

# NASA

National Aeronautics and  
Space Administration



**Dryden Flight Research Center**  
P.O. Box 273  
Edwards, California 93523  
Voice 661-276-3449  
FAX 661-276-3566  
pao@dfrc.nasa.gov

## Information Summary

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### Aerospace Careers: Flight Operations Engineer

The Flight Operations Engineering Branch at NASA's Dryden Flight Research Center plans, coordinates and schedules all flight research and test projects at the Center. The branch is part of the Flight Operations Directorate, the focal point of all aeronautical and flight research activities at Dryden.

#### **What is a Flight Operations Engineer?**

Flight operations engineers work on all projects at Dryden that involve aircraft or flight vehicles. They are familiar with all aeronautical disciplines, including aircraft structures and subsystems, and designing and planning aircraft modifications.

Responsibilities differ depending on the status of each research project. Acting as technical managers, operations engineers provide direction relating to aircraft modifications to crew chiefs, and provide an aircraft maintenance schedule. They work closely with all members of the project team, maintenance, engineering and management, to assure that delays in modification and flight schedules are minimal and that project milestones are met.

Flight operations engineers are involved in the development and execution of the comprehensive systems tests and safety checks that are carried out after major aircraft modifications, major repair work or when an aircraft is being readied for flight after a lengthy "down" period. During these tests, flight operations engineers seek to identify potential safety or flight hazards so they can be eliminated or corrected.

Project engineers work closely with flight operations engineers in the development of all electrical, mechanical and structural work on the Center's aircraft and are the final approval authority for all aircraft modification work at Dryden.

The installation of instrumentation and other components on aircraft is approved by flight operations engineers. They also provide the hardware development and the installation of flight control and avionics systems for the systems engineers.

Flight operations engineers attend all technical, safety and crew briefings associated with each project with the goals that all activities are properly coordinated, chains of command and authority are in place, and flight safety is not compromised.

Operations engineers are the lead participants in the reconfiguration of aircraft from one project to another, and they continuously support the aircraft maintenance team to make sure that flight schedules are maintained. In this role, they interact with project managers, project engineers and technicians as decisions are made on the operational aspects of flight activities and also on safety issues.

Operations engineers have an active role in all aircraft ground vibration, loads, and thermal testing. They also oversee all new projects where modifications to aircraft may affect flight characteristics or behavior.

A Combined Systems Test (CST) is performed before all initial research flights, or after major modification, to ensure that every integrated system will perform as planned, accurate research data will be generated and transmitted properly, and that the aircraft and its systems will be flown and operated safely. The test includes running the aircraft engines and staffing a mission control room just as it would be on flight day. Flight operations engineers are involved in developing these CST procedures and all of the appropriate checklists.

A flight operations engineer may fly on an aircraft as a flight test engineer to help conduct and coordinate research activities. On other missions, flight operations engineers serve as mission controllers in the mission control room communicating with the research pilot and serving as a single point of responsibility for flight safety and coordination.

## **Tools of the Flight Operations Engineer**

Flight operations engineers at Dryden work with many different disciplines, branches and support groups.

They must be familiar with engineers and managers on every project with which they are associated, including cooperative projects involving other NASA centers, Department of Defense and other federal agencies.

Commercial aerospace firms also are members of the project teams.

The Flight Operations Engineering Branch maintains an up-to-date flight operations

manual that acts as a “cookbook” to standardize all the test and flight procedures so they are consistent and lead to safe, efficient flight operations.

Flight operations engineers must be familiar with the scope and limitations of each test and research facility at Dryden such as the Flight Loads Laboratory where mechanical, thermal and structural testing are carried out. They also work closely with the Edwards Air Force Base Weight and Balance Facility where precise center-of-gravity measurements are obtained.

## **The People and The Projects**

Flight operations engineers are associated with all research projects at Dryden. Many past projects were unique and significant. The X-29 demonstrated such unusual concepts and technologies as forward-swept wings, advanced composites in construction and close coupled canards in front of the wings. The X-31 demonstrated the value of thrust vectoring coupled with advanced flight control systems, to provide controlled flight during close-in air combat at very high angles of attack. The fly-by-wire F-8 used an electronic flight-control system coupled with a digital computer to replace conventional mechanical flight controls.



*Mission control room.*

To successfully and adequately plan, coordinate and schedule these types of aeronautical projects, flight operations engineers must be familiar with a broad range



*The X-31 showed the value of thrust vectoring coupled with advanced flight control systems, to provide controlled flight during very high angles of attack.*

of aerospace disciplines — avionics, aerodynamics, propulsion, mechanical design, flight controls and hydraulics.

## **Education and Experience**

Members of the Flight Operations Engineering Branch have varied backgrounds of experience, but the common thread is education. Most have a bachelor of science degree in aerospace or aeronautical engineering, while others majored in mechanical or electrical engineering.

Individuals interested in a career as a flight operations engineer should be well versed in all aerospace disciplines and aircraft systems, and be familiar with procedures to carry out aeronautical research in a wide range of flight environments. The ability to communicate effectively with people working in all aerospace disciplines at all levels of management is essential, as well as experience in computer operations for administrative functions and research work.

Positions equivalent to flight operations engineering are found at nearly all commercial aircraft manufacturers and major aircraft modification companies. Within the federal government, similar positions can be found in the Federal Aviation Administration and in the flight test branches of the U.S. armed forces, in addition to NASA.