National Aeronautics and Space Administration

# 2006 Highlights

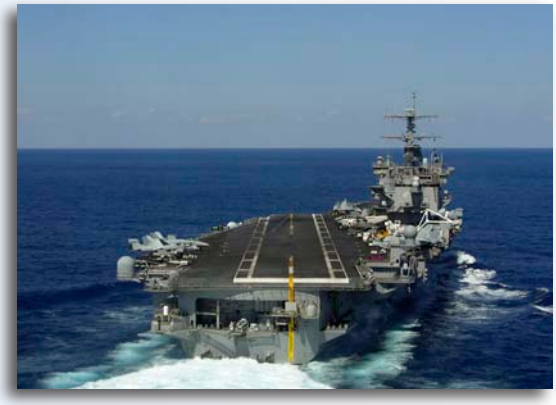
NASA SimLabs News

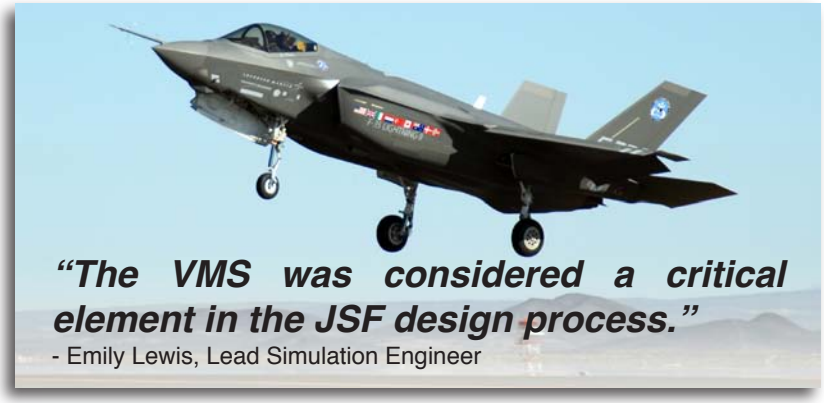
## Advanced Simulation Research at NASA Ames

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.

## F-35 Joint Strike Fighter Variant Evaluations

Lockheed-Martin evaluated three variants of the F-35 Joint Strike Fighter (JSF) aircraft in SimLabs' Vertical Motion Simulator (VMS), including the Short Take-Off Vertical Landing (STOVL) configuration, the Conventional Take-Off and Landing (CTOL) configuration, and the Carrier Variant (CV). The simulation investigated take-off maneuvers, flight readiness, and a Shipboard Rolling Vertical Landing (SRVL) procedure. Several aircraft handling qualities issues were identified, giving designers the opportunity to improve the system while the vehicle is under development.





***"The VMS was considered a critical element in the JSF design process."***

- Emily Lewis, Lead Simulation Engineer

## US Army Prepares for the Next Generation Light Utility Helicopter

The US Army's Aviation Technical Test Center (ATTC) used the VMS to prepare for the assessment of their next generation Light Utility Helicopter (LUH). The simulation used the large motion capabilities of the VMS to realistically simulate a cargo helicopter, and familiarize pilots and engineers with hover and low-speed maneuvers from the Aeronautical Design Standard-33 helicopter handling qualities standard. The VMS training will expedite the Army's assessment of the LUH.

**Hypotheses to headlines. Visit www.simlabs.arc.nasa.gov for more information.**

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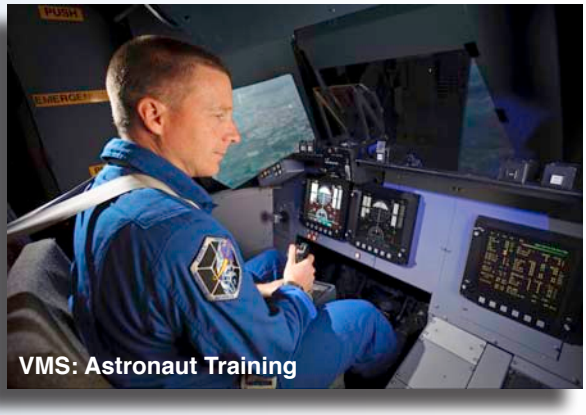

VMS: Astronaut Training

## Vertical Motion Simulator (VMS)

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

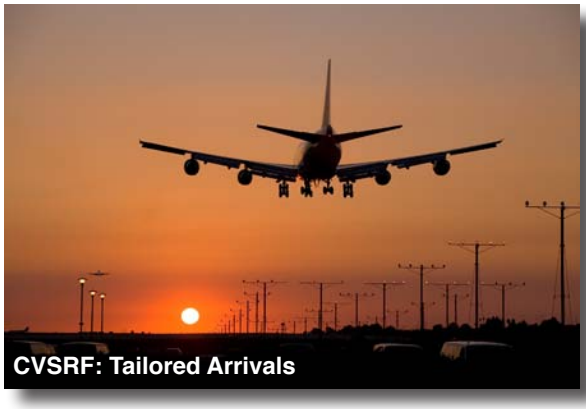
**Pilot Control Loaders - Upgrade:** The Pilot Control Loaders at the VMS were upgraded from analog to a new digital force-feel system in 2006. This upgrade made it possible for the VMS to expand its pilot control force simulation capability - in particular, the simulation of stiction ("static friction") force, an attribute that is unique to the VMS facility. The addition of stiction force has greatly enhanced the realism of VMS vehicle simulations.

**Astronaut Training:** Two NASA Space Shuttle astronaut training sessions were completed in 2006 on the VMS. Forty-one pilots and 12 mission specialists completed 829 training runs. This periodic training familiarizes crews with vehicle handling during approach, landing, and rollout under normal operating conditions, as well as off-nominal and failure conditions.

## Crew-Vehicle Systems Research Facility (CVSRF)

The CVSRF houses two high-fidelity flight simulators and an air traffic control simulation laboratory capable of full-mission simulation.

**Damage/Tolerance:** Dryden Flight Research Center (DFRC) used the Advanced Concepts Flight Simulator (ACFS) for the second phase of human-in-the-loop simulation research to develop ways to estimate and infer the effects of damage to an airplane. Damage cases included wing and tail section surface area losses. The study determined the maximum amount of tolerable damage where recovery and landing were still possible.


CVSRF: Tailored Arrivals

**Tailored Arrivals:** Tailored Arrivals simulations at the CVSRF investigated customizing descent procedures using the latest in communications and navigation technology, as well as air traffic management algorithms to attain an ideal approach. Data was collected for future field studies to identify optimum altitudes, speeds, and glide paths that reduce fuel use, noise, and emissions.


FFC: SOAR

## FutureFlight Central (FFC)

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

**Virtual Airspace Simulation Technology-Real-Time (VAST-RT):** In 2006, several upgrades were added to the VAST-RT architecture (which links simulation facilities, including the VMS, CVSRF, and FFC). The Airspace Traffic Generator (ATG) now receives timed taxi instructions, and ground-based automation was added to increase efficiency. A new weather server provides cross-simulator weather consistency to enhance realism.

**Surface Operations Automation Research (SOAR):** The SOAR concept, which includes tower and cockpit automation components,was studied with the Ground-operation Situation Awareness & Flow Efficiency tool (GoSAFE) in a Dallas/Fort Worth (DFW) airport simulation. Valuable feedback was collected for future development to reduce aircraft queues and surface delays.

**Visit www.simlabs.arc.nasa.gov for full articles.**