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# FORMAL REPORT OF INVESTIGATION

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5 December 1997

OFFICE OF THE SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

## I. AUTHORITY AND PURPOSE

A. At the direction of the Commander, Air Force Materiel Command, on AFI 51-503 investigation was conducted at Edwards AFB, CA. The AFMC/CC letters, dated 14 November 1997 (Tab Y), appointed the following:

**Accident Investigator:** Colonel Michael L. Buck  
46 TW/CV  
Eglin AFB, FL

**Legal Advisor:** Capt Michelle L. King  
AFFTC/JA  
Edwards AFB, CA

**Technical Advisor:** Lt Col Hector Acosta  
AFRL/HEJT  
Brooks AFB, TX

**Technical Advisor:** Major Joseph T. Kindelin  
HQ AFMC/DOV  
Eglin AFB, FL

**Technical Advisor:** Capt Eric North  
WRALC/LJPW  
Warner-Robbins AFB, GA

B. **Purpose:** This investigation was conducted to preserve available evidence surrounding the F-16B, SN 78-0088, and AT-38B, SN 62-3746, mid-air collision over the Precision Impact Range Area, Edwards AFB, CA on 22 October 1997, while providing photo chase coverage for a B-1B, SN 84-0049. The accident resulted in two fatalities, no damage to private or public property, and an estimated \$219,540 in damage to F-16B, SN 78-0088, and \$5,300,000 in damage to AT-38, SN 62-3746 (Tab M)

## II. SUMMARY OF FACTS

### A. History of Flight:

On 22 October 1997, the mishap aircraft (MA) and crews were flying as part of a test mission to evaluate the separation characteristics of the BDU-33C/B practice bomb from the aft and mid weapons bay of the B-1B at Edwards AFB, CA. Three aircraft were

NUCLEAR REGULATORY COMMISSION

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Official Exh No \_\_\_\_\_

Doc't No 083 IDENTIFIED

In the matter of \_\_\_\_\_ RECD FD

Staff \_\_\_\_\_ REJECTED \_\_\_\_\_

DATE 7/1/82

Witness \_\_\_\_\_

Contractor \_\_\_\_\_ CM

Other \_\_\_\_\_

Reporter \_\_\_\_\_

scheduled for this test mission: Torch 01, B-1B, SN 85-0049; Zoom 02, F-16B, SN 78-0088 (MA-1); and Rick 15, AT-38B, SN 62-3746 (MA-2). Torch 01, the primary test aircraft, took off from Edwards AFB at 0827 PST (Tab HH4) with Capt David Baysinger as aircraft commander, Capt Harold Turner, copilot; Maj David Harris, offensive systems officer; and Capt James Rogers, flight test engineer (Tab A2, EE5). A delay in takeoff of the mishap aircraft was planned to allow Torch 01 to accomplish air refueling prior to their departure and to conserve fuel for the photo chase activities. MA-1—with Lt Col Richard Stevens, pilot (MP-1), and Capt Nicole Blatt, photographer; and MA-2—with Flt Lt Leigh Fox, pilot (MP-2), and Lt Col William Nusz, photographer; departed Edwards AFB at 0935 PST as a two ship formation to join up with Torch 01 over the Edwards range complex (Tab V33, HH1). MA-1 was positioned about 50 to 100 feet on the right side of Torch 01 with MA-2 on the left side in approximately the same chase position (Tab V4,20). Four bombing passes at 5000 feet mean sea level, .8 mach/520 knots airspeed, heading 070 degrees were accomplished over the Precision Impact Range Area (PIRA) on Edwards AFB, CA (Tab V36, EE8). The first and third runs were planned simulated releases (no weapons dropped). The second and fourth runs were hot passes (10 BDU-33's rippled on each pass) (Tab EE8,9). After the fourth pass was complete, Torch 01 cleared MA-1 and MA-2 to leave the test formation. MA-2 started a shallow left turn to leave the formation and proceed to a straight-in approach to runway 22 at Edwards AFB, CA. MA-1 then began a left turn to cross under Torch 01 and proceed to an area north of the PIRA for training (Tab V26,36). During his turn to the North, MA-1 aggressively maneuvered to avoid birds and struck MA-2 with his left wing at approximately 1009 PST (Tab N9, V37). MA-2 then impacted the ground in a portion of the PIRA (Tab R3, CC3). MA-1 landed at Edwards AFB, CA with damage to the left wing at approximately 1031 PST (Tab HH4). Torch 01 left the area to the North to avoid any conflict with rescue efforts and landed at Edwards AFB, CA at approximately 1130 PST (Tab HH3). Air Force Material Command handled questions regarding this accident. The Public Affairs office at Edwards AFB, CA received 13 requests for information and coordinated with all television networks, the Associated Press and local news and camera teams during media coverage of the accident. In addition, since one of the fatalities involved a British Air Force pilot, there was interest from the Washington Post, New York Times, BBC, London Times and London News (Tab GG2). The media interest declined within the first 30 hours of the accident and remained at normal levels.

#### **B. Mission:**

The mishap crews and aircraft were on a scheduled test flight in accordance with approved test plan, B-1B MK-84, MK-65, and BDU-33C/B, CERTIFICATION DETAILED TEST PLAN, dated August 1997; approved safety plan, Control Number 97-58, 29 Sep 97; and approved 419 FLTS FLIGHT TEST CARDS, 21 Oct 97, Flight Number 049-0239. The purpose of this mission was to certify carriage, release, and jettison of BDU-33C/B practice bombs from the Enhanced Conventional Bomb Module for B-1B aircraft. The BDU-33C/B is a practice bomb developed for aircrew training in high-drag weapon delivery techniques and is 23 inches long, 4 inches in diameter, and weighs 25 pounds. This certification was requested by Air Combat Command through

Seek Eagle Request 46-96, 18 March 1996. [The Seek Eagle organization is the approval authority for carriage and release of weapons and carriage equipment on Air Force aircraft] (Tab EE5, II2,4,7).

### C. Briefing and Preflight:

1. The aircrew members involved in the accident were well rested and did not exhibit any evidence of fatigue. The 72 hour histories revealed each crew member was properly nourished (Tab AA2,3,5,12). The briefing was conducted in two parts. The first part was conducted the day prior, 21 Oct 97, in the morning at 0900 PST. For this particular test mission, a form readiness review was conducted. This briefing involved ensuring the test items, the weight and balance of the B-1B, and the maintenance status were reviewed for any discrepancies. The test conductor and applicable engineers attended this briefing with the B-1B aircrew members only. The second portion of the briefing was conducted at 1545 PST on the day prior also and ended 45 minutes later at 1630 PST. Not all crew members were present. Capt Turner and Maj Harris were excused from this flight briefing by the aircraft commander, Capt Baysinger. The photo chase aircrew members were present for the flight coordination briefing (Tab V4,10).

2. The flight briefing was in accordance with the local briefing guide prescribed in AFFTCI 11-1 and was conducted by Capt Baysinger. Items briefed included the weather, sequence of events and other pertinent items. There were three items that were not specifically addressed in the brief and preflight.

(a) Actual fuel states were not discussed. However, it was apparent to everyone in the briefing that MA-2's limited fuel capacity was a factor. It was discussed MA-2 would possibly not be able to make all four bomb passes. Specific joker and bingo fuels were individually established but were not shared with other flight members or the test conductor. The formation responsibilities were briefly discussed (Tab V8,10,31).

(b) The unit's local briefing guide did not list formation breakup responsibilities and it was not addressed in the brief. The actual delegation of formation duties was administered to each of the crews during this portion of the brief. It was decided by default who would actually lead the photo chase to join the B-1B by which aircraft was more capable. It was determined that MA-1 would be the element lead of the two photo chase aircraft since it had a radar to use for the join-up. The B-1B aircraft commander would be the formation lead for the entire flight during the test runs (Tab EE9).

(c) The formation leader and element leader were not documented on the Air Force Material Command Form 83, Flight Authorization as required in AFI 11-401/AFMC Supp/AFFTC Supp (Tab K2,3,4).

3. The rest of the briefing included detailed instructions for the photographers and how the BDU-33s were to be photographed. Lt Col Nusz and Capt Blatt were to use bulky high-speed cameras (Tab V4,8,33) to capture the bombs leaving the B-1B. It was thoroughly discussed who would take which side of the B-1B. Since the camera was heavy, Capt Blatt would need to be on the right side of the B-1B, so she could point the camera easier; and, Lt Col Nusz would be on the left (Tab V33). Both Capt Rogers and Lt Col Nusz instructed Capt Blatt on the operation of the high speed camera. Lt Col Nusz was highly regarded as a competent and experienced photographer. The day of the flight, both MP-1 and MP-2 made telephone contact with the test conductor prior to stepping out to their aircraft to ensure the prebriefed takeoff times were still good (Tab V4,8).

#### D. Flight Activity:

1. The bombing runs were to certify one of three SEEK EAGLE test requirements for the practice bomb high drag BDU-33C/B (Tab II5). The bombs were to be dropped on the PIRA located adjacent to the Edwards AFB complex. The requirements for certification of the weapons was data captured on high speed film contained internally on the B-1B and externally by two photo chase aircraft. The high speed cameras used by the photo chase aircraft contained only 40 seconds of film (Tab V35). This was a driving factor in using two photo chase aircraft to ensure the data was captured on film.
2. Communication during the flight was normal. The controlling agency, Space Positioning Optical Radar Tracker (SPORT), provided adequate service during the entire sequence of events (Tab N2). The communication that describes the actual formation flight breakup was a cockpit voice recorder and camera used to capture data in the B-1B (Tab N9). This transcript provided details of the formation after the final test point was accomplished.
3. The weather for the mission was a typical day in the high desert. There were few clouds and the winds were less than 5 kts at takeoff for both aircraft (Tab K5, W2 and V26 ). The PIRA elevation varies with sloping terrain throughout. The average target elevation is 2600 ft mean sea level. The range area is high desert characterized by packed sandy soil with abundant Creosote Brush Scrub and numerous Joshua trees. The sun angle was a mid-morning sun, fairly high in the sky, and was not a factor in the mishap (Tab K5, P3).
4. Both aircrew members for the photo chase aircraft left their respective units to make the prebriefed takeoff time. MA-2 started later than MA-1 to maximize the T-38's fuel. The B-1B had taken off one hour earlier to accomplish air refueling. Both photo chase aircraft met at the end-of-runway (EOR) and took off together at 0935 (Tab HH3,4, V45). MP-1 coordinated the rendezvous on the B-1B with SPORT. MP-2 saw the B-1B before MP-1 and assisted him in the rejoin. After the rejoin was accomplished MA-1 took the right wing position on the B-1B and MA-2 took the left wing (Tab

V33,34). The formation proceeded in a race track pattern around the PIRA. The target run for all four passes were identical. The parameters for the planned runs were on a heading of 070 degrees run-in heading (West to East) at 5000 ft mean sea level. The first pass was dry (practice) to ensure the timing and switch positions were correct. The second pass was a hot (release) with the bombs leaving the aft bay of the B-1B. MA-1 and MA-2 were supposed to photograph the release from their respective positions. However, MA-2 did not film the pass due to a late radio call. MA-1 did get the data (Tab EE8, V8). The B-1B pilot requested from MA-2 his fuel situation to determine if MP-2 would be able to film the fourth pass (Tab N4). The third pass was another dry pass. The target run was normal except MP-1 interjected a radio call during the countdown to bomb release to indicate the conditions were not right for release. This was done by MP-1 on the dry pass to educate the B-1B crew to ensure enough time is allowed in between the countdown to inject a call if needed. Since this pass was a dry pass, there was no data lost. On this pass also, MP-2 coordinated with SPORT his intentions after the final (fourth) pass. He requested to be cleared off the last pass for straight-in to runway 22 at Edwards AFB. This request was broadcasted on the same frequency the entire flight was on (Tab N5). The fourth pass was a hot pass with a release of the bombs out of the mid-bay position on the B-1B. This pass was normal with both cameras capturing the required data. Immediately after the bomb released, the doors on the weapons bay automatically shut. MP-1 quickly made a clean and dry call, indicating both weapon bay and the blast door were shut. The B-1B pilot told MP-1 that he and MP-2 were no longer needed and they were cleared off. MP-1 immediately told MP-2 that he was cleared off and on his own (Tab N6). From MA-2's position on the left wing, MP-2 initiated a shallow left turn (Tab V5). The B-1B started a 5 degree left turn with a shallow climb to 6500 ft (Tab V5). MP-1 left his position on the right wing after his check on the weapons doors and accelerated forward off the right side of the B-1B. MP-1 briefly waited in a position to the B-1B and 100 ft below until the camera was stowed in the back seat. MP-1 initiated a 70 to 80 degree gentle turn to the north to maintain sight of the B-1B. Looking over his left shoulder, MP-1 saw MA-2 leaving the formation to a position slightly north of MA-1 (Tab V8,26,36,37). Once clear of the the B-1B, MP-1 saw birds in front of his aircraft and attempted to avoid them. MP-1 increased his rate of turn from 2 Gs to 7 Gs and collided with MA-2 at approximately 1009 PST (Tab N9, V37). MA-1 was traveling at 508 kts indicated airspeed at 5353 ft MSL (Tab O3). It was estimated MA-2 was traveling a similar airspeed due to the relative position of the B-1B and MA-1 (Tab V26). The impact of MA-1's left wing and missile rail penetrated the MA-2 cockpit area from a position below the right side between the front and back cockpit (Tab S5,6) at an angle between 45-60 degrees heading crossing angle (Tab V27). The force of the impact extracted both crew members at a very high rate of speed (Tab J6) from MA-2 and sheared three feet of MA-1's left wing (Tab S5,6). The mid-air collision occurred while MA-2 was in a continuous 20 to 30 degree left bank (Tab V27).

5. MA-2 continued flying with a mild wing rock, slowly losing altitude (Tab V27) until it impacted in a 15 degrees nose low and 30 degree right bank (Tab Z ). MP-1 concluded after seeing the damage to his left wing, that a mid-air collision between MA-1 and MA-2 had occurred. MP-1 turned back around to look for

any parachutes while analyzing his aircraft. MP-1 requested a chase ship to look him over and did a controllability check in accordance with the F-16 emergency checklist. MP-1 quickly recovered to Edwards AFB and landed on the dry lakebed at 1031 PST with no further problems ( Tab HH4, V39,40).

#### **E. Impact:**

At 1009 (PST), on 22 Oct 1997, MA-1 collided with MA-2 approximately 8 miles east southeast of Edwards AFB, CA over the PIRA (Tab R2). MA-2 was in approximately a 20 degree left bank level turn at 5,300 feet altitude and MA-1 was in a 70 to 80 degree left bank turn, traveling 508 knots indicated airspeed when the left wing of MA-1 came in contact with MA-2 (Tab N2, O3, V7). MA-2 traveled approximately 3 miles northeast after the mid-air collision and impacted the ground on the PIRA heading 055 degrees, 15 degrees nose low, and 30 degree right bank at approximately N34 53.894 W117° 37.065 (Tab CC3).

#### **F. Egress System:**

Although MA-2 had an ejection system, it was determined that neither crewmember attempted to eject from the aircraft. The force of the collision extracted both crewmembers from their respective ejection seats and gave them no opportunity to initiate an ejection. There were no indications that the life support and egress systems would have failed to function as designed if they had been used within the parameters for which they were designed (Tab J6).

#### **G. Personal and Survival Equipment:**

A check of the survival equipment inspection records indicated that all checks and inspections were current, but a documentation error was noted on the AFTO 392 . No personal or survival equipment was utilized in this accident. (Tab J6)

#### **H. Rescue:**

The time of the MA-1 and MA-2 mid-air collision and subsequent crash of MA-2 on the Precision Impact Range Area was 1009 PST. The initial communication of the accident came from the B-1B, TORCH 01, at 1009 PST to SPORT control (Tab N6, V6). SPORT contacted Edwards AFB Tower to initiate the Primary Crash net at 1010 PST (Tab N6). The Tower then initiated the Primary Crash Net at 1010 PST. Emergency crews from both the Phillips Laboratory and Edwards AFB were dispatched to the scene at 1012 PST with the following units: Chief 1, Chief 2, Crash 32, Engine 40, Rescue 41, and Tanker 54 (Tab CC2). The bodies of the MA-2 crew were found by Security Police at N34° 52.556 W117° 40.151 at 1051 PST and N34° 52.543 W117° 40.119 at 1133 PST. The primary wreckage site was located at N34° 53.894 W117° 37.065 at 1038 PST (Tab CC3,4).

### **I. Crash Response:**

The rescue efforts were coordinated by the Edwards AFB Fire Chief, Joe Ybarra and were initiated at 1012 PST (Tab CC3). No major difficulties were experienced with the rescue efforts though some problems were encountered with the primary communication net. There were many vehicles dispatched from both the Phillips Laboratory and Edwards AFB. Medic 8 was enroute to the scene and had requested to the Command Post to notify Ft Irwin Army Airfield that a medivac (helicopter) may be needed. There were 3 surveyors in the immediate area that witnessed the debris and wreckage falling. They assisted in directing the emergency crews efforts (Tab V16). There were essentially two separate, remote sites to search. This, along with the topography of the large area, complicated the search efforts. Although the crash occurred over an isolated part of the Edwards range complex and two crash scenes had to be coordinated, ground observers were able to direct rescue and emergency vehicles to the appropriate sites (Tab V21, CC3). The following weather conditions prevailed: sky was clear, winds calm, and temperature 63 degrees Fahrenheit (Tab W3).

### **J. Maintenance Documentation**

1. Maintenance documentation for F-16B aircraft SN 78-0088 was reviewed to determine if any maintenance procedures contributed to the mishap. The last sortie for this aircraft, prior to the mishap, was on 16 Oct 97. It flew an uneventful sortie of 1.5 hours, returning to base with no discrepancies. The aircraft was scheduled but did not fly on 21 October. The unit did not fly the aircraft between 16 Oct and 21 Oct due to preparation for the Edwards AFB Open House/Air Show that weekend. All documentation was reviewed and found to be in proper order (Tab D2, H2, M3). There were no discrepancies which contributed to the mishap aircraft.

2. Maintenance documentation for AT-38B aircraft SN 62-003746 was reviewed to determine if any maintenance procedures contributed to the mishap. The last sortie for this aircraft, prior to the mishap, was on 21 Oct 97, for a total of 2.2 hours. The aircraft was preconfigured for static display for the Edwards AFB Open House/Air Show during the weekend of 17-19 Oct 97. The aircraft had not flown since 10 Oct 97, when it flew a 1.4 hour sortie. All documentation was reviewed and found to be in proper order (Tab D3, H5, M2). There were no discrepancies which contributed to the mishap aircraft.

### **K. Maintenance Personnel and Supervision:**

1. F-16B SN 78-0088: No major discrepancies were found in training documentation and all personnel were qualified to sign off on the AFTO Form 781's. In addition, all personnel were properly certified to document Special Certification Rosters.

2. AT38B SN 62-003746: No major discrepancies were found in training documentation and all personnel were qualified to sign off on the AFTO Form 781's. In addition, all personnel were properly certified to document Special Certification Rosters.



### **L. Engine, Fuel, Hydraulic, and Oil Inspection Analysis:**

1. Engine S/N PW0E703625 was installed in F-16B 78-0088. All engine documentation was reviewed. All inspections were up to date and there were no outstanding inspections, TCTO's, or Time Change Items on this engine. The engine times were accurately tracked in the AFTO Form 781J. The Liquid Oxygen (LOX) cart, the Hydraulic cart, the Oil cart and the Fuel that serviced MA-1 were examined. No abnormalities discovered that would have contributed to the mishap.

2. Engine S/N GE00230335 was installed in position #1 in AT-38B sn 62-003746. Engine SN GE00230602 was installed in position #2 in this aircraft. All engine documentation was reviewed. All inspections were up to date and there were no outstanding inspections, TCTO's, or Time Change Items on these engines. The engine times were accurately tracked in the AFTO Form 781J. All inspections were up to date and there were no outstanding inspections, TCTO's, or Time Change Items on these engines. The Liquid Oxygen (LOX) cart, the Hydraulic cart, the Oil cart and the Fuel that serviced MA-2 were examined. No abnormalities were discovered that would have contributed to the mishap.

### **N. Operations Personnel and Supervision:**

This mission was authorized by the Operations Group Commander. The mission consisted of assets generated by three separate flying units. The test mission for the B-1B was authorized by the Operations Group Commander the day prior (Tab EE5). The test assets (photo chase aircraft, T-38 and F-16) were requested in accordance with the test plan. Each unit commander or representative authorized the mission for his respective aircraft through the Edwards Scheduling System and assigned the available aircrew to the mission. The AFMC Form 83, Flight Authorization, (Tab K2-4) for each unit was signed by the appropriate individual signifying the final flight authorization. However, no unit designated the formation leader or element leader on the AFMC Form 83 in accordance with AFMC and AFFTC directives (refer to Section S, this report).

### **O. Aircrew Qualifications:**

1. Flt Lt Leigh Fox was current and fully qualified to fly the photo chase mission. (Tab G14-17, T8). He was a British exchange officer, and a graduate of the French Test Pilot school. As such, his selection to fill the British exchange officer position at the AFFTC was highly regarded and reflected his excellent flying abilities. He was assigned to the AFFTC on 4 May 1996, and started United States Air Force (USAF) flying training in August 1997. His British military flying history was not available (Tab T11). However, his USAF flying training and flight evaluations indicated that he received the required flight training in both the T-38 and F-15 aircraft. His record of Aircrew Qualification revealed two flight evaluations and was awarded a qualification level one on both evaluations. His training folder was in accordance with AFMC

applicable training guidance. His last 30/60/90 Day Flying History (Tab G14, T13) indicated 12.9/30.1/42.9 hours. As of 22 Oct 1997, he had accumulated 181.6 flight hours in USAF aircraft, 74.5 hours in the T-38 and 106.9 hours in the F-15 aircraft. During the 30 days before the mishap, Flt Lt Fox flew the T-38 aircraft four times (5.3 hours) and the F-15 aircraft six times (7.6 hours). There were no long breaks from flying in the previous 90 days. His recent flight history indicated he was proficient in both aircraft. His ground training requirements revealed he completed Initial Crew Resource Management (CRM) training on 7 May 1997 (Tab T10).

2. Lt Col William Nusz was current and fully qualified as a mission support aircrew member to photograph the B-1B/BDU-33C/B test mission (Tab G18,23, T2,5). He graduated from the Air Force Test Pilot School in 1984. He was assigned to the AFFTC in August 1995 and was qualified as a mission support flyer in the T-38 aircraft on 19 September 1995. He was also trained in the B-1B aircraft to accomplish mission support duties in December 1995. Lt Col Nusz was highly regarded as a proficient and experienced in flight photographer. His training folder was in accordance with AFMC applicable training guidance. His last 30/60/90 Day Flying History indicated 1.9/30.1/42.9 hours (Tab G18, T5). As of 22 Oct 1997, he had accumulated 918.2 flight hours in numerous aircraft. In the T-38 he had 111.5 hours and 234.6 hours in the B-1B. During the 30 days before the mishap, Lt Col Nusz flew in the back seat of the T-38 once (1.2 hours). CRM training was completed on 15 Sep 1995 (Tab T4).

3. Lt Col Richard Stevens was current and fully qualified to fly the photo chase mission (Tab G2,7, T14,22). He graduated from the United States Air Force Test Pilot School Edwards Air Force Base California in June 1988 and had been highly qualified in the F-16 and the F-4 as indicated on numerous flight evaluations. Lt Col Stevens had a five year break from flying from 1990-1995 to attend schools and a non-flying assignment. He was re-assigned to the AFFTC in August 1995 as the Squadron Commander of the 416 Flight Test Squadron. His requalification in the F-16 aircraft was completed on 26 September 1996 in accordance with AFMC training guidance. His last 30/60/90 Day Flying History was 1.9/5.8/32.3 hours (Tab G3, T22). As of 22 Oct 1997 he had accumulated 1814 total flight hours in various aircraft with 463.7 flight hours in the F-16. During the 90 days before the mishap Lt Col Stevens flew 15 times for a total of 33.7 hours. In the last 60 days, he flew only three times for 5.8 hours and he flew only once in the last 30 days prior to the mishap. The majority of his flying time during this period was weekend cross-country proficiency flights during 8 August to 12 August 1997. Despite his limited flying in the 90 days prior to the mishap, he met Air Force and AFMC minimum flying currency requirements. His ground training requirements were not complete. Initial CRM training was not accomplished (Tab T18).

4. Capt Nicole Blatt was current and qualified as a mission support aircrew member to photograph the B-1B/BDU-33C/B test mission (Tab G8,13, T24). She had recently graduated from the Air Force Test Pilot School in July 1997 and was assigned to the 416 FLTS in the same month. She received training as a mission support flyer in the F-16 on 14 July 1997. She received photo training from Lt Col Nusz and

Capt James Rogers who both were regarded as proficient and experienced in flight photographers. Her training folder was in accordance with AFMC applicable training guidance. Capt Blatt's last 30/60/90 Day Flying History indicated 5.6/10.2/16.6 (Tab G13, T25). As of 22 Oct 1997, she had accumulated 129.4 total flight hours in numerous aircraft and completed CRM training (Tab T24).

#### **P. Medical:**

1. Flt Lt Fox was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 30 Jan 97 within normal limits. The 72 hour history revealed nothing unusual (Tab AA3) A post-mortem physical examination was completed on 25 Oct 97. The cause of death was due to multiple blunt force injuries. The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident (Tab X3, 10).
2. Lt Col Nusz was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 9 Jul 97, within normal limits except for a waiver for bilateral hearing loss. The waiver, valid through 31 Jul 98, was granted for H-3 profile hearing loss. The 72 hour history revealed nothing unusual (Tab AA2). A post-mortem physical examination was completed on 25 Oct 97. The cause of death was due to multiple blunt force injuries. The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident (Tab X2, 9).
3. Lt Col Stevens was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 26 Mar 97, within normal limits except for a waiver granted for mitral valve prolapse with mild mitral regurgitation which expires 31 Mar 98 (Tab AA20). A post-accident eye exam was taken with no abnormalities found (Tab AA29). The toxicological studies were negative. The 72 hour history revealed nothing unusual (Tab AA5). There is no evidence of medical facts that would have contributed to this accident.
4. Capt Blatt was medically qualified to fly at the time of the accident. Her flying class II physical examination was accomplished on 9 Oct 97 within normal limits (Tab AA21). The toxicological studies were negative (Tab X11). The 72 hour history revealed nothing unusual (Tab AA12). There is no evidence of medical facts that would have contributed to this accident.
5. Major Harris was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 17 Dec 97 within normal limits (Tab AA22). The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident.

6. Capt Turner was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 16 Jan 97, within normal limits (Tab AA23). The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident.

7. Capt Baysinger was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 11 Feb 97, within normal limits (Tab AA24). The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident.

8. Capt Rogers was medically qualified to fly at the time of the accident. His flying class II physical examination was accomplished on 22 Sep 97, within normal limits (Tab AA25). The toxicological studies were negative. There is no evidence of medical facts that would have contributed to this accident.

#### Q. Nav aids and Facilities:

1. All nav aids and airdrome facilities were operational and able to support flight operations at Edwards AFB, CA on 22 Oct 97 (Tab FF2).

2. Bird activity during the time of the mid-air collision was not posted. There were no sightings of bird activity before the mishap by any of the other crew members. Previously to the mid-air, all three aircraft in the formation had flown over the same area and same altitude within the last 30 minutes and did not report any bird activity that would have been a factor on the test runs. Investigation to the normal bird activity at Edwards AFB revealed in the past 2 years, there were 21 bird strikes reported at Edwards AFB and sent away for analysis (Tab BB2). Of these, 18 of the 21 birds strikes occurred below 500 ft. In addition to the actual strikes, the majority of the birds involved were indigenous to the Edwards area (Tab BB1). The major threat is the abundant Horned Lark which is a small bird tending to flock at or near the surface (below 500 ft). The Bird Aircraft Strike Hazard (BASH) Program at Edwards does not have data collected over the PIRA. In April of 1996, the Air Force BASH Team did an analysis of the surrounding area to assess the bird activity and threat. This team assessed the area and offered recommendations to control the major bird threat. The recommendations were centered around controlling the Horned Lark bird and its habitat. There are two known migration routes which involve raptors (eagles, hawks and vultures) and water fowl (shorebirds and pelicans). These routes are generally over the Edwards AFB complex (Tab BB20) which is farther west than the range area. The Environmental wildlife office at Edwards AFB who tracks and documents the different bird species, maintains a data base of the bird species and their movements. The results revealed inconclusive evidence of the types of birds that could have been observed during the month of October around the PIRA (Tab BB21).

**R. Weather:**

The weather at the time of the accident was: clear skies, wind 150 degrees at 3 knots, visibility 35 miles, temperature 14 degrees C, and altimeter setting 30.05 (Tab W2).

**S. Governing Directives and Publications:**

## 1. There were a number of directives governing this mission.

(a) AFI 11-401	Flight Management
(b) AFI 11-206	General Flight Rules
(c) AFI 11-214	Fighter, Weapons Control Procedures
(d) AFI 99-101	Development Test and Evaluations
(e) AFMCMAN 10-202, V1	Aircrew Training
(f) AFMCI 11-202	Fighter Training Aircrew Procedures
(g) AFFTCI 11-1	Aircrew Operations
(h) AFFTCR 127-3	Test Safety Review Process

## 2. Known or suspected deviations from Directives/Publications:

(a) The flight briefing did not address formation flight breakup procedures in accordance with the requirements of AFI 11-206, paragraph 4.2.2. bullet 6, AFMCI 11-202, paragraph 4.3.8. In addition, AFFTCI 11-1, A10.1 and A10.7 did not contain or address formation flight breakup procedures in the unit's local briefing guide.

(b) The formation flight leader and element leader for the photo chase aircraft were not designated on the flight authorization in accordance with AFMCI 11-202, paragraph 4.3, AFI 11-401/AFMC Supp, paragraph 1.8.1.6, AFI 11-401/AFFTC Supp, paragraph 1.4.3.3, , and AFFTCI 11-1, paragraph 4.1.2.1.

(c) Actual fuel status was never addressed in the flight brief or while airborne for either of the photo chase aircraft in accordance with AFI 11-206 paragraph 2.1, AFFTCI 11-1, paragraph 4.2.

### III. STATEMENT OF OPINION

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

#### A. Cause:

The mid-air collision that occurred on 22 October 1997 between Zoom 02, F-16B, SN 78-0088 and Rick 15, AT-38B, SN 62-3746, over Edwards AFB, CA was caused by Lt Col Richard Stevens, pilot of Zoom 02, maneuvering to avoid hitting birds he saw in his flight path. This 7G reactive, evasive maneuver placed his aircraft on a collision course with Rick 15. The mid-air collision resulted in approximately 2-3 feet of the F-16B's left wingtip being sheared off, the AT-38B being destroyed, and the deaths of Flt Lt Leigh Fox and Lt Col William Nusz (Tab S, V19,20, Z).

#### B. Contributing Factors:

##### 1. Mission Briefings:

(a) The crew briefings conducted 21 October 1997 in preparation for B-1B, BDU-33C/B test mission K7865 were in accordance with local briefing guides prescribed in AFFTCI 11-1. All aspects of the mission were covered in detail with exception of the test formation breakup after the last bomb pass (Tab V4,32). Neither AFFTCI 11-1 nor the local squadron briefing guides include formation breakup as a specific briefing item (Tab EE10).

(b) The start of the formation breakup after the last pass began with the chase aircraft being cleared out of formation by Torch 01, the B-1B and test formation lead. Rick 15 was then cleared off by Zoom 02, the photo chase element lead, and began approximately a 20 degree shallow left turn to exit the formation and proceed to a straight-in landing at Edwards AFB, CA. Torch 01 also began a shallow climbing, left hand turn to continue his mission. Zoom 02 paused off the right side of the B-1B to allow the photographer in his backseat to stow her camera equipment before proceeding on with the rest of his mission. Once the camera was stowed, Zoom 02 visually cleared his left side and determined Rick 15 was not a factor, he then began a left turn under the nose of the B-1B to leave formation. This maneuver was not expected by the crew of Torch 01. Although no "standard" maneuver is published, this turn put Zoom 02 in front of and below the B-1B and out of the crew's field of vision. Both pilots of Torch 01 were expecting Zoom 02 to maneuver above their aircraft so they would be able to maintain visual contact with him. This turn also forced Zoom 02 to focus his attention on

avoiding the B-1B and to rely on his initial look at Rick 15 to judge his position from him as he crossed under the B-1B (Tab N6, V8,10,20,26,37).

(c) AFMCI 11-202, paragraph 4.3.8 addresses dissimilar formation and the requirement of all participants to be knowledgeable of procedures, visual references, and limitations of the other aircraft in the formation. This particular test mission included three dissimilar types of aircraft: B-1B, F-16B, and AT-38B. While the visual references, danger areas, and limitations of the B-1B were covered for the test formation portion of the mission, it was not done to cover formation breakup, specifically crossing under the B-1B's nose (Tab V30). Had this been discussed in detail the concerns of the B-1B crew with this maneuver may have been revealed, a more common cross over maneuver may have been used by Zoom 02, and the geometry of this accident might have changed significantly. The lack of a formation breakup discussion in the mission briefings was a contributing factor in this mishap.

## 2. Human Factors:

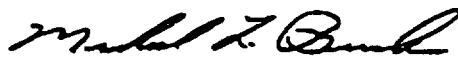
(a) The formation breakup of the B-1B, BDU-33C/B test mission K7865 was initiated in clear weather conditions, at 1009 PST, approximately 5,000 feet mean sea level, .8 mach/520 Knots air speed, heading 070 degrees, and in level flight. The sun was not a factor with everyone maneuvering out of the formation to the North (Tab V34,36).

(b) As stated earlier, Rick 15 was the first to be cleared out of the test formation. His initial move was approximately a 20 degree left turn to proceed East of the Phillips Lab no-fly zone enroute to a straight-in to Edwards AFB, CA. Torch 01 began a shallow left, climbing turn with Zoom 02 on his right wing. Zoom 02 noted Rick 15 checking away in a turn level with the B-1B (Tab V36). With Torch 01 in a slight left climbing turn his initial perception was flawed, Rick 15 was actually lower than Torch 01 (Tab V5). Zoom 02 then started a 60 to 80 degree descending left turn to cross about 200 feet below and in front of the B-1B. Zoom 02's estimate of Rick 15's position as he crossed under Torch 01 was that he was above him, in a left turn, and approximately 2 to 3 thousand feet away (Tab V37,42). Again, with no outside references other than Torch 01; his full attention on the B-1B; only a short scan of the AT-38B, and the fact that the AT-38B is a smaller aircraft than the F-16B this position estimate may also have been in error. With the size differential between the two aircraft, the AT-38B may have been as much as 30 percent closer than perceived by the F-16B pilot. The speed maintained by Zoom 02, 508 knots crossing over Rick 15 (Tab O3), during the formation breakup was higher than normal for this phase of a chase mission (Tab V42). At those speeds, Zoom 02 was traveling at 858 feet/second and a hard 7G maneuver of 3 to 4 seconds duration would close the distance he estimated Rick 15 to be away from him and not have produced the turning angles expected (Tab V42, DD2, JJ2). Human factors were a contributing factor in this mishap.

### 3. Situational Awareness

(a) Lt Col Stevens maintained proper flying currency by Air Force and AFMC standards (Tab G2). His work schedule though made it difficult to schedule him to fly on a frequent basis and by mutual consent with the 416th FLTS he would not be scheduled to fly complex, demanding test missions (Tab G2, V17). This is not unusual for staff fliers. Prior to the 22 Oct 97 mission, Lt Col Stevens had flown only once that month, 7 Oct 97, and only once in September, 17 Sep 97. This did maintain currency, but fell short of the recommended 5 sorties per month of AFMCMAN 10-202, Vol 1 to maintain a level of proficiency. Basic flying skills and judgment in a highly qualified and experienced pilot such as Lt Col Stevens should not degrade in normal flying situations even with infrequent flying.

(b) After the last bombing run on the test mission Zoom 02 maintained his position on the right side of the B-1B test aircraft to allow his backseater to stow her equipment. He checked the position of Rick 15 and then began a 60 to 80 degree bank turn to cross under the nose of Torch 01. This particular maneuver required his full attention to perform, he felt any collision potential was with the B-1B. He thought Rick 15 would be no factor (2-3,000 feet separation, turning away, and above), so once on the other side of the B-1B he glanced at him, looked back at the B-1B, and focused his attention on his flight path. It was at this time that he saw birds and pulled into a hard 7G left turn to avoid them, he held the turn for 3-4 seconds to maneuver farther to the North and then felt the "thump" (Tab V37,38,42). The graphic of the flight path, estimated from radar data of Rick 15 as he began to leave the formation indicates that he was less than 2,000 feet from Torch 01 (Tab FF7). The last time Zoom 02 checked the position of Rick 15 prior to reacting to the birds was a quick glance 4 seconds before beginning evasive maneuvering. The break turn was started at a higher than normal airspeed and would not have produced the turn rate normally expected of this reactive maneuver (Tab V42, JJ2). The mental picture Zoom 02 had of Rick 15 placed Rick 15 well clear and of no factor; however, Zoom 02's mental picture was inaccurate (Tab V37,43). Situational awareness was a factor in contributing to this mishap.

  
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