Bell 205 Airborne Simulator

The NRC Institute for Aerospace Research (NRC Aerospace) supports Canadian and international avionics manufacturers by collaborating with them on advanced technologies of potential use in the modern helicopter cockpit. Side arm controllers, advanced control laws, and helmet-mounted displays are some of the technologies being demonstrated and perfected using the NRC Bell 205 airborne simulator.

The Airborne Simulator has also provided key data crucial to the development of a handling qualities specification, Aeronautical Design Standard for Helicopter Handling Qualities ADS-33E. The realistic environment the simulator provides is unsurpassed in the handling qualities community. It is also being used to operate as a surrogate UAV to enable flight-test of UAV systems while maintaining the ability to revert to manual pilot control.

Unique capabilities
The highly modified Bell 205A-1 serves as a fly-by-wire variable stability platform for in-flight simulation of other aircraft, in flight investigation of control system characteristics, cockpit systems development (inceptors, displays and speech I/O), and data generation for advanced aircraft specifications.

Supplementing the NRC Bell 205 are a PC-based data playback and analysis system with sophisticated graphics display capability, a close support computing system for software development and testing, and a special display development facility for ground based validation of advanced cockpit technologies to be demonstrated in the airborne simulator.

Experience and versatility
The NRC Aerospace technical team has many years of experience in rotorcraft-based airborne simulation, and an international reputation in rotorcraft flight mechanics research. The flexible, high-quality expertise and service available with the NRC Bell 205 simulator means that staff can meet a broad range of research challenges.


NRC Bell 205

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Technical specifications

Airborne simulator:	• Bell 205A-1 single-engine, medium-sized helicopter, fly-by-wire, variable stability
On-board installations:	• Dual-function, mechanically and electrically signalled actuators • VME-based digital 68000 series processors • Doppler radar and radio altimeter, laser altimeter • Digitally-controlled electrohydraulic, fully-programmable artificial force field system enabling simulation of a range of flight controls mechanical characteristics • In-house developed high-accuracy/low-latency strap-down navigation system based on a Litton LN200 fibre optic gyro and Novatel RT-20 differential GPS • Three-axis, hydraulically driven camera platform • 20 kVA 400 Hz auxiliary generator • 4-axis side-arm controllers • Wireless Ethernet 802.11b short-range telemetry
Planned installations:	• Programmable head-down display and audio warning system
Project power:	• 300 A continuous 28 V dc (8,400 W) • Two 110 V ac/60 Hz solid-state inverters (max. input of 48 A each) • Three 110 V ac 400 Hz 750VA inverters • Three 110 V ac 400 Hz 750VA inverters in 3-phase configuration
Data system:	• 64 12-bit Analog Channels recorded at 64 Hz • Strapdown Inertial Navigation System data recorded at 400 Hz • PC-based data playback and analysis (including frequency response identification) • Real-time and post-processed flight path visualisation • STANAG-4586 compliant data stream for UAV applications
Measurement capabilities:	• 3-axis attitudes and angular rates • Accelerations • Velocities (air reference, and inertial) • Static and dynamic pressures • Air temperature • Angles of attack and sideslip • Pilot control inputs (force and position) • Actuator/Swashplate positions • Rotor flap angle and RPM
Special configurations:	• As required