

**EXECUTIVE SUMMARY**  
**AIRCRAFT ACCIDENT INVESTIGATION**  
**RQ-4A GLOBAL HAWK UAV ACCIDENT**  
**FORWARD OPERATING LOCATION**

**30 DECEMBER 2001**

On 30 December 2001, at 1222 Local (0822 Zulu), the Mishap Air Vehicle (MAV), RQ-4A Global Hawk Unmanned Aerial Vehicle Serial Number 98-2005, was returning from a truncated operational mission in support of Operation ENDURING FREEDOM when it departed controlled flight, entering a right spin. There is no spin recovery capability for Global Hawk air vehicles, and the MAV continued the spin until ground impact. The MAV came to rest in an uninhabited area approximately 80 miles south of the classified Forward Operating Location landing site. No damage to government or private property, other than the air vehicle, was sustained. The damage to the air vehicle, including the sensor package, is estimated at \$40.6 million.

There is clear and convincing evidence that the primary cause of this mishap was structural failure of the right V-tail and ruddervator assembly due to massive delamination of the main spar in the right V-tail.

During the return flight, the right outboard ruddervator actuator control rod failed, allowing the ruddervator to travel unrestrained beyond its normal range. The control rod failure was a metal fatigue failure induced by a bend in the rod that occurred when it contacted an improperly installed actuator nut plate bolt. At 0822Z, while the MAV was descending through approximately 54,000 feet above sea level during the second of three 90° planned left turns, the lift spoilers were fully deployed to assist the descent. Twenty-nine seconds later, the MAV departed controlled flight, entering a right spin.

Once the four lift spoilers were raised to their maximum 45° deflection at this altitude, the ensuing turbulent air induced violent oscillations and vibrations (flutter) on the unconstrained right outboard ruddervator. The energy of the resultant flutter was absorbed by the right V-tail main spar, and quickly resulted in delamination of the spar caps and center webbing from the root to over one-third the length of the spar. The flexing of the spar and continuing flutter eventually caused failure of the double torsion box construction of the right V-tail, further subjecting the V-tail to increasing torsional (twisting) loading. The overall result was the structural failure of the right V-tail inducing the right spin.

Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.