

USAF AIRCRAFT ACCIDENT INVESTIGATION REPORT



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OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

**F-16C SERIAL NUMBER 88-0411
128th FIGHTER WING
TRUAX FIELD, WISCONSIN
30 MARCH 1994**

CONDUCTED IN ACCORDANCE WITH AFR 110-14

**APPOINTING AUTHORITY:
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COPY ONE OF TEN

PFS Exh. 169

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Template = SECY-028

SECY-02

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II. SUMMARY OF FACTS

A. HISTORY OF FLIGHT

At 0842 CST (1442 Greenwich Mean Time [GMT]), Wednesday, 30 March 1994, an F-16C (serial number 88-0411) assigned to the 128th Fighter Wing, took off from Truax Field, Madison, Wisconsin (K-2). The aircraft, callsign GATE 02, was scheduled to fly with another F-16C, GATE 01, to Buckley Field outside of Denver, Colorado with a flight time of approximately two hours. After aircraft servicing was complete, GATE flight was to take off from Buckley at 1730 GMT and fly approximately two hours to March Air Force Base, California. Both flights were to be flown at 39000 feet (K-2). Approximately six minutes after takeoff, GATE 02 crashed just off the departure end of runway 18 while attempting to land (A-2, O-15). The aircraft was completely destroyed by ground impact and fire (M-2, S-4). The pilot

successfully ejected from the aircraft and sustained a compression fracture of a vertebra and a fractured wrist (A-2, X-2).

Local media interest in the crash was high, but there was very little national interest (AA-2). Media inquiries were handled by the 128th Fighter Wing Public Affairs Office, Truax Field, Wisconsin.

B. MISSION

The mission of GATE 02 was to receive a supervised cross-country checkout in accordance with (LAW) 176th Fighter Squadron mission qualification training (MQT) (V-1-1, V-3-1). GATE flight was to fly to Buckley Field, Colorado and then on to March AFB, California on 30 March 1994. On 31 March 1994, GATE flight was to return to Truax Field via Buckley Field (K-5).

C. BRIEFING AND PREFLIGHT

[REDACTED] (GATE 02) and the flight lead, [REDACTED] (GATE 01), reported for duty at 0620 CST (V-3-1). Both pilots had worked the day before and had left the operations building at 1630 CST (V-1-1). Crew rest was normal. All of the flight planning had been done in the previous two days by [REDACTED] and [REDACTED] IAW Air Force Regulation 60-16 and Department of Defense Flight Information Publications General Planning (V-1-1, V-3-1, BB-2). The briefing was conducted IAW Multi-Command Instruction 11-416, to include routes of flight and alternate airfields (V-1-1). The briefing, which lasted approximately one hour, included an emergency procedure (EP). The published EP for the 30th day of the month was out-of-control recovery, however, [REDACTED] briefed asymmetrical conditions with a pylon-mounted baggage pod because [REDACTED] had never flown with one before (V-3-1).

Following the brief, both pilots went out to their aircraft after properly signing out and being briefed by the supervisor of flying (SOF) (K-4). Configuration for aircraft 88-0411 was one centerline external fuel tank, two weapons pylons, and one baggage pod mounted on the left weapons pylon (M-2, R-2). Ground operations to include preflight, engine start, check of the secondary engine control (SEC), check of the emergency power unit (EPU), taxi, and end-of-runway inspection were all normal (N-2, V-1-1, V-3-1, V-16). Madison Clearance Delivery cleared GATE flight to Buckley Field as filed, to climb and maintain 5000 feet, and expect flight level 390 (39000 feet) ten minutes after departure (N-2). At 0841 CST, Madison Tower cleared GATE flight for takeoff on runway 36 with clearance to contact Madison departure after takeoff and turn to a heading of 310 degrees. The winds were reported to be 320 degrees at 5 knots (N-3).

D. FLIGHT ACTIVITY

At 0842 CST, GATE 02 executed a military power (full power without use of afterburner) takeoff behind GATE 01 in a 20 second radar trail departure (V-1-1, V-3-1, O-19). GATE 02 started climb to 5000 feet mean sea level (MSL) and initiated turn to 310 degrees in order to rejoin with GATE 01 (V-1-1). Shortly after rolling out on a heading of 310 degrees, GATE 02 saw the the word WARNING flash in heads-up display (HUD); heard "WARNING, WARNING" in headset; and saw an ENGINE warning light illuminate on glareshield (V-1-1, V-2-1). looked, but did not see any lights illuminate on the caution light panel (V-1-1, V-2-1). transmitted to GATE 01 on very high frequency (VHF) radio, "GATE 01, 2 has a problem right now. Got an ENGINE warning light; planning on climbing to investigate" (V-1-1, V-3-1).

GATE 01 directed GATE 02 on VHF to turn back to Truax Field and climb to simulated flameout (SFO) parameters (V-3-1, V-4). GATE 02 started towards Truax Field in an easy right hand climbing turn to a heading of 180 degrees and an altitude of 9400 feet MSL (V-1-1, O-20, O-21). GATE 01 requested a 360 degree turn from Madison approach on ultra-high frequency (UHF) radio to rejoin with GATE 02, declared an emergency, and further informed Madison approach that GATE 02 had an engine malfunction (N-4). GATE 01 queried GATE 02 on VHF as to the status of engine and GATE 02 responded that engine was running normally (V-1-1, V-3-2). The ENGINE warning light extinguished after 20-30 seconds (V-2-1). The aircraft was in military power with engine indications of 100% revolutions per minute (RPM); 800 degrees Celsius fan turbine inlet temperature (FTIT); 9000 pounds per hour of fuel flow; 2850-3250 pounds per square inch (psi) hydraulic pressure; 40-45 psi oil pressure; and nozzle closed (V-1-1). GATE 01 directed GATE 02 to call up the test page to see if there were any maintenance fault list (MFL) or pilot fault list (PFL) entries. GATE 02 complied and reported no entries (V-2-1, V-3-2). GATE 01 told GATE 02 on VHF that the plan was to go to high key (a position over the field between 7000-10000 feet above ground level from where a flameout approach is commenced) at Truax Field, burn down gas, and land (V-1-1, V-3-2). Madison approach informed GATE 01 on UHF, "the airport is yours. You can go back to the Madison airport and circle if you wish (N-4, V-7-1)."

GATE 01 and GATE 02 changed over to VHF radio channel 2, the squadron common frequency, to talk to the supervisor of flying (SOF)(V-1-2, V-3-2). GATE 01 told the SOF on VHF that GATE 02 had an engine warning light and they were going to high key to burn down gas (V-3-2, V-5, V-7-1, V-11, V-12, V-15, V-29). Madison approach transmitted on UHF, "GATE 01, we will have the appropriate cable up when we see the aircraft turn final to, a particular runway. The wind is 280 degrees at 5 knots, the altimeter is 30.40. Equipment is standing by." GATE 01 acknowledged, "30.40, thanks (N-4, V-7-1)." GATE 01 informed Madison approach on UHF that GATE flight was going to circle over the field. Madison approach acknowledged and cleared GATE to circle at any altitude that wanted (N-4, V-7-1).

GATE 02 noticed that the nozzle had remained closed for an extended period of time and manipulated the throttle on two different occasions to see if the nozzle would move (O-16, O-17, V-1-2, V-2-1). (Note: the nozzle is the most aft part of the engine which opens and closes based on thrust required and the need to control exhaust gas temperature). The first movement, at 2:50 into the flight, was from midrange, to idle, to military power, to idle, and back to midrange; all in a ten second period. The second movement, at 3:10 into the flight, was from midrange, to military power, to idle, and back to midrange; once again in a ten second period (O-16). The engine generated thrust and there were no abnormal engine sounds or vibrations (V-1-2).

GATE 02 reported on VHF that [REDACTED] had a nozzle problem and the nozzle was closed (V-1-2, V-3-2, V-5, V-7-2, V-11, V-12, V-15, V-29, V-30). The SOF directed GATE 02 on VHF to pull [REDACTED] power to idle and report [REDACTED] indications (V-5, V-7-2, V-11, V-12). Gate 02 pulled the throttle to idle at 3:25 into the flight and left it there (O-16, O-17, O-19, V-1-2). The nozzle opened to 41% over a period of ten seconds and gradually opened to 78% over the next 35 seconds (O-18).

GATE 02 initiated a left hand descending turn over the field from 9500 feet and 270 knots calibrated airspeed (KCAS) (O-20, O-21, V-3-3). GATE 02 reported that the nozzle was opening (V-5, V-7-2, V-11, V-12, V-13). GATE 02 then reported that [REDACTED] nozzle was fluctuating on VHF (V-3-3, V-5, V-11). GATE 01 directed GATE 02 on VHF to select secondary engine control (SEC) (V-1-2, V-3-3, V-5, V-11, V-12, V-13, V-15, V-29). (Note: secondary engine control removes computer inputs to the engine and turns the engine into a mechanical engine. Engine stall protection is removed and afterburner is inhibited). Gate 02 selected SEC at 4:04 into the flight going through north at 240 KCAS and 7000 feet (O-2, O-11, O-15, O-20, O-21). The nozzle closed to zero (O-18). GATE 01 asked on VHF, "are you in SEC; is the nozzle closed (V-7-2, V-11)?"

GATE 02 transmitted on VHF, "I'm going to land unless there is further guidance (V-7-2, V-15)." GATE 02 lowered the landing gear at 250 KCAS turning left through 280 degrees and 5000 feet (O-11, O-20, O-21). GATE 01 transmitted on VHF, [REDACTED] going for it (V-4, V-5, V-11, V-12, V-15)." GATE 01 transmitted on UHF, "GATE 01, Runway 18, can you get the barrier up by the south side of 36?" Madison approach answered, "the southside barrier will be up for runway 18 for GATE 01, the emergency aircraft is cleared to land runway 18, the number 2 aircraft can make a low approach, left closed traffic, winds 280 at 5 (N-5, V-3-4, V-7-1)." GATE 02 had between 7000 and 8000 pounds of fuel onboard (V-1-2). GATE 02 flew a normal SFO and rolled out on final approach on a heading of 180 degrees at 1600 feet and 235 KCAS (O-20, O-21, V-3-1, V-5, V-11, V-12, V-15).

GATE 02 landed the aircraft at 180 KCAS approximately 1500-2000 feet down runway 18 (O-36, V-1-3, V-20, V-25). GATE 02 held the aircraft in its landing attitude and did not attempt raise the nose into two-wheel aerodynamic braking (V-1-3, V-3-4, V-7-3, V-11, V-12,

V-15, V-19). GATE 02 lowered the nose into a three-point attitude shortly thereafter, but prior to taxiway foxtrot, an intersection approximately 5000 feet down runway 18 (V-1-3, V-7-3, V-19, V-20). GATE 02 actuated the arresting hook at about the same time the SOF transmitted, "use the hook if you need it (V-1-3, V-3-4, V-5, V-12, V-29)." The hook was observed down (V-3-4, V-7-3, V-8, V-15, V-18, V-19, V-22, V-24, V-26).

GATE 02 crossed the south BAK-14 arresting cable right of the runway centerline (an undetermined distance) at 124 KCAS (O-36, V-4, V-8, V-9, V-22). The cable was up (V-1-3, V-7-3, V-8). The hook did not engage the cable (V-1-3, V-7-3, V-8, V-10, V-17, V-18, V-28). The cable struck the hook shank approximately 12 inches above the hook toe (J-30, Z-2, Z-3).

GATE 02 attempted to brake following the missed barrier engagement and the aircraft decelerated to 116 KCAS (O-36, V-1-3, V-8). Braking was abandoned and GATE 02 attempted to takeoff again and pushed throttle into afterburner (O-2, O-23, V-2-2, V-10, V-17, V-18, V-22, V-24, V-28).

GATE 02 departed the prepared surface of the runway and ejection was initiated at 124 KCAS on a heading of 182 degrees (O-23, O-36, V-1-3, V-10, V-17, V-19). Simultaneously, GATE 01 transmitted, "bailout, bailout, bailout (V-3-4, V-5, V-7-3, V-13, V-15, V-29)."

E. IMPACT

At approximately 0848 CST on 30 March 1994, GATE 02 departed the prepared surface of runway 18 at Truax Field, Wisconsin in a slightly nose up attitude and the main wheels on the ground (O-20, S-2). The aircraft speed was 124 KCAS and the ground track was just to the right of the sequenced flashers for runway 36 (O-36, R-3, S-2, S-3). The aircraft continued on this vector until the nose gear and engine intake dug in 500-550 feet from the prepared surface and started disintegrating (R-2, R-3). The aircraft's momentum and ground strikes with different parts of the aircraft left both wings, both horizontal stabilizers, both weapons pylons, the nose gear, and cockpit area strewn in the path of travel (R-2, R-3). The wreckage stopped travel as it spun around and impacted an instrument landing system (ILS) antenna 967 feet from the prepared surface (S-4). The aircraft's final resting place was North 43 degrees, 7 minutes latitude and West 89 degrees, 20 minutes longitude and was oriented approximately 030 degrees (S-3). All structural damage was a result of impact and the resultant fire (S-4).

F. EJECTION SEAT

The ACES II ejection seat operated properly. The mishap pilot ejected at 124 KIAS with the aircraft pitching nose down from the resultant dig-in with the terrain (O-36, V-10). Upon ejection, the seat reverted to Mode I operations where the recovery parachute assembly departs almost immediately after the ejection seat separates from the aircraft. The radio beacon activated

after pilot/seat separation and the survival kit deployed (N-6, S-5). Due to the close proximity of the recovery parachute to the fireball that ensued, the parachute ignited and burned, thereby creating a free fall situation for the mishap pilot from an undetermined height (V-1-4, V-3-5, V-10, V-19, S-5). [REDACTED] landed approximately 35 feet from the final resting location of the main wreckage (R-2, R-3, S-5, V-20, V-21).

G. PERSONAL AND SURVIVAL EQUIPMENT

A review of life support historical records shows that all equipment inspections were current (CC-1).

H. RESCUE

The Truax Field Airport Fire Station was notified of an Alert 2 (emergency) from Madison Tower at 0843 CST and vehicles were in position by 0844 CST (N-4, V-20, V-21). The initial response consisted of four crash and rescue vehicles from the Truax fire station; a fifth vehicle responded after the crash. At 0847 CST, the mishap aircraft landed, departed the prepared surface, disintegrated from ground impact, and burst into flames. The crash and rescue vehicles were able to respond rapidly to the burning wreckage due to a convenient access road just to the east of the sequenced flasher light standards (V-20, V-21). Rescue 6 found the pilot approximately 35 feet from the burning wreckage and pulled [REDACTED] to safety (V-20, V-21).

I. CRASH RESPONSE

[REDACTED] and incident commander, called for a Level Two response from the Madison Fire Department (V-19). Additional fire response units arrived and were staged by the incident commander. The fire was quickly brought under control. An ambulance happened to be on Anderson Street, which borders the southern airfield boundary. [REDACTED] was carried to the ambulance, which departed for Meriter Hospital-Park at 0903 CST and arrived approximately 10 minutes later.

J. MAINTENANCE DOCUMENTATION

The active Air Force Technical Order (AFTO) Form 781 series for the mishap aircraft were destroyed in the crash and resulting fire (H-2). Overall, the records and Form 781 series for the mishap aircraft revealed no maintenance discrepancies relating to the mishap (H-2)

There were ten open Time Compliance Technical Orders (TCTO) on 88-0411. One TCTO was in abeyance, five were awaiting parts, one was not complied with because of lack of equipment, and three were ready for work (H-3).

The only overdue inspection was an aircraft wash and corrosion control inspection due on 12 Jan 94 (U-2). The last major scheduled inspection performed was a #3 200-hour phase inspection completed 6 Dec 93 (H-2).

The last engine oil sample was taken on 27 Mar 94 and all readings were in limits (U-3).

There were no overdue Time Change requirements (U-4).

The Equipment Review Report was reviewed and there were no discrepancies other than those listed above.

There was one unscheduled maintenance discrepancy and three significant pilot reported discrepancies. None of these maintenance discrepancies had any relation to the mishap. (H-2)

K. MAINTENANCE PERSONNEL AND SUPERVISION:

A review of the maintenance personnel and supervision records, aircraft records other than AFTO 781, and the testimony of maintenance personnel revealed no factors contributing to the mishap.

L. ENGINE, FUEL, HYDRAULIC, AND OIL INSPECTION ANALYSIS

A review of the engine records and Crash Survivable Flight Data Recorder (CSFDR) readings for engine number 509169 revealed no overdue inspections nor any indication of pre-mishap abnormal engine performance. The engine operated normally until impact with the ground at which point it sustained foreign object damage (FOD) (J-2). The CSFDR and Engine Monitoring System (EMS) both recorded a pilot transfer to secondary engine control (SEC) at 4:04 into the flight (O-15). The only related maintenance fault listing was Engine 051 which indicates engine transfer from primary to SEC (O-2).

Fuel was tested and was deemed satisfactory for use (J-20).

Hydraulic fluid was tested and deemed satisfactory for use (J-23, J-24, J-25).

Oil was tested and deemed satisfactory for use (J-22).

M. AIRFRAME AND AIRCRAFT SYSTEMS

Engine S/N 509169 was torn down and indicates that the engine was operating normally in secondary engine control (SEC) (J-2).

The afterburner fan temperature control (AFTC) was removed from the engine and sent to Tinker AFB for investigation. All test points were within field limits with three exceptions (J-6).

The T5.6 sensor was removed and sent to Tinker AFB for testing. The sensor passed all required tests (J-6).

The Delta P pressure switch was removed and sent to Tinker AFB for testing. The switch met depot test limits (J-6).

The alternator rotor and stator was removed and sent to Tinker AFB for testing. These components passed all tests (J-6).

The nozzle position transducer was removed and sent to the vendor for testing. The transducer indicates that the nozzle was working normally (J-7).

The nozzle indicator was removed and sent to Tinker AFB for testing. The nozzle indicator passed post impact testing and was assessed as functional prior to the mishap (J-33).

A complete test of the arresting hook and its supporting systems showed no abnormalities. It was deemed that the arresting gear was operational at the time of the mishap (J-31). The last arresting gear release system operations check had occurred on 7 Mar 94 (U-5). Aircraft 88-0411 had taken the south cable on two different occasions; the first time was on 17 Jun 93 at an estimated speed of 70 KCAS and the second time was on 14 August 93 at an estimated speed of 30 KCAS (U-6, U-7).

The engine warning control unit (EWCU) was removed and sent to the vendor for testing. The EWCU passed the vendor's acceptance test procedure and the circuits associated with warning light activation and voice messages appeared to be normal (J-34).

The brake assemblies were removed and sent to Tinker AFB for testing. Both brake assemblies were assessed as functional (J-35).

The anti-skid control box, the brake control box, and the two wheel speed sensors were removed and sent to Tinker AFB for testing. All four components passed post impact testing and were assessed as functional prior to the mishap (J-37).

N. OPERATIONS AUTHORIZATION AND SUPERVISION

The mission was authorized by the 128 FW commander as directed by the flying schedule and annotated on flight order 94-089 for 30 Mar 1994 (K-4). Specific flight orders authorizing

cross country flight were authorized by the 128 FW vice wing commander (K-5). The mission was briefed by [REDACTED] IAW Air National Guard Regulation MCI 11-416.

A SOF and a runway observation monitor (ROM) were on duty and in their assigned positions (V-5, V-7-1).

O. AIRCREW QUALIFICATIONS

Aircrew qualifications were examined and [REDACTED] was qualified for flight. [REDACTED] was inexperienced in the F-16 and had 168.2 hours in the F-16C/D and 358.6 total. [REDACTED] had flown 16.6 hours in the last 30 days, 33.2 hours in the last 60 days, and 38.6 hours in the last 90 days (T-2). [REDACTED] initial mission and instrument/qualification checks were current (T-3-1, T-3-3).

[REDACTED] had not been declared Mission Ready with the 128FW, but that is the case with many of the 128th FW pilots. The unit was still in its conversion from the A-10 to the F-16. Even though maintenance problems in the fall of 1993 had forced the squadron commander to halt the conversion for a period of two months, [REDACTED] was given priority, as were all of the lieutenants (V-31-1). [REDACTED] sortie totals for January, February, and March were 4, 11, and 13 respectively (T-2). The low total in January was attributed to time off for [REDACTED] wedding (V-31-2).

[REDACTED] had completed most of the squadron's two-phase top-off program and needed two rides to be declared Mission Ready. [REDACTED] had completed Phase I, which concentrated on two-ship tactics, and was close to completing Phase II, which concentrated on four-ship tactics (T-4-2). A review of [REDACTED] gradebook revealed normal progression, with the exception of three rides which were graded '1'. These rides were reflown because of student non-progression (T-4-5, T-4-7, T-4-9). Student non-progression was attributed to tactically employing the aircraft and not for flying the aircraft.

[REDACTED] flew the Pratt & Whitney F100-PW-200 engine at McConnell AFB, Kansas where [REDACTED] underwent [REDACTED] qualification training in the F-16. Prior to departing McConnell [REDACTED] was given two hours of academic training on the differences between the F100-PW-200 engine and the General Electric F110-GE-100 engine that is in the 128 FW aircraft (T-4-1, V-14). [REDACTED] was to have received a simulator ride with the F110-GE-100 engine configuration at McConnell, but that did not occur (V-31-2). To make up for that deficiency, the 128 FW developed its own cockpit familiarization trainer (CFT) program which concentrated on operating limitations and emergency procedures (V-31-2). [REDACTED] completed this CFT on 13 Aug 93 (T-4-2).

[REDACTED] was assessed as a solid, above average pilot whose training had been progressing normally up to the point of the mishap (V-3-5, V-31-1, V-31-2). [REDACTED] works extremely hard on mission preparation and had only missed one question on the unit's monthly 25-question test that is given at the unit training assembly (V-3-5, V-31-1).

P. MEDICAL

Review of [REDACTED] medical and dental records revealed that [REDACTED] had a current physical examination and [REDACTED] had been medically approved for flight duties. Post-mishap toxicological tests revealed nothing which would have had an influence on the mishap (X-2).

Q. NAVAIDS AND FACILITIES

A review of applicable notices to airmen (NOTAMS) revealed no significant information related to the mishap (W-3).

R. WEATHER

Runway conditions were dry with scattered clouds at 2000 feet MSL. Visibility was 8 miles (W-2). Reported winds at takeoff were 320 degrees at 5 knots with an altimeter of 30.40 (N-3). Upon return to the airfield the winds were 280 degrees at 5 knots with the altimeter remaining the same (N-4).

S. DIRECTIVES AND PUBLICATIONS

	Department of Defense Flight Information Publications General Planning.
AFR 60-16	General Flight Rules, 27 Jan 92 ACC Sup 1, 25 Feb 93
MCI 11-416	F-16 Operational Procedures, 7 May 93 128 FW Sup 1 ANGR 55-116, 15 Apr 93 128 FW Pilot Aid, 1 Jan 93, Change 4, 29 Sep 93
MCI 60-3	Supervisor of Flying, 1 Jul 93
ANGR 55-038	Runway Observation Monitor (ROM) Program, 1 Jul 89 128 FW Standard Procedures, 21 Sep 93
T.O. 1F-16C-1	Flight Manual, F-16C/D, 17 October 1988, Change 9, 4 October 1993

T.O. 1F-16C-1CL-1

Flight Crew Checklist, F-16C/D, 17 October 1988,
Change 9, 4 October 1993

FCIF 93-7, F-16 Flameout Approaches

Known deviation:

T.O. 1F-16C-1CL-1

The pilot did not consult his checklist for ENGINE warning light or his suspected nozzle problems (V-1-2).

III. STATEMENT OF OPINION

Under 10 U.S.C. 2254(D), any opinion of the investigator as to the cause of, or 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.

In my opinion, analysis of the evidence clearly supports the following conclusions:

a. The mishap pilot was properly trained and qualified for flight. [REDACTED] had a good record of flight activity for the previous two months. [REDACTED] had received training on the F110-GE-100 engine. (Tab T, X-2)

b. The mishap aircraft was properly maintained and correctly configured for flight. There were no indications on the day of the mishap, or on any previous inspections or flights, that any abnormalities or deficiencies existed. One minor inspection was overdue and ten time compliance technical order (TCTO) actions were open, but were irrelevant to the mishap. (Tabs H and U)

c. The aircraft operated normally throughout the flight. Teardown of the engine and testing of aircraft systems indicated no abnormalities which would have contributed to this mishap (Tab J). The crash survivable flight data recorder (CSFDR) indicated no abnormalities in engine performance (Tab O).

d. The reason for the illumination of the ENGINE warning light and why it extinguished 20-30 seconds later cannot be determined from available data.

(1) Nothing occurred which would have triggered an ENGINE warning light to illuminate according to T.O. 1F-16C-1, Section 3. All engine indications were normal and there were no associated maintenance fault list (MFL) or pilot fault list (PFL) entries (Tab O, V-2-1, V-3-2). The engine alternator and engine warning control unit (EWCU) passed post-mishap testing (J-6, J-34). The RPM indicator was working (V-1-1).

(2) The CSFDR did not record any special events IAW T.O. 1F-16C-1 (O-2). Occurrences which would trigger an ENGINE warning light and also record as a CSFDR special event are an engine in subidle (less than 60%) or an engine overtemperature (greater than 1000 degrees Celsius for longer than 2 seconds). CSFDR data over the entire flight period does not indicate either of these conditions occurred (O-19).

(3) An F-16, fleetwide maintenance history on EWCU writeups was run for the period 1 January 1993 through 1 January 1994. There were 21 separate occasions where an ENGINE warning light illuminated. Of these, 18 were recorded inflight and all had normal engine indications. Two occurrences were on the ground prior to flight and one was on takeoff roll. There were no occurrences that were associated with any of the indications listed in T.O. 1F-16C-1. (Tab DD)

e. The mishap pilot, after having an ENGINE warning light illuminate, focused on a suspected nozzle problem. (V-1-2).

f. The nozzle operated normally.

(1) The nozzle position transducer and nozzle indicator worked normally (J-7, J-33).

(2) According to T.O. 1F-16C-1 and the F110 Powered Falcon, a manual written on the F110-GE-100 engine by General Electric, nozzle position is controlled by electrical signals from the afterburner-fan-temperature control (AFTC); not throttle position. There is not a mechanical linkage between throttle and nozzle. The AFTC uses throttle position (throttle angle) as one of its electrical inputs, but the signal sent to open or close the nozzle is dictated by the measurement of fan discharge Mach number. Based on this Mach number, the throttle demand by the pilot, and other engine variables, the AFTC may or may not command the nozzle to move, so as to provide fan stall margin. In laymen's terms, if the AFTC senses deceleration and the throttle is at idle and remains there for a period of time (not transient), it will schedule the opening of the nozzle. If the AFTC does not sense deceleration, the nozzle may not be commanded to move.

(a) At 2:30 into the flight, just prior to the first investigative movement of the throttle, the mishap pilot placed the throttle in idle and left it there for ten seconds (O-16). The nozzle, coincident with an airspeed deceleration from .58 Mach to .52 Mach over the next twenty seconds, opened to 29% (O-17, O-32). At 2:40, the pilot pushed the throttle back up to midrange and the nozzle closed down to 3% (O-16, O-17). These nozzle indications would be considered normal considering the performance desired by the pilot.

(b) During the mishap pilot's two investigative efforts, the nozzle stayed between 2-3% during both movements of the throttle (O-17). This would be considered normal because the throttle was never stabilized at any one position and there was no deceleration; the first movement was at .51 Mach and the second was at .49 Mach (O-16, O-32).

(c) When the throttle was pulled to idle, the nozzle opened smoothly to 41% because the throttle was left in idle and there was a corresponding decrease in Mach (O-17, O-32).

(d) The nozzle continued to open in a normal fashion to 78% as a function of the throttle being at idle, his descent, and the corresponding decrease in Mach (O-18, O-19, O-32).

(e) When the engine was placed in SEC, the nozzle closed to zero in ten seconds, well within T.O. 1F-16C-1 limits of 0% (plus or minus 5%) within 30 seconds (O-19, O-20).

g. The mishap pilot channelized attention on a suspected engine problem and decided to land the aircraft without taking time to fully analyze the situation.

(1) During investigation of the nozzle, the engine generated thrust and there were no abnormal engine sounds or vibrations (V-1-2).

(2) The mishap pilot did not follow the flight lead's game plan to orbit at high key, burn down gas, and land. Once overhead the field, descended directly into a simulated flamout (SFO) approach (V-1-2).

(3) The mishap pilot did not consult checklist for the ENGINE warning light or suspected nozzle problems (V-1-2).

(4) Coordination between the flight lead and Madison Approach and other transmissions by Madison Approach on UHF, at the time the SOF was discussing the suspected nozzle problem, detracted from the communication flow on VHF (V-3-2, V-7-2).

(5) The mishap pilot only communicated that the nozzle was fluctuating and did not communicate any numeric values of the nozzle fluctuation to the flight lead or the SOF (V-2-1, V-4, V-5, V-7-2, V-11).

(6) The mishap pilot was confused as to when he saw the nozzle fluctuation. He stated that fluctuations of 20-60% only occurred after he positioned the engine control switch to SEC (V-1-2, V-2-1). Other witnesses stated that he reported nozzle fluctuations prior to the flight lead directing him to go to SEC (V-3-3, V-5, V-11).

(7) After selecting SEC, the mishap pilot lowered the landing gear, indicating that he was going to land opposite traffic (O-15, V-1-2). This caught the flight lead and the SOF by surprise. They thought there was a much more serious problem and did not want to bother him as he flew his approach to landing (V-3-3, V-5).

h. The mishap pilot landed a heavy weight SFO in SEC, thereby reducing his chances of stopping the aircraft with normal braking.

(1) The aircraft had 7000-8000 pounds of fuel onboard (V-1-2). Procedures in T.O. 1F-16C-1 require adding 5 KCAS for every 1000 pounds of fuel/store weight over 1000 pounds to all pattern airspeeds. In this case, speed was increased 35 KCAS.

(2) T.O. 1F-16C-1 does not recommend landing with the engine operating satisfactorily in SEC because the higher level of idle thrust may result in a long and fast landing and there will be difficulty stopping the aircraft. The unit had emphasized in safety briefings that the engine runs fine in SEC and the plan should be to burn down gas and land from a straight-in approach (V-31-3).

(3) The mishap pilot held the landing attitude for a short distance and lowered the nose. Two-wheel aerodynamic braking was not attempted. (V-1-3, V-3-4, V-7-3, V-11, V-12, V-15, V-19). T.O. 1F-16C-1 states that maximum braking is achieved by using two-wheel aerodynamic braking until approximately 80 knots, flying the nose to the runway, and then use full three-point braking with the wheel brakes. Wheel braking at high speeds is very low compared to two-point aerodynamic braking.

i. The hook missed the cable for an undetermined reason. Evidence indicates the cable struck the hook shank approximately 12 inches above the hook toe (J-30, Z-2, Z-3). The cable was inspected ten minutes after the crash. There were no marks on the cable and all support blocks were intact (V-8, V-9).

j. The mishap pilot ejected in a flat trajectory due to aircraft dig-in and disintegration, the downslope of the terrain to the south, and the resultant positions of the pilot, canopy, and ejection seat (R-2, R-3, V-10). This flat trajectory is further evidenced by the fact that the seat kit deployed, but the life raft did not inflate. This occurred because the fireball consumed the parachute and the life raft pouch impacted the ground intact. There was not sufficient altitude for the connecting cord to stretch out and activate the CO² bottle (S-5).

In conclusion, it is the opinion of the Investigating Officer that this accident was the result of pilot error. The mishap pilot failed to follow two of the three basic rules in T.O. 1F-16C-1 which apply to all emergencies. [REDACTED] did maintain aircraft control, but [REDACTED] did not analyze the situation and take proper action. [REDACTED] subsequently did not land as the situation dictates. If [REDACTED] had taken the time to orbit at high key, consult [REDACTED] checklist, and talk over the specifics of [REDACTED] situation with the flight lead and SOF, the outcome would have been far different. As it was, channeled attention on a suspected engine problem led [REDACTED] to determine that [REDACTED] needed to land immediately. Time compression, coupled with switching the engine into SEC and flying a heavyweight SFO, merely exacerbated the situation. There is no clear evidence as to why the hook missed the cable. Finally, the pilot made the decision to eject without a moment to spare.

T. SIGNATURE

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