

REPORT OF AIRCRAFT ACCIDENT INVESTIGATION



ACLEAR REGULATORY COMMISSION

Report No. PFS Official Ex. No. 170

In the matter of

Staff IDENTIFIED ✓

Applicant RECEIVED ✓

Intervenor REJECTED

DATE 7/1/02 WITHDRAWN

Witness

F - 16C
SN 87 - 0274
8th FIGHTER WING (PACAF)
KUNSAN AB, REPUBLIC OF KOREA

F - 15C
SN 78 - 0530
18th WING (PACAF)
KADENA AB, JAPAN

SUBMITTED BY:
LT COL GILBERT L. BRAUN
AFR 110 - 14 INVESTIGATING OFFICER

DOCKETED
USNRC

2003 JAN 17 PM 1:46

OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

06 MAY 94

UNCLASSIFIED PFS Exh. 170



DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES



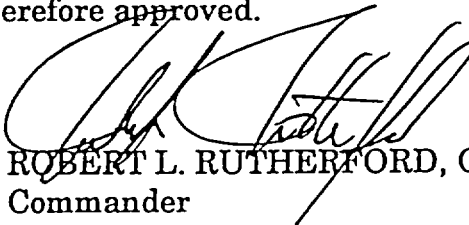
16 AUG 1994

MEMORANDUM FOR 5 AF/CC AND 7 AF/CC

FROM: HQ PACAF/CC
25 E Street Suite C214
Hickam AFB, HI 96853-5403

SUBJECT: AFR 110-14 Report of Investigation, F-16C, SN 87-0274, and F-15C,
SN 78-0530

The subject report of investigation substantially complies with applicable statutory and regulatory requirements and is therefore approved.



ROBERT L. RUTHERFORD, General, USAF
Commander

**REPORT OF INVESTIGATION
MID-AIR COLLISION BETWEEN
F-16C, SN 87-0274
F-15D, SN 78-0530
6 May 1994**

I. AUTHORITY

Lt Col Gilbert L. Braun, Deputy Operations Group Commander, 432d Fighter Wing, Misawa Air Base (AB), Japan, conducted an investigation from 1 June 1994 through 22 June 1994 into a mid-air collision that occurred approximately 38 nautical miles (NM) northwest of Kunsan AB, Republic of Korea (ROK), under the authority of the Vice Commander, Pacific Air Forces [letter dated 11 May 1994 at Tab Y] and Air Force Regulation (AFR) 110-14.

II. MATTER INVESTIGATED:

This was an investigation of a Class A aircraft accident involving a mid-air collision between an F-15C, serial number 78-0530, assigned to Kadena AB, Japan, and an F-16C, serial number 87-0274, assigned to Kunsan AB, ROK. The mishap occurred approximately 38 NM northwest of Kunsan AB, at 0508Z (1408 local) on Friday, 6 May 1994. Both aircraft impacted the water near coordinates N36-15, E125-59. The pilot of the F-15C, callsign Razor 01, was Captain John R. Kindred. The pilot of the F-16C, callsign Cobra 11, was Captain Timothy W. Strawther.

SUMMARY OF FACTS

A. History of Flight:

A.1. The F-15C mishap aircraft, callsign Razor 01, was a scheduled 67th Fighter Squadron (FS) training sortie, with a planned duration of 1.3 hours. Planned activities included blue-air support of a Large Force Exercise (LFE) in a Defensive Counter-Air (DCA) role. The pilot was scheduled to land at Osan AB, ROK at 1430L. The F-16 mishap aircraft, callsign Cobra 11, was scheduled in support of an 80 FS training sortie with a planned duration of 1.0 hours. Planned activities included red-air Suppression of Enemy Air Defense (SEAD) activities through simulated High Speed Anti-radiation Missile (HARM) employment and Offensive Counter-Air (OCA) support for the same LFE package. The pilot was scheduled to land at Kunsan AB, ROK at 1500L. The mission progressed as planned, through a series of tactical air-to-air engagements and simulated HARM weapons employment. However, during the final air-to-air engagement, Razor 01 and Cobra 11 collided while maneuvering at approximately 19,000 ft over the Yellow Sea. During the collision sequence, Razor 01 was fatally injured. Cobra 11 successfully ejected from his disabled aircraft, sustained only minor injuries, and was rescued approximately 35 minutes later. Both aircraft were destroyed upon impact with the water.

A.2. News coverage and media interest was low following this accident. 7th Air Force public affairs provided the initial news release within one hour of the collision. They then transferred responsibility to the 8th Fighter Wing public affairs office, who received minimal requests for information. Within three days of the accident all media inquiries ceased. There has been no unusual host nation interest in this accident.

B. Mission:

B.1. The mishap aircraft were part of a LFE which included eight F-15s providing blue air (Cock 1-4 and Razor 1-4) and 12 F-16s as red air (Fiend 1-4, Brag 1-4, and Cobra 11-14). The E-3A Airborne Warning and Control System (AWACS), callsign Brigham, provided airborne warning and control. The F-15 pilots were stationed at Kadena AB, Japan, but were on temporary duty (TDY) to Osan AB, ROK. Fiend and Brag flight members were stationed at Osan AB, and the Cobra pilots were flying out of Kunsan AB.

B.2. Cock 01 was the blue air mission commander and the overall LFE mission commander. Cock 01 conducted all the required coordination with the red-air mission commander (Fiend 1) and the Airborne Warning and Control System (AWACS) personnel. The F-15 mission was to defend a section of friendly territory against enemy attack. Due to the airspace restrictions, the F-15s planned to first defend in the east, while the attackers ingressed from the west. Following the ingress, while four F-16s (Fiend 1-4) were delivering their ordnance at Kooni range, Cock and Razor flights would reset to the western edge of the airspace and set up for a second look at red-air, this time coming from east to west [Tab V-2.2, 3.2, 8.2, 8.3].

B.2.1. Cock 1's game plan gave primary responsibility for the northern sector of the airspace to Cock flight, and the southern sector to Razor flight. Their initial Combat Air Patrol (CAP) point and bullseye were set for a western look, while their second set of CAP points and bullseye were set for an eastern look [Tab V-2.2, 8.2, 8.3, 8.4].

B.2.2. The mission rules of engagement (ROE) were AFR 55-79 standard with one exception; air-to-air maneuvering was limited, as defined in AFR 55-79 [Tab V-1.2, 8.3, 10.4]. The F-15 mission commander (Cock 1) established limited maneuvering due to the demands of this mission -- a mission commander upgrade and a LFE sortie -- and a perception that the Kunsan F-16s were restricted in their maneuvering whenever the engagement exceeded two versus two [Tab V-8.3]. Simulated kill removal was to be permanent for each phase of the mission. At the reset, aircraft that had previously kill-removed would regenerate for the second phase of the mission. Kill removal in the second phase was permanent [Tab V-2.5, 8.3].

B.2.3. The blue air communications plan with AWACS was to have Cock 01 and Razor 01 on separate UHF control frequencies, while they all monitored a common UHF Have Quick frequency [Tab V-12.5, V-14.3].

B.3. Fiend 01 was the red air mission commander and personally conducted all the coordination with the blue-air mission commander, the Cobra flight lead, and the AWACS personnel. The red air mission was to get a four-ship of attack aircraft (Fiend 1-4) to a target undetected and able to deliver their ordnance. The target was at Kooni range, in the northeast corner of their airspace. Support for the package included four F-16s (Brag) in the OCA role, and four F-16s (Cobra) in the SEAD and OCA roles [Tab V-10.1, 10.2].

B.3.1. As red air mission commander, Fiend 01 originally intended the Cobra flight to be OCA only. However, after Cobra 11 requested permission to integrate HARM tactics into the mission, Cobra flight was assigned both the SEAD and OCA role. According to Fiend 01's testimony, the OCA mission had priority [Tab V-10.1, 10.2]. According to Cobra 11's testimony, SEAD had priority [Tab V-4.2, 4.6].

B.3.2. The overall red air game plan was to establish three separate push points in the west, to give blue air three distinct entities to deal with. Brag flight was in the north, Fiend flight in the center, and Cobra flight in the south. Mission tactics were designed so that Brag and Cobra flight would occupy the blue air assets, while the Fiend flight would make it through to the target unscathed. Following the first push to the east, and the resultant engagements, the F-16s were to flow through and reset on the east side and set up for a second push to the west, using similar tactics [Tab V-10.2]. Fiend 01 testified the signal for this reset, that he communicated to all F-16 participants, was when he checked his flight off the primary mission frequency and went over to the Kooni range frequency. The push back to the west was to occur when he checked back on primary mission frequency [Tab V-10.2]. Brag 01's testimony indicates he understood the reset concept but was more vague about the point at which the reset was to occur [Tab V-11.5]. Cobra's testimony indicates he understood that a reset was desirable, but not necessary. Further, he did not understand the reset would occur at the radio frequency change [Tab V-4.4, 4.5].

B.3.3. Red air ROE was also AFR 55-79 standard, except for the limited maneuvering restrictions previously discussed. However, this restriction was not communicated to the Cobra flight [Tab V-10.4], and all Cobra flight members assumed unlimited maneuvering [Tab V-4.5]. Kill removal was to be permanent for each phase of the engagement.

B.3.4. The red air communications plan with AWACS was to have all 12 F-16s monitoring a single UHF frequency, using one controller. Each flight would monitor their own individual VHF frequencies [Tab V-10.6].

C. Briefing and Preflight:

C.1. The board flight surgeon conducted a complete review of all the crewmembers' 72-hour histories, evaluated their crew rest, and investigated normalcy of procedure, briefing and preflight. A detailed summary of his investigation is found at Tab AA-3. Following is a summary of his findings. He noted no abnormalities for any of the AWACS controllers, or the Cobra flight

However, Razor 01 had the following minor deficiency. Razor 01 was only able to obtain 11.75 duty free hours, but did have the opportunity for at least 8 hours of uninterrupted rest in accordance with AFR 60-1 [Tab AA-3]

C.2. The coordination for this mishap flight consisted of several briefings. Fiend 01 briefed telephonically with Cobra 11 at least twice, once to establish the overall game plan Thursday afternoon, 5 May 1994, and once again Friday morning, 6 May 1994 to review the game plan and conduct the coordination brief [Tab V-4.2, 10.3, 10.4] Fiend 01 also telephonically briefed the mission with the AWACS crew on Thursday evening, the night prior to the mishap flight [Tab V-13.1, 13.2]. Cock 01 personally met with the AWACS crew Thursday evening at the Osan AB officer's club to brief his portion of the mission and Cock 01 and Fiend 01 discussed the mission over the phone several times [Tab V-8.2, 13.2, 17.2, 17.3]. Cock 01 accomplished the coordination brief with Fiend, Brag, Cock and Razor flights on Friday morning [Tab V-8.2]. Cobra flight was unable to attend the coordination brief because of their geographic separation. Despite extensive preflight coordination and briefing, some misunderstandings remained among the flights.

C.2.1. The overall mission objectives were not clearly understood by all players. As the overall mission commander, Cock 01 desired two distinct looks at the package to meet his flight objectives. He devised a reset plan to make that happen [Tab V-8.2, 8.3]. Fiend, Brag, Cock and Razor flights understood the reset plan; Cobra flight did not [Tab V-2.2, 4.4, 4.5, 8.2, 11.4]

C.2.2. Cock 01 briefed limited maneuvering during the mass coordination brief [Tab V-8.4]. Cobra flight was not in attendance at the mass coordination brief and had earlier received their coordination brief from Fiend 01 telephonically. Fiend 01 acknowledged briefing Cobra 11 unlimited maneuvering during this coordination brief [Tab V-10.4], and Cobra 11 briefed his flight accordingly. Fiend 01 later attempted to telephonically contact Cobra 11 and advise him that maneuvering was now limited. Failing to establish direct contact, Fiend 01 left a message with an unidentified person manning the operations desk. This message was never passed. Fiend 01 made no additional attempts to confirm limited maneuvering with Cobra flight [Tab V-10.4].

C.2.3. Fiend 01 testified there was a restriction of no more than four aircraft in any engagement at a time [Tab V-10.4]. No other flight members involved in this LFE acknowledged knowing of this restriction, including Cock 1, the overall mission commander [Tab V-8.5].

C.3. Preflight for the Cocks, Razors, Fiends, and Brags was uneventful, and except for minor discrepancies, each flight took off as scheduled. Preflight for Cobra flight was also uneventful except for a slight delay by Cobra 13 as he had maintenance fix a minor flight control system malfunction. Cobra 11 element took off approximately 5 minutes prior to Cobra 13 element [Tab K-2, V-4.6]

D. Flight: This flight was a complex series of engagements involving 20 aircraft. It is not the intent of this investigation to reconstruct each of these engagements. However, as necessary to help understand the overall flow of the mission, the report goes into some limited detail on engagements not directly related to this mishap. *NOTE: When the supporting reference indicates VTR assessment, that refers to our assessment of videotape recordings (VTRs) from Cobra flight, Razor flight, Cock flight, Fiend flight, and Brag flight. However, we did not have the VTRs from Cobra 11's or Razor 01's aircraft.*

D.1. Fiend 01 flight took off from Osan AB at 1310, followed shortly thereafter by Brag 01 flight at 1315 [verified by 36 FS operations]. Both Fiend and Brag flights proceeded to the west side of the exercise area where they set up an orbit, waiting for the other mission players to arrive in the area. Cock and Razor flight took off at 1339 [Tab K-5] and proceeded directly to the east side of the exercise area, arriving as planned. Cobra 11 and 12 took off at 1337, followed five minutes later by Cobra 13 and 14 [Tab K-2]. Cobra 11 arrived at the southwest end of the airspace approximately three minutes prior to push time (1350:00), and set up a brief orbit. Cobra 13 arrived just in time to join in the push [Tab V-4.7].

D.2. As the mission began, the F-16s were in the western portion of the assigned airspace in three separate groups, Brag 01 flight in the north, Fiend 01 flight in the center and Cobra 11 flight in the south. At approximately 1349, Fiend 01 flight and Brag 01 flight pushed in an easterly direction. One minute later, at 1350, the Cobras pushed from the south [VTR assessment]. As the Cobras pushed, the Cobra 11 element was approximately 20 NM ahead of Cobra 13 [Tab V-6.2]. At the same time, Razor 01 flight and Cock 01 flight committed from the east on a westerly heading in an eight-ship line-abreast formation (Figure 1) [Tab V-8.5]

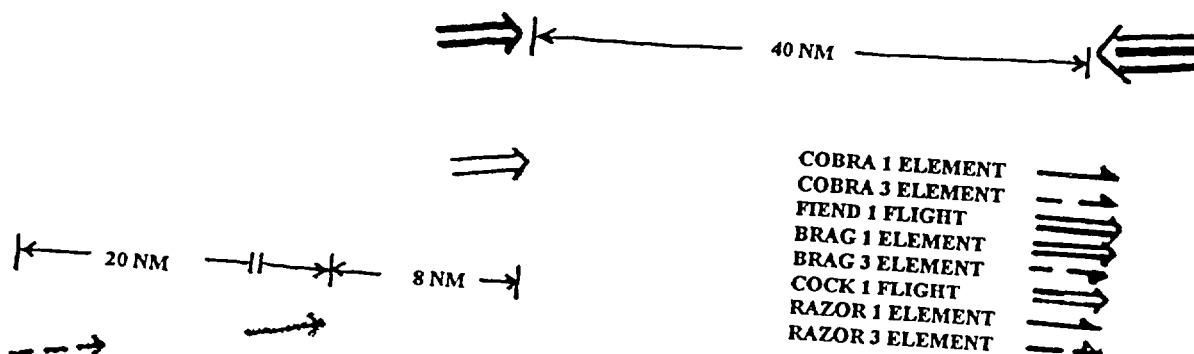


Figure 1

D.3. As Fiend and Brag flight approached within 22 NM of the F-15s (1351 hrs), Brag 01 flight and Fiend 01 flight executed a preplanned course reversal to the west with Fiend 01 flight descending to approximately 12,000 ft Above Ground Level (AGL) [VTR assessment]. The Cobra 11 element continued to the northeast with the Cobra 13 element still 20 miles in trail. At this point, Cock 01 flight and Razor 01 flight split into two separate four-ships with Cock 01 flight responsible for the northern portion of the area (against Brag 01 flight) and Razor 01 flight operating in the south (against Fiend 01 flight and Cobra 11 flight) [Tab V-2.7]. At approximately 1352, Cobra 11 turned right to south, setting up to make his HARM shot timing correct. Approximately 2 minutes later, Cobra 11 element turned back left to the northeast to take a HARM shot, but, feeling threatened by Razor 01 element, took his shot early (1354:30) and maneuvered defensively in a right turn back to the south and then west [VTR assessment]. Meanwhile, Cock 01 flight and Brag 01 flight engaged in fights to the north with mutual shots exchanged. At the same time, noting on the radar that Fiend 01 flight turned back to the east and descended to 3000 ft AGL, the Razor 03 element split from the Razor 01 element, and took up a northwesterly heading to engage Fiend 01 flight (approximately 5 NM to the north, and heading northeast) [Tab V-1.6, 2.7, 2.9]. After Razor 03 split from Razor 01, the Cobra 13 element engaged the Razor 01 element with mutual shots exchanged. Meanwhile, the flight path of the Cobra 11 element took them approximately 2 NM west of this engagement and then to the north as they supported the Cobra 13 element (Figure 2). Cobra 11 flight, and Razor 01 element terminated the engagement in the south, while Brag, Fiend, Cock, and Razor 03 terminated their engagements in the north [VTR assessment]

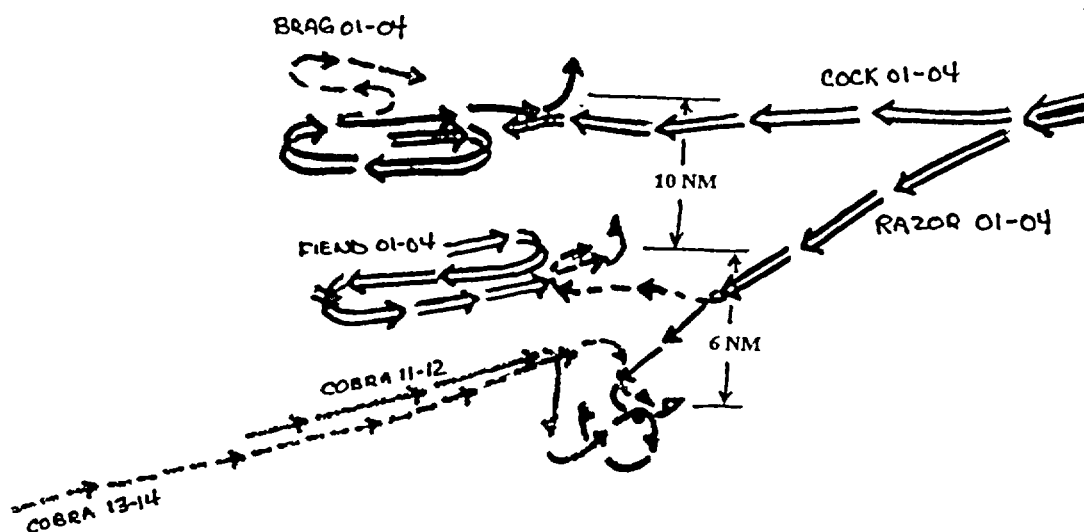


Figure 2

D.4. Following these engagements, Fiend 01 flight proceeded east and then north to Kooni range, while Brag 01 flowed east to their reset point [Tab V-10.8, 11.6]. Cock 01 flight flowed

west to their northern reset point (approximately 15 miles north of Razor 01's reset area) while Razor 03 element flowed south to rejoin with the Razor 01 element [Tab V-2.8. 8.5]. Cobra 13 element flowed to the west and then north to set up to support subsequent HARM shots by Cobra 11 and 12 [VTR assessment]. At this point, Brag 01, Fiend 01, and Cock 01 were all in the north, resetting for the second push, and Cock 1 called for all F-15s to reset when able [Tab V-2.3]. Since Brags', Fiends', and Cocks' subsequent engagements had limited impact on the mishap, this summary will not provide any further details on their engagements.

D.5. While the northern fighters were resetting their fight, and Razor 01 flight was rejoining and setting up at their reset point, Cobra flight was maneuvering for subsequent HARM shots, still to the southwest of Razor flight (Figure 3). The Cobra flight did not reset. Cobra 11 turned right to the northeast for his second HARM shot at 1400:15 hrs, and then executed a right 360 degree turn and set up for Cobra 12 to take his HARM shots. Cobra 12 took two HARM shots (at approximately 1402 hrs) and the Cobra 11 element maneuvered right to south and then left to northeast following their shots (Figure 3) [VTR assessment].

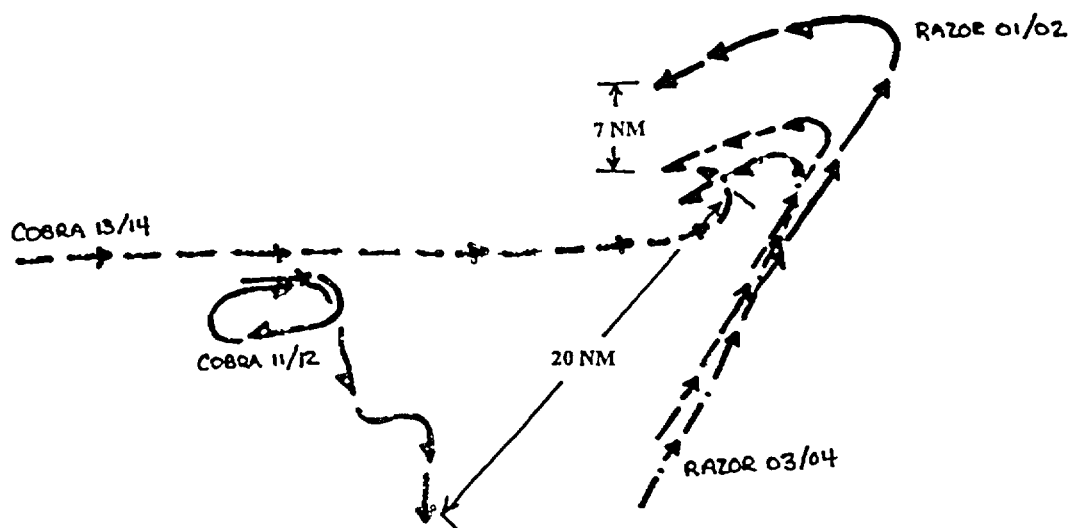


Figure 3

D.6. Meanwhile, as Cobra 11 took his second HARM shot, Cobra 13 element passed north of Cobra 11, heading east, in pursuit of Razor 01 flight [Tab V-4.11, VTR assessment]. Razor 01 element and Razor 03 element had rejoined into a seven mile trail and had turned northeast toward their western reset point (Figure 4) [VTR Assessment]. As Razor 01 flight prepared to turn southwest in their reset area (cold in their reset CAP), the Cobra 13 element prepared to engage [Tab V-6.5]. Cobra 11 element was approximately 20 NM to the south-southwest (Figure 3).

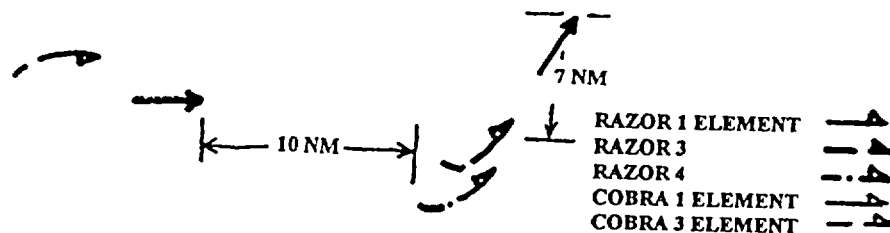


Figure 4

D.7 As Razor flight turned southwest, with Razor 01 element approximately 7 NM north of Razor 03, Cobra 13 engaged Razor 03 element, while Cobra 14 split to the north (approximately 6-7 miles initially) to engage the Razor 01 element. Cobra 13 and 14 both called tally on four eagles during this engagement, but Cobra 11 did not acknowledge hearing either call, and assumed an unknown number of Eagles in each group [Tab V-4.12]. Mutual shots were exchanged during this engagement, after which the Cobra 13 element departed the fight to the west, and then southwest, as they attempted to reestablish visual mutual support. Cobra 14 believed he had been simulated killed [Tab V-6.6]. Razor 01 called for a terminate and disengaged to the southwest, with Razor 02, 03, and 04, near line abreast and in front of Razor 01 (Figure 5) [Tab V-1.4, 2.8, 3.6]. Razor 01's terminate call was not acknowledged by Brigham or relayed to Cobra 11 flight [Tab N-1]. At the terminate call, Cobra 11 was still approximately 6 miles southwest of this engagement, flying towards it at 30,000 ft AGL [VTR assessment].

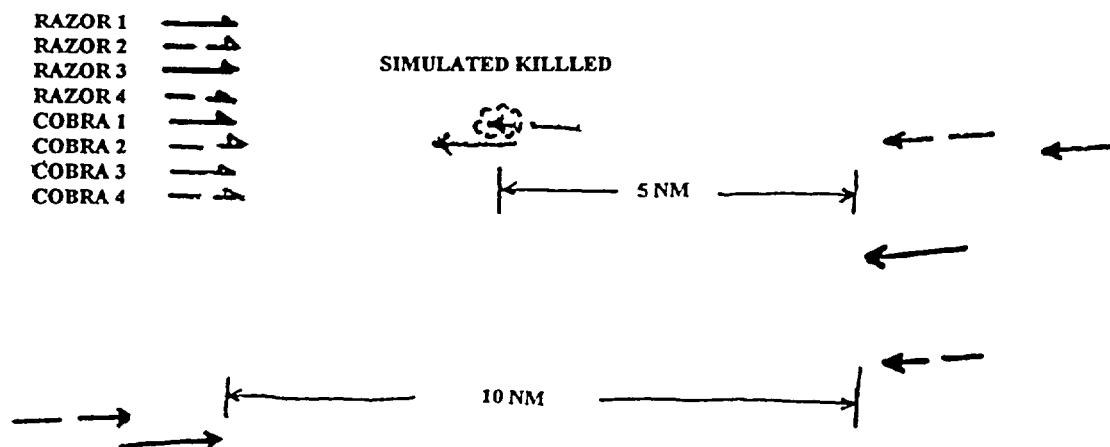


Figure 5

D.8. At approximately 1407 hrs the Cobra 11 element engaged Razor 01 flight. Cobra 11 saw Razor 03 heading southwest at approximately 20,000 ft, and began a steeply descending left hand turn to engage Razor 03. As he descended from 30,000 ft to engage, Cobra 11 gained sight of Razor 02, approximately 2 1/2 miles to the north of Razor 03's position. Cobra 11 testified that he was confident he had tally on all flight members in the area, thinking he had engaged the southern two-ship [Tab V-4.14] In reality, he had engaged the entire four-ship, but saw only two aircraft in that flight. Cobra 12 delayed slightly to clear the outside of the formation, and then followed Cobra 11 in a spiraling right hand turn which put him approximately 1.5 miles in trail, slightly offset, behind Cobra 11 [Tab V-5.7]. Cobra 11 took an unobserved radar missile shot on Razor 03, from approximately 2.1 NM in trail and called a kill on an F-15 in a left-hand turn (Figure 6) [Tab N-2, V-4.16]. Because of another kill shot being called by Brag flight in a northern engagement, Brigham did not understand Cobra 11's call and asked him to repeat it [Tab N-2] The kill call was never relayed to Razor flight [Tab N-1] Note: at the time Cobra 11 made his kill call, there were no F-15s in a left turn [Tab V-5.7, 5.9, 5.10, AA-1.2]

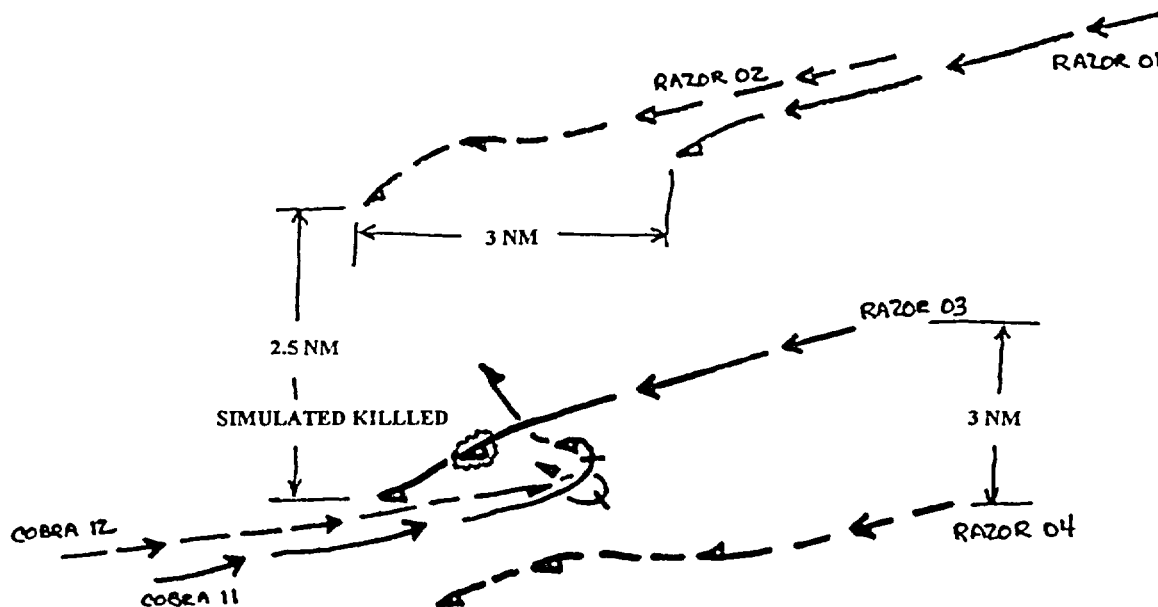


Figure 6

D.9. As Cobra 11 made his kill call on an F-15, he maneuvered his aircraft approximately 50 degrees to the right (heading 300 degrees), in pursuit of Razor 02 [Tab V-4.46, VTR assessment]. However, unknown to Cobra 11, Razor 01, approximately 2 NM northeast of Cobra 11 (at Cobra 11's 2 O'clock position), picked up the tally on Cobra 11 and called engaged. At the same time Razor 02 also gained sight of Cobra 11 and began a hard left-hand defensive turn, and expended flares. At 1407:45, Razor 02 and Cobra 11 passed each other in a left-to-left high aspect pass [Tab V-1 5, 1 13, 4.16, 4.19, 4.41] Meanwhile, the Razor 03 element began an

easy 180 degree left-hand climbing turn maneuvering back toward the expected threat axis (northeast), as yet unaware of the presence of Cobra 11 and 12 (Figure 7) [Tab V-2.15].

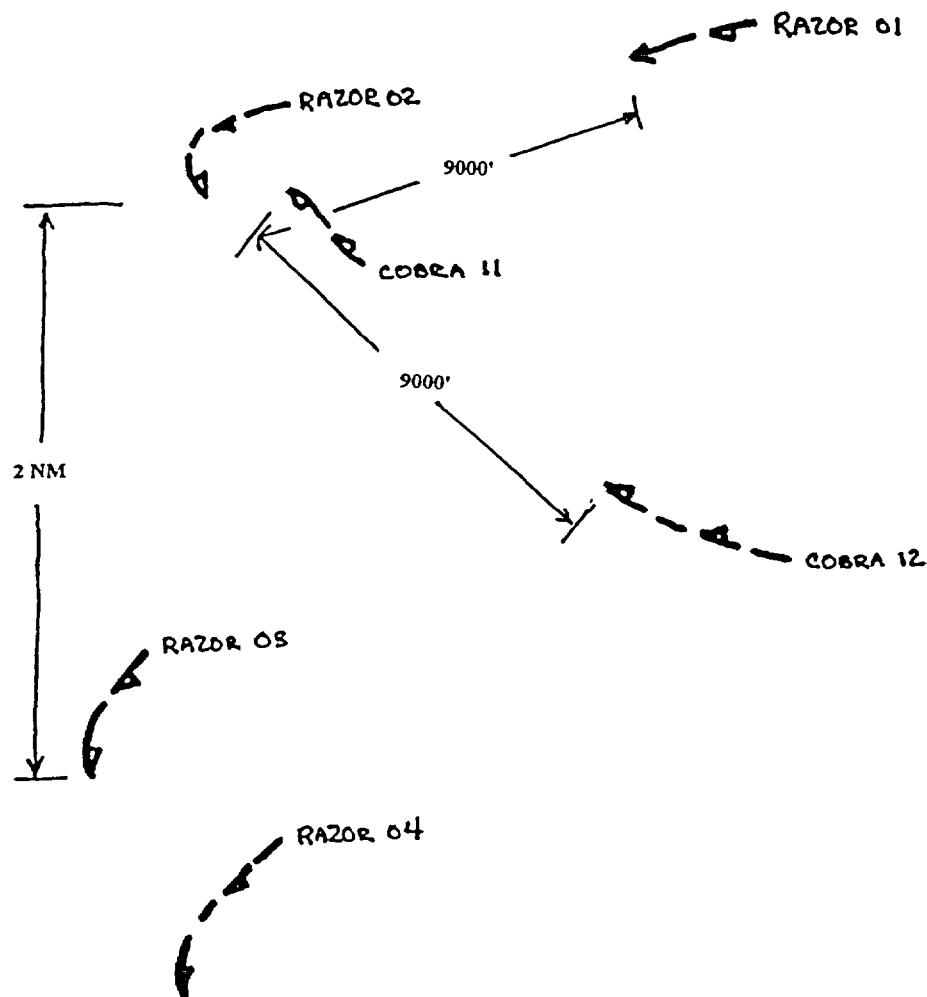


Figure 7

D.10. As Razor 02 and Cobra 11 passed, approximately 2000-3000 ft apart, Razor 02's testimony and Razor 02's videotape indicate Razor 02 began a deeply descending left spiral [Tab V-1.5, AA-1.2]. However, according to Cobra 11's testimony, Razor 02 rolled out to the southwest, in an extension maneuver, and, after Cobra 11 completed a slight left pitch-to-slice maneuver he rolled out approximately 9000 ft in trail [Tab V-4.19, 4.41, 4.42]. Meanwhile, Razor 03 and 04 were approximately 2-3 miles to the south in a left hand turn back to the northeast [Tab AA-1.3]. At 1407:52, as Cobra 11 completed his pitch-to-slice maneuver, Razor 01 positively identified Cobra 11 as a bandit and called a simulated kill (Figure 8) [Tab N-1]. This kill was not acknowledged by Brigham and was not passed to Cobra 11 flight. In addition,

Razor 01's kill call specified an F-16 at 28,000 ft, whereas Cobra 11 was actually at approximately 19,000 ft [Tab N-1, N-2].

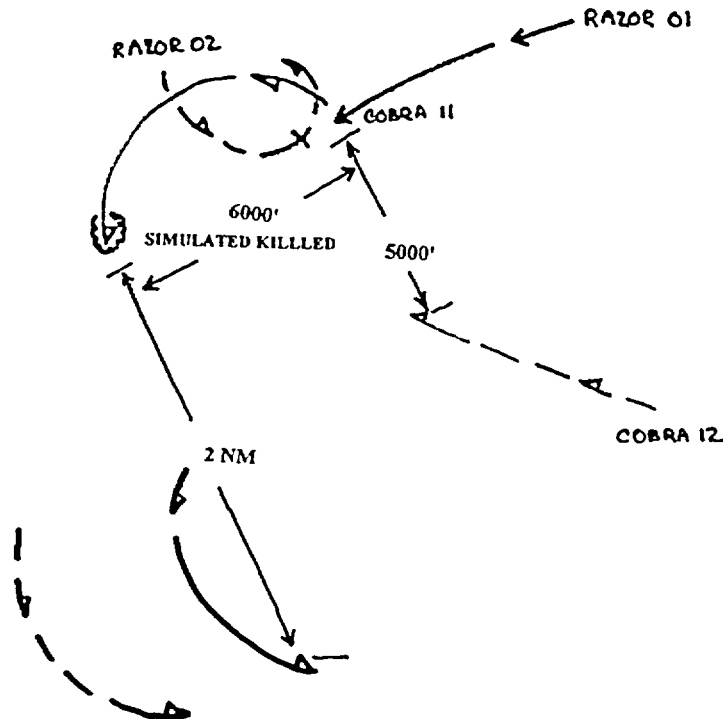


Figure 8

D.11. Cobra 12 observed Razor 01 attacking Cobra 11 and, at 1407:54, called for Cobra 11 to break defensively to the left [Tab N-2]. Cobra 11 began a hard left turn, which he testified was approximately 90 degrees of bank, and 10 degrees nose low, while Cobra 12 maneuvered to the right and then back to the left to attack Razor 01 [Tab V-4.20, 4.21, VTR assessment]. At the same time, from the northeast, Razor 02 saw Cobra 12 attacking Razor 01, and called for Razor 01 to react defensively to the left (1407:56). Razor 01 began a left turn and dispensed flares [Tab V-1.16]. Razor 02 continued his left turn, low and to the northeast of the fight [Tab V-1.5]. Razor 04 saw the fight approximately 3 NM to the north and maneuvered Razor 03 element left to point toward Cobra 12 from the South [Tab N-1, VTR assessment]. Cobra 11 continued in a left turn and testified that he gained sight of Razor 01 after about 40 degrees of turn, when Razor 01 was approximately 4000 ft away from Cobra 11, with his nose pointed slightly aft of Cobra 11's aircraft. Cobra 11 further testified that, at that point, it appeared Razor 01 would pass approximately 1000 ft behind and slightly above him [Tab V-4 21]. Cobra 12 engaged Razor 01 from behind at a distance of approximately 3,000 ft., attempting to maneuver for a gun shot but stopped his shot attempt as he perceived a closure problem developing between Razor 01 and Cobra 11, approximately 2 seconds prior to impact [Tab V-5 12]. Cobra 11 testified that at 2,000 ft Razor 01's aircraft appeared to move to pure pursuit -

- pointing right at Cobra 11's aircraft [Tab V-4.21]. Cobra 11 further testified that he initiated a negative G-maneuver, pushing the nose of his aircraft down, to avoid a collision as Razor 01 closed to a range of approximately 1500 ft. Cobra 11 and Cobra 12 testified that Razor 01 initiated a roll out of the left turn approximately 1,000 ft prior to impact [Tab V-4.21, 4.42 through 44, 5.14]. Two seconds later, Cobra 11 and Razor 01 impacted (1408:08) at approximately a 90-110 degree heading crossing angle [Tab V-4.21, 5.14] (Figure 9)

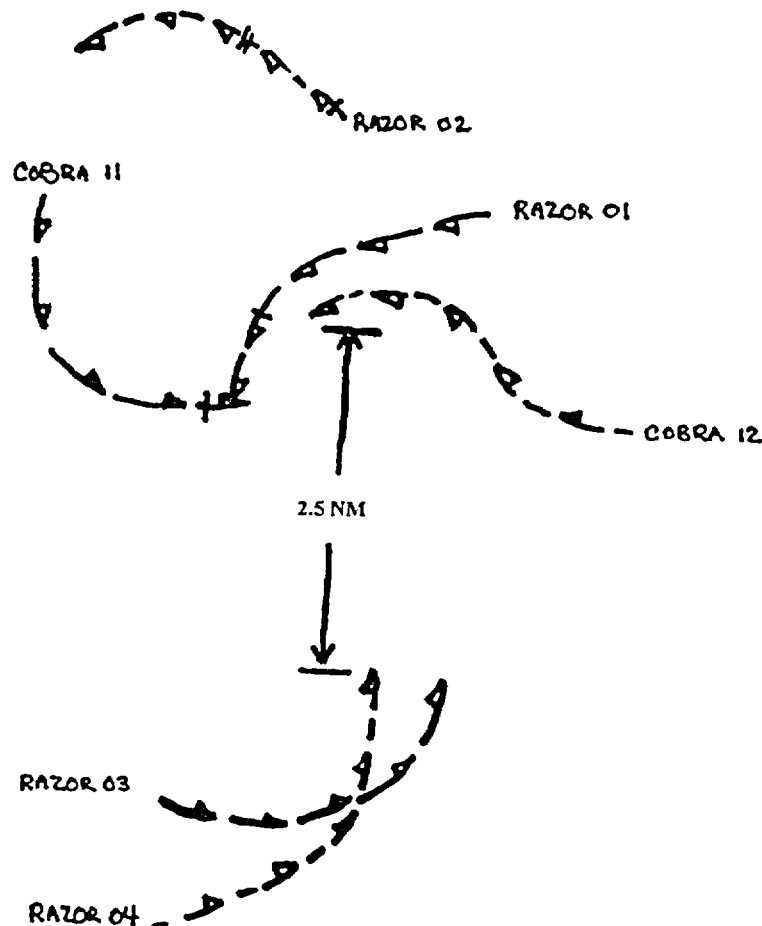


Figure 9

E. Impact:

E.1. The actual impact geometry could not be precisely determined due to a lack of recovered aircraft wreckage from the Yellow Sea. The following scenario is derived from witness testimony and analysis of the VCR tape from Cobra 12. At impact, Razor 01 was heading between 170-190 degrees, flying at 19,000 ft., with an airspeed of approximately 330 knots indicated [VTR assessment]. Cobra 11 was at the same altitude, heading between 080-100 degrees with unknown airspeed. Razor 01 was in a slight left bank rolling to the right towards

wings level with the flight path below level flight. Cobra 11 was in a steeper left bank also rolling to the right with a flight path below level flight. Razor 01 struck Cobra 11 at a 90-110 degree impact angle with heading crossing angle between the two airplanes of 90-110 degrees. The nose of Razor 01's aircraft passed between the right wing and right horizontal stabilizer of Cobra 11 just prior to impact. The vertical tail of Cobra 11's aircraft struck Razor 01's aircraft in the cockpit area severing the nose of Razor 01's aircraft, just forward of the engine inlets and causing a post-impact explosion. The bulk of Razor 01's aircraft struck Cobra 11 in the right wing causing extensive wing damage and a post-impact fire in the right wing area. Following the collision, Razor 01's aircraft entered a flat left spiral; Cobra 11's aircraft entered a very nose low right spiral until water impact [Tab V-4.45, 4.46, 5.14]. Razor 02 testified that initially, he thought it was the left wing of the F-16 that had been hit and was on fire, but later changed his view after consulting with the Kunsan F-16 pilots [Tab V-1.5]. Based on Razor 02's testimony, just prior to the collision he was looking at the top side of Cobra 11's aircraft. In our analysis, right after the collision, unknown to him at the time, Razor 02 was then looking at the bottom side of the aircraft, causing his mistaken perception.

F. Ejection Seat Sequence:

F.1. An ejection sequence was initiated by Cobra 11. Exact ejection parameters (altitude, airspeed, attitude, and rate of descent) could not be determined. Based on Cobra 11's testimony, the ejection sequence occurred in Mode 3 (altitude greater than 15,000 ft Mean Sea Level) [Tab V-4.25]. Cobra 11 testified he distinctly remembered the canopy separating from his aircraft, the seat firing and moving up the rails, and then looking below and watching the F-16 aircraft as it fell away. He also remembered the drogue chute deploying, heard the rustling sound of the main canopy deploying, and then felt the pull of the main chute inflating [Tab V-4.25]. After ejection, Cobra 11 verified he had a good chute, raised his visor and discarded his mask, ensured his seat kit had deployed and the raft was inflated, and then executed the four line jettison. Cobra 11 activated the Life Preserver Unit's (LPU) inflation prior to landing. When Cobra 11 landed in the water, he testified he was drug approximately 100 ft before he manually released the parachute risers. According to Cobra 11's testimony, the Sea Water Activated Release System (SEWARS) did not function properly [Tab V-4.26]. Cobra 11's parachute was not recovered and a teardown analysis of the SEWARS release system could not be accomplished. The post accident review of all equipment records indicated no overdue inspections.

F.2. No ejection sequence was observed from Razor 01's aircraft. Furthermore, several pilots testified that they either saw an explosion near the cockpit area of the F-15, or observed the cockpit area, forward of the engine inlets, completely missing from the falling wreckage [Tab V-1.17, 4.27, 5.14, 5.15]. Cobra 11 did testify, that while descending in his parachute, he observed a portion of another parachute, with something small and geometric attached to it, falling like a streamer at about twice his rate of descent. Cobra 12 also observed something similar. Both stated it was definitely not the body of Razor 01 attached to the falling material [Tab V-4.28, 5.17]. We were unable to determine precisely what the articles were that Cobra 11 and Cobra 12

observed, or how they got to be free from the wreckage, but, the analysis at Tab J-7 provides some possible alternatives. Neither ejection seat from either aircraft was recovered after this accident.

G. Personal and Survival Equipment:

G.1. Both pilots' personal and survival equipment met all current inspection requirements. The emergency locator transmitter (ELT) of Cobra 11 was heard to be functioning after the ejection. Cobra 11 also used his raft, the survival radio, his LPUs, and the sea dye marker which all functioned normally. Cobra 11 did not deactivate his ELT due to its location underneath him in the raft and his desire not to get out of the raft once he had climbed inside. Cobra 11 was also unable to properly use the scuba diving gloves located in his seat kit. Cobra 11 did not wish to remove his flying gloves and was unable to put the scuba gloves on over his wet flying gloves [Tab V-4.31]

G.2. Several items from Razor 01's seat kit, including a fully inflated raft, the seat kit, and many of its contents, were recovered from the Yellow Sea [Tab S-4,6,7, AA-6.1, 6.2]. Teardown analysis of this equipment, and the extensive damage done to certain components, indicated application of a tremendous force, incompatible with normal ejection forces [Tab J-1 through J-6]. There is no evidence of any attempt to use these items post-impact.

H. Rescue:

H.1. Time of impact between Cobra 11 and Razor 01 was 1408:08. At 1409:16, Cobra 12 directed Brigham to request helicopter assistance. Brigham acknowledged and confirmed that helicopters were already airborne [VTR assessment].

H.2. Nomad 11, an Osan 31st Special Operations Squadron MH-53, heard the ELT beacon, discontinued their training mission, and began to head in the direction of the beacon. Approximately 12 minutes after impact (1420), Air Force Rescue 644, an HH-60, took off from Osan AB. Nomad 11 was first to arrive on scene, and located and picked up the survivor at approximately 1445 hrs at 3616.37N 12601.87E. Air Force Rescue 644 arrived on scene at approximately 1450 and continued to search for Razor 01 and/or aircraft wreckage. Air Force Rescue 644 located and picked up debris [Tab J-1 through J-6] at 3619N 12600E (+/- 1NM).

I. Crash Response:

I.1. The Senior Director (SD) on Brigham notified Airedale of the mid-air collision immediately after hearing Cobra 12 and Razor 02 call knock-it-off. Cobra 12 directed Brigham to request helicopter assistance at 1409:16, approximately one minute after the impact. Brigham acknowledged and confirmed that helicopters were already airborne [VTR assessment]. Cobra 12 had a visual on one chute from the F-16 [Tab V-5.15]. Observing no ejection from Razor 01's aircraft, both Razor 02 and Razor 03 directed Razor 01 to bailout over the UHF radio.

[Tab V-1.17]. Razor 03 then directed Razor 02 and 04 to climb above him, and subsequently sent Razor 02 home [Tab V-2.20]. At this time, Razor and Cobra flights marked key positions and began coordinating among each other through Brigham, with Razor 03 at 12,000 ft MSL, Cobra 12 at 14,000 ft MSL, Cobra 13 and Cobra 14 at 24,000 ft MSL, and Razor 04 at 30,000 ft mean sea level (MSL) [Tab V16.4, VTR assessment]. Brigham then directed Razor flight to push to the F-16 frequency. Cock 03, the instructor for the blue air package, joined the formation at 45,000 ft MSL, and Razor 04 went home.

I.2. Nomad 11, (MH-53, 31st Special Operations Squadron, Osan AB) on a local training flight, heard a bailout call on UHF guard, followed by a beacon at 1411 hrs. Nomad 11 initiated use of the Personnel Locator System (PLS) from N3651.00 E12656.38. Nomad 11 immediately proceeded enroute, contacted Airedale, and offered assistance. Initially they were told to standby by Airedale, but continued toward the ELT [Tab AA-7]. They were then given the frequency the rescue operation was using by Razor 04 [Tab V-2.21] who was exiting the area on Airedale's frequency. Nomad 11 then contacted Brigham and was given clearance to proceed inbound.

I.3. The Battle Controller (BD) at Airedale contacted the Senior Operations Duty Officer (SODO) at the Osan Hardened Theater Air Control Center (HTACC), who then notified the 38th Rescue Squadron (Osan) at 1410 hrs and advised them of the situation. The Korean Combined Rescue Coordination Center (KCRCC) contacted on beeper by the SODO began its operation. The KCRCC contacted the 38th Rescue Squadron to confirm they had already been notified and authorized the launch of the alert HH-60. Air Force Rescue 644 departed Osan AB at approximately 1420 hrs. The KCRCC also alerted ROKAF search and rescue (SAR) forces. Sung Ri 31 (ROKAF UH-60) departed Suwon AB at 1426 hrs, and Honama 63, (ROKAF C-130) departed Seoul at 1439 hrs to provide communications relay between the KCRCC and ROK SAR forces [Tab AA-7].

I.4. Razor 03 and Brigham provided vectors to Nomad 11, and served as a communications relay between Nomad 11 and Cobra 11 [Tab V-2.21, VTR assessment]. Nomad 11 sighted Cobra 11 at approximately 1440 hrs, overflew the survivor once, and then made a hoist approach to an 80 ft hover. Nomad 11 then lowered the penetrator to Cobra 11 who initially waited in his raft for a Para-rescue person to jump out and assist him [Tab AA-7]. However, no pararescue personnel were aboard Nomad 11 because they had been on a training mission and were not manned for that type of rescue. After a short delay, Cobra 11 determined he was on his own, swam to the penetrator, and after disconnecting from his raft, was hoisted onboard the helicopter at approximately 1445 hrs [Tab V-4.26]. Nomad 11 then searched the area for Razor 01. Razor 03 and Cobra 13 and 14 returned to base after Cobra 11 was picked up. Cock 03 remained overhead and helped direct the remaining rescue aircraft to the scene. As Air Force Rescue 644 arrived on scene at 1450 hrs, Nomad 11 elected to depart for Kunsan AB, where they unloaded Cobra 11, refueled, then departed to resume the search. Cock 03 departed the area at approximately 1455 hrs and Brigham assumed responsibility for the coordination effort.

I.5. USAF and ROK forces began a combined effort to locate Razor 01 with USAF forces concentrating on the western portion of the impact site, and the ROK forces working the eastern portion. Additional help on 6 May was provided by: Sung Ri 71, a ROKAF rescue UH-60 from Kwang-Ju; Air Force Rescue 728, an Osan AB HH-60; Dustoff 25, a UH-60 from Camp Humphreys; and Sumo 11, a KC-130 from Futenma, Okinawa. The helicopters continued their search until sunset (approximately 1930 hrs). Sumo 11 maintained a listening watch on UHF 243.0 and 282.8 until relieved by a USN P-3, Yankee Delta 01, at 2320 hrs [Tab AA-7]. Yankee Delta 01 performed an infrared search of the area throughout the night. During the search, Yankee Delta 01 discovered several flashing lights and Kamsun 01, a ROK patrol boat, was dispatched to investigate. Each time, the lights were identified as flashers that Korean fishermen had attached to their nets. The P-3 also dispensed sonar buoys to calculate drift to aid in the continuing search [Tab AA-7]. There were also other ROK patrol boats in the vicinity, aiding in the search.

I.6. On 7 May, USAF and ROK aircraft resumed the search for the missing pilot and wreckage at sunrise (approximately 0545 hrs) and continued until sunset (approximately 1930 hrs). Sumo 17, a KC-130, initially assumed On-Scene Commander (OSC) duties but was forced home due to an aircraft malfunction. Brigham came on station as OSC from 1130 to 1630 hrs. The following additional search aircraft were involved. Nomad 02 (MH-53, 31st SOS, Osan AB); Air Force Rescue 644 (HH-60, 38th RQS, Osan AB), Strike 02 and Strike 06 (UH-60s, 5/501st Aviation Regiment, Camp Eagle), Dustoff 10 and Dustoff 17 (UH-60s, 377th Medical Company, Seoul AB); Dustoff 20 (UH-60, 2/377th Medical Company, Camp Humphreys); Dustoff 34 (UH-60, 3/377th Medical Company, Camp Walker); Sung Ri 31 and Sung Ri 91 (ROKAF UH-60s, 233rd Air Rescue Squadron, Suwon AB); and Honama 63 (ROKAF C-130, 255th Airlift Squadron, Seoul AB) [Tab AA-7]. A ROK Minesweeper arrived on the afternoon of the 7th, and provided sonar sweeps of the area. Golf Delta 0807, (USN P-3, VT-4, Misawa AB, Japan), arrived on station at approximately 2000 hrs and performed another infrared search and again dispensed sonar buoys to monitor the drift rate [Tab AA-7]. The P-3 departed the area at 0700, 8 May, 1994.

I.7. On 8 May, USAF helicopters resumed the search at sunrise (approximately 0545 hrs) and continued until sunset (approximately 1930 hrs). The search helicopters were: Nomad 02 (MH-53, 31st SOS, Osan AB); Air Force Rescue 728 (HH-60, 38th RQS, Osan AB); Strike 02 and Strike 06 (UH-60s, 5/501st AVN, Camp Humphreys); and Red Baron 22 (UH-60, 1/501st AVN, Camp Humphreys). Brigham was on station as the OSC from 1100 to 1630 hrs [Tab AA-7]. In addition, numerous ROK Naval vessels deployed to the area with landing parties and searched the local small islands [Tab AA-7]. With the concurrence of the Pacific Air Forces Director of Operations, the air search was terminated at sunset (1930 hrs) on 8 May 94 [Tab AA-7.3, 7.4].

I.8. The Korean Minesweeper continued its sonar search until 1200 hrs, 9 May 94 [Tab AA-7 interview]

I.9. The USS Beaufort, a USN vessel, began official search and recovery operations on 18 May 94 and continued operations until Friday, 10 June 1994. Their search priorities were focused on: 1) Human remains, 2) Ejection seat components; and, 3) Cockpit instrumentation and VTR tapes (8FW Msg 160700Z May 94]. Strong currents and poor underwater visibility continually hampered recovery operations. The USS Beaufort did recover limited portions of the F-16 wreckage and mapped out portions of both aircraft wreckages, but were unable to find any of the priority items.

I.10. All SAR crew testified that the weather was no factor to the SAR effort. They reported scattered clouds with good visibility low level. Condition of the water also did not impact the surface search effort [Tab AA-7 interview] However, water currents and poor visibility (less than 5 feet at the wreckage depth of 175 feet) severely restricted wreckage recovery operations.

J. Maintenance Documentation:

J. 1. There were no maintenance discrepancies in the Air Force Technical Order (AFTO) Forms 781 for either mishap aircraft that relate to this accident [Tab AA-2].

J. 2. The following safety of flight time compliance technical orders (TCTOs) were not complied with on F-16C, 87-0274: 1F-16-1683D and 1F-16-1865E These TCTOs were not overdue the allotted amount of time for compliance and had no effect on the accident. The following non-grounding TCTOs were not complied with on each aircraft F-16C, 87-0274: 1F-16-1762C, 1F-16-1935, 1F-16-1591, 1F-16-1894, 1F-16-1984, 1F-16-1790C, 1F-16-1711, 1F-16-1627, and L940005. F-15C, 78-0530: 1F-15-1252, 1F-15-1060, 1F-15-1237, 1F-15-1183, and L400018. There is no evidence these open TCTOs had any effect on the accident [Tab AA-2].

J. 3. There was one overdue inspection on F-16C, 87-0274, for a 75 hour download of the Crash Survivable Flight Data Recorder (CSFDR). This was due to a malfunction in the CSFDR, causing an inability to perform the download. Parts were on order to correct this discrepancy. This had no effect on the accident. There were no overdue inspections on F-15C, 78-0530 [Tab AA-2].

J. 4. All pre-accident oil samples from the three applicable engines (one F-16, and 2 F-15 engines) were within standards [Tab AA-2].

J. 5. There were no overdue time change items on either mishap aircraft [Tab AA-2].

J. 6. The equipment review report revealed that timely component inspections were accomplished with the exception noted above [Tab AA-2].

J. 7. Unscheduled maintenance on the F-16 since January 1994 included the following: Ground aborts were reported for a popped differential pressure indicator, a frozen up front control keyboard and dauber switch, a leaking accessory drive gearbox, a malfunctioning external fuel tank and a jet fuel starter which would not start. Code 3/In-flight emergencies were reported for an anti-skid light on landing and an erratically firing gun. Additional Code 3 discrepancies were reported for a malfunctioning heads-up display, an inertial navigation system failure, a malfunctioning electronic countermeasures pod and a gun door dropped in flight. All repairs appear to have been adequate and there is no indication that these discrepancies had any effect on the accident. Unscheduled maintenance on the F-15 during the same time period included the following: ground aborts were reported for malfunctioning brakes, a jet fuel starter, an emergency generator and a leaking speed brake. Code 3 discrepancies were reported for several malfunctioning avionics components, a malfunctioning electronic engine control, a malfunctioning nozzle position indicator, inoperative fuel gauge, flight controls and a frozen fan turbine inlet temperature gauge. Repairs for these discrepancies appear to have been adequate and there is no indication that these discrepancies had any effect on the accident [Tab AA-2].

J. 8. There is no evidence that any maintenance practice or procedure was a factor in this accident [Tab AA-2].

K. Maintenance Personnel and Supervision:

K. 1. Pre-flight aircraft servicing personnel and supervision for both mishap aircraft were unremarkable [Tab AA-2].

K. 2. On-the-job training records showed all personnel working on the mishap aircraft were qualified for the tasks performed [Tab AA-2].

K. 3. There is no evidence that any maintenance practice or procedure was a factor in this accident [Tab AA-2].

L. Engine, Fuel, Hydraulic, and Oil Inspection Analysis.

L. 1. Thorough analysis of data from the core automated maintenance system, consolidated engine management system, and the engine AFTO Forms 95 revealed zero overdue time changes, TCTOs, or inspections on the F-16 engine F110-GE-100, serial number 509280. All safety of flight TCTOs were complete. Although there were some TCTOs not yet completed, these were not yet overdue, and there is no evidence they had any effect on the accident. A similar F-15 engine analysis revealed neither engine serial number 681933 or engine serial number 681262, had any overdue inspections, TCTOs, or time change items. Both of these engines had two non-accomplished safety of flight TCTOs, 2J-F100-865 and 2J-F100-III-544, although neither was yet overdue. There is no evidence that either of these had any effect on the accident [Tab AA-2].

L. 2. Fuel test data from both mishap aircraft was normal [Tab AA-2]

L. 3. Hydraulic fluid test report from both mishap aircraft was normal [Tab AA-2]

L. 4. Oil test report data from both mishap aircraft was normal [Tab AA-2]

M. Airframe and Aircraft, Missile or Space Vehicle Systems:

M.1. There were no Product Quality Deficiency Reports submitted for this accident [Tab AA-2].

M.2. There were no component or accessory system failures that had any relation to this accident [Tab AA-2].

N. Operations Personnel and Supervision:

N.1. The daily flight authorization for Razor 01 [Tab K-4] was duly approved by Lt Col John M. Dailey, 67 FS Operations Officer and deployed detachment commander. The daily flight authorization for Cobra 11 [Tab K-1, 2] was duly approved by Lt Col James R. Mitchell, 80 FS Operations Officer.

N.2. The briefing for Razor 01 flight was conducted in three parts by two different persons. Cock 01 conducted the overall coordination brief, with Cock, Razor, Fiend and Brag flights in attendance, using prepared briefing slides which followed the guidance in AFR 55-115. Following the coordination brief, Cock 01 then briefed both Cock and Razor flights on all the required items, using additional briefing slides. Cobra 11 used his personal mission briefing guide, prepared using AFR 55-116 as a guide. There were no squadron supervisory personnel present during either brief. However, the IP of record for Cock 01's mission commander upgrade, and two other pilots, testified it was one of the best briefings they had seen [Tab V-9.5]. In addition, Lt Col Mitchell, 80 FS operations officer, observed Cobra 11's preflight preparation and noted his briefing boards were very well prepared [V-21.1].

O. Crew Qualifications:

O.1. Captain Kindred (Razor 01) was fully qualified to fly the mission as scheduled and briefed [Tab V-18, 19]. Captain Kindred was an experienced F-15 pilot, fully qualified flight lead and instructor pilot. His initial instructor flight check, conducted on 2 February 1993, was discrepancy free and current through July 1994. His instrument check was current through May 1995. Captain Kindred had a total of 1254.3 hours flying time and had accumulated 963.6 in the F-15, of which 142.6 were logged as instructor hours [Tab G-9]. During the last 30/60/90 days, Captain Kindred had accumulated 12/22/40 sorties and 15.4/33.6/56.7 hours, respectively [Tab G-1]. There are no identifiable past training discrepancies or deficiencies that would have contributed to this accident.

O.2. Captain Strawther (Cobra 11) was fully qualified to fly the mission as scheduled and briefed [Tab V-20, 21] Captain Strawther is an experienced F-16 pilot, fully qualified flight lead, instructor pilot and graduate of the USAF Fighter Weapons Instructor Course. He became an instructor in February 1990. His instrument checkride is current through July 1995 and his instructor/mission check is current through March 1995. Captain Strawther has a total of 2,722.3 hours flying time and has accumulated 1294.9 total hours in the F-16, of which 535.3 are logged as instructor hours [Tab G-4]. During the last 30/60/90 days, Captain Strawther had accumulated 23/46/67 sorties and 33.3/62.3/91.0 hours, respectively [Tab G-1]. There are no identifiable past training discrepancies or deficiencies that would have contributed to this accident.

P. Medical:

P.1. The accident investigation's flight surgeon reviewed the medical records, toxicology reports and post-accident examinations (as necessary) for all aircrew members associated with this mishap flight. A detailed summary of his investigation can be found at Tab AA-4. The following is a summary.

P.1.1 All AWACS personnel were medically qualified for flight. The toxicology reports indicated one major deficiency. The Weapons Controller for Cock flight had Dimetapp, an over the counter cold/cough medicine unauthorized for use before flight, in his urine. The controller denied his use of the medication and offered a written statement to explain his position [Tab V- 13.9, 13.10, Tab AA-4]. These medical findings had no impact on this aircraft mishap.

P.1.2. All Cobra flight members were medically qualified for flight. Captain Strawther was flying on a waiver for ulcerative colitis, but extensive post-flight questioning and a medical examination indicate he suffered no related symptoms before, during, or after the mishap flight. In addition, there were no significant post-ejection injuries noted for Cobra 01. There were no abnormal post-flight toxicology results noted for any Cobra flight members. These medical findings had no impact on this aircraft mishap [Tab AA-4].

P.1.3. All Razor and Cock flight members were medically qualified for flight. Both Capt Kindred (Razor 1) and Capt Connolly (Razor 02) were on medical waivers [Tab AA-4], neither of which were factors in this accident. The toxicology testing on all pilots was negative. There were three toxicology reports that identified substances in the fluids of three ground crewmembers, but none of these substances were in violation of any regulation or procedure. There were no post-accident physical examinations performed on any Razor or Cock flight members. These medical findings had no impact on this aircraft mishap.

Q. Nav aids and Facilities:

Q.1. Kunsan and Osan AB Airman Advisories, current as of 6 May 94, 0001 local, contained no information about nav aids or facilities that impacted the mishap.

R. Weather:

R.1. The initial forecast, valid 6 May 94, (valid 1000 to 1600 hrs local) for the 1405 local time period was: 1) Winds - 270 degrees at 10 gust 18 knots; 2) Visibility - 7 NM; 3) Clouds - Scattered at 3,000 ft, scattered at 8,000 ft; and 4) Altimeter setting - 29.60 [Tab K-7].

R.2. The actual weather observation, based on unofficial observations from pilots in Cobra flight, Nomad 11, and Air Force Rescue 644, on 6 May 94, at 20,000 ft, at approximately 1400 local was: 1) Winds - 268 degrees at 45 knots; 2) Visibility - 20 NM; 3) Clouds - Clear above 10,000 ft; and, 4) Altimeter setting - unknown [Tab V-2.6]

R.3. Weather was not a factor in this mishap

S. Directives and Publications:

We reviewed the currency of all pilot publications and directives applicable to this flight and found no discrepancies that were a factor to this accident. The directives and publications referred to during this investigation were:

1. AFR 55-79, Aircrew and Weapons Director Procedures for Air Operations.
2. AFR 60-16, General Flight Rules.
3. MCM 51-50, Aircrew Training.
4. MCR 55-116, F-16 Pilot Operational Procedures.
5. MCR 55-115, F-15/F-15E Aircrew Operational Procedures
6. AFR 160-43, Medical Examinations and Standards.
7. AFR 60-1, Change 1, Crew Rest and Flight Duty Limitations
8. AFR 110-14, Investigations of Aircraft, Missile, and Nuclear and Space Accidents.
9. AFR 127-4, Investigating and Reporting US Air Force Mishaps

III. STATEMENT OF OPINION

Under 10 U.S.C. 2254 (D) any opinion of the accident investigator as to the cause 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 such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements

A. Factors Causing this Accident In my opinion, there were three factors which substantially contributed to the accident: (1) Approximately 80 degrees into his break turn, and approximately 2 seconds prior to impact, Razor 01 began an unloaded roll to the right, which established a collision course vector between Razor 01 and Cobra 11; (2) AWACS controllers did not hear/relay a terminate call made by Razor 01 approximately two minutes prior to impact; and, (3)

Fiend 01 did not ensure Cobra 11 adequately understood the overall mission objectives and game plan for this large force exercise. However, before delving into each of these factors in detail, some general observations are important.

Reference the first factor, although in my opinion this is what happened, I do not think there is "clear and convincing" evidence to support my conclusions. We were unable to recover the evidence that would have given us the most complete picture of this accident — the in-flight recorders from the mishap aircraft, and key components of the aircraft wreckage. Therefore, our reconstruction of this accident is based primarily upon witness testimony and available aircraft VTR assessment. In the key portion of our reconstruction, the last few seconds prior to impact, we rely heavily on the testimony of the only two witnesses who were in a good position to observe the actual impact, Cobra 11 and Cobra 12. However, as discussed earlier, some discrepancies exist between Cobra 01's testimony and the video tapes from other aircraft (see paragraphs D.8 and D.10). These unresolved discrepancies indicate Cobra 11's perception was mistaken at various points during the flight, and may have been mistaken during the final impact sequence. In addition, the testimony of both Cobra 11 and Cobra 12 could be heavily influenced by their discussions and analysis they have both consciously and subconsciously performed over the intervening period between the accident, and the start of this investigation. Consequently, given the inherent weakness of available testimony, and the lack of supporting evidence, I do not think the evidence meets the clear and convincing standard

Concerning the second factor, while the evidence meets the clear and convincing standard, and it was a significant factor to this accident, in my opinion there was no negligence on the part of the AWACS controllers, and this was not a proximate cause.

Concerning the third factor, the evidence also meets the clear and convincing standard, but, in my opinion, is also not a proximate cause.

A.1. Factor - Approximately 80 degrees into his break turn, and approximately 2 seconds prior to impact, Razor 01 began an unloaded roll to the right, which established a collision course vector between Razor 01 and Cobra 11. As Cobra 11 began his break turn, heading approximately 220 degrees [VTR assessment and board reconstruction], Razor 01 was approximately 1 NM to the north-northeast. Two seconds later, Razor 01 began his break turn, from a heading of about 250 [Tab N-1, N-2]. Rough analysis of F-15 and F-16 turn circles and turn rates indicates that if Razor 01 and Cobra 11 both did maximum break turns, Razor 01 would have passed 500-1000 ft in front of Cobra 11, approximately 110-120 degrees through their turns. However, according to testimony from Cobra 12, who observed the fight from high and behind, Razor 01 was not generating quite as much turn as Cobra 11 during the early break [Tab V-5.12], meaning that if neither aircraft changed its maneuver, they would pass closer together, but still not impact. However, when Razor 01 began an unloaded roll to the right, approximately 2 seconds prior to collision, he unknowingly established a collision course vector with Cobra 11. At this point, in my opinion, Cobra 11 was unable to process and react to this new input in time to avoid the collision.

A.2. Factor - AWACS controllers did not hear/relay a terminate call made by Razor 01 approximately two minutes prior to impact. While a variety of radio calls were not correctly passed during this mission, one call was missed, that in my opinion, if correctly relayed, would have prevented this accident.

Razor 01 made a terminate call approximately 1 minute and 50 seconds prior to the collision, during maneuvering against Cobra 13 and 14. Although this call could be clearly heard on the control frequency, monitored by Razor flight and the AWACS controllers, it was not acknowledged by any Razors or AWACS controllers, and was never passed to the Cobras [Tab N-1]. After Razor 01 made the call, all Razor flight members terminated maneuvering, and turned cold in their CAP (southwest), indicating they had heard the call [Tab V-1.10, 2.14, VTR assessment]. At this point, according to testimony by the Razor pilots they were expecting the Cobras to proceed east for the second reset. In their mind, this engagement was complete and the next engagement would not occur until after the reset [Tab V-1.10, 2.14, 3.4]. However, since the terminate call was never relayed and Cobra 11 did not understand the F-15's desire for a reset, Cobra 11 and 12 engaged the Razor flight, in what turned out to be the fatal engagement. According to his own testimony, had Cobra 11 heard AWACS relay Razor 01's terminate call, he would not have engaged the F-15s [Tab V-4.29], and this particular accident would not have happened.

However, although, in my opinion, failure to relay the terminate call was significant, there is no evidence that any of the AWACS controllers were negligent or that they willfully failed to pass the call. When asked specifically about that terminate call, none of the AWACS controllers remembered hearing it [Tab V-12.4, 13.8, 14.5, 14.6]. In fact, after initially being questioned about the call, the Razor flight controller who was responsible for passing terminate calls from the Razor flight to the Cobra flight controller, asked to clarify whether the call had been made on her frequency [Tab V-12.8]. She was noticeably concerned that she could have missed a terminate call. After talking with her, I found no evidence to suggest that she had heard the call when it was made. The controlling environment is a demanding and saturated one. Each controller monitors three or four frequencies simultaneously, while receiving simultaneous input for onboard crewmembers. Consequently, while it is unfortunate, it is not surprising this single call was missed. Therefore, in my opinion, there is no evidence that the controller was negligent.

Further, I do not think this failure was proximate cause. Although it is the responsibility of the AWACS controller to relay terminate radio calls, it was not the only means at Razor 01's disposal to terminate the subsequent engagement with Cobra 11. If, in Razor 01's judgment, his flight was not ready to engage with Cobra 11, he could have made another terminate radio call, and directed his wingmen to rock their wings as a visual signal to terminate. Instead, he offensively engaged Cobra 11. These intervening actions break the causal chain, with respect to the AWACS controllers, and eliminates this as a proximate cause.


A.3. Factor - Fiend 01 did not ensure Cobra 11 adequately understood the overall mission objectives and game plan for this large force exercise. According to both Cock 01, the overall mission commander, and Fiend 01, the red-air mission commander, the mission was to occur in two separate phases. The first, was with the blue air (Cock and Razor flight) in the east, and red air (Cobra, Fiend and Brag) in the west. The second phase, occurring after Fiend flight came off Kooni range, was to occur with blue air starting in the west and red air starting in the east. Following initial engagements, in the first phase, both forces were to flow to their reset points, allowing blue air a second look at the LFE coming towards them in the second phase.

Fiend 01 as the red air mission commander was responsible for ensuring Cobra 11 understood the game plan. All the mission pilots who testified before this board understood this game plan, except the Cobra pilots. Once airborne, Fiend, Brag, and Cock flights all properly executed this game plan and Razor flight was attempting to comply. However, Cobra flight did not. Just prior to the mishap engagement, when Cobra 13 and 14 terminated their engagement with Razor flight, instead of egressing the fight to the east, as this game plan dictated, Cobra 13 and 14 egressed to the west. This is when Cobra 11 and 12, rolled in on an unsuspecting Razor flight from the Southwest, and the fatal engagement ensued. Had Cobra 11 adequately understood that he was to reset his flight to the east, he would have terminated prior to the mishap engagement, and this accident would not have happened.

However, the fact that Cobra 11 did not understand the mission objectives completely did not mean this accident was destined to happen. As discussed above, when Cobra 11 engaged the Razor flight they could have rocked him off or sent a message to him through AWACS to terminate. Once the Razor pilots agreed to engage, as evidenced by their actions, the causal link, with respect to Cobra 11's misunderstanding, is broken.

B. Summary: This mid-air collision occurred between two highly experienced and qualified fighter pilots. Both squadron commanders and operations officers had only positive things to say about the skill and professionalism of both pilots, and there is no evidence to suggest that either pilot committed any willful violation of flight regulations or breach of discipline that led to this accident. However, it is also evident, that a series of actions, under the control and authority of a variety of individuals, established an unfortunate chain of events that eventually allowed (not destined) this tragedy to occur. Had this chain been broken at any point, in my opinion, this particular accident would not have happened. Nonetheless, I cannot identify any individual culpability in this accident.

All records and tapes not included in this report were transferred to the 8 FW/JA. Mishap wreckage was transferred to the 8 FW/JA and will remain there until disposition is authorized by HQ USAF/JACC. This report is respectfully submitted 22 June 1994.


GILBERT L. BRAUN, Lt Col, USAF
AFR 110-14 Accident Investigation Officer