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# AFR 110-14 USAF AIRCRAFT ACCIDENT INVESTIGATION

11 SEPTEMBER 1993  
ILLINOIS AIR NATIONAL GUARD  
GREATER PEORIA REGIONAL AIRPORT  
PEORIA, ILLINOIS

F-16A  
81-0779

182 FG  
169 FS

INVESTIGATING OFFICER  
COL RICHARD S. KENNEY  
158 FIGHTER GROUP  
VERMONT AIR NATIONAL GUARD

COPY NUMBER 2 OF 7

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#### SUMMARY OF FACTS

1. History of Flight: On Saturday, 11 September 1993, Bronco One Flight (four F-16A aircraft) was scheduled for a 1245L departure for a surface attack mission at Cannon Range, Fort Leonard Wood, Mo. [REDACTED] the mishap pilot (MP) was scheduled to be number four in the flight, flying the mishap aircraft (MA), F-16A, 81-0779. [REDACTED] was flight lead as Bronco 1; [REDACTED] was Bronco 3. During ground operations, the number two aircraft ground aborted and the flight became a three ship, and changed call signs accordingly. The MP was now Bronco 3 and [REDACTED] Bronco 2. Bronco 1 flight departed Greater Peoria Regional Airport at 1243L and proceeded to Cannon Range uneventfully. During a pull up after the third bombing pass, Bronco 3 experienced a momentary airframe vibration which stopped, then reappeared moments later on the base turn. [REDACTED] terminated the bomb pass and began a climb towards the emergency divert field. Attributing the vibration to a suspected leading edge flap malfunction and since all engine indications and warning systems were normal, the flight agreed that Bronco 2 and 3 would proceed back to Peoria. During the climb to Flight Level 330, the vibration stopped at 17,000 feet. However, approximately 5 1/2 minutes

later at FL290, the MA experienced an explosion and subsequent fire, forcing the pilot to safely eject; the aircraft crashed and was destroyed. The crash site was located approximately five miles northwest of Union, Mo., in Franklin County, coordinates 38 degrees - 28 minutes north, 91 degrees - 05 minutes west. The aircraft crashed at 1338 CDT, 0.9 hours after takeoff; the MP was recovered unharmed. The Public Affairs office from the 131 FW, Missouri ANG at Lambert Field St. Louis, provided initial support to the news media. The 131 FW formed an interim safety investigation board, and responded to the scene.

2. Mission: The mission was scheduled and planned as a four-ship, conventional surface attack mission. The planned profile included a four-ship, 15 second spacing departure, rejoin and cruise to Cannon Range at high altitude, letdown and perform multiple bomb and strafe passes at Cannon, rejoin and return to Peoria at high altitude for recovery. (TAB K).

3. Briefing and Preflight: The flight briefing began at 1045L, and was conducted by [REDACTED] Bronco 1. All members were present as the standard briefing items were accomplished. Contingency plans included using Forney AAF, approximately 7 nautical miles from the target, as an emergency divert field for any immediate landing requirements. The briefing was comprehensive and did not leave any questions regarding planned events and flight member responsibilities. Aircraft preflight and ground operations were normal and uneventful until the number two aircraft ground aborted for a flight control problem. Bronco 3 and 4 became Bronco 2 and 3, as the flight renumbered and continued as a three ship with no other unusual occurrences or deviations. (TAB V). The MA was configured for a surface attack mission with two 370 gallon external wing tanks on stations 4 and 6, an ALQ-131, Electronic Counter Measures (ECM) pod on station 5, and two Triple Ejector Racks (TER) on stations 3 and 7, carrying 3 BDU practice bombs each; the aircraft was fully fueled.

4. Flight Activity: Bronco 1 flight of three took off single ship at 1243L from Greater Peoria Airport, and rejoined for an uneventful cruise and letdown to Cannon Range. Range entry and bomb deliveries were normal until Bronco 3 pulled off the target on the third delivery, a 10 degree pass. As the MP started a turn to downwind, he noticed a momentary airframe vibration; there were not any abnormal engine instrument indications or warning lights. The vibration started again only moments later, prompting the MP to call a "Knock-It-Off" and begin a climb towards Forney AAF, the briefed emergency landing field. (TAB V). Bronco 2, the original element lead, joined up with Bronco 3 to assess the situation. The vibration persisted, but there were still not any abnormal indications or warning lights. During the climb, the MP noticed that his leading edge flaps did not appear to be programming normally; the flight members agreed that this was probably the source of the vibration. Bronco 2 and 3 decided to return to Peoria, leaving Bronco 1 to complete his range work. Bronco 3 declared an emergency as 2 and 3

began a climb to Flight Level (FL) 230; Bronco 2 was now escorting 3 as a chase aircraft. While obtaining clearance from Kansas City Center to climb to FL330 and passing 17,000 feet MSL, the aircraft vibrations stopped; the leading edge flaps appeared to be operating normally and all engine instruments and warning lights were normal. The MP continued a normal climb for approximately 5 1/2 minutes, and was passing FL290 when a violent explosion rocked the aircraft. Bronco 2 advised him to turn towards St. Louis, intending that to be an available emergency landing site. (TAB N). The MP determined that [REDACTED] had an engine failure, and began the critical action procedures (CAPS) for an airstart. Shortly thereafter, Bronco 2 advised [REDACTED] that [REDACTED] was on fire. The MP checked [REDACTED] aircraft and saw the back half of the fuselage engulfed in flames. Bronco 2 advised [REDACTED] to turn west away from the populated area, just as the MA did an uncommanded pitchup. The MP turned west, rolled out, and initiated a successful ejection. The MA impacted the ground and was destroyed; the MP was uninjured during a successful ejection. Bronco 2 remained in the area long enough to determine that Bronco 3 had landed okay, and then returned to Peoria.

5. Impact: The MA crashed on a mild slope in a sparsely populated area, and came to rest just inside a wooded area. There were no dwellings in the immediate vicinity. It had impacted upright, with wings practically level, and little forward velocity, as evidenced by ground scars. (TAB S). Most of the wreckage was located within an area 200 feet by 150 feet and had been engulfed in post impact fire. (TAB R).

6. Ejection Seat: The ejection seat functioned normally during the sequenced ejection process; it was found on the ground at the expected landing point. (TAB R)

7. Personal and Survival Equipment: All personal and survival equipment functioned as designed, except for the emergency beacon assembly. It failed to activate at seat-man separation due to a dead battery. (TAB I).

8. Rescue and Crash Response: Normal search and rescue (SAR) functions were not activated. The MP was met by local civilian medical personnel almost as soon as [REDACTED] stepped from [REDACTED] parachute harness. (TAB V). After going directly to a nearby house to call the 169 FS, the civilian ambulance transported [REDACTED] to DePaul Hospital in St. Louis. Local fire suppression responded to the crash scene, along with personnel from the 131 FW, Lambert Field. Personnel from the 131 FW maintained security and on-scene duties until personnel from Scott AFB arrived.

9. Maintenance Documentation: A review of the AFTO Forms 781, 95, and 350, Consolidated Engine Management System (CEMS), Core Automated Maintenance System (CAMS) records, and the maintenance inspection work packages was completed. There were not any maintenance discrepancies, inspections, Time Compliance Technical Orders, or time change items.

overdue or related to this mishap. The aircraft had completed a No. 1 200 hour phase inspection on 7 September 1993, and had flown 2 sorties for 2.5 hours since the phase completion. There was not any unscheduled maintenance performed since the 200 hour phase that relates to this mishap. Oil analysis records indicate normal readings up to the mishap sortie.

San Antonio Air Logistics Center conducted the Technical and Engineering Evaluation of the aircraft engine. During the engine inspection, the investigating engineer found an improperly torqued "B" nut securing the #5 bearing oil scavenge tube. It was estimated to be torqued to something less than 150 inch - pounds, versus the specified 300-350 inch - pounds. There was also evidence of an air leak on the sealing surface of the tube. The air leak adversely affected the engine bearing oil scavenge capability, resulting in engine bearing and turbine disc failure. (TAB J). As a result of these findings, investigation centered on the history of the engine and maintenance performed in the #5 bearing area over the last two and one-half years.

The engine records showed the last documented maintenance performed on the #5 bearing was at the San Antonio ALC engine facility in April 1991. The module containing the #5 bearing was installed on the mishap engine at Atlantic City New Jersey in May 1991, and was assigned to one other ANG unit before arriving at the 182 FG in June 1992. The engine had accumulated 383 hours since the last documented #5 bearing maintenance in April 1991. (TAB O). There has not been any maintenance documented on the suspect oil scavenge line since the engine arrived at the 182 FG, or since the depot maintenance. If maintenance was performed, it was not documented.

In-process-inspections (IPI) are recommended whenever maintenance is performed in this area of the engine. These inspections are locally prescribed and normally require supervisory, or second person witness and sign off to the task performed. The 182 FG does have a published operating instruction (OI) for IPI documentation. (TAB O).

10. Maintenance Personnel and Supervision: Maintenance personnel providing support for the mishap sortie were all properly trained and supervised. All personnel were qualified and experienced. There were not any maintenance practices, procedures, supervision, or qualifications relating to the preparation and launch of the mishap sortie. However, at an unknown time and location, the #5 bearing oil scavenge tube was not properly installed, as evidenced by an under-torqued nut and air leak.

11. Engine Fuel, Oil and Hydraulic Inspection Analysis: All fluid inspection analyses were found normal or satisfactory. Particular attention was directed to the Spectrometric Oil Analysis Program (SOAP) results leading up to the mishap sortie; oil samples were normal. (TAB O).

12. Airframe and Aircraft Systems: —

a. Flight controls and related systems: There is not any evidence indicating that any flight control or related accessory system, other than the engine, contributed to this accident. (TAB J). The pilot's attention to a possible leading edge flap malfunction early in the sequence was not related. (TAB M, TAB V).

b. Avionics, hydraulics, instrument and electrical systems were operating normally.

c. Engine: The engine was examined and analyzed by an Aerospace Engineer from San Antonio Air Logistics Center; his full report is found at J-2 thru 8. His findings follow:

(1) The number five bearing oil scavenge tube was not torqued properly during installation. This allowed an air leak into the oil scavenge system as evidenced by a leak path across the seal. (TAB S).

(2) The consequence of the air leak interrupting the normal oil scavenge process was a fire in the number five bearing compartment that led to the fracture of the fourth stage turbine disc. (TAB S).

13. Operations/Personnel and Supervision: The mishap flight was conducted under the authority of the 182 FG Commander, in accordance with AFR 60-1. The MP was performing duty in an inactive duty training status, on an Additional Flying Training Period (AFTP). The daily flying schedule for this flight was a computer generated, 182 FG Form 25, properly approved by the designated representative for the commander. (TAB K). Before approval it is reviewed for compliance with crew rest requirements, pilot qualifications, mission/syllabus requirements, working area deconfliction, and any other operations factors impacting effective mission accomplishment. All pilots were current in all administrative requirements for flight. The briefing guide used is approved and published by the 182 FG Standardization/Evaluation Section. The briefing was conducted by Bronco 1, [REDACTED] Pilot testimony indicates the briefing was complete and did not leave any questions. (TAB V).

14. Pilot Qualifications: [REDACTED] is an F-16 pilot assigned as a flight commander in the 169 Fighter Squadron. [REDACTED] is a traditional Guardsman (part-timer) who is employed by [REDACTED] as a B-737 Captain. [REDACTED] was current and fully qualified to fly the scheduled mission. [REDACTED] had 4720 total flying hours, 2093 hours of the total is instructor time. Total time in the F-16 is 113.8 hours. Other aircraft flown since Undergraduate Pilot Training (UPT) include the T-38 (997 hours), O-2A (860 hours), and OA-37 (2397 hours). (TAB G). Major Burke's latest checkrides included an Instrument/Qualification flight on 4

September 1992, and an initial Tactical Check on 26 May 1993. Both were in the F-16 and rated Qualified. (TAB G). [REDACTED] 30, 60, 90 day lookback flying hours/sorties showed 3.3 hrs/2 sorties, 13 hrs/11 sorties, and 16.7 hrs/14 sorties respectively. [REDACTED] was scheduled for a "non-demanding sortie" due to the length of time elapsed since [REDACTED] last sortie, 23 August 1993. (TAB G). The MP was mission ready (MR), and fully qualified to fly the mission.

15. Medical: [REDACTED] was medically qualified/certified for flight, and had a current AF Form 1042 on file. (TAB G). The post ejection examination at DePaul Hospital did not reveal any injuries. Toxicological analyses completed at the examining facility were all negative.

16. Navigational Aids and Facilities: All applicable navigation aids were in operation. There were not any NOTAMS applicable to the accident.

17. Weather: The sky conditions and visibility at Peoria for departure were scattered clouds and 15 miles visibility. At Cannon Range there were scattered clouds at 5,000 feet, and broken clouds at 25,000 feet. Visibility was seven miles with surface winds from the south at 13 to 18 knots. There was a broken ceiling at 25,000 feet in the St. Louis area, and a scattered layer at 15,000 feet. Weather conditions were VMC (Visual Meteorological Conditions) for the flight.

18. Directives and Publications: Publications applicable to the operation of the mission are listed; there were not any deviations from directives.

- AFR 60-1, Flight Management
- AFR 60-16, General Flight Rules
- T.O. 1F-16A-1, Flight Manual
- T.O. 1F-16A-1CL-1, Flight Manual Checklist
- MCR 55-116, F-16 Pilot Operational Procedures
- NGR 55-116, F-16 Pilot Operational Procedures
- 182 FG Briefing Guide
- 182 FGR Sup 1, Chapter 8 to MCR 55-116
- 182 FGR 50-46, Air to Ground Weapons Range Procedures
- Unit Flight Crew Information (FCIF)

19. Opinion as to the Cause of the Accident: Under 10 U.S.C. 2254 (D), any opinion of the accident investigator 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 proceedings 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.

The #5 bearing internal oil scavenge tube installation and



maintenance has been a high interest problem area for some time. Pratt and Whitney, San Antonio ALC, Air Combat Command and the National Guard Bureau have all published special emphasis notices and procedures as recently as March 1993. (TAB O). Since November 1990, approximately 69 incidents associated with the #5 bearing oil pressure and scavenge tubes have been documented. Thirteen of these resulted in in-flight emergencies, with 12 of the 69 incidents resulting directly from loose oil scavenge tubes.

Based upon the historical evidence available from previously documented incidents, and the catastrophic results of this incident, it is my opinion that the design of the oil scavenge system is deficient, and is a cause for this accident.

Based upon the evidence provided by the investigating engineer, the installation of the oil scavenge tube was negligent, and resulted in an air leak. In my opinion this condition was a cause for this accident. However, there is not clear and convincing evidence that leads to any recent maintenance on the oil scavenge system. Lack of any documentation, and denial of any maintenance performed, do not support attribution to a person or organization. In my opinion, the design of the scavenge tube seal, and the existence of an air leak created during installation at an unknown place and time also caused this accident. No evidence is available to indicate how long the condition existed before the accident.

*Richard S. Kenney*  
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Investigating Officer