

## AFI 51-503 ACCIDENT INVESTIGATION BOARD

**AUTHORITY:** Under the provisions of Air Force Instruction (AFI) 51-503, General Richard E. Hawley, the Commander of Air Combat Command, appointed Brigadier General Fred R. Sloan on 17 October 1997 to investigate and determine the facts and circumstances surrounding the F-16 midair mishap that occurred on 16 September 1997 off the coast of Atlantic City, New Jersey. The mishap involved two aircraft assigned to the 177 Fighter Wing (FW), New Jersey Air National Guard. Aircraft serial numbers (S/N) are 84-1320 (F-16 D/Block 25) and 84-1286 (F-16C/Block 25). The accident resulted in the loss of aircraft 84-1320 in the Atlantic Ocean approximately 40 nautical miles off the New Jersey coast. The two pilots onboard successfully ejected and were recovered by rescue forces. Aircraft 84-1286 recovered to Atlantic City International Airport with left wing, left horizontal stabilizer, fuselage, canopy, and engine damage. There were no casualties. Property loss was limited to government property and included loss of F-16D 84-1320 (estimated cost: \$16,392,086.68 (Tab D-2)) as well as extensive damage to F-16C 84-1286 (estimated repair cost: \$1,155,393.80 (Tab D-4)). The Accident Investigation Board, in addition to the Investigating Officer named above, consisted of Lieutenant Colonel Warner R. McGraw (Assistant to the AIB President), Lieutenant Colonel William M. Ekadis II (Legal Advisor), Major Gerald L. Gallmeister (Maintenance Officer), and Captain Maria T. Lattouf (Flight Surgeon). The above named officers were each appointed by letters dated 17 October 1997 (Tab Y). Each appointment was from General Richard E. Hawley, Commander Air Combat Command. The accident investigation was conducted from 21 October through 11 November 1997.

**PURPOSE:** This aircraft accident investigation was convened pursuant to AFI 51-503. This investigation is separate and apart from the safety investigation conducted under AFI 91-204. The purpose of this investigation is to find and preserve evidence as well as determine the relevant facts and circumstances for use in claims, litigation, disciplinary actions, adverse administrative proceedings, and for all other purposes deemed appropriate by competent authority. The report is available for public dissemination under the Freedom of Information Act (5 USC 522) and AFI 37-131.

## SUMMARY OF FACTS

In the summary of facts, the term "Mishap Aircraft 1" or MA1, refers to the F-16D, S/N 84-1320. MA1 was piloted by Maj John F. Barton (front cockpit pilot (FCP)) and instructor pilot Maj Thomas L. Bartel (rear cockpit pilot (RCP)). The term "Mishap Aircraft 2" or MA2, refers to the F-16C, S/N 84-1286. MA2 was piloted by Capt Scott L. Mulgrew. All three pilots are assigned to the 177 Fighter Wing, New Jersey Air National Guard. The terms "night vision goggle" (NVG) and "night vision device" (NVD) are used interchangeably.

1. History of Flight: On 16 September 1997, Major John F. Barton was scheduled to fly two missions in MA1 with an instructor pilot (IP) in the back seat for each sortie (Tab K-ŷ). The missions were scheduled to be flown as part of a recurrency and requalification

NUCLEAR REGULATORY COMMISSION

Docket No. \_\_\_\_\_ Office File No. 195  
 In Re Matter of: PF3  
 Staff: \_\_\_\_\_ ☒ ✓  
 Applicant: ✓ \_\_\_\_\_ ☒ ✓  
 Intervenor: \_\_\_\_\_ ☐ ✓  
 Cont'g-Off'r: \_\_\_\_\_ 7/1/02  
 Contractor: \_\_\_\_\_ add  
 Other: \_\_\_\_\_  
 Reporter: \_\_\_\_\_

DOCKETED  
USNRC

2003 JAN 17 PM 3: 59

OFFICE OF THE SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

program developed by the Training Officer of the 177 Operational Support Flight (177 OSF) and approved by the Commander of the 177 Operations Group (Tabs T-29 and VE-7). Major Barton had not flown since 16 May 1997 (Tab G-4) due to an administrative action taken by the 177 Operations Group Commander. The first mission, with a day takeoff at 1330 Local (L), was scheduled, planned, briefed, and flown to regain basic currencies in takeoff, landing, intercepts, and simulated flame-out approach. The mission was uneventful (Tab T-30). The second mission (mishap sortie) was scheduled to be flown as an NVG recurrency ride for Maj Barton. Maj Barton was scheduled to fly in the front cockpit of MA1 with an IP, Maj Bartel, in the rear cockpit of the aircraft. The mission was scheduled as a two-ship formation with MA2. The pilot scheduled to fly the second aircraft was Captain Scott L. Mulgrew. The call signs for the flight were Smash 11 and Smash 12. Scheduled takeoff time was 1945L. Scheduled mission duration was one hour (Tab K-2). Sunset on 16 September 1997 was 1902L, end of civil twilight was 1929L, moonrise was 1907L, and moon illumination was 99% (Tab O-221).

The briefing for the mishap sortie began two hours before the scheduled takeoff at 1745L (Tab VO-25). The three pilots received a "step" brief from the Supervisor of Flying (SOF), donned their personal life support equipment, and proceeded to their aircraft 45 minutes prior to their scheduled takeoff time. Preflight, engine start, and taxi to end-of-runway (EOR) inspection were normal. Following EOR, MA2 was given the tactical/navigation lead of the flight as per the briefing. He was to lead the flight to the working airspace W-107 for the initial set up of the first planned event once the flight was established in W-107. The flight was to takeoff on Runway 13 at Atlantic City International Airport and depart on an Adam 6 departure with routing in accordance with flight routing designated as AA-101 in the 177 FW F-16 Pilot Aid- Viper Notes (Tab AD-1).

The flight was cleared for takeoff at 1948L by Atlantic City Tower (Tab N-5). MA2 took off first followed 20 seconds later by MA1. Both aircraft took off utilizing afterburner as briefed. Once airborne MA2 accelerated to 324 knots calibrated airspeed (KCAS) and then established approximately a 50 degree climb angle (Tab VO-10). He climbed to 7000 feet above mean sea level (ft MSL) upon coordination with Atlantic City Departure Control. MA1 got airborne 20 seconds later, accelerated through 200 KCAS, and established a pitch attitude in excess of 15 degrees. During this time frame MA1 gained radar lock on MA2 who was 20 seconds in front passing through 5600 ft MSL (Tabs O-143-144,148, 223-227, VB-12-13, VC-18,45).

Both aircraft climbed to 7000 ft MSL using afterburner and leveled off to continue a briefed Radar Assisted Trail Departure (RATD). Procedures for a RATD in accordance with Multi Command Instruction (MCI) 11-F16 Vol 3 and 177FW Standards include flying with power set at 800 degrees fan turbine inlet temperature (800 degrees FTIT) and 350 KCAS (Tab AF). The aircraft leveled off approximately one minute after takeoff. During the next two minutes and 30 seconds, while level at 7000 ft and proceeding on the departure clearance, MA2 accelerated to a maximum of 450 KCAS while MA1 accelerated to a maximum of 512 KCAS. A radar lock providing closure, range, airspeed, and azimuth information was maintained by MA1, the trailing aircraft (Tabs AH-1, VB-12-13, 15, VC-20). According to pilot testimony, aircraft position lights and strobe light anti-collision beacon were illuminated on both aircraft at this time.

MA2, the lead aircraft, coordinated with the Atlantic City Departure Control for handoff to Giant Killer, the agency that controls entry into the W-107 warning area. The flight switched frequencies to Giant Killer and received approval to enter the designated airspace. With this approval, they began a climb to 14,000 ft MSL (Tab N-2-3).

MA1 continued to overtake the lead aircraft and collided with MA2 five minutes and 16 seconds after MA1 tookoff. The time was 195423L.

MA1 proceeded past MA2 after the midair collision. The two pilots in MA1 attempted to fly the aircraft for approximately 30 seconds. MA1 went out of control (Tab J-11) and the pilots successfully ejected. MA1 crashed into the Atlantic Ocean one minute and 10 seconds after the initial out-of-control indication. MA2 orbited the area at approximately 14,000 ft MSL for three minutes and began search and rescue coordination. He then felt engine rumbles, climbed to 19,000 ft MSL and proceeded direct to Atlantic City LAP. He coordinated with the Supervisor of Flying (SOF), performed a controllability check, and landed MA2 17 minutes and 39 seconds after takeoff with left wing, left horizontal stabilizer, fuselage, canopy, and engine damage (Tab J-3, Tab O-147).

The two pilots who ejected (Maj Barton, FCP, and Maj Bartel, RCP) were subjected to a normal ejection sequence initiated by the FCP (Tab VB-19, VC-22). Seat separation and parachute deployment were normal. The pilots parachuted into the Atlantic Ocean approximately 40 miles off the coast of Atlantic City, NJ. After water entry and chute separation both pilots climbed into the one-man life rafts that are part of their personal survival equipment packed in the ejection seat. The rafts had deployed normally, inflated, and were suspended below the pilots during descent into the water.

Cosmk 21, another F-16 flight from the 177 FW, was airborne at the time. The flight lead of Cosmk 21 started coordinating the search and recovery of the downed pilots with a rescue HC-130 and Coast Guard rescue helicopters. The helicopters successfully recovered both pilots 82 minutes after they had entered the water. Maj Barton was treated and released from a local hospital for mild hypothermia and a cut over his eye which occurred when his glasses struck his face during ejection. Maj Bartel was treated for minor injuries and released (Tab X-2,5).

Initial media inquiries were handled by the public affairs office and command element of the 177 FW. News media involvement was initially heavy (Tab AB).

2. Mission: The mission of the mishap flight was to update currencies and requalify Maj John Barton in night vision goggle utilization in accordance with a locally developed syllabus and training plan (Tab T-29). The plan included flying Maj Barton in MA1 with an instructor pilot (Maj Bartel) supervising the flight (Tabs K-2, VG-5,8,9, VE-7). The second aircraft in the flight was assigned to be a training aide. The mission overview included a radar assisted trail departure with MA2 leading out to the working area. Once established in the working airspace with MA2 designated as the "target" aircraft, MA1 was to conduct three intercepts with terminal closure culminating in visual identification of the target utilizing night vision goggles. The mission was scheduled and planned to be accomplished in one hour by unit supervision. This mission duration was mentioned by the pilots involved as a factor in their plan to have MA2 lead out to the area so that the first intercept would be expedited (Tabs AD-2, VB-8, VC-14).

3. Briefing and Preflight: All three pilots, Maj Barton, Maj Bartel, and Capt Mulgrew, reported normal crew rest. The day prior to the mishap was a unit-scheduled day off. On the day of the mishap each of the three pilots reported in at 1000 (Tabs VB-39, VC-41, VO-5). Crew rest or crew duty time were not factors.

The goal of the mission was to expeditiously accomplish a total of three intercepts to an NVG identification of the target aircraft and then return home for landing within the one hour allotted (Tab VB-8, VC-14).

The briefing started at 1745L, two hours before the scheduled takeoff time. Maj Barton conducted the briefing. Maj Barton briefed the flight using the 177 FW Briefing Guide (Tab AF) to cover what he considered pertinent and required items. He testified that he only referenced what is known as the General Briefing Guide (Tab AF-1,2) and training rules posted in the briefing room. Special emphasis was placed on a "non-standard" change of navigation/tactical lead that would occur prior to takeoff wherein MA2 would lead the flight to the area in order to expedite the initial NVG setup to be accomplished by MA1 from a trail formation.

Maj Bartel offered no changes to the briefing. Capt Mulgrew testified that he left the briefing understanding the mission and his role. Pilot testimony varies on briefing time length. Maj Bartel and Maj Barton estimate total briefing at 20-25 minutes in length. Capt Mulgrew reported it to last only eight minutes.

Pilot testimony agrees that MA2 was to lead MA1 into W-107 airspace, that both aircraft were to accomplish a radar assisted trail departure in accordance with MCI 11-F16 Vol 3 and 177 FW standards, and that the flight would begin the NVD intercept training from a 2-3 NM trail formation once established in the airspace (Tabs VB-8, VC-14, VO-9,12).

Pilot testimony disagrees on whether MA2 was briefed to automatically turn off his lights after the flight was cleared for exclusive use of the airspace or not until directed by MA1. MA2's exterior lights were off for approximately one minute prior to impact (Tab VO-39).

Aircraft preflight and start were normal. MA2 and MA1 taxied from their parking spots at the pre-briefed time.

4. Flight activity: The flight was assigned a local, pre-approved clearance that provided direction from the Atlantic City IAP to W-107 airspace as well as return to Atlantic City IAP (Tab AD). Weather at the time was clear, unlimited visibility with light winds at the airport and in the working area. It remained unchanged throughout the flight and was not a factor (Tab W).

The two aircraft checked in with Atlantic City (ACY) clearance delivery at 1920L and received an AA-101 clearance via the Adam 6 departure. The flight acknowledged the clearance and changed to ACY ground control for taxi instructions at 1921L. ACY ground control cleared the flight to taxi to runway 13. The two aircraft taxied to runway 13 and entered a holding area short of the runway for end-of-runway inspections by 177 FW maintenance personnel. At 1945L, the flight checked in with ACY tower controllers and received clearance to taxi onto the runway and hold position because of wake

turbulence from a previous aircraft. MA2 was given the navigational/tactical lead of the flight as briefed. From this time until the midair collision, Capt Mulgrew in MA2 made all of the radio calls and navigated the flight into working area W-107 as directed by the flight clearance.

The flight was cleared for takeoff and changed radio frequencies to ACY radar departure control at 1948L. The two aircraft conducted an afterburner takeoff with 20 seconds between initiation of takeoffs in order to execute the briefed radar assisted trail departure (RATD). [A RATD is used by aircraft in a flight to maintain 2-3 NM between the lead aircraft and the following aircraft. The pilots achieve an orderly departure sequence by using on-board radar systems and power settings to maintain a speed of 350 KCAS and an engine temperature of 800 degrees FTIT to attain the desired aircraft separation (Tab AF).]

MA2 tookoff in afterburner, accelerated then established approximately a 50 degree climb angle. MA1 visually monitored this departure from the runway position. Twenty seconds later he began the takeoff roll, became airborne, and retracted the landing gear. MA1 then established a climb angle which would allow a radar lock on the preceding aircraft and conduct a RATD. The takeoff by MA2 and MA1 was not in accordance with standard procedures but was not considered unsafe by the pilots in either aircraft (Tabs VB-17, VC-13, VO-10). The pilot in MA2 obtained radio contact and clearance to 7000 ft MSL from ACY departure control. MA2 and MA1 climbed to 7000 ft MSL using afterburner power. After the weight was off the landing gear, on-board aircraft systems began to record events for each aircraft (Tab O-143-152, 199-220). This recorded data plus pilot testimony allowed reconstruction of the flight scenario.

MA2 leveled at 7000 ft MSL and approximately 300 KCAS one minute after takeoff. MA2 accelerated while level to 452 KCAS in the next minute. MA2 then began to slow to 434 KCAS in the next minute and a half while still level. Between 195202L and 195314L, the controlling agency for the working airspace, Giant Killer, gave MA2 clearance into the airspace. MA2 climbed from 7000 ft MSL to 13,760 ft MSL over the next two minutes and decelerated to 292 KCAS (Tab O-142-144). During the climb he turned off all exterior lights to prepare for NVG training. He testified that the mission briefing authorized turning lights off at this time (Tab VO-31).

MA1 leveled at approximately 7000 ft MSL one minute and 10 seconds after takeoff approximately 20 seconds in trail of MA2. MA1 was expected to be at 350 KCAS and 2-3 NM behind MA2, but on-board systems indicated there was up to 4 NM of separation. To reduce the separation, the front cockpit pilot (FCP) allowed the jet to accelerate through 350 KCAS. Power was set at mid-range. He selected auto-pilot to hold the altitude. He then donned his NVG's. He began to make adjustments to his NVG's and mentioned adjustment procedures to the RCP. At that time, control of the aircraft was transitioned to the RCP. The RCP noted that their aircraft had dropped further behind MA2 aircraft than planned, so he increased the engine power to military power. The aircraft accelerated to over 500 KCAS while level at 7000 ft MSL. The FCP continued to adjust his NVG's during this time (Tab VC-19,20).

The RCP then transferred control of the aircraft back to the FCP after having begun a climb out of 7000 ft MSL following the lead aircraft. At transfer of control, the RCP did not communicate flight parameters or position to the FCP (Tabs VB-17, VC-

20). The FCP assumed control of the aircraft, turned off his NVG's, and for an unknown reason left them in the down position, partially obscuring his view (Tab VC-31). During the climb, MA1 decelerated to 436 KCAS. The FCP testified that he lost situational awareness and did not realize he was overtaking MA2 (Tab VC-32). The RCP was donning and adjusting his NVG's at this time. He did not note the activity of the FCP and had no other communication with him until after collision (Tab VB-17). The FCP testified that he saw the MA-2, without lights on, moments before impact. Data showed that the MA-1 pilot made a control input just prior to impact. Collision occurred five minutes and 16 seconds after the MA1 aircraft had taken off.

MA1 then passed over MA2, damaging MA2's left wing, left horizontal stabilizer, fuselage, and canopy (Tab J-3). The pilot of the overtaken aircraft, MA-2, saw fuel venting out of MA1, which was now visible in front of him. Data from MA1 showed dual hydraulic failure within seconds after the collision. The pilots tried to fly MA1 but within 30 seconds they determined that the aircraft was out of control and decided to eject (Tab VB-19, VC-22). The aircraft crashed unoccupied into the ocean one minute and 10 seconds after the collision (Tab O-237).

Capt Mulgrew, pilot of MA2, made a "knock it off" radio call after he realized he had been hit. He then transmitted "Mayday, Mayday, Mayday" upon observing the pilots eject from MA1. He could see the ejection as MA1 descended out of control below him. Capt Mulgrew orbited the area at approximately 14,000 ft MSL and planned to direct search and recovery efforts. His engine then began to run roughly. He then climbed back to 19,000 ft MSL and headed directly toward ACY. En route he communicated with Giant Killer and the Supervisor of Flying (SOF) at the 177 FW and told them what had occurred. He performed a controllability check, which demonstrated that he could safely land the aircraft. He then proceeded to home station and landed uneventfully 17 minutes and 39 seconds after takeoff (Tabs O-161, VO-36). Search and rescue efforts for the two pilots who ejected are described later.

5. Impact: On 16 September 1997 at 1954L, MA1 collided with MA2 five minutes and 16 seconds after they took off from Atlantic City IAP. The aircraft were at an altitude of 13,760 ft MSL approximately 40 NM from the airport and 30 NM off the New Jersey coastline. MA1's right wing passed over MA2's left wing. The right wingtip of MA1 nicked the fuselage and left side of the canopy of MA2. Suspension equipment and underwing stores on MA1's right wing tore into the trailing edge of MA2's left wing (Tab J-3, S).

MA2 had reduced airspeed 80 knots from 370 KCAS to 290 KCAS during the previous minute while climbing from 11,520 ft to 13,760 ft. MA2 had all exterior lights off. MA1, climbing in a radar trail formation, closed from 2.5 NM to contact MA2 in 60 seconds. MA1 averaged over 160 knots of closure during the final minute prior to impact (Tab O-195).

Following the impact, MA1 continued past MA2. Within ten seconds MA-1's on-board aircraft indications of dual hydraulic failure were recorded ( Tab J-10). Pilot testimony confirmed that attempts to fly the aircraft were futile and an ejection decision was made approximately 30 seconds after the initial impact with the other aircraft. MA1 crashed into the ocean unoccupied one minute and ten seconds after the collision, having

descended from a maximum recorded altitude of 14,000 ft MSL just after impact (Tab O-24). The aircraft debris pattern was located at N 39.06.3 W 73.45.6 as measured by the wreckage recovery ship (Tab R-3). Partial recovery of MA-1 was undertaken until winds and waves prevented further recovery efforts.

MA-2 returned to Atlantic City IAP with left wing damage, scrapes on the left fuselage aft of the canopy, a scrape on the canopy transparency, and substantial engine damage from debris ingested after the collision. MA-2's landing and stopping the aircraft on the runway were uneventful.

6. Egress System: The F-16D ACES II egress system worked within prescribed operating criteria. Mishap pilots' testimony describes a normal, front-cockpit-initiated sequenced ejection (Tab VB-19) which met the parameters for a mode II separation. The depth of the wreckage and murky conditions on the ocean floor made recovery of the ejection seats and aircraft canopy impossible. Review of the AFTO Forms 781A indicated the last egress inspection was performed on 25 Aug 97 with no discrepancies noted (Tab U-2). Review of the Core Automated Maintenance System (CAMS) maintenance history indicated no overdue ejection seat Time Compliance Technical Orders (TCTO's) (Tab H-5). All reports indicate that the ejection system functioned as designed (Tab VB-25, VC-26).

7. Personal and Survival Equipment: Parachutes deployed automatically during descent. The pilots saw no damage to the parachutes on canopy check. Maj Barton performed a four-line jettison, but Maj Bartel was unable to find the jettison lanyards. There was no problem with seat-chute or man-seat separation. Maj Barton's helmet was lost at egress. Both pilots separated from their parachutes manually immediately on impact with the water. Both rafts deployed properly (Tabs VB-26, VC-24). All personal and survival equipment inspections were up to date (Tab AE).

8 and 9. Rescue and Crash Response: The mishap occurred on 16 Sep 97 at 1956L. The mayday call was sent at 1956L by Capt Mulgrew of MA2. Another flight of F16's was in the area, and one of these (call sign Cosmk 21) assumed the duties of On-Scene Commander initially (Tab AG-2). Maj Bartel attained radio contact with Cosmk 21 pilot Maj DeSanctis, who coordinated the rescue by relaying radio transmissions (Tab AG-2). Maj Barton became disoriented on impact with the water and had no radio contact with rescuers. At 1958L, Coast Guard Air Station Brooklyn, NY and Coast Guard Air Station Cape May, NJ each dispatched an HH65 Dolphin helicopter, each manned with a rescue swimmer (Tab AG-3). The Brooklyn unit was airborne approximately 90 nautical miles from the mishap site and arrived at 2045L; the Cape May unit was scrambled from 50.5 nautical miles away and arrived at 2111L (Tab AG-2,5). A rescue-configured HC-130 from the Air National Guard at Suffolk County, NY was in the area and reported to the scene (Tab AG-2). Maj Bartel set off three flares which were seen by Cosmk 21, the HC-130 and the HH65's at approximately 2055L. Maj Bartel was loaded onto a rescue basket by the rescue swimmer from the Brooklyn unit, ASM3 Brain Doolittle, hoisted into the HH65 and transported to a local hospital at 2105L (Tab AG-5). While homing in on Maj Barton's emergency beacon, the Cape May HH65 spotted him in the water at 2115L. The



rescue swimmer from Cape May, ASM1 Richard Gladish, entered the water, administered first aid and pulled Maj Barton onto a rescue basket. Maj Barton was then hoisted into the HH65 from Cape May and transported to a local hospital at 2118L. The HC-130 assumed On-Scene Commander duties during the rescues, when Cosmk 21 left the scene to in-flight air refuel (Tab AG-2). Refueling was accomplished by a KC-135 from the 108<sup>th</sup> Air Refueling Wing from McGuire AFB, NJ which also had been in the vicinity at the time of the mishap (Tab AG-2). In addition, two HH60 helicopters were dispatched from the Air National Guard at Suffolk County, NY and remained at the site (Tab AG-2,4). They were not directly involved in the rescue.

10. Maintenance Documentation: Air Force Technical Orders (TCTO) Forms 781 for MA1 and MA2 for the year prior to the mishap revealed no evidence of maintenance discrepancies that would have contributed to the accident. Engine data from the Crash Survivable Flight Data Recorder (CSFDR) indicated that engine E-3928 (MA1) and engine E-4031 (MA2) were operating normally at the time of the mishap (Tab O). Time Compliance Technical Orders (TCTO) did not reveal any evidence relating to the accident (Tab H-3,5). All scheduled inspections were current and in order (Tab H-3,5). Both mishap aircrafts' oil samples had been analyzed and were within normal limits for oil consumption and metal wears. The most current oil analysis was done after the first flight on 16 Sept 97 (97259 - Julian day) and the test results were normal (Tab U-3,4). There was no unscheduled maintenance performed during the 16 days prior to the accident which was pertinent to the accident (Tab H-2-5). Both aircrafts' weights and balance were within established technical order criteria (Tab L-4,5). The Equipment Review Report did not reveal any overdue maintenance actions. No discrepancies relating to this accident were noted in maintenance procedures or practices performed on these aircraft.

11. Maintenance Personnel and Supervision: A review of maintenance personnel training records and CAMS currencies for those personnel involved in preflight, through-flight, launch and end-of-runway inspection of both mishap aircraft indicate that all personnel were properly trained and had the level of experience required to perform their duties (Tab AA-2 to 18). The dedicated crew chief of aircraft 84-1286 did have two overdue training requirements (cockpit familiarization and crash recovery training) which were the only minor discrepancies in currency noted (Tab AA-14,15). Maintenance personnel and supervision were not factors in this accident.

12. Engine, Fuel, Hydraulic and Oil Inspection Analysis: JP-8 fuel samples were taken from two bulk storage tanks, two fuel stands and refueling truck 91L-254. All samples met established Military Specification (Mil Spec) limits (Tab U-5). Both mishap aircraft were refueled by the same truck. Liquid oxygen (LOX) samples were taken from LOX carts LX1 and LX2. Cart LX1 serviced aircraft 84-1286 and Cart LX2 serviced MA1 and passed all Mil Spec tests for purity and odor (Tab U-6,7). No hydraulic or engine oil samples were taken from the MA1 crash site due to salt water contamination and lack of retrieval of the engine and flight control components. Hydraulic and engine oil samples

were not taken from MA2. Serviceability of fuel, LOX, hydraulic fluid and the oil analysis program do not appear to be factors in this accident.

13. Airframe and Aircraft Systems: There are no indications that hydraulic, electrical, mechanical, avionics or power plant systems were a factor in this accident.

a. There is no evidence that any damage or malfunction had occurred to either mishap aircraft's engines prior to impact based on mishap pilot's testimony (Tab VB, VC). The engine diagnostic unit (EDU) was not recovered from aircraft 84-1320 with engine F-100-PW-220E, Serial Number PW0E703928 installed. The Crash Survivable Memory Unit (CSMU) type 1 data indicates at the time of impact that the engine was running normally at MIL power setting. There are no indications of fuel or oil system malfunctions or contamination on mishap sortie (Tab O-87-107). The EDU was recovered from aircraft 84-1286 with engine F-100-PW-220E, Serial Number PW0E704031. Data concludes no malfunctions prior to impact (Tab J-6, O-181-203).

b. Recovery of the FLight Control System (FLCS) components -- four memory chips -- were transferred and read on download fixture. Raw data file was converted into the data printout. LMTAS Stability and Control Engineer assessment indicates that all major components of the aircraft, including flight control surfaces and speedbrakes were present and fully functional at impact.

c. The electrical, fuel and hydraulic systems appeared to be functioning normally at the time of impact (Tab O-168-177). There was no indication of hydrazine consumption during the mishap flight.

Aircraft and aircraft systems were not a factor.

14. Operations Personnel and Supervision: All 177 FW flights on the day and night of 16 Sep 97 were annotated on 177 FW Form 40, Flight Order and Authorization. The day flight order was signed by the Operations Supervisor LTC Maurice Elderidge, whose normal responsibilities included signing the daily flight authorizations (Tab VG-12). Additionally, the Operations Group Commander was aware of the missions for the day of the mishap and had briefed the Wing Commander (Tab VE-5,7). The flight authorization included two sorties scheduled for Maj Barton. Both sorties would be flown in an F-16D (two-seat aircraft) with an instructor pilot in the back seat. Sortie one would be a day sortie to regain normal takeoff and landing currency as well as practice intercepts. This sortie would be considered non-demanding. Sortie two, the mishap sortie, would be flown at night with the primary goal of night recurrency with NVG's in accordance with MCI 11-F16 Vol 1.

The other key supervisors in the chain included the mission instructor pilot and the supervisor of flying (SOF), who executes the daily flying order. The SOF's guidance and authority is written in MCI 11-463, as supplemented by the 177 FW. The SOF reviewed the schedule and executed it as scheduled, making implementation adjustments based on aircraft and pilot changes throughout the day (Tab VF-5). He made no changes to the mishap flight other than substituting the pilot Capt Mulgrew for Capt Gold due to a job conflict for Capt Gold (Tab K-2). The assigned SOF conducted normal duties appropriate to his experience and guidance.

The assigned instructor pilot was Maj Bartel; he coordinated with Maj Barton prior to the established briefing time on basic mission planning elements and suggested the "non-standard" departure, with MA2 leading out to the area to expedite the mission. Maj Bartel attended the briefing given by Maj Barton. Maj Bartel made no intervention to challenge content, clarity, appropriations, depth, or breadth of the briefing (Tab VB-42,43).

Maj Barton briefed from the 177 FW Briefing Guides provided in the briefing rooms. The instructor pilot, Maj Bartel, noted in his testimony that the briefing covered all required items and that everyone left the briefing with no questions about the mission elements or sequence of events (Tab VB-11,41,43).

15. Pilot Qualifications: a. Major Barton's last sortie prior to the day of the accident was four months earlier on 16 May 1997 (Tab G-4). His last day landing was accomplished on the day of the mishap, 16 Sept 1997 (Tab T-30). His last night ride was on 3 April 1997 (Tab T-25A) and his last NVD intercept was accomplished on 4 Feb 1997 (Tab T-25B). Major Barton's mission qualification currency expired on 31 July 1997 (Tab T-35). An instrument/instructor pilot checkride was accomplished with no discrepancies on 12 Aug 1996 (Tab T-34). All pre-requisites for his mission ready (MR) requalification training plan were accomplished prior to his resuming flying duties (Tab T-28). Major Barton has a total of 2560 hrs. of flying time with 1477 hrs. in the F-16 (Tab G-2). He has been flying the F-16 since 1986 (Tab T-23) and completed conversion training to the F-16C in Feb 1994 with above average performance (Tab T-33).

30/60/90 Day Flying Summary (shows zero hours and zero sorties flown although one 1 hour sortie was flown earlier on the day of the accident) (Tab G-2):

30 Day	0 Hours/0 Sorties
60 Day	0 Hours/0 Sorties
90 Day	0 Hours/0 Sorties

b. Major Bartel was a current and qualified instructor pilot (Tab T-10,13); however, his NVG currency had expired (Tab T-10, G-22). His last NVG sortie was on 16 April 1997 and his last night sortie was on 17 April 1997 (Tab T-7,10). Major Bartel has 2195 total flying hours with 565 hours in the F-16. He has 145 instructor hours in the F-16C and 13.9 instructor hours in the two-seat F-16D (Tab G-7). He completed conversion to the F-16C in Feb 1995 with average performance (Tab T-14).

30/60/90 Day Flying Summary (Tab G-9):

30 Day	12.1 Hours/8 Sorties
60 Day	22.5 Hours/15 Sorties
90 Day	34.2Hours/22 Sorties

c. Captain Mulgrew was current and qualified to perform the mission (Tab G-20, T-52). His last NVD intercept was accomplished on 10 June 1997 (Tab T-49,52). He has a total of 1391 flying hours with 1188 hours in the F-16 (Tab G-14). He completed initial checkout in the F-16 in April 1992 (Tab T-56). He completed F-16C conversion in Dec 1994 meeting course standards (Tab T-55).

30/60/90 Day Flying Summary (Tab G-15,16):

30Day 17.1Hours/9Sorties

60Day 35.9 Hours/17 Sorties

90 Day 57.8 Hours/29 Sorties

16. Medical: Maj Barton, Maj Bartel, and Capt Mulgrew were medically qualified to fly at the time of the mishap. All mishap pilots had current flying class II physicals and valid AF Form 1042's. All toxicology reports done after the mishap were negative. The pilots suffered minor injuries in the accident (Tab X-2,5,8). Maj Barton had a history of chronic neck pain subsequent to a car accident in 1993 (Tab X-5). Although Maj Barton was seen by a civilian orthopedic surgeon for this problem for several years, the flight surgeon who had evaluated him in 1993, 1995, and 1997, Lt Col (Dr.) Ronald Gelzunas, stated that Maj Barton had no significant injury that would have interfered with his ability to fly (Tab VH-12). On 14 Sep 97, Dr. Gelzunas signed Maj Barton's AF Form 1042 and flight physical, which was within normal limits (Tab X-7). Maj Barton was on no medications at the time of the mishap. Maj Barton was required to wear corrective lenses for flying and was doing so at the time of the mishap (Tab VC-23,50). Medical qualifications were not a factor.

17. Nav aids: There were no outstanding notices to airmen (NOTAMs) for Atlantic City International Airport at the time of the accident and none that affected any of Smash flight's mission on the night of 16 September 1997. All relevant NAVAIDS and facilities were functional (Tab VO-26). The NOTAM system is updated daily by airfield management personnel and posted by operations duty desk personnel. NAVAIDS were not a factor.

18. Weather: Synoptic weather on 16 September 1997 for South New Jersey received from Northeast Air Defense Sector and National Weather Service was: Atlantic City IAP, NJ forecast predicted clear 7 miles visibility, 3000 ft. scattered, 25,000 ft. scattered, minimum altimeter 30.00. Observed weather was 10 miles visibility and clear (Tab K-3,4). W-107 warning area forecast was 4500 ft. to 8000 ft. scattered. W-108 warning area forecast was 20,000 ft. to 25,000 ft. scattered to broken. Observed weather was clear with 10 plus miles visibility (Tab K-3,4). Weather was not a factor.

19. Governing Directives and Publications: Primary directives and publications relevant to this investigation are:

AFI 11-206, *General Flight Rules*, 1 Dec 96

AFI 11-206, ACC Sup 1, *General Flight Rules*, 30 Aug 95

AFI 11-214, *Aircrew and Weapons Director Procedures for Air Operations*, 25 Feb 97

AFI 11-214, ACC Sup 1, *Aircrew and Weapons Director Procedures for Air Operations*, 30 May 97

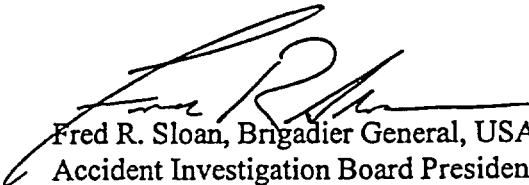
AFI 11-401, *Flight Management*, 1 Mar 96

AFI 11-401, ANG Sup 1, *Flight Management*, 1 Apr 96

MCI 11-463, *Operations Supervision*

MCI 11-463, 177 FW Sup 1, *Operations Supervision*, 3 Sep 96  
MCI 11-F16 Vol 1, *Pilot Training F-16*, 1 Jul 97  
MCI (ANG) 11-F16 Vol 1, *Pilot Training F-16*, 1 Aug 95  
MCI 11-F16 Vol 3, *Pilot Operational Procedures*, 21 Apr 95  
MCI 11-F16 Vol 3, 177 FW Sup, Chapter 8, *Local Operating Procedures*, 2 Dec 95  
MCH 11-F16 Vol 1, *Tactical Employment F-16*, 17 Mar 95  
MCH 11-F16 Vol 2, *Tactical Employment F-16*, 17 Mar 95  
MCH 11-F16 Vol 5, *Fighter Fundamentals*, 10 May 96  
T.O. 1F-16C-1, *F16C/D Flight Manual*, 27 Feb 95  
T.O. 1F-16C-1-4, *F16C/D Flight Manual*, 17 Feb 97  
T.O. 1F-16C-1-1, *Supplemental Flight Manual*, 14 Nov 94  
T.O. 1F-16C-1-2, *Supplemental Flight Manual*, 1 May 97  
T.O. 1F-16C-1CL-1, *Flight Crew Checklist*, 27 Feb 95  
T.O. 1F-16C-1-4, *Supplemental Flight Manual*, 17 Feb 97  
T.O. 1F-16C-34-1-1, *Avionics and Non-nuclear Weapons Delivery Flight Manual*, 7 Sep 94  
T.O. 1F-16C-34-1-1CL-1, *Avionics and Non-nuclear Weapons Delivery Flight Crew Procedures*, 7 Sep 94  
ACC Syllabus F16 00NVGPD, *Night Vision Goggles Training Course*, Sep 96  
177 FW F-16 Pilot Aid, *Viper Notes*, Jan 95

Dated this 11<sup>th</sup> day of November, 1997

  
Fred R. Sloan, Brigadier General, USAF  
Accident Investigation Board President

## STATEMENT OF OPINION

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

In this Statement of Opinion, the term "Mishap Aircraft 1," or MA1, refers to the two-seat F-16D, S/N 84-1320. MA1 was piloted by Maj John F. Barton (front cockpit pilot (FCP)) and instructor pilot Maj Thomas L. Bartel (rear cockpit pilot (RCP)). The term "Mishap Aircraft 2," or MA2, refers to the single seat F-16C, S/N 84-1286. MA2 was piloted by Capt Scott L. Mulgrew. All three pilots are assigned to the 177 Fighter Wing, New Jersey Air National Guard.

By clear and convincing evidence, the midair collision on 16 Sep 97 between MA1 and MA2 was caused by pilot errors by all three pilots involved. The front cockpit pilot (FCP) and the rear cockpit pilot (RCP) of MA1, Maj Barton and Bartel respectively, failed to effectively communicate, prioritize tasks, and control aircraft performance parameters to avoid the collision. In simpler terms, they lost situational awareness. The pilot of MA2 failed to provide optimum parameters and conditions that would have simplified the task loading of the FCP/RCP in MA1. The optimum parameters and conditions could have enabled them to recognize and correct their loss of situational awareness. Other contributing factors, amplifying comments, and facts that support this opinion follow.

1. Higher Headquarters (HQ): There is no definitive guidance in publications distributed directly to the pilots that clarifies Night Vision Goggle (NVG) operations. Higher HQ has not published guidance, technique, or procedures for NVG use in the pilots' fundamental guide, MCH 11-F16 Vol 5, *Combat Aircraft Fundamentals- F16*, or in MCH 11-F16 Vol 3, *Pilot Operational Procedures*. Pilots respond to printed technique and procedure. Varied pilot testimony confirms that pilot judgment, experience, and technique were the primary tools they used to prepare, brief, and lead missions including NVG operations (Tabs VB, VG, VR). The 177 FW has been training with NVG's since 1991 with minimal HQ guidance. Lack of clear, concise guidance by higher HQ was a factor.

2. Leadership/Supervision: Wing and squadron leadership/supervision were actively working to improve the climate and culture of the organization at the time of the accident according to testimony (Tabs VE, VM, VQ). There had been documented concerns with several unit personnel, including two pilots involved in the mishap (Maj Barton and Capt Mulgrew). Testimony from all levels of unit leadership validates this statement (Tabs VA-VT). The time spent on dealing with personnel problems coupled with day-to-day mission execution demands caused leadership to lose focus on important details that may have enhanced effective decision-making.

Records review revealed four examples of the leadership's lack of attention to detail. First, the grade sheet for the day mission (Tab T-30) and the retraining plan

qualification documentation sheet (Tab T-29) indicate a formation takeoff was accomplished on Maj Barton's first sortie on 16 Sep 97. That mission was scheduled and flown (Tab AD-3) with an F-16D and an F-16C. The weight differential of the two aircraft in that sortie was approximately 4000 pounds. MCI 11-F16 Vol 3 prohibits formation takeoffs when the aircraft weight differential exceeds 2500 pounds. Second, a Letter of Certification dated 4 Sep 97 (Tab T-2X) indicates that Maj Barton was qualified as a Flight Lead and qualified in NVG's with a weather category of 2. In fact, he was not qualified as a flight lead or in NVG's on 4 Sep 97. He was still administratively grounded and had been for 120 days. His weather category should have been regressed to category 3 for lack of currency or qualification in instrument approaches. Third, the 177 Form 40, Local Flight Clearance/ Flight Order Log (Tab K-2) did not meet criteria established in AFI 11-406, ANG Sup 1. The form did not properly indicate and label the mission pilot, instructor pilot, evaluator pilot, or flight lead of record. The intention of the flight order was therefore not fulfilled. Fourth, two of the three pilots had failed to initial off on either receipt of publications, pilot read file items, or delinquent event grounding items. This indicates a poor system (Tab T-2Y).

In addition, the unit did not formulate or publish detailed guidance on NVG use. Instead they relied on experience and let pilots innovate procedure (Tabs VE, VG, VR). Unit leadership believed that the safest, most conservative approach was to have Maj Barton fly his first two sorties in the two seat F-16D after returning from grounding. They assigned Maj Bartel to be the instructor for the night sortie. Although all testimony regarded Maj Bartel as conscientious and an excellent aviator, he had not flown a night sortie since 17 Apr 97 with NVG's and had only 13.9 instructor hours in the F-16D. Maj Bartel did not recall if any of these hours were at night or in the rear cockpit (Tab VB). Unit leadership approved a recurrency/requalification program for Maj Barton they believed was sufficient and met guidance. However, MCI-11-F16 Vol 1 states that a pilot who exceeds 180 days of currency for NVG's will do a thorough academic review of all available NVG guidance. Such a review was not documented in Maj Barton's training program description. He had not flown with NVG's for 224 days. The unit had not developed an adequate program for ensuring that pilots took 8mm tapes or the data transfer cartridge (DTC) for the aircraft (Tabs J-6, VB, VC, VO). The tapes and DTC are part of a total system for recording and reconstructing operational and aircraft parameters during a mission for use during the debriefing. Unit leadership had stressed the need to plan and execute the mission in one hour of flight time (Tabs AD-3, VB, VC, VO). All pilots stated that they felt this meant they should expedite the mission and minimize the training. These examples indicate lack of focus and attention to detail on the part of leadership and supervision. They suggest a climate of selective compliance with rules as well as an acceptance of less than optimal standards.

The last line of supervision was the instructor pilot. Maj Bartel did not actively assume his role. *General Flight Rules*, AFI 11-206, ACC supplement 1, para 4.2.3 states, "An instructor pilot (IP) on the flight authorization will assume command of the aircraft/flight for as long as required to correct a safety discrepancy or other potentially dangerous condition when the IP observes that proper corrective action is not being taken." During the flight, Maj Bartel did not take corrective action in a timely manner (Tab VB).

Cockpit Resource Management (CRM) teaches that each pilot is accountable for safe, effective mission accomplishment using the resources with which he is entrusted. Each pilot and supervisor is personally and professionally accountable for his action or lack thereof. All leaders, supervisor, and pilots interviewed stated they had been trained in CRM; this training was generally poorly implemented by the unit. Overall, leadership and supervision were factors in the mishap.

3. Mission Planning and Preflight Briefing: *Combat Aircraft Fundamentals- F16*, MCH 11-F16 Vol 5, para 2.11.2, states that the briefing sets the tempo for the mission. The briefing for Smash 11 flight on 16 Sep 97 was incomplete by any standard. Maj Barton, the briefer, admitted to not having used all available briefing aides. These included all applicable briefing guides as well as dry-erase boards on which the mission overview, objectives, and amplifying techniques could have been posted. He relied on his experience, even though he had not flown an F-16 in 120 days and had not flown at night with NVG's since 4 Feb 97. The briefing set a casual tone, which was not what would be expected during participation in a recurrency training program.

Neither Maj Bartel nor Capt Mulgrew challenged the content or depth of briefed items (Tabs VB, VC, VO). Yet testimony conflicts. The pilots of MA1 testified that they had briefed a Radar Assisted Trail Departure (RATD) as standard. This would have been adequate given that the details of a RATD are contained in guidance the pilots are responsible to know (MCI 11-F16 Vol 3 as amplified by 177 FW Standards). Capt Mulgrew's references to airspeed control demonstrate that he intended to fly a RATD. In flight, however, neither airplane complied with RATD procedure or technique (Tab O-143-144, 223-233). In addition, the pilots have conflicting views on when Capt Mulgrew was to turn out his aircraft lights. Majs Barton and Bartel believed that a radio call from them would direct when lights should have been turned out and the exercise would begin. Capt Mulgrew believed he would extinguish his lights automatically upon being cleared into the working airspace. Maj Barton failed to brief a hard altitude for deconfliction purposes as required by AFI 11-214 para 5.2.9.1 (Tab VC). Last, all pilots agree that 2-3 NM would separate the aircraft and that this relative position would be maintained until training began. None of the pilots flew the aircraft in accordance with briefed or commonly known procedures. Each pilot assigned to a flight has a responsibility to clarify and understand all procedures and mission-essential details during the briefing and the mission. This basic guidance is explained in *Combat Aircraft Fundamentals- F16*, MCH 11-F16 Vol 5. The pilots of Smash 11 flight failed to do this as evidenced by departure deviations, the "lights-out" condition of MA2 at impact, and the failure of MA1 to stabilize the aircraft in a 2-3 NM trail position. Mission planning and the preflight briefing were factors in the mishap.

4. Mission: The mission was properly scheduled. Mission details are included in the Statement of Fact preceding this document. Preflight of the aircraft, engine start, systems checks, and taxi to the runway were normal. From this point, the two aircraft (MA1 and MA2) were to do individual afterburner takeoffs, fly a Radar Assisted Trail Departure (RATD) (as defined in MCI 11-F16 Vol 3 and 177 FW Standards) then proceed with the departure clearance into the training airspace (Tabs VB, VC, VO).



MA2 took the lead out onto the runway as briefed. MA2 was to navigate the flight to the training airspace to expedite the training after completion of the departure phase. The time was approximately 1948 local (L), sunset was at 1902L, and it was night with clear weather (Tabs K-4, O-221). MA2 made an afterburner takeoff and allowed the aircraft to accelerate to 324 KCAS at low altitude. He then established an approximately 50 degree initial climb angle and climbed to 7000 feet above mean sea level (ft MSL) with the clearance of departure control (Tabs N-2, O-143-144). He maintained afterburner power for 47 seconds after takeoff to expedite the climb (Tab O-143). MA1 had monitored this departure from their position on the runway. Twenty seconds later they tookoff and made adjustments to their initial climb pitch and power. The result was arrival at 7000 ft MSL at less than optimum airspeed and range in NM from MA2 (Tabs O-223-233, VB).

The standard RATD is a controlled procedure in which the pilot takes off in afterburner then cancels afterburner at 300 KCAS when safely airborne. The pilot then accelerates to 350 KCAS at a normal climb angle for aircraft configuration and weight, setting the engine power at 800 degrees Fan Turbine Inlet Temperature (FTIT). He should then climb to the designated altitude and establish the standard spacing of 2-3 NM between aircraft. Shortly after takeoff, the pilot in the trailing aircraft attains a radar lock on the lead aircraft. He then establishes briefed spacing by using the aircraft's radar to provide range, airspeed, and altitude. All F-16 pilots are trained to use this procedure and practice it regularly. It is primarily used in the weather and at night to provide for orderly, controlled departures and a comfortable travel formation. The pilots of MA1 and MA2 did not perform a RATD in accordance with standard procedure.

After the pilots of MA1 and MA2 had leveled at 7000 ft MSL they continued to deviate from RATD parameters. MA2, the lead aircraft, accelerated to 452 KCAS in the next minute and a half, slowing to no less than 432 KCAS while level at 7000 ft MSL (Tab O-143-144). MA2 then received clearance to climb into the W-107 airspace and eventually slowed to 292 KCAS while leveling at approximately 14,000 ft MSL during the next two minutes of flight. MA2's erratic airspeed control contributed to the loss of situational awareness of the MA1 pilots.

Even with the deviations in MA2, the pilots of MA1 should have been able to stabilize in a 2-3 NM trail position had they used the on-board system indications and flown the aircraft to meet the standard position. MA1 maintained a radar lock on MA2 from shortly after takeoff until the collision (Tabs VB, VC). With a radar lock on, the cockpit cues to the pilot are presented in two formats: the Heads Up Display (HUD) and the Left Multifunctional Display (LMFD) (Tab AH-1). Both formats provide ownship information in relation to the aircraft (MA2) locked onto. Information includes closure rate in knots, range to target aircraft, speed of target, ownship speed, altitude of target aircraft, ownship altitude, and ownship position relative to target aircraft. The HUD has a flight path marker for ownship which can be deconflicted with a target designator box (TD box) which indicates the target position. All of these cues must be assimilated by the pilot and then transferred into action in a timely manner to avoid conflict. This is known as situational awareness (SA). A simple definition of SA is an accurate space and time assessment that provides an accurate perception and understanding of what is actually occurring in the aerial arena. SA can be lost due to inattention, misprioritization,

complacency, judgment errors, and other reasons. It is more difficult to maintain SA with a lack of currency in a given environment. The pilots of MA1 lost and failed to regain SA prior to the collision. Aircraft performance data (Tab O-223-233), testimony (Tabs VB, VC), and pilot qualification information (Tab T) support this opinion.

The FCP leveled the jet at 7000 ft MSL, accelerated through 300 KCAS, and saw that he was 2-3 NM behind MA2 (Tab VB). Shortly thereafter the RCP took control of the aircraft and accelerated to over 500 KCAS as he realized MA1 was now more than 4 NM behind MA2. The FCP elected to don and adjust his NVG's. He was not aware of aircraft parameters at that time. Approximately two minutes after level-off MA1 was closing inside of 4 NM on MA2. Approximately one minute and 40 seconds prior to the collision, the RCP transferred control of the aircraft back to the FCP. He did not communicate detailed performance parameters of their aircraft, instead trusting that the FCP had full situational awareness. MA1 began climbing toward MA2 with closure speed averaging 160 knots and closure distance decreasing to less than 3 NM. The RCP began to don and adjust his NVG's, paying no attention to aircraft parameters. The FCP reported in testimony that at this point he "felt bad, like my SA was real low (Tab VC)." He failed to adequately reduce power or deconflict altitude to control the situation. There were no significant aircraft control inputs until moments before the collision, and those inputs did not deconflict the aircraft. Both pilots had misprioritized tasks by donning and focusing NVG's instead of controlling their aircraft and stabilizing in a 2-3 NM trail position.

Last, the pilot of MA2 had turned out his exterior lights approximately one minute prior to the impact. He thought he was cleared to do so to expedite NVG training (Tab VO). The pilots of MA1 testified that they briefed the lights would be turned out by a directive radio call from MA1 (Tabs VB, VC). The fact that MA2's lights were out may have made it impossible to "see and avoid" MA2 even if the pilots had had SA.

The pilots of MA1 and MA2 failed to communicate properly or control aircraft parameters to meet standards of a RATD. They did not maintain situational awareness. This was causal to the mishap.

5. Pilots: a. Qualifications: (1) Maj Bartel was a current and qualified instructor pilot the night of the mishap (Tab T-10). Prior to the flight, supervisors believed Maj Bartel was current in Night Vision Device (NVD) intercepts (Tab G-20). Other records indicate his NVD currency had expired almost a month earlier (Tab G-22). Major Bartel was highly regarded as an instructor and a pilot. Many described him as one of best instructor pilots in the unit (Tabs VJ-9, VQ-14, VS-6). He was a conscientious pilot who was disciplined and followed the rules well within defined limits and parameters (Tabs VM-17, VQ-14-15, VR-12). His instructor pilot experience in the rear cockpit at night was very limited or nil.

(2) Capt Mulgrew was current and qualified to perform pilot duties the night of the mishap (Tab T-52). As an F-16 pilot, he was described as very good to excellent, but tended to push the edge (Tabs VQ-11-13, VD-16, VM-24). His supervisors and peers mentioned lapses in flight discipline, but mentioned nothing that would be considered unsafe (Tabs VJ-9, VM-25, VS-6).

(3) Maj Barton was regaining Mission Ready (MR) qualification and Night Vision Device currency the night of the mishap (Tab T-29). This currency and qualification had

expired during his administrative grounding 120 days prior (Tab T-36). He had flown one 1 hour, non-demanding sortie the day of the mishap as part of his re-qualification training plan (Tab T-29,30).

Supervisors and peers described Major Barton in different and sometimes conflicting ways. He was described as both a good pilot and a "cowboy" (Tabs VM-18, VQ-15, VR-12,19, VS-7). The reason for his administrative grounding and its 120 day length were significantly influenced by Maj Barton's decisions and inaction (Tabs VC-5-9, VE-6, VQ-5,6, VS-5).

b. Human factors: (1) Months before the mission: During the 12 to 18 months before the mission, several events occurred which may have contributed to the mishap.

(a) Maj Barton demonstrated verbal hostility toward several members of the 177 FW over the 12-18 months prior to the mishap. Maj Barton was angered by Capt Mulgrew's testimony before a board investigating Maj Barton for alleged fraternization, and clearly stated his dislike for Capt Mulgrew (Tab VR-22). Maj Barton was also noted to have erupted angrily at a squadron briefing (Tabs VQ-17, VR-20,21) and to have had widely noted arguments while deployed (Tab VM-18, VR-25). This personality style in the setting of a history of many stressors may have detracted from Maj Barton's ability to safely perform his flying duties.

(b) Maj Barton had been administratively grounded for four months prior to the mishap sortie. This grounding occurred after Maj Barton refused to apologize before the squadron for what was interpreted by the Operations Group Commander as an offensive comment made at a squadron briefing (Tab VC-5). Maj Barton's personality style likely contributed to this refusal and the length of the grounding. The length of the grounding then resulted in Maj Barton's limited recent experience with F-16 flight, formation flight, night operations, and night vision goggle (NVG) use.

(2) Day of the mishap: (a) General: Maj Barton apologized to the squadron on 14 Sep 97 for the comment which had led to his grounding. This was two days before the mishap. He was then permitted to return to flying status. Immediately after his apology he was given his Officer Performance Report (OPR), which down-graded him for lack of leadership skills (Tab VC- 8). Maj Barton expressed frustration at having received this down-grade after having apologized (Tab VC-8,9). Concern about his OPR and his feeling that the command was "out to get him" (Tab VC-9) may have created another distraction for Maj Barton. Maj Barton testified that he had mentioned the OPR several times on the day of the mishap and was told by several pilots to try to put it out of his mind and concentrate on flying (Tab VC-13). Maj Barton testified that after the mishap he questioned whether he "should have been flying until after all this was resolved (Tab VC-11)."

(b) Briefing: The briefing was given by Maj Barton. Capt Mulgrew testified that the briefing lasted exactly eight minutes (Tab VO-25). The testimony of the other pilots states that the briefing was approximately 20-25 minutes long (Tabs VB-42, VC-46). Maj Barton used the general briefing guide to brief a night sortie with NVG's after not having flown in the F-16 for four months before the day of the mishap (Tabs T-23, VB-11). Capt Mulgrew testified that he felt the briefing was quite short and that the other pilots

appeared complacent about it (Tab VO-37). He testified that there were no objectives for the sortie listed on the dry-erase boards in the briefing room (Tab VO-37). Although he noted to himself the brevity and lack of clear objectives, Capt Mulgrew failed to comment on this or ask for further clarification. Both his prior antagonistic relationship with Maj Barton and his own complacency over a sortie in which he was merely a "training aide" (Tab VO-25) could have contributed to an unsafe situation.

The lack of detail in the brief was a significant factor in the mishap. Testimony differs on when in the sortie aircraft lights were to be turned out. Capt Mulgrew stated that the brief specified that "when we hit the airspace and we were cleared to work in the airspace we would turn the exterior lights off (Tab VO-31)." Maj Bartel's testimony is vague on this point, stating that "I felt like Mulgrew asked about auto lights out" but that the decision was "something to the effect that we'll call" the controlling agency before shutting off the exterior lights (Tab VB-21). Maj Barton testified that he planned to make a radio call to instruct the time for turning out exterior lights (Tab VC-17). The end result was poor flight member coordination and lack of clear direction for timing of tasks.

Also, Maj Bartel had not functioned as an instructor pilot for a NVG sortie in some time, if ever (Tab V-46,49). Had he had experience in this capacity he may have provided more specific guidance during the briefing as well as other phases of the sortie.

(c) Personal equipment check: Maj Barton had difficulty adjusting his NVG's during the sortie, as discussed below (Tab VB-17). Testimony revealed that several pilots focused their NVG's at the life support section before a sortie, but that no standard procedure existed for this (Tabs VD-11-12, VR-13). A more thorough preparation of personal equipment may have prevented Maj Barton's fixation on focusing his goggles in flight. Maj Bartel also displayed imperfect knowledge regarding focusing the goggles in flight (Tab VB-17). The lack of adequate guidance on this matter also likely contributed to the mishap.

(d) Takeoff: Capt Mulgrew executed an aggressive takeoff and departure (Tab VO-28,29) which he performed for friends who were watching him that evening (Tab VO-28). Capt Mulgrew continued to deviate from planned airspeed until he leveled off at approximately 14,000 ft MSL (Tab O-223). When Maj Bartel noted Capt Mulgrew's position and parameters, Capt Mulgrew was 1.5 miles ahead of his expected position. This led to faster-than-usual airspeed during departure and the feeling among the pilots in the trailing aircraft that they "needed to catch up (Tab VB-15)." In addition, Capt Mulgrew was briefed to lead the flight to the working area, a non-standard method the pilots felt would speed up the training and keep the sortie within one hour (Tab VC-42). This sense of hurriedness may have degraded the flight's attention to detail in subsequent phases of the mission.

(e) Departure: Several human factors contributed to the mishap at this stage. Maj Barton states he felt "out of place" in the F-16 at night given his long period of grounding (Tab VC-18). He felt, though, that he was "in a whole different mode of feeling safe that I've got somebody that's watching over my shoulder after four months of not flying (Tab VC-32)." This subordinate style was a likely contributor to the mishap.

Poor intracockpit communication occurred during transfer of the aircraft between Majs Barton and Bartel. Aircraft parameters were not conveyed during transfer, and Maj Barton remained unaware of their excessive airspeed upon resuming aircraft control from

Maj Bartel. In addition, Maj Barton failed to check his airspeed upon taking control of the aircraft. He completely lacked perception of airspeed and closure (Tab VC-32). This was clearly a contributing factor in the mishap.

Maj Barton misprioritized tasks. Instead of checking aircraft parameters and position, he was attempting to focus his NVG's. Aircraft control was transferred to allow him to complete this task. After focusing his goggles, he turned them off but left them in the down position and resumed control of the aircraft. He stated that "all I really had was this hunk of metal that was in front of my face taking out half my cross-check of the HUD (Tab VC-31)." This visual defect was clearly a factor in the mishap. His lack of recent experience with NVG's was also a factor at this phase.

The absence of lighting of the other aircraft also contributed at this stage. Maj Barton would likely have seen the other aircraft much sooner had it been illuminated.

Immediately prior to collision, Maj Barton was distracted and confused. He stated he was aware of his lack of situational awareness but was unable to compensate for this deficit (Tab VC-21). He asked about a radio frequency change despite realizing something was wrong (Tab VC-20).

(3) Conclusion: Many human factors were either possibly or certainly involved in this mishap. The contribution of various stressors, underlying problems in the squadron, concern about an OPR, and crew composition is speculative but feasible. The contribution of inadequate written procedures (i.e., lights-out and goggle procedures), hurriedness of the mission, poor flight member coordination, poor intracockpit communication, and Maj Barton's subordinate style is substantially supported by evidence and is likely. Limited recent experience, misperception of speed and closure, the visual defect created by improper use of equipment, task misprioritization, and inability to correct known lack of situational awareness clearly contributed to this mishap.

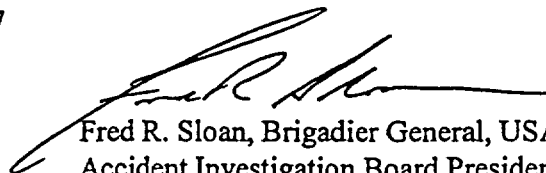
6. The Machine: Post-mishap analysis indicated that both aircraft were operating normally prior to impact (Tab O-133-152, 223-243). Both aircraft were considered professionally maintained, "high flyers". MA1 was scheduled for 200 hour phase inspection the morning after the accident. MA2 had flown 9 sorties for 13.4 hours since 1 Sep 97. No unusual maintenance actions occurred during this time. The following facts were provided by informal interview. The dedicated crew chiefs stated that both aircraft were configured for night vision goggle operation prior to the flight. The exceptional release was not annotated on MA1 in the AFTO Forms 781H after a through-flight maintenance inspection was complete. The pilot reviewed the forms prior to flight, but did not sign off the forms as per regulatory guidance. There were no discrepancies in aircraft maintenance records, indicative data, or documents which could be considered causal to this accident. Maintenance was not a factor .

7. Culture: Woven throughout testimony are leadership and followership issues which indicate that the common bond that would be optimal in a fighter squadron was lacking. Current leadership is working diligently to rebuild and strengthen a known deficiency. This was the setting that existed at the time of the accident. The potential for improvement is there and strongly evident. The unit as a whole must continue to work at

"team building" to make this effective and lasting. This lack of cohesiveness and a common focus may have been an underlying factor, although the pilots testified that they were fully focused on the mission and were not distracted by other concerns. Formal inspection results from First Air Force within the last 12 months demonstrate that the unit has the ability to excel above standards. This same standard of excellence, focus, and attention to detail must be a part of daily operations as well.

8. Remarks: Deficiencies in the following areas all contributed to the accident: headquarters' NVG guidance and procedures, unit-level leadership and supervision, mission planning, the preflight briefing, execution of a RATD as briefed, pilot qualifications, and various human factors.

Dated this 11<sup>th</sup> day of November, 1997

  
Fred R. Sloan, Brigadier General, USAF  
Accident Investigation Board President