

NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

2003 FEB 25 PM 2:31

OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Docket No. _____	Official Exh. No. <u>6</u>
In the matter of <u>PFS</u>	
Staff _____	IDENTIFIED <input checked="" type="checkbox"/>
Applicant _____	RECEIVED <input checked="" type="checkbox"/>
Intervenor _____	REJECTED _____
Other <u>Joint</u>	WITHDRAWN _____
DATE <u>4-11-02</u>	Witness _____
Clerk <u>L. Shindurling</u>	

2. Summary of Facts

NOTE: All times are Central Standard Time, five hours less than Greenwich Mean Time (Z).

a. History of Flight activity.

(1) WOLF flight was planned as a 2V2 Dissimilar Air Combat Tactics training sortie flown against CF-18 aircraft. Planned departure time was 1000 on 18 Sep 92. WOLF 01 was to receive a tactical flight evaluation from the Standardization Evaluation Flight Examiner (SEFE) flying as WOLF 02. The flight was planned to takeoff from Duluth International Airport, fly to a local airspace known as Snoopy, and return to land at Duluth.

(2) WOLF flight planned and flew a radar trail departure from runway 27 at Duluth IAP, Duluth, MN, taking off at 1000:29 following the CF-18's by approximately five minutes (TAB N-1). Shortly after WOLF 02 raised his landing gear after takeoff, he experienced severe "engine bangs" from the engine with a whining engine noise between bangs (TAB V-8). This was accompanied by a severe loss in thrust.

(3) WOLF 02 made an initial turn to the north in an attempt to work towards low key for a possible flameout approach to runway 09. Based on engine performance, the pilot placed the EEC BUC switch to the BUC position in order to regain usable thrust. This action had no effect on the engine's performance. The pilot then made the decision to eject based upon inability to climb or accelerate and devoted full attention to the ejection attempt. (TAB V-9).

(4) WOLF 02 turned the aircraft to a northerly heading toward the published controlled bailout area (TAB O-80) to minimize ground impact damages or injuries, and initiated ejection at approximately 600' AGL, approximately 50 seconds after take-off (TAB N-1, TAB V-10).

(5) Pilot ejection and aircraft ground impact were uneventful with no injuries to the pilot (TAB O-28) and none to civilian persons. The aircraft landed on County property (TAB O-82) and was completely destroyed. There was minimal damage to the foliage in the swampy wooded area at the crash site, and superficial damage to a nearby house (TAB V-78, 90).

(6) The aircraft canopy, ejection seat, and pilot's survival equipment and parachute landed without damage to persons or property and were recovered.

(7) Numerous articles and pictures have appeared in local media. To date, no request for a formal report has been received by the 148 FG Public Affairs Office.

(8) No claims have been filed against the government (TAB P-1).

b. Mission. The mission of the Mishap Pilot (MP), WOLF 02, was to perform a tactical flight evaluation of his flight lead, WOLF 01, IAW AFR 60-1 and ACCR 60-2 Vols. I & III.

c. Briefing and Preflight.

(1) The MP was within crew rest (TABS O-14 and V-3). He worked a normal schedule the day prior and was released from duty at 1630 hours. On 18 Sep 92, he reported for duty at 0715 for an 0800 briefing. He appeared in normal health and fit to fly (TAB V-3).

(2) The mishap mission briefing began exactly on time at 0800 given by the F-16 flight lead WOLF 01 acting as mission commander and attended by the MP along with the two CF-18 pilots (TAB V-19). Briefing guides IAW ACCR

55-116 for general information and the air-to-air scenario were available to and used by the flight lead during the flight briefing (TAB O-2). After the flight briefing, there was approximately 10 minutes left before step time of 0915. (TAB V-36)

(3) The mission was filed under Instrument Flight Rules (IFR) on a standard local flight plan. Planned flight time was 2 + 30 (TAB K-2).

(4) The MP signed out for his aircraft and stepped to the jet on time at approximately 0915 (TAB V-36). The MP reviewed the aircraft maintenance forms and completed a walk-around preflight inspection of the aircraft IAW T.O. 1F-16A-1CL-1 (TAB V-5, 51).

d. Flight Activity.

(1) Engine start occurred at approximately 0935. The only abnormality occurred during the after engine start checklist where the crew chief initially missed visually, but the pilot felt physically, the "kick" of the horizontal stabilizers during the Manual Pitch Override check. The re-check of the system was normal with no maintenance action required (TAB V-5).

(2) The aircraft taxied at approximately 0945, completed a "last chance" inspection, then proceeded to the runway. The flight lead called "ready" for takeoff at approximately 0958 (TAB V-22). WOLF 01 flight was cleared for a 20 second radar trail departure at 1000 (TAB N-1). WOLF 02's engine run up and takeoff roll were uneventful with all engine indications and aircraft performance normal. (TAB V-6)

(3) Aircraft rotation and lift-off were normal. The pilot retracted the landing gear at approximately 170 KIAS, and 100' AGL. Immediately after the gear handle was raised, the aircraft experienced a severe loss of thrust and simultaneously a cycle of severe bangs and whines with about a 3 second frequency. (TABS V-8, 63, 67, 69)

(4) Ground witnesses within 500 feet observed flames coming from the tailpipe and heard abnormal engine sounds beginning at lift-off (TAB V-63). Other witnesses observed the trail of fire from the tailpipe of the engine from greater distances, including FAA tower personnel, (TABS V-67, 69) and 148th members (TAB V-55). The flight lead WOLF 01, upon turning around also saw a stream of fire similar to, but much brighter than afterburner exhaust plume, trailing from the mishap aircraft (TAB V-25). These observations correlate to the pilot's description of intermittent banging and lack of thrust.

(5) The MP elected not to abort due to airspeed above computed refusal speed, wet runway remaining, and an already raised landing gear (TAB O-8 and V-8).

(6) Guidance in the F-16 flight manual regarding engine malfunctions

covers both specific and non-specific engine problems with both specific and non-specific generalized procedures for many common engine problems.

(7) The flight manual states "an engine malfunction on takeoff presents a demanding situation where critical actions must be accomplished quickly with little time for analysis." In this situation, the pilot had already retracted the landing gear and was above computed refusal (abort) speed. The flight manual goes on to state "If takeoff is continued, a straight ahead climb is generally preferred over an immediate turn to low key. This action provides more favorable ejection parameters and an increase in analysis time. If necessary, use only shallow turns to avoid aggravating the situation" (TAB O-27).

(8) Generally, initial reaction to any low altitude (below 10,000' AGL) malfunction should be to trade excess airspeed for altitude as altitude translates into time and/or glide range. In this case, there was no excess airspeed for this purpose.

(9) In this case, the pilot had normal engine instrument indications with severe engine bangs and whines along with a report of fire coming out of the tailpipe of the aircraft accompanied by a severe loss in thrust. (TAB V-8). There is no specific guidance in the flight manual that covers this situation.

(10) The pilot testified he was going to accomplish a procedure similar to the Low Thrust on Takeoff/Low Altitude Critical Action Procedure (TAB V-8). He omitted the first two steps; (1) EEC BUC switch-off, If thrust is still insufficient; (2) Throttle - AB; based on the information and engine indications available at the time and proceeded to the next steps: If thrust is still insufficient: (3) Throttle - MIL, (4) EEC BUC switch - BUC, (5) Stores - Jettison (if required). These actions had no effect on the engine operation. There were no stores to jettison. (TAB V-9)

(11) The MP initiated a turn in an attempt to fly to low key for a flameout approach pattern, but was unable to reach a low key altitude or accelerate so the MP leveled the wings to the north in an attempt to reach the controlled bailout area (TAB O-80) and began concentrating on the impending ejection. (TAB V-10)

(12) The MP was below the recommended minimum safe ejection altitude the whole time, was unable to climb, and his airspeed was decreasing (TAB V-10). The pilot pointed the aircraft to a low-populated area and ejected (TABS R-4 and V-11).

(13) Communications with ATC and WOLF 01 up to the point of ejection were appropriate and informative to the MP for the given situation (TABS N-1 and V-24).

(14) Review of the ejection seat data recorder information showed no malfunctions existed up to the point of ejection with systems associated with

the Flight Control Computer (FLCC) or Electronic Control Assembly (ECA) (TABS O-9-13).

(15) Two dead birds identified as Golden Plovers were found along the runway near the 6,000' remaining marker of runway 09 immediately following the mishap aircraft's takeoff by civilian airport personnel. This was near the aircraft takeoff point (TAB O-8). No other aircraft had taken off between the time of the accident and when the dead birds were found (TAB V-71). Morning checks of the runway by the same personnel, and by the 148th FG Supervisor of Flying were good (TABS V-36, 37, 63, 72, 73).

(16) The engine suffered in flight damage to the fourth stage airfoils (TAB J-10). Bird remains were found inside the engine, but could only be identified as from the same type of bird as Golden Plovers (TABS O-32, V-97, 98). Additional bird remains positively identified as belonging to Golden Plovers were found in areas of the aircraft adjacent to the engine (TABS O-32, V-98).

(17) Other common types of possible foreign object damage (FOD) were investigated. Tools (TAB O-117); runway FOD (TABS V-36, 37, 63, 72, 73), aircraft safety pins, panels and rivets (TABS V-47, 48, 52, 58, 59, 60); and ice FOD (TAB V-21 and W-1); were eliminated as possible sources of damage.

e. Impact. The aircraft impacted in a wooded, marshy area approximately 1/2 mile northwest of Duluth IAP at 1001 hours and was destroyed (TAB S-1). A single explosion and fire ball occurred with little or no residual fire present (TAB V-26 and 27). Aircraft impacted 21 degrees nose down, 29 degrees left wing down, 255 KIAS, with excess of 6,000 fpm descent (TAB J-2, 3).

f. Ejection Seat.

(1) Ejection was initiated within the performance envelope of the ACES II ejection seat which functioned properly (TAB O-15).

(2) The Emergency Locator Transmitter (ELT) failed shortly after activation due to contact with the seat housing which moved the selector switch to the manual position. (TAB S-4)

(3) The tacking on the left parachute riser failed to break upon deployment preventing 4-line jettison on the left side of the parachute (TAB S-5).

g. Personal and Survival Equipment.

(1) All personal and survival equipment inspections were current (TAB O-16).

(2) There were no deficiencies in equipment noted. Survival equipment was not required as ground personnel were on the scene immediately (TAB V-13).

crew rest (TABS O-14 and V-3). The briefing was exceptionally thorough (TAB V-4), utilizing briefing guides IAW ACCR 55-116 (TAB O-2 and V-19).

(3) The SOF, [REDACTED] was within crew rest and took an active role in mission preparation (TABS O-14 and V-35).

o. Crew Qualifications.

(1) The MP is an experienced pilot and up to 18 Sep 92, had 1569.5 total flying hours including 1218.5 hours as pilot in the T-37, T-38, F-4C/D and F-16; and 351.0 hours as navigator and Weapons Systems Operator in the RF-4 and F-4C/D aircraft. He is an instructor pilot (IP) and flight examiner (SEFE) in the F-16, with 295.2 hours IP time and 22.7 hours SEFE time (TAB T-5).

(2) The MP was current and qualified to fly the mission (TAB O-30). His last Instrument/Qualification Evaluation was administered on 26 Sep 91 (valid through 28 Feb 93) (TAB T-27), and his last Tactical Flight Evaluation was administered on 26 Apr 91 (valid through 30 Sep 92) (TAB T-28). They were both instructor pilot evaluations with no discrepancies. He had completed the National Guard Bureau Return-to-Fly Program IAW the local program and was qualified to fly the Dissimilar Air Combat Tactics mission briefed (TAB T-46).

p. Medical.

(1) The MP was medically qualified for flight (TAB O-21). He was current in physiological training (TAB T-42).

(2) Toxicology result reports were negative (TAB O-23).

(3) Post accident medical records show no serious problems only possible right shoulder strain (TAB O-28).

q. Navaids and Facilities.

(1) All navaids available at Duluth IAP, Minnesota, usable by the F-16, were operational.

r. Weather.

(1) The official weather at the time of the accident was a broken overcast at 2,000 feet with 15 miles visibility underneath. Winds were from 310 degrees gusting 16 to 25 knots. An overcast cloud layer was at 3,000 feet and there were light rain showers at the time. The temperature was 47 degrees F with a dewpoint of 40 degrees F (TAB W-1). This weather report differs slightly from that reported by the SIB (TAB K-3).

(2) The pilots and SOF both generally confirm the official weather (TABS V-10, 21, 36).