

EXECUTIVE SUMMARY

F/A-22, 91-4003

AIRCRAFT ACCIDENT INVESTIGATION BOARD

EDWARDS AIR FORCE BASE, CALIFORNIA

28 SEPTEMBER 2004

On 28 September 2004, at approximately 15:37 local time, an F/A-22, Serial Number 91-4003, assigned to the 411th Flight Test Squadron, Edwards Air Force Base, California, exceeded load factor limits while flying near Edwards Air Force Base.

The mishap aircraft (MA) was flying a high risk test mission. The relevant mission event was an air-to-air tracking test at an altitude of 5,000 feet with an F-16C. The event was designed to accomplish closed-loop handling, stressing aircraft flying qualities and highlighting anomalies, during air-to-air tracking in a narrowly defined envelope. While repositioning during the air-to-air tracking test at an altitude of 8,500 feet and 500 knots calibrated airspeed, the MA encountered the target aircraft's wake vortices triggering the mishap event. Over the next approximately three seconds, the MA oscillated divergently in the pitch axis (nose up and nose down) with increasing positive and negative pitch rates, load factors, and angles of attack (AOAs). During these three seconds, stab rate limiting was present with commanded stab rates cycling between maximums in the trailing edge up (TEU) and trailing edge down (TED) directions with increasing time periods in each subsequent cycle. After approximately three seconds, the AOA exceeded -36 degrees and Flight Control System (FLCS) initiated auto pitch recovery (APR). At this point, the FLCS disregarded the mishap pilot's inputs and commanded constant full TEU stab. Approximately 8.5 seconds after the triggering event, the MA recovered to level flight. During these events, the MA exceeded both positive and negative G limits for the structure. The MA safely returned to Edwards AFB after the incident. The total cost of the mishap is currently estimated at \$3,599,377. There were no injuries and no damage to private property.

The primary cause of this accident, supported by clear and convincing evidence, was a deficiency in the mishap aircraft's FLCS. Despite the inclusion of AOA & G limiters in the FLCS software design, a wake vortex encounter triggered a divergent oscillation in the pitch axis that exceeded the MA AOA and G limits. Contributing factors, supported by clear and convincing evidence, were wake vortices from the target aircraft and mishap pilot control inputs, despite the appropriateness of pilot inputs for the perceived aircraft motions.

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