# FACT SHEET
# RESEARCH OPPORTUNITIES 2007
## NASA-DRYDEN FLIGHT RESEARCH CENTER

The Dryden Flight Research Center (DFRC) is NASA's center for aeronautical flight research and atmospheric flight operations. DFRC is chartered to research, develop, verify, and transfer advanced aeronautics, space and related technologies. It also serves as a backup landing site for the Space Shuttle and a facility to test and validate design concepts and systems used in development and operation of the Orbiters.

Research Opportunities for students will be available in:

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**Aerodynamics** - The following are research areas in Aerodynamics: laminar and turbulent flow boundary-layer drag reduction, configuration aerodynamics, experimental methods, wing/body aerodynamics, full-scale Reynolds number research technology, high angle of attack aerodynamics, advanced instrumentation development research, Aero- Gravity Assist simulation, rapid prototyping of aerodynamic simulation model databases and atmospheric processes research.

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**Aerostructures**

**– Advanced Structures Concepts** - The following are research areas for Advanced Structure Concepts: Hot Structures Testing, Flight Loads Research, Test Technique Development, Structural Dynamics Test and Analysis Research, Structural Health Monitoring, Advanced Strain and Temperature Measurement Technology, Aero/Thermal/Structural Test and Analysis Research.

– **Structural Dynamics** - The following are research areas in Aerostructures: Vibration and flutter prediction by finite element based aeroelastic and aeroservoelastic analysis, aircraft flutter, flight envelope expansion, ground vibration and inertia testing, active control of structural resonances, and advanced flight test technique development.

**– Modeling, Identification and Control** - Aerostructural Modeling, Identification, and Control Safer and more efficient design of advanced aerospace vehicles requires advancement in current predictive design and analysis tools. Aeroservoelastic testing is often extensive and time consuming for careful and safe envelope expansion. Aeroservoelastic models are subject to errors resulting from simplifications in structural, aerodynamic, and control system modeling. Robust estimation methods to identify and generate models describing nonlinear phenomena is extremely important to NASA Dryden and the flight test community for stability estimation and control objectives. Research is in progress to investigate methods of aeroservoelastic modeling with uncertainty descriptions consistent with the data. Dryden is also studying linear and nonlinear identification algorithms and methodologies for in-flight aeroservoelastic robust stability determination. Use of advanced data-adaptive analysis methods are being encouraged for more informative data acquisition. Intelligent data processing and analysis routines are required to accomplish the goal of accurate stability and performance determination during flight. This integrated research effort requires innovative data processing, modeling, identification, and robust system theory applications. Control objectives include feasible and realistic boundary layer and laminar flow control. aeroelastic maneuver

feasible and realistic boundary layer and laminar flow control, aeroelastic maneuver performance and load control including smart actuation and active aerostructural concepts, autonomous health monitoring for stability and performance, and drag minimization for high efficiency and range performance.

*URL:* http://www.nasa.gov/centers/dryden/research/Facilities/FLL/index.html

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**Aircraft Simulation** - The following are current research areas in Aircraft Simulation: high-fidelity generic aircraft modeling of aerodynamics, propulsion and structural dynamics for a wide range of classes of aircraft; and a data collection and analysis software suite for simulation and verification and validation support".

*URL:*http://www.dfrc.nasa.gov/Research/

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**Dynamics and Controls**

**– Aircraft Automation** - Most of these programs and projects are part of an integrated strategy that addresses the challenges in aviation by developing technology solutions to create environmentally compatible aircraft with revolutionary capabilities for unprecedented levels of performance and safety. The following are the research areas in Aircraft Automation: Knowledge-based systems development, verification and validation of knowledge-based systems, neural networks, heuristic controllers, knowledge-based acquisition/ implementation, maneuver controllers, performance optimization, guidance, pilot-vehicle interface, and robotic aircraft.

**– Flight Dynamics** - The following are research areas in Flight Dynamics: Pilot/aircraft interaction with advanced control systems and displays, assessing and predicting aircraft controllability, developing flying qualities criteria, parameter estimation, and mathematical model structure determination.

**– Advanced Digital Flight Controls** - Most of these programs and projects are in keeping with the "Revolutionary Vehicles" element of NASA's Aeronautics Blueprint, an integrated strategy that addresses the challenges in aviation by developing technology solutions to create environmentally compatible aircraft with revolutionary capabilities for unprecedented levels of performance and safety. The following are research areas in Dynamics and Controls: Modeling, simulation, and flight testing of distributed control systems. Design criteria and methods for unconventional vehicles, including decoupling of asymmetrical airplanes and stabilization of highly unstable airframes.

*URL:*http://www.dfrc.nasa.gov/Research/

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**Flight Instrumentation** - The following are research areas in Flight Instrumentation: Flow measurement, skin friction drag, fuel flow, integrated vehicle motion measurements, space positioning, airframe deflection, sensor and transducer miniaturization, and digital data processing.

*URL:*http://www.dfrc.nasa.gov/Research/

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**Flight Systems**

**– Vehicle Health Monitoring/Management** - Advancement of the monitoring and management of the health status of vehicle subsystems and the synergistic integration of health information from the variety of vehicle subsystems are of significant interest at NASA Dryden. These technologies are important in decreasing the cost of operation of commercial and military aircraft, and are of critical importance to the deployment of UAVs. This information is necessary for advanced vehicle management systems and mission planning in order to maximize mission effectiveness. Research in the areas of wiring systems health monitoring, propulsion health monitoring, actuator health monitoring, and other subsystem health monitoring as well as the integration of these subsystem health monitoring technologies to identify and isolate broader system issues are of interest in Flight Systems

**– Vehicle Ultra-reliable Flight Control Systems** - Research into the analysis and design of flight control and other flight critical systems to increase reliability of these systems by one or more orders of magnitude is of interest at NASA Dryden. Promoting overall vehicle reliability, reducing vehicle operating cost, and improving mission effectiveness are the goals to be achieved through this research. Advancements in component, redundancy, and architectural approaches as well as others are sought in this research area. One application of near term interest is the inclusion of these technologies in ultra- long duration flight at high altitudes for addressing the required increase of reliability while avoiding large penalties for increased weight and power requirements.

*URL:*http://www.dfrc.nasa.gov/Research/

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**Propulsion and Performance** - The following research areas in Propulsion and Performance are: Propulsion controls, integrated propulsion/airframe systems, and vehicle performance measurement.

*URL:*http://www.dfrc.nasa.gov/Research/

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**Network-Centric Test Systems** – The integration of measurement instruments and network computing enables improved verification, and technology transfer in the area of interactive network communications amongst distributed instrumenta that address the needs of the aerospace flight test, Earth-observing science, and space communication communities. Ne communication with terrestrial computing and network distribution infrastructure. Embedded Linux systems development,

*URL:* http://www.nasa.gov/centers/dryden/research/ESCD/OTH/

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**Control Engineering: Range Engineering** - The following are current research areas in Range Engineering: range instrumentation, data processing and mission control room developments for test of research aircraft, and research into areas of satellite communication and extended range for test of research vehicles.

*URL*:http://www.dfrc.nasa.gov/

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**FIELDS OF STUDY/COMPETENCIES**

Mechanical Engineers
Electrical/Electronics Engineers
Aerospace Engineers
Systems Engineers
** Civil Engineers (occasionally)
Computer Engineers
Computer Science
Business Management
Test Engineering
Design & Development Engineering
Integration Engineering
Network Engineering

For the Coop Program we are also looking for: Accounting, Finance, Marketing, Journalism, English and Design.
www1.dfrc.nasa.gov/education