

# F-22 INITIAL HIGH ANGLE-OF-ATTACK FLIGHT TEST RESULTS

**Lee R. Peron**  
**Air Force Flight Test Center**  
**Edwards Air Force Base, California**

## **ABSTRACT**

The High Angle-of-Attack (AOA) test program for the F-22 Raptor is expanding the flight envelope at the Air Force Flight Test Center (AFFTC) at Edwards Air Force Base, California. The program has demonstrated outstanding flight characteristics at AOAs ranging from below -40 degrees to above 60 degrees. The key components to the successful design have been the pitch axis thrust vectoring, flight control design, air-data system, and the Pratt & Whitney F-119 Engines. However, flight test has revealed differences from simulator and windtunnel predictions. The following paper outlines the F-22 approach to testing, the results to date, and the challenges this program and future flight test programs face.

## **INTRODUCTION**

The F-22 is the United States Air Force's newest air superiority fighter built by the team of Lockheed-Martin, Boeing, and Pratt & Whitney. The F-22 is a single-place twin-engine fighter designed to provide superior maneuverability and high resistance to departure and spins.

The F-22 is progressing through engineering and manufacturing and development (EMD) testing at Edwards Air Force Base. High AOA envelope expansion testing began on 22 July 99 and cleared 1-g maneuvering beyond 60 degrees AOA by 8 September

1999. As of May 2000, testing has demonstrated as low as negative 40 degrees AOA, slow-speed envelope expansion with zoom climbs, and the start of departure resistance testing. Testing of other configurations such as dual side or main weapons bay doors open (SWB or MWB), lateral asymmetry and the power approach (PA) configurations are scheduled to begin in the summer of 2000.

The F-22 high AOA test program is still a work in progress. As in all EMD programs, unique and unpredicted aerodynamics and system characteristics need to be determined and fixed before release to the operational users. This is especially true of aircraft that are designed to fly in the poststall regime. The F-22 test program is an excellent example of how control law designers react to unexpected aerodynamic characteristics and rapidly implement changes in the control laws.

## **TEST CONFIGURATION**

The F-22 utilizes advanced technology in all aspects of its design. All air vehicle flight control surfaces are directed by a triplex electronic flight control system (FLCS). The aircraft has a head-up display (HUD), right side stick controller and hands on throttle and stick (HOTAS) control. The glass cockpit has six displays: the test aircraft has two upfront displays, two multifunction displays (MFDs), a flight test instrumentation display, and a flutter excitation system (FES) panel.