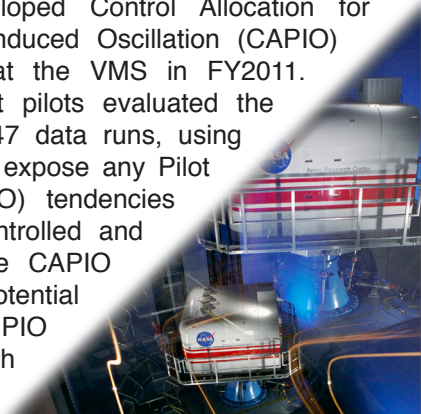
Crew-Vehicle Systems Research Facility (CVSRF)

The CVSRF's high-fidelity flight simulators offer full-mission capability for human factors & aerospace operations research.
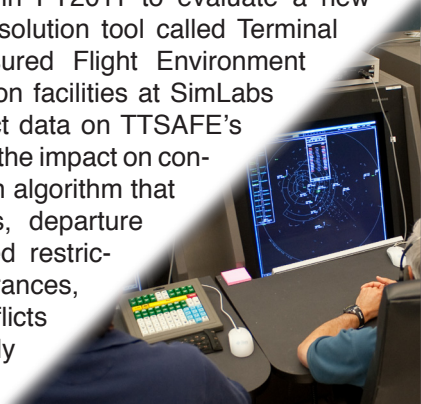
TBAS: Two simulation studies were completed in FY2011 for continued development of the Trajectory-Based Automation System (TBAS) that can enhance future air traffic safety and efficiency through intelligent automation tools. The flight and air traffic control simulators at CVSRF were linked for human-in-the-loop evaluations of a Trajectory-Based Operations concept with mixed voice and datalink operations. Eight experimental conditions were tested: four datalink levels ranging from 0% (voice only) to 80%, with two levels of traffic density. Weather avoidance advisories were also tested, and feedback on the feasibility of the concept was positive from both pilots and controllers. One key finding was that controllers issued significantly more time-saving flight plan amendments under datalink conditions than under voice-only conditions, amounting to between five and twelve minutes of flying time savings per hour.
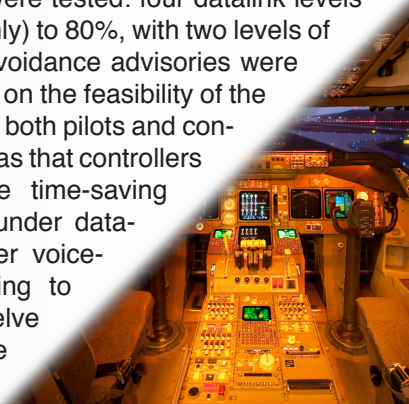
Air Traffic Management Labs (ATM)

Our ATM Labs provide state-of-the-art tools to research and develop current and futuristic air traffic management concepts.

TTSAFE: Conflict prediction in terminal airspace is challenging due to complex separation standards, dense traffic, and limited flight plan data. Current tools rely on the use of dead reckoning without intent information, causing the tools to generate large numbers of false alerts. Two human-in-the-loop experiments, simulating air traffic operations in the Southern California terminal radar approach control (TRACON), were conducted in FY2011 to evaluate a new conflict detection and resolution tool called Terminal Tactical Separation Assured Flight Environment (TTSAFE). ATM simulation facilities at SimLabs were used to both collect data on TTSAFE's performance and assess the impact on controller workload. Using an algorithm that incorporates flight plans, departure and arrival routes, speed restrictions, and altitude clearances, TTSAFE predicts conflicts much more accurately than current tools.