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INVESTIGATING OFFICER'S REPORT

OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

I. AUTHORITY AND PURPOSE.

A. Pursuant to Special Order M-08, 17th Air Force, dated 11 January 90 (Tab Y), Colonel Michael C. Francisco, 66th Electronic Combat Wing, was appointed to conduct an accident investigation into the circumstances surrounding an aircraft accident occurring over Maxdorf, Federal Republic of Germany (FRG), on 18 December 1989, and involving two F-16Cs, serial numbers 84-1263 and 84-1293, assigned to the 50th Tactical Fighter Wing, Hahn Air Base, Federal Republic of Germany. Pursuant to the same order, Major D. Robin Hitt, 66th Electronic Combat Wing, Office of the Staff Judge Advocate, was detailed as the legal advisor for the investigation. Captain Wallace W. Bleyl and MSgt John C. McKeown, 86th Tactical Fighter Wing, were detailed respectively as the Life Support Systems Advisor and Egress Systems Advisor. Captain James R. Witter, 50th Tactical Fighter Wing, was detailed as the Aircraft Maintenance Advisor.

B. Colonel Michael C. Francisco conducted the investigation in accordance with AFR 110-14 and was guided by the provisions of AFR 120-4. The objective of this investigation was to obtain and preserve all available relevant facts and evidence pertaining to the accident and to investigate the circumstances leading to the accident and subsequent damage for use in claims, litigation, disciplinary and administrative proceedings, or any other purpose deemed appropriate by competent authority.

C. Formal inquiry by the investigating officer and legal advisor began on 18 January 1990, at Hahn Air Base, Federal Republic of Germany. The specific areas investigated included, but were not limited to:

1. History of Flight Activity
2. Purpose for Flight
3. Mission Preparation and Briefing
4. Flight Activity
5. Maintenance Supervision and Documentation
6. Operations Supervision and Documentation
7. Pilot Qualification
8. Mishap Sequence
9. Ejection
10. Crash Response and Rescue
11. Medical
12. Weather
13. Directives
14. Damage and Claims

CLEAR REGULATORY COMMISSION

Docket No. _____ Official Exh. No. _____
 In the matter of PFS
 Staff _____ IDENTIFIED
 Applicant RECEIVED
 Intervenor _____ REJECTED _____
 Owner _____ WITHDRAWN _____
 DATE 7/1/02 Witness _____
 Clerk. [Signature]

PFS Exh. 109

D. A glossary of abbreviations used in this report follows this summary of the report of investigation.

II. SUMMARY OF FACTS

A. HISTORY OF FLIGHT.

1. On 18 December 1989, Major Roderick R. Kallman was assigned the duties of flight lead for a two-ship F-16 flight from Hahn Air Base, FRG, to conduct Dissimilar Air Combat Tactics (DACT) training with F-15s from Bitburg Air Base, FRG. His wingman on this mission was 1st Lieutenant Steven C. Sundstrom. Colonel Jerry D. Hokkanen was assigned the duties of wingman in a two-ship F-15 flight from Bitburg Air Base. His assigned flight leader, Captain Wentworth, was scheduled but did not fly on the mission due to lack of aircraft.

2. On 18 December 1989, Major Kallman reported for duty at approximately 0745 hours local time (L), and Lt Sundstrom reported for duty at 0730L hours. (Tab V-5 p.3) Col Hokkanen arrived for duty at Bitburg at 0700L. (Tab V-2 p.2) The F-16 pilots initially attended a squadron meeting in which the daily conditions and instructions were briefed, and the squadron commander gave a short briefing covering the results of a safety meeting at Headquarters, United States Air Forces, Europe (HQ USAFE), from which he had recently returned. This briefing addressed weather hazards of wintertime flying in Central Europe. (Tab V-3 p.3) At 0830L, Maj Kallman conducted a telephonic pre-mission coordination brief with Capt Wentworth, the F-15 adversary flight leader. Maj Kallman then attended an operations staff meeting. Maj Kallman and Lt Sundstrom then briefed and completed a scheduled emergency procedures flight simulator mission which commenced at 1000L and ended at 1115L. (Tab V-5 p.4)

3. In the afternoon, Maj Kallman and Lt Sundstrom were scheduled to fly F-16 aircraft on a "2 versus 2" Dissimilar Air Combat Tactics (DACT) mission with two F-15C aircraft from the 36th Tactical Fighter Wing, Bitburg Air Base, with a flight brief time of 1315L and a scheduled takeoff time of 1515L. Maj Kallman planned the mission in the flight briefing room after checking range availability, GCI availability and the weather. Both pilots ate lunches in the squadron that they had made at home. Maj Kallman was unable to establish contact with the GCI site that had been scheduled, and he intended to work autonomously unless contact could be established in the air. (Tab V-5 p.18)

4. Talon 01 flight, the F-16s, with Maj Kallman as Talon 1, in F-16C serial number 84-1263, and Lt Sundstrom as Talon 2, in F-16C serial number 84-1293, was scheduled for departure at 1515L. The F-15 flight, Lobo 01 with Capt Wentworth as Lobo 1 and Col Hokkanen as Lobo 2, was scheduled for departure from Bitburg AB at 1520L. The airspace, Temporary Restricted Area (TRA) 205E, was reserved for their flight activity from 1530-1600L. The altitude block reserved for their maneuvers extended from Flight Level (FL) 090

to FL 240 (9000 feet to 24000 feet above sea level).

B. MISSION.

1. The purpose of the mission was to accomplish Dissimilar Air Combat Tactics (DACT) continuation training between the F-15s and F-16s to increase all pilots' proficiency in the missions of air superiority and air defense. While the ideal configuration of the mission was to have all four aircraft on the mission, authorized alternate missions included "two versus one" training using three aircraft, or "one versus one" Basic Fighter Maneuver (BFM) training with only two aircraft. Due to his experience level, Lt Sundstrom was not authorized to go on the mission without his flight leader. In the event weather precluded Air Combat Training (ACBT), tactical intercepts were the alternate mission. (Tab V-2 p.7, V-5 p.14)

2. Planned mission events for the F-16s included single ship takeoffs, weapon system checks, tactical formation, warm-up exercises, multiple DACT engagements as fuel permitted, and return of the aircraft to their respective bases. (Tab V-5 p.14)

C. BRIEFING AND PREFLIGHT.

1. Maj Kallman's activities from completing his duties and departing the squadron on 15 December 1989, and Lt Sundstrom's activities from completing his duties and departing the squadron on 17 December 1989, through their planned recovery from the mishap sortie, were within the required crew rest parameters established in Air Force Regulation (AFR) 60-1. Lt Sundstrom was not experiencing any abnormal stress at home or at work. (Tab V-5 p.3, V-12 p.1) Col Hokkanen's activities from departing work on 17 December 1989 were also within the required crew rest parameters. (Tab V-2 p.3)

2. Maj Kallman conducted the adversary portion of his briefing telephonically with Capt Wentworth at Bitburg AB at 0830L. The briefing was conducted with a squadron adversary briefing guide (Tab V-5, pp. 10-13) and was in accordance with USAFER 55-79. (Tab AA-6, V-5 p.11)

3. The mishap mission briefing began at 1315L, two hours prior to the scheduled takeoff time, which is standard for the 50th Tactical Fighter Wing. Maj Kallman and Lt Sundstrom were present for the briefing, which was given by Maj Kallman. The briefing followed the standard briefing outline as found in USAFER 55-116, F-16 Pilot Operational Procedures. (Tab AA-7) Maj Kallman's briefing addressed all applicable briefing items. (Tab V-5 pp.13-32)

4. During the briefing, Maj Kallman described his tactical plan for engaging the adversaries. His planned tactics for the first two engagements involved maneuvers which would allow his formation to split up to attack separate adversaries and could intentionally result in loss of visual mutual support in several circumstances. (Tab V-5 p.35) This tactical doctrine was

not uncommon in the 496th TFS. (Tab V-3 p.6, V-4 p.7, V-6 p.7) The second two engagements were intended to allow the F-16s to maximize visual mutual support. (Tab V-5 p.41)

5. Supporting and engaged roles were specifically briefed. While he did not brief that he would use the term "engaged" to indicate that he was in that role, Maj Kallman briefed that the leader was the planned engaged fighter. He addressed that the other fighter should be able to tell who was engaged based on the tactical radio calls, such as "he's on me". In that case, he briefed that the support fighter should maneuver for an unobserved entry, but was not to engage without specific clearance. (Tab V-5 p.27)

6. In terms of a plan for loss of mutual support, Maj Kallman briefed that if they had lost mutual support but had situation awareness, they could continue to try to regain mutual support. If visual contact was lost on the intercept portion of an engagement, the leader would automatically go to the bottom two thousand feet of their altitude block and the wingman would go to the top two thousand feet, to ensure at least one thousand feet of vertical separation between them. (Tab V-5 p.21)

7. A joker fuel of 2500 pounds and a bingo fuel of 2000 pounds were established. Joker and bingo fuels are codewords for preplanned quantities of fuel needed to prepare to depart the training area and to depart the training area in order to land at the planned field with adequate fuel reserves. The planned joker and bingo fuels were appropriate for the forecast weather at Hahn AB. (Tab V-11 p.3)

8. Following the crew briefing of the mission, Lt Sundstrom had approximately 10 minutes before the step briefing (i.e., "stepping" to the aircraft). The step briefing began at approximately 1420L, was given by Lt Thomas, and was in accordance with the squadron briefing guide. (Tab V-11 p.4, V-5 p.32, AA-11)

9. According to his crew chief, SSgt Thomas Bonser, Lt Sundstrom's preflight, engine start and pre-taxi checks were without incident. (Tab V-13 p.1)

10. Maj Kallman's preflight, engine start, and pre-taxi checks were normal. (Tab V-5 p.32)

D. FLIGHT ACTIVITY.

1. Talon flight completed pre-taxi checks and taxied on time. Ground operations were normal. (Tab V-5 p.32)

2. There were no known aircraft navigational difficulties. The weather was not a factor and the field was operating under Visual Flight rules (VFR). There were no Notices to Airmen (NOTAMS) that would have affected the

flight. All available airfield navigational aids were functioning properly. (Tab V-11 p.4)

3. After clearance for takeoff, Talon flight took Runway 21 for departure, lined up in echelon formation and accomplished single ship takeoffs at 1514L. Talon 2 (Lt Sundstrom) accomplished his weapon system checks uneventfully. (Tab V-5 p.32)

4. Talon flight was cleared into the TRA airspace by Rhine Control (air traffic control). Upon entry into the area, Talon 1 (Major Kallman) put Talon 2 into a "fighting wing" maneuver formation and checked the clouds. There was cirrus cloud in the area with bottoms ranging from 21000 feet MSL to 25000 feet MSL. Based on where he estimated the engagements would take place, Talon 1 limited the planned maneuvering altitude to 20000 feet MSL. After conducting warm-up maneuvers, the F-15 adversaries had not yet arrived so Talon flight accomplished several intercepts on each other while waiting. (Tab V-5 p.32) Due to maintenance problems, only one F-15 was available for the mission which was flown by Col Hokkanen who used the original leader's callsign, Lobo 01. (Tab V-2 p.3)

5. The DACT portion of the mission began with Talon flight in the northeast of the area and Lobo 1 in the southwest with about 30 miles separation. The two flights shared a common radio frequency, Rhine Control, for area monitor and for passing of shot calls and safety calls between them. The F-16s conducted their tactical flight communications on a Very High Frequency (VHF) radio. (Tab V-2 p.13)

6. On the first intercept, the flights initially closed on each other until about 20 miles when the single F-15 mistakenly conducted an intercept behind an unknown aircraft flying above the reserved airspace. The F-15 did not depart his assigned airspace during this maneuver. This resulted in a 20 mile tail chase for about two minutes with Talon 2 about 2 and 1/2 miles from Talon 1, about 30 degrees back (behind his wing line). (Tab EE-2) The F-16 leader, Talon 1, told his wingman to enter a wide split which developed into about 6 miles separation. The F-16 wingman, Talon 2, lost sight of his leader and failed to inform him of this until queried by Talon 1, who observed that his wingman was getting very wide in the formation. After unsuccessfully attempting to get his wingman to see him, Talon 1 continued the intercept by directing a heading for his wingman. Talon 1 did not call an altitude because Talon 2 had been prebriefed to use the top 2000 feet of the F-16 block of airspace if he lost visual, and because Talon 1 could still see him. (Tab V-5 p.43) After the F-15 turned to meet the F-16s, Talon 1 told Talon 2 that he was turning to place the F-15 off his right wing, putting his wingman about 5 miles in trail. He told his wingman, "You should be able to come in from the left, he's on me, I'm in the beam". (Tab EE-2) Talon 1 did not call "engaged", assuming that his call "he's on me" would indicate that. (Tab V-5 p.36) Talon 2 acknowledged that he was turning to point toward the F-15 and called that he had the F-15 in sight. The F-15 made a high angle firing pass on Talon 1. Talon 1 told Talon 2 where he was from the F-15.

Talon 2 acknowledged that he had both of them in sight. Talon 2 then misinterpreted his position with respect to the F-15 and attempted to press an attack on the F-15. (Tab EE-3) When queried by Talon 1 as to his position, Talon 2 told Talon 1 that he was converting on the tail of the F-15, when in fact Talon 2 was approaching a head-on pass. Talon 1 looked behind himself to see if he was clear of his wingman at that point. (Tab V-5 p.38) The wingman broke off his attack on the F-15 when it was apparent that he was approaching from the front quarter. When Talon 2 broke off his attack, he passed about 700 feet from the F-15, then rolled "belly up" to his leader and passed him at the same altitude at a range of approximately 3000 feet, without being in visual contact. Talon 1 then called a missile shot on the F-15 and terminated the engagement. (Tab EE-3) Maj Kallman was aware that his wingman had met the engagement in the front quarter of the F-15, but was not aware of the close pass by Talon 2 until after the accident. In between the engagements, Maj Kallman debriefed Lt Sundstrom on the need to get some lateral offset in order to get an entry to the engagement, because Maj Kallman believed Lt Sundstrom had not been able to get an entry. (Tab V-5 p.38)

7. During the second engagement, Talons 1 and 2 lost visual contact with each other during the tactical intercept, and Talon 2 became separated from the flight. (Tab V-5 p.40) Talon 1 called his "tally ho" on the F-15 (meaning that he saw the adversary aircraft) and began turning with him. Talon 1 did not call engaged. Talon 2 remained separated from the engagement by several miles, gave his position, and asked for the location of the engagement. Talon 1 called a visual ground reference (Tab DD-2), but did not say what altitude he was using. (Tab V-5 p.40) Talon 1 achieved a gun "kill" on the F-15 in about one minute. Talon 2 was unable to reacquire his leader or the F-15 visually, and the F-16s rendezvoused after the engagement was terminated.

8. During the third intercept, the F-16s both lost their radar lock-ons of the F-15 after they had initiated a bracket intercept of the F-15 (from both sides of the F-15). Due to simultaneous radio transmissions, the leader did not hear his wingman's call that he was turning away. The F-16s lost sight of each other, and the F-15 shot Talon 2 without being observed by Talon 1. The remainder of the engagement only involved Talon 1 because Talon 2 had been removed from the engagement by the F-15. Talon 2 maintained visual contact with Talon 1 and joined him after the F-15 had been "killed" by Talon 1. After this engagement, Maj Kallman told his wingman to stay in visual contact on the intercept, as briefed, and not to go so wide that he could not keep sight of Talon 1. (Tab V-5 p.42, DD-3)

9. The fourth and final intercept initially resulted in a missed intercept, because the F-16s pilots thought the F-15 was below a thin cloud layer, and the F-15 pilot only had one F-16 in sight. (Tab V-5 p.41, V-2 p.16) The F-16s turned around to a heading of 080 degrees after they passed the F-15 and trailed him to the northwest with a separation of about 6 1/2 miles. (Tab EE-4) At this time it was 1609L, 19 minutes before official sunset. Talon 1 called a radar contact and turned to the right about 30 degrees without a

radio call. Talon 2 drifted north to a spacing of 6 miles and lost visual contact. He did not call loss of visual until queried by his leader, who then gave him a parallel heading. The F-15 began a turn to the right to meet the F-16 leader, Talon 1, in a head-on pass. Talon 1 directed Talon 2 to come to a heading of south to come "back into the fight," and Talon 1 began turning with the F-15. Talon 1 did not call that he was engaging and did not give an altitude call. At this time the F-16s were about 8 miles apart. Talon 2 called that he had a radar contact at Flight Level (FL) 160 that he thought was climbing. Talon 1 asked him if he had an entry into the fight or a tally ho. Talon 2 first responded that the F-15 had gone into the clouds and then confirmed he had a tally ho. (Tab EE-5) Both Major Kallman and Col Hokkanen confirmed after the mission that clouds were not a factor and that the momentary misunderstanding was caused by loss of sight against the dark clouds to the south. (Tab V-5 p.44, V-2 p.12) Talon 2 never called visual contact with his leader. Talon 1 was in a turning engagement with the F-15 for approximately one minute, asking a total of three times if the wingman could enter the fight. Talon 1 never transmitted that he was "engaged". Maj Kallman stated that as tactical leader and giving his wingman vectors back to "the fight", Talon 1 was the engaged fighter, "according to our contract." (Tab V-5 p.43) Talon 2 continued to point generally at the F-15 as Talon 1 closed head-on to the engagement. To Talon 1's first two queries if Talon 2 could get an entry into the fight, Talon 2 responded, "Negative, he just went into the clouds...Tally Ho now," and, "He's coming high aspect on me." The third query by Talon 1 was immediately prior to the mid-air collision and was never completed. Talon 1 had made a high angle gun attack on the F-15 and, as Talon 1 overshot the F-15's flight path, was again asking his wingman if he was going to come in. At this time, Talon 2 was pressing a pure pursuit attack without receiving clearance and had not called that he had his leader in sight. (Tab EE-5) This resulted in collision geometry between the two F-16s behind the F-15, with the F-16s belly up to each other. Talon 1 was in a right turn and Talon 2 was in a left turn. (Tab V-14 p.1)

E. IMPACT.

1. At 1612 CEST, at an approximate location of 49 degrees, 27 minutes north latitude, and 8 degrees, 15 minutes east longitude, Talon 2, an F-16C aircraft, SN 84-1293, piloted by First Lieutenant Steven C. Sundstrom collided in mid-air with Talon 1, an F-16C aircraft, SN 84-1263, piloted by Major Roderick R. Kallman at an altitude of approximately 14950 above ground level (AGL) which was 15350 feet mean sea level (MSL) barometric altitude. The collision took place near the town of Maxdorf, seven (7) miles west of Ludwigshafen, FRG. (Tab R-2)

2. Lt. Sundstrom's aircraft was in a left bank at impact. (Tab V-1 p.23) His head up display (HUD) film showed his speed to be 380 knots indicated air speed (KIAS) nine (9) seconds prior to impact. His seat data recorder showed 369 KIAS with an angle of attack (AOA) of 1.9 degrees at

impact. (Tab O) Maj. Kallman's HUD film showed his aircraft in approximately 60 degrees of right bank in a right climbing turn, at 168 knots indicated airspeed, pulling 2.5 G's at impact. His seat data recorder showed 155 KIAS, 12.8 degrees AOA at impact. (Tab O) Eyewitnesses on the ground observed the two F-16's converging behind the F-15 with opposing turns and converging flight paths. The witnesses described a large fireball immediately after the collision with wreckage coming down around and in the town of Maxdorf. (Tab V-14 p.1)

3. My examination of the wreckage indicated that Talon 2's left wing was totally destroyed and the left horizontal stabilizer appears to be sheared off. Talon 1's engine appears to have been cut in half behind the cockpit. There was no apparent impact damage to either ejection seat. (Tab J-4&5)

4. Maj Kallman described that at impact he felt as though a giant axe had just cut his aircraft in half. His aircraft seemed to hesitate and was enveloped in flame and smoke. He estimated that he ejected between 3 and 5 seconds after impact, just as the aircraft felt that it was beginning to slowly pitch down. (Tab V-5 p.47) HUD recording shows the camera view obscured totally between 3 and 6 seconds after impact and the aircraft pitching down thereafter. After ejection, Maj Kallman observed his aircraft falling beneath him on fire and saw Lt Sundstrom's aircraft further away in a rolling cylinder of flame. (Tab V-5 p.51)

F. EJECTION SEATS.

1. Approximately 3 to 5 seconds after impact, Maj Kallman ejected from his F-16 aircraft, SN 84-1263, under low speed conditions with the aircraft starting to pitch down slowly. Pilot extraction and the ensuing ejection sequence was normal. (Tab J) He obtained a full parachute and his seat kit deployed normally. He observed a smaller white parachute falling away below him after his parachute opened, but he thought it might be a drogue chute and he does not believe he ever saw Lt Sundstrom. Due to the altitude of the ejection and the strong wind blowing at altitude, Maj Kallman drifted about 10 miles from the collision during descent. He used his 4 line jettison to steer the parachute and was concerned about landing in the Rhine River during descent. He steered away from a line of trees and landed in a plowed field near the town of Frankenthal without injury. (Tab V-5 p.50)

2. At an undetermined time after impact, Lt Sundstrom ejected from his F-16 aircraft, SN 84-1293. The ejection was initiated within the airspeed and altitude performance envelope of the seat. (Tab CC-2) Lt Sundstrom's ejection equipment and components activated and operated as designed. However, due to adverse aircraft attitude (rolling, yawing and pitching) at the time of ejection, the equipment was prevented from deploying as designed. Aircraft attitude allowed the seat to rapidly and severely yaw to the left and pitch forward during drogue parachute deployment. This resulted in

entrapment/involvement of the drogue parachute suspension lines with the flight data recorder disconnect fitting/bracket and prevented proper drogue deployment. Seat stabilization was then prevented prior to personnel parachute mortar firing and seat man separation. This condition did not hinder the personnel parachute mortar-firing or seat man separation. The personnel parachute deployed and seat man separation probably occurred while the seat was in an inverted (pitched forward) attitude. This condition caused the parachute to be deployed at some point beneath the crewmember, not above as designed. After seat man separation, the crewmember had to become aligned under the parachute canopy for proper descent. During the alignment process, the crewmember passed through the riser, entrapping/encircling it around his right leg, without involving the parachute suspension lines or canopy. Since the parachute canopy cannot properly inflate until the crewmember is beneath it, the now rapidly descending crewmember/parachute mass was able to catch up to the previously cleared pilot parachute container. In passing, the pilot parachute bridle line was able to entrap/encircle all twenty-eight (28) parachute suspension lines, preventing inflation of the parachute canopy. Pilot parachute bridle subsequently entangled the sea anchor retention line, rucksack dropline lanyard and entrapped/encircled parachute suspension lines 4, 5, 6, 7, 10, and 11. This now allowed the uninflated parachute to twist and entrap the life raft dropline lanyard within the suspension lines, until the crewmember impacted the ground.

G. PERSONAL AND SURVIVAL EQUIPMENT.

1. Personal and survival equipment inspections for both pilots were current. (Tab U-2)
2. Emergency locator beacons functioned automatically as selected by the pilots. Life rafts and survival kits for both pilots deployed automatically as selected. (Tab J)
3. Maj Kallman used his survival radio, four pen gun flares, and the night end of one locator flare effectively during his recovery. (Tab V-5 p.60)

H. RESCUE.

1. Immediately after he observed the mid-air collision, Lobo 1 declared "mayday" over the radio to Frankfurt radar. The crash was also reported by two U.S. Army UH-1 helicopters.
2. As Maj Kallman approached the ground, he called to a local national walking down the road but was not understood. After landing, another local national who spoke English drove up and came over to offer assistance. Maj Kallman passed his position relative to the crash site via his survival radio to a flight of Ramstein F-16's in the area, but his relative direction was off by 90 degrees. The F-16s helped him contact an E-3A, Airborne Warning

and Control System (AWACS), aircraft to vector some helicopters. The local national assisted him in vectoring the U.S. Army helicopters in the area using Maj Kallman's pen gun flares while Maj Kallman talked on the radio. Maj Kallman used the night end of his signal flare as a guide and three helicopters landed. (Tab V-5 p.59)

3. After pickup Maj Kallman requested to be taken to Ramstein hospital. The helicopter crew told him they had been directed to take him to Heidelberg Army hospital. After his arrival there, he was taken to the emergency room but received no medical attention for two and one half hours. The staff physician told him that he had to wait for a flight surgeon to conduct an examination. After 15 minutes, he requested a phone and called the 50th TFW Command Post and his wife to tell them what had happened and where he was located. Maj Kallman advised the hospital staff that a blood sample and a urine sample would be required. The hospital staff would not take the blood sample until they had spoken to an Air Force flight surgeon. After the samples were taken they were not properly controlled, and additional samples were taken at Hahn Air Base after Maj Kallman's return by car at 2300L. (Tab V-5 p.61, GG-2)

I. CRASH RESPONSE.

1. The mid-air collision was reported immediately to Frankfurt radar by Lobo 1. The accident was also observed by two U.S. Army UH-1 helicopters in the area who also reported the crash to air traffic control. Eyewitnesses on the ground also rapidly reported the accident to the German emergency response authorities. (Tab V-16 p.1)

2. Lt Sundstrom's body was discovered by a German national in a plowed field shortly after he hit the ground. He was pronounced dead at the scene by a German national physician, Dr. Stumph, at 1630L. This was confirmed formally by Maj Klepatz, flight surgeon from Sembach Air Base, after the local authorities turned the body over to U.S. forces that evening. (Tab BB)

3. Upon initial notification of an aircraft accident somewhere in the area, both the Sembach Air Base and the Ramstein Air Base Disaster Control Groups were activated. After determination of approximate location of the crash, the Sembach Air Base Disaster Control Group (DCG) responded, and the Ramstein Air Base DCG provided support as required. (Tab BB)

4. The lead element of the Disaster Control Group, commanded by Col Wanda Wood, Commander, 66th Combat Support Group, and accompanied by Col William Eckert, Commander, 377th Combat Support Wing, departed Sembach Air Base by helicopter provided by the 316th Air Division at 1750L. Upon arrival at the scene, Col Wood met with German authorities who had already secured the crash sites and commenced fire fighting operations. At the initial meeting between German authorities and Col Wood, it was agreed that the German authorities would maintain control and that U.S. forces commanded by Col Wood

would assist as necessary. During the initial operations, Ramstein's hydrazine spill team secured two aircraft hydrazine cylinders, Sembach's Explosive Ordnance Disposal team rendered items on the ejection seats safe, and Sembach's Security Police were posted at crash locations thought to have classified components. (Tab BB)

5. Clean-up operations were a joint U.S. Air Force, U.S. Army, and German effort. By 1400L, 22 December 1989, all wreckage and debris had been removed and relocated to Hahn Air Base. (Tab BB)

J. MAINTENANCE DOCUMENTATION

1. No maintenance discrepancies were noted in the AFTO Forms 781 of either aircraft that could have affected the accident.

2. There were no overdue Time Compliance Technical Orders and none that were waiting that could have affected this mishap for either aircraft.

3. Both aircraft had all scheduled inspections satisfactorily completed.

4. No discrepancies were noted for either aircraft on a review of oil analysis records.

5. All time change requirements for both aircraft were completed on time with no discrepancies.

6. A review of the equipment review reports for both aircraft indicated timely component inspections for both aircraft.

7. There was no unscheduled maintenance performed on either aircraft since the completion of the last scheduled inspection that could have had a relationship to the mishap.

8. All indications from testimony and document reviews are that maintenance procedure, practice, and performance had no bearing on this mishap. (Tabs H, J, and U)

K. MAINTENANCE PERSONNEL AND SUPERVISION.

1. All preflight and basic post-flight inspections from the previous flight have been reviewed and there is no indication of any performance that would have had a bearing on this mishap. All personnel were adequately trained for their assigned tasks.

2. There is no evidence of any type of maintenance practice or procedure that may have been a contributing factor in this accident. (Tabs H,

J, and U)

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

The following items for both aircraft were reviewed and all found to be within normal limits:

1. Engine Inspection data
2. Fuel test report data.
3. Hydraulic fluid test report data
4. Liquid oxygen test report data.
5. Oil test report.

M. AIRFRAME AND AIRCRAFT SYSTEMS

A review of all pertinent component and accessory systems operation was conducted. An analysis of the F-16C seat data recorder for the mishap aircraft (SN 84-1293) indicated that all aircraft flight control systems were functioning normally just prior to the collision. (Tab O) An Egress and Life Support Report pertaining to the components and performance of the ACES II ejection systems of both aircraft was prepared by an Air Force investigator assigned to the Air Logistics Center at Kelly AFB, Texas. (Tab J)

N. OPERATIONS PERSONNEL AND SUPERVISION.

1. Lt Sundstrom was cleared to fly DACT by his flight commander. Maj Kallman was authorized to fly with him by the operations officer who also authorized the mission on USAFE Form 406. Maj Kallman's flight commander had identified to the squadron schedulers, and the squadron Air Force Operations and Resources Management System (AFORMS) records also reflected, that Maj Kallman would not be ACBT current on the day of the mission. This apparent lack of currency was inadvertently missed when the schedule was built. (Tab V-7 p.1, T-20) After the accident, however, Maj Kallman and Capt Sage indicated that they had flown a single BFM engagement on a mission during the local exercise on 5 December 1989, but had failed to log the accomplishment. (Tab V-5 p.7) The squadron "Top Four" supervisor the day of the accident was aware of the BFM mission before the accident flight, but did not realize that the AFORMS showed Maj Kallman as non-current. (Tab V-6 p.11) The squadron policy was that one BFM engagement was sufficient to update ACBT currency. (Tab V-4 p.17) Lt Sundstrom had flown a DACT mission on Thursday, 14 December 1989, when he was out of ACBT currency, having not flown ACBT for the preceding 48 days. His performance on that mission was satisfactory, and he subsequently flew a satisfactory BFM mission on 15 December 1989 with an air-to-air instructor pilot.

2. The mission was briefed by an air-to-air qualified flight leader, Maj Kallman, and the wingman, Lt Sundstrom, met the minimum

requirements to fly an ACBT mission. The mission was briefed with a USAFER 55-116 briefing guide. (Tab AA-7) The flight leader briefed all pertinent items, including the necessary clearance for the wingman to engage offensively. (Tab V-5 p.13-31)

3. The desk (or "step") brief was conducted by Lt Thomas, the duty supervisor, using the squadron desk briefing guide. (Tab AA-11) The briefing guide contained adequate data to prepare the aircrews to step to their aircraft for the mission.

4. All pilots in the squadron did not have the same interpretation of the leader/wingman responsibilities in MCM 3-3 and MCM 3-1. The squadron commander stated that a wingman had to be cleared by his leader to fire a missile. (Tab V-3 p.8) The weapons officer, some of the flight leaders, and some wingmen interviewed stated that, depending on the flight leader, a wingman may be allowed to employ missiles against the engaged leader's adversary without clearance, if the wingman had the leader in sight and not in his head up display. (Tab V-9 p.8, V-11 p.9, V-6 p.9, V-8 p.9) The operations officer stated that if the wingman had situation awareness of where his leader was, he could shoot without being in visual contact with him. (Tab V-3 p.11/12)

5. There were also differences of opinion on whether the flight member engaging had to specifically call "engaged" when he was assuming the role of the engaged fighter, but there was agreement that, if in visual mutual support, the wingman was the support fighter unless he was specifically directed to be the engaged fighter. (Tab V-3 p.7, V-8 p.8, V-9 p.8, V-6 p.9) Maj Kallman correctly stated that MCM 3-3 specifies that the exact terminology of "engaged" is not required if the other flight member understands the "contract". (Tab V-5 p.36, AA-9)

6. Tactics training given by the squadron supported the necessity to be separated during "advanced tactics". (Tab V-9 p.7) There was no guidance from the squadron commander or the operations officer that precluded the use of non-visually supporting tactics when engaging all aspect threats. (Tab V-3 p.10, V-4 p.19) USAFEM 3-1 specifies the following:

"Visual mutual support is the desired form of mutual support in virtually all tactical situations (offensive or defensive). Non-visual mutual support can occur in the execution of preplanned bracket attacks or when defensive reactions force loss of visual mutual support. For example, non-visual mutual support may be necessary to permit maximum capability for targeting and engaging from different aspects and altitudes." (extracts at Tab AA-10 p.2)

7. Due to limitations on air-to-air training airspace, the requirement for a different configuration to fly air-to-air sorties from the configuration for strike/attack, and the requirement for ACM and ACT missions to be led only by a dissimilar flight leader or instructor, the 496TFS goal

for air-to-air training was 12 sorties per half. (Tab AA-13) This figure was consistent with the USAFE requirements for Graduated Combat Capability (GCC) Level B for an experienced pilot (the training required to increase proficiency in the primary task, to lower attrition, and to provide training in specialized tactics/weapons and additional unit tasking). Lt Sundstrom had flown 17 sorties that half, exceeding the GCC level B for inexperienced pilots (16 sorties), and Maj Kallman had flown 15 sorties, exceeding his GCC level B requirement.

O. CREW QUALIFICATIONS

1. Major Kallman was an experienced, qualified air-to-air flight leader who had completed his basic instructor pilot checkout. He was not yet an air-to-air instructor because he was new to the F-16 and had not developed the requisite proficiency with the radar. (Tab V-9 p.3) He had 222 hours in the F-16 of which 13.8 were instructor hours. He also had 2024 hours in several other tactical fighters. He was a graduate of and a former instructor in the F-5 Fighter Weapons School. He was the top graduate in his class in the F-16 conversion training course. (Tab G-6) In terms of his recent air-to-air proficiency, he met the regulatory requirement of an ACBT sortie within the last 45 days. He had not flown ACM or ACT in the 60 days prior to the accident and had flown four ACBT missions (of which two were ACT) in the 90 days preceding the accident. His 30/60/90 day flying totals were respectively 6.8 hours(5 sorties) /34.1 hours (17 sorties)/49.7 hours (31 sorties). (Tab G-3)

2. Lt Sundstrom was an inexperienced pilot who had a total of 259.5 hours of fighter time of which 219.9 were primary pilot hours in the F-16. (Tab G-4) He was a mission ready pilot and had completed his full mission qualification program (CAVE CANEM) on 15 December 1989. He was considered an above average, aggressive wingman. (Tab V-9 p.3, V-2 p.2, V-8 p.2) He was DACT qualified but had not completed his 4 versus 4 DACT checkout (not required for the accident mission). In terms of his recent air-to-air proficiency, he met the regulatory requirements for ACBT and had flown a BFM and a 2 versus 2 DACT sortie the preceding week. Prior to that week he had not flown ACBT for 54 days. In the sixty days preceding the accident he had flown 4 ACBT missions of which 3 were ACM/ACT, and in the preceding 90 days he had flown 8 ACBT missions of which 7 were ACM/ACT. His 30/60/90 flying totals were respectively 14.6 hours (10 sorties)/32.5 hours (24 sorties)/43.1 hours (33 sorties).(Tab G-5)

P. MEDICAL.

1. Both Major Kallman and Lt Sundstrom were medically qualified to fly the mission. Major Kallman was required to wear glasses and was wearing Air Force issue glasses which corrected his vision to 20/20 on the mishap flight.

2. All post-mishap toxicology and medical reports indicate there was no drug or alcohol substance affecting either of the mishap pilots. (Tab GG)

3. Lt Sundstrom suffered fatal injuries as a result of his impact with the ground at high speed due to his entangled parachute. Cause of death was determined to be multiple internal injuries. (Tab X-1)

4. Major Kallman was uninjured.

Q. NAVAIDS AND FACILITIES.

All NAVAIDS and facilities were functioning on the day of the mishap. (Tab W-2) A GCI site was not available for the mission.

R. WEATHER.

Weather in the mishap area approximated the forecast, with cirrus cloud extending as low as 21000 MSL. (Tab W-1) Combination of the low sun and clouds to the south contributed to make it difficult to acquire aircraft visually looking from north to south, even though inflight visibility was greater than the 8 kilometers (5 NM) required for ACBT. (Tab V-5 p.33/34, V-2 p.12/13)

S. DIRECTIVES AND PUBLICATIONS.

1. Conduct of air-to-air missions in F-16s is governed by USAFER 55-79, USAFER 55-116, and USAFER 51-50. Additional guidance is presented in USAFEM 3-1 (classified) and USAFEM 3-3. (Tab AA)

2. The squadron commander had not established a minimum requirement for videotape review of wingmen. (Tab V-3 p.10) His requirement for supervisor review was to periodically review flight leaders' VTRs during flight debriefing. (Tab AA-2) USAFER 51-50, Vol VIII, Para 1-8a, requires periodic review by supervisors at each level and requires unit commanders to determine the reviews necessary to meet the minimum requirements. (Tab AA-3 p.3) Lt Sundstrom's flight commander last reviewed Lt Sundstrom's air-to-air VTR after flying with him on 17 Oct 89.

3. USAFER 51-50, Vol VIII, Chapter 7, Attachment 4, Part 3, para 11d, does not include a requirement to review USAFEM 3-3 in TAFT training. (Tab AA-3 p.4)

4. Maj Kallman had not flown with Lt Sundstrom before this mission. When he asked the squadron weapons officer his opinion of Lt Sundstrom the previous weekend, he was told that even though Lt Sundstrom appeared somewhat casual on the ground, he was a "weapons school quality" wingman. Maj Kallman had taken a "quick look" at Lt Sundstrom's gradebook to see what his qualifications were, but he was not aware of written comments about problems with communication during engagements. He was not aware that Lt Sundstrom had only flown two ACBT missions in the preceding 54 days. (Tab V-5 p.57) According to USAFER 55-79, Chap 7, Para 7-2c, "the flight leader must ensure the mission does not contain situations that extend past the flight members' capabilities", but there is no literal requirement to know what their recent flight experience is. (Tab AA-5 p.1)

5. USAFER 55-79, para 7-2d, specifies that crews should fly formed elements to the maximum extent possible. (Tab AA-5 p.1) Flight records reflect that Lt Sundstrom flew with five different flight leads on his last eight sorties prior to the accident. This was due to competing requirements of upgrade training and different missions tasked to the 496th TFS.

6. Lt Sundstrom twice pressed an attack on an adversary with whom his leader was engaged without calling that he had an entry, requesting permission, or keeping his leader (who was the engaged fighter) in sight. (Tab EE-2&4, V-5) USAFEM 3-3, para 2-2c, specifies that the top three priorities are to not go out of control, to not hit the ground, and to not "hit anything in the air (i.e. your leader)". Para 2-6 specifies that a wingman is to engage when directed by the leader and to support when the leader is engaged. Para 4-8c(1)b emphasizes the requirement of the supporting fighter to keep the engaged fighter in sight. Para 4-8c(1) specifically states that to avoid "smashing into each other", only one fighter can be totally involved with the adversary. Para 4-8c(1)a further states that wingmen will only be allowed to assume the engaged role on the attack when cleared by the flight lead. (Tab AA-9) USAFEM 3-1, para 16-1d(1)(b)2, specifies that the supporting fighter will "maneuver as briefed/directed to achieve a position to kill the bandit in case roles change" and inform the engaged fighter if he has an entry. (Tab AA-10 p.3)

7. USAFE Chapter 7 to JCR 55-79, Para 7-2d, says "flight leads will ensure all flight members clearly establish and maintain strict adherence to "supporting" and "engaged" roles". (Tab AA-5.1) Talon 1 did not require or use full call signs during the engagements and did not use or enforce wingman use of radio terminology to clearly establish the roles. (Tab DD-2,3)

T. CLAIMS

1. As of 31 Jan 1990, The U.S. Army Claims Service at Mannheim, FRG, has received a total of 25 claims. As of that date, all but one of the claims filed are for damaged property or lost revenue. There have been no claims filed to date for personal injury. There has been one claim filed for psychological shock. For the fourteen claims which named a specific monetary amount of damage, the total amount claimed is DM 598,690.78. The remaining eleven claims do not specify a specific amount of monetary damage. (Tab FF)



MICHAEL C. FRANCISCO, Colonel, USAF
Accident Investigating Officer

I have observed and reviewed all aspects of this investigation and find that it has been conducted in a legally sufficient manner, in accordance with AFR 110-14, AFR 120-4, and other applicable directives. Any information from the documents included in this report which would not be appropriate for release under the provisions of the Privacy Act has been deleted.



D. ROBIN HITT, Major, USAF
Legal Advisor

ABBREVIATIONS

A/A - AIR-TO-AIR
AB - AIR BASE
AB - AFTERBURNER
ACBT - AIR COMBAT TRAINING
ACM - AIR COMBAT MANEUVER
ACT - AIR COMBAT TACTICS
AD - AIR DIVISION
ADO - ASSISTANT DEPUTY COMMANDER FOR OPERATIONS
AFR - AIR FORCE REGULATION
AGL - ABOVE GROUND LEVEL
AHC - AIRCRAFT HANDLING CHARACTERISTICS
ALC - AIR LOGISTICS CENTER
AMD - ACCELERATION MONITORING DEVICE (ALSO AMA)
AOA - ANGLE OF ATTACK
AS - AIRSPEED
AVTR - AIRBORNE VIDEO TAPE RECORDER
BFL - BFM FLIGHT LEAD
BFM - BASIC FLIGHT MANEUVER
BUC - BACK UP CONTROL
BVR - BEYOND VISUAL RANGE
CAP - COMBAT AIR PATROL
CARB - CANOPY ACTUATOR RELEASE BOLT
CEST - CENTRAL EUROPEAN STANDARD TIME
COMM - COMMUNICATION
CP - COMMAND POST
CSD - CONSTANT SPEED DRIVE
CT - CONTINUATION TRAINING
DACBT - DISSIMILAR AIR COMBAT TRAINING
DACM - DISSIMILAR AIR COMBAT MANEUVERS
DACT - DISSIMILAR AIR COMBAT TACTICS
DBFM - DISSIMILAR BASIC FIGHTER MANEUVERS
DEG - DEGREES
DFL - DACBT FLIGHT LEAD
DIP - DACBT INSTRUCTOR PILOT
DOC - DESIGNATED OPERATING CAPABILITY
DTA - DETONATION TRANSFER ASSEMBLY
ECA - ELECTRONIC COMPONENT ASSEMBLY
ECRL - EMERGENCY CANOPY RELEASE LINE
EEC - ELECTRONIC ENGINE CONTROL
EPU - EMERGENCY POWER UNIT
FAM - FAMILIARIZATION
FAR - FEDERAL AVIATION REGULATION
FCC - FIRE CONTROL COMPUTER
FCIF - FLIGHT CREW INFORMATION FILE
FLCS - FLIGHT CONTROL SYSTEM
FLQSS - FLIGHT LEAD QUALIFIED SQUADRON SUPERVISOR
FLUG - FLIGHT LEAD UPGRADE
FOD - FOREIGN OBJECT DAMAGE

FOX I - RADAR MISSILE SHOT
FOX II - INFRARED MISSILE SHOT
FP - FIRST PILOT
G - FORCE OF GRAVITY
GCA - GROUND CONTROL APPROACH
GCC - GRADUATED COMBAT CAPABILITY
GCI - GROUND CONTROL INTERCEPT
GLOC - G-LOSS OF CONSCIOUSNESS
HG - MERCURY HUD - HEADS-UP DISPLAY
HZ - HERTZ
IDG - INTEGRATED DRIVER GENERATOR
IFF/SIF - IDENTIFY FRIEND OR FOE/SELF-IDENTIFICATION FEATURE
IP - INSTRUCTOR PILOT
IRCM - INFRARED COUNTER MEASURES
ISA - INTEGRATED SERVO ACTUATOR
JCR - JOINT COMMAND REGULATION
JFS - JET FUEL STARTER
KCAS - KNOTS CALIBRATED AIRSPEED
KEAS - KNOTS EQUIVALENT AIRSPEED
KIAS - KNOTS INDICATED AIRSPEED
KCAS - KNOTS CALIBRATED AIRSPEED
KTAS - KNOTS TRUE AIRSPEED
LAI - LOW ALTITUDE INTERCEPTS
LASTD - LOW ALTITUDE STEP DOWN TRAINING
LEF - LEADING EDGE FLAP
LSN - LOCAL SALTY NATION
MCM - MULTI COMMAND MANUAL
MFD - MULTI FUNCTION DISPLAY
MP1 - MISHAP PILOT 1
MP2 - MISHAP PILOT 2
MQT - MISSION QUALIFICATION TRAINING
MR - MISSION READY
MRT - MINIMUM RADIO TRANSMISSION
MSL - MEAN SEA LEVEL
NAF - NUMBERED AIR FORCE
NAV - NAVIGATION/NAVIGATOR
NCO - NONCOMMISSIONED OFFICER
NM - NAUTICAL MILE O - OFFICER
PAA - PRIMARY ASSIGNED AIRCRAFT
PIF - PILOT INFORMATION FILE
PMG - PERMANENT MAGNETIC GENERATOR
RCO - RANGE CONTROL OFFICER
RHAW - RADAR HOMING AND WARNING
RMD - RADAR MISSILE DEFENSE
ROE - RULES OF ENGAGEMENT
ROTC - RESERVE OFFICER TRAINING CORPS
RPM - REVOLUTIONS PER MINUTE
RTU - REPLACEMENT TRAINING UNIT
RWR - RADAR WARNING RECEIVER
SA - SITUATIONAL AWARENESS
SDR - SEAT DATA RECORDER
SN - SERIAL NUMBER

STAPAC - STABILIZATION PACKAGE
TAFT - TACTICAL AIRCREW FAMILIARIZATION TRAINING
TCTO - TIME COMPLIANCE TECHNICAL ORDER
TD - TARGET DESIGNATOR
TDY - TEMPORARY DUTY
TFS - TACTICAL FIGHTER SQUADRON
TFW - TACTICAL FIGHTER WING
TOD - TIME OF DAY/TIME OF DETONATION
TOT - TIME ON TARGET
TR - TRAINING RULES
TRA - TEMPORARY RESERVED AIRSPACE
UFC - UNIFIED FUEL CONTROL
UHF - ULTRA HIGH FREQUENCY (RADIO)
USAFE - UNITED STATES AIR FORCE IN EUROPE
VAC - VOLTS, ALTERNATING CURRENT
VHF - VERY HIGH FREQUENCY (RADIO)
VFR - VISUAL FLIGHT RULES
VMC - VISUAL METEOROLOGICAL CONDITIONS
VSD - VERTICAL SITUATION DISPLAY
VTR - VIDEO TAPE RECORDER
WTD - WEAPONS TRAINING DEPLOYMENT