UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION
BOARD REPORT

F-16C, T/N 89-2013

35TH FIGHTER SQUADRON
8TH FIGHTER WING
KUNSAN AIR BASE

LOCATION: KUNSAN AIR BASE, REPUBLIC OF KOREA

DATE OF ACCIDENT: 31 JANUARY 2024

BOARD PRESIDENT: COLONEL DANIEL A. ROESCH

Conducted IAW Air Force Instruction 51-307

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

F-16C, T/N 89-2013
KUNSAN AIR BASE, REPUBLIC OF KOREA
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On 31 January 2024, the mishap pilot (MP), flying a F-16C, Tail Number (T/N) 89-2013, assigned to the 35th Fighter Squadron (35 FS), "the Pantons," 8th Fighter Wing (8 FW), Kunsan Air Base, Republic of Korea, conducted a routine training sortie as part of the wing's local readiness exercise BEVERLY MORNING. Approximately 40 minutes after at 08:00 a.m. Korea Standard Time (KST) takeoff, the MP ejected from the mishap aircraft (MA). The MA was destroyed upon impact in the Yellow Sea at approximately 08:41 a.m. KST, 61 nautical miles (nm) northwest of Kunsan Air Base. The mishap resulted in the loss of a $25,764,648.00 United States government asset.

The mishap flight (MF) was planned and authorized as a training mission within local training airspace. The MP was flying as the fourth aircraft in a 4-ship formation. During the air refueling portion of the mission, MP was fourth to refuel from a KC-46 aircraft. The prevailing weather was clear with no clouds in the refueling airspace. The MP accomplished three successful contacts with the KC-46, onboarding approximately 1,700 pounds of fuel. On the third contact attempt with the KC-46 aircraft, MP heard a loud bang inside the MA. The MP separated from the KC-46 aircraft to monitor the condition of the MA. Coincident with separating, MP noticed low engine revolutions per minute (RPMs), and high fan turbine inlet temperature (FTIT) causing the MA to be unable to maintain airspeed and altitude. Unable to maintain airspeed, the MP descended the MA to maintain 250 knots airspeed. The MP attempted multiple restarts of the engine without success, and determined the MA would not be able to fly to a nearby runway to land the aircraft. The MP continued to descend to 1,500 feet Above Ground Level (AGL) to gain airspeed to perform a final climb to 2,000 feet AGL. Once the MA reached approximately 2,000 feet AGL, the MA successfully ejected 30 nm west of Seosan Airfield, Republic of Korea.

The Accident Investigation Board President found by a preponderance of evidence the cause of the mishap was an engine stall due to hardware failure. The initial engine stall was unrecoverable by the MP after several attempts to restart the engine from 24,000 feet Mean Sea Level (MSL) to approximately 8,000 feet MSL. MA displayed unreliable and inaccurate data with multiple failure indications. The MP ejected over water from the MA. The MA crashed into the Yellow Sea and was never recovered.

SUMMARY OF FACTS AND STATEMENT OF OPINION
F16C, T/N 89-2013
KUNSAN AIR BASE, REPUBLIC OF KOREA
31 JANUARY 2024

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ACRONYMS AND ABBREVIATIONS

7 AF	7th Air Force
8 FW	8th Fighter Wing
80 FS	80th Fighter Squadron
AAR	Air-to-Air Refueling After
AB	Burner
AC	Aircrew Cabin
ACE	Agile Combat Employment
ACES II	Advanced Concept Ejection Seat
ACMC	Aircrew Main Cabin
ACMI	Air Combat Maneuvering Instrumentation
ACT	Air Combat Training
ADI	Attitude Display Indicator
ADO	Assistant Director of Operations
ADTD	Aircraft Data Transmit Device
AFI	Air Force Instruction
AFLCMC	Air Force Life Cycle Management Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFSC	Air Force Specialty Code
AFTO	Air Force Technical Order
AGL	Above Ground Level
AIB	Accident Investigation Board
ACMI	Air Combat Maneuvering Instrumentation
APG	Airframe Powerplant General
APU	Auxiliary Power Unit
AR	Air Refueling
ARCT	Air Refueling Control Time
ARMS	Air Refueling Management System
AROCDU	Air Refueling Operator Control Display Unit
AROS	Aerial Refueling Operation Station
ASM	Active Security Manager
ATOC	Air Terminal Operations Center
BD	Battle Damage
BDA	Battle Damage Assessment
BFM	Basic Fighter Maneuvers
BPO	Basic Postflight Operation
CADC	Central Air Data Computer
CAP	Combat Air Patrol
CAP	Critical Action Procedure
CAPRE	Common Aircraft Portable Reprogrammable Equipment
CDS	Centerline Drogue System
COCOM	Combatant Command
CSAR	Combat Search and Rescue
CSEL	Combat Survivor Evader Locator
CSFDR	Crash Survival Flight Data Recorder
CSMU	Crash Survivable Memory Unit
CVR	Cockpit Voice Recorder
DAFI	Department of the Air Force Instruction
DD	Data Display
DIFM	Due in for Maintenance
DFLCC	Digital Flight Control Computer
DO	Director of Operations
DoD	Department of Defense
E&E	Electrical and Environmental
ECP	Entry Control Point
ECS	Engine Control Switch
ECS	Environmental Control System
ENDEX	End Exercise
EP	Emergency Pilot
EPU	Emergency Power Unit
ER	Exceptional Release
FCC	Flying Crew Chief
FDP	Flight Duty Period
FGS	Fighter Generation Squadron
FOD	Foreign Object Debris
FS	Fighter Squadron

ft	Feet
FTIT	Fan Turbine Inlet Temperature
FW	Fighter Wing
GAB	Ground Abort
HAS	Hardened Aircraft Shelter
HMCS	Helmet Mounted Cueing System
HSI	Horizon Situation Indicator
HUD	Head Up Display
I&E	Inlet and Exhaust Inspection
IAW	In Accordance With
IFE	Inflight Flight Emergency
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IMDS	Integrated Maintenance Data System
IMM	Immediate Transmit Key
IP	Instructor Pilot
IR	Infrared
HUD	Heads-Up Display
HSI	Horizontal Situation Indicator
HFACS	Human Factors Analysis and Classification System
JFS	Jet Fuel Starter
JPRC	Joint Personnel Recovery Center
KST	Korea Standard Time Large
LAIRCM	Aircraft Infrared Countermeasure
LDS	Large Display System
LPU	Life Preserver Unit
MA	Mishap Aircraft
MC	Main Cabin
MC	Mission Commander
MCD	Magnetic Chip Detector
MCDU	Multi-function Control Display Unit
METAR	Meteorological Aerodrome Report
MF	Mishap Flight
MFD	Multi-functional Display
MFL	Maintenance Fault Lists
MFR	Memo For Record Modular
MMC	Mission Computer
MOC	Maintenance Operations Center
MOO	Maintenance Operation Office
MOPP	Mission Oriented Protective Posture
MP	Mishap Pilot
MS	Mishap Sortie
MSL	Mean Sea Level
NCOIC	Non-Commissioned Officer In-Charge
nm	Nautical Miles
NMCR	Non-Combat Mission Ready
NOTAM	Notice to Airmen
OBIGGS	Onboard Inert Gas Generating Systems
OG	Operations Group
ORM	Operational Risk Management
PA	Public Affairs
PACAF	Pacific Air Forces
PAUSEX	Pause Exercise
PDL	Pilot Director Lights
PFLD	Pilot Fault List Display
PHA	Periodic Health Assessment
PL	Panton Lead
PLF	Parachute Landing Fall
PLI	Pre-launch Inspection
PR	Pre-Flight
PRD	Pilot-Reported Discrepancy
PWC	Pilot Weather Category
QA	Quality Assurance
QC	Quality Control
RESCAP	Rescue Combat Air Patrol
RE	Readiness Evaluation
RPM	Revolutions Per Minute
RTB	Return to Base
SA	Situational Awareness

SAR	Search and Rescue
SARM	Squadron Aircrew Resource Manager
SAU	Signal Activation Unit
SEC	Secondary
SEPT	Simulated Emergency Procedure Trainer
SIB	Safety Investigation Board
SME	Subject Matter Expert
SOF	Supervisor of Flying
SPINs	Special Instructions
TA	Transient Alert
TCTO	Time Compliance Technical Orders
TDY	Temporary Duty
T/N	Tail Number
TO	Technical Order
TX	Transition
UHF	Ultra High Frequency
USAG	United States Army Garrison
UWARS	Universal Water Activated Release System
VHF	Very High Frequency
VMC	Visual Meteorological Conditions

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 27 June 2024, Lieutenant General Laura L. Lenderman, Pacific Air Forces (PACAF) Deputy Commander, appointed Colonel Daniel A. Roesch as president of this Accident Investigation Board (AIB) to investigate the subject mishap under the provisions of AFI 51-307, *Aerospace and Ground Accident Investigations* (Tab Y-3). A Captain Legal Advisor and Technical Sergeant Recorder were also appointed (Tab Y-3). On 1 July 2024, an F-16C Pilot was appointed as an additional member to the AIB (Tab Y-5). On 12 July 2024, two Maintenance Subject Matter Experts (SMEs) were detailed to assist with the AIB (Tab Y-7 and Y-9). The AIB Team conducted this investigation at Kunsan Air Base, Republic of Korea from 8 July 2024 through 2 August 2024.

b. Purpose

In accordance with (IAW) AFI 51-307, *Aerospace and Ground Accident Investigations,* this Accident Investigation Board conducted a legal investigation to inquire into all facts and circumstances surrounding this Air Force aerospace accident, prepare a publicly releasable report, and obtain and preserve all available evidence for use in litigation, claims, disciplinary action, and adverse administrative action.

2. ACCIDENT SUMMARY

On 31 January 2024, at approximately 08:41 a.m. Korea Standard Time (KST), an F-16C Block 40, Tail Number (T/N) 89-2013 crashed into the Yellow Sea 61 nautical miles (nm) northwest of Kunsan Air Base (Tabs Z-5 and Z-14). Both the Mishap Pilot (MP) and Mishap Aircraft (MA) were assigned to the 35th Fighter Squadron (35 FS), 8th Fighter Wing (8 FW), Kunsan Air Base, Republic of Korea (Tabs G-3 to G-12). The MP was number four of a 4-ship formation, taking off from Kunsan Air Base on a training mission in support of a local exercise (Tab AA-7). Approximately 33 minutes after take-off during aerial refueling with a KC-46, the MA experienced an engine stall. The MP was unable to maintain airspeed and altitude due to a lack of thrust (Tab V-1.8). After multiple attempts to restart the failed engine, the MP determined he would not be able to reach a nearby runway to land the aircraft (Tab V-1.10 to V-1.13). The MP successfully ejected from the MA, which subsequently crashed into the Yellow Sea approximately 30 nm west of Seosan Airfield, Republic of Korea (Tabs Z-5 and Z-14). The MA, valued at $25.8 million, was destroyed and lost at sea (Tab P-4).

3. BACKGROUND

a. Pacific Air Forces (PACAF)

To execute the National Defense Strategy and support the objectives of United States Indo-Pacific Command, PACAF must be agile, resilient, lethal, and revolutionary. As the Air Component, PACAF will integrate joint force air, space, and cyberspace capabilities to safeguard a free and open Indo-Pacific. PACAF's mission, in coordination with other components, allies, and partners, provides United States Indo-Pacific Command with continuous unrivaled air, space, and cyberspace capabilities to ensure regional stability and security. An agile, accurately postured undeterred, and lethal force capable of dedicating peerless effects from cooperation to conflict. PACAF's priorities are: Ready - Readiness and resilience of our force protects the homeland, deters aggression, and ensures PACAF's ability to fight and win if needed. It is critical to advance joint all domain capabilities to integrate with our allies and partners. Exercises, exchanges, and operations refine the readiness and resilience of the joint team, our allies, our partners, and ourselves so that we expedite collective responses to any challenges to the rules base international order. Innovative - The way we approach, analyze, and solve the challenges we encounter today, and those that we will encounter in the future requires an innovative and boundless attitude. We must challenge the status quo, operationalize resourcefulness, and adopt concepts and technologies that drive the readiness, resilience, and lethality of the force. Lethal - Our credibility directly correlates to our lethality. Synchronizing the kinetic and non-kinetic capabilities across all domains in coordination with the joint team and our allies and partners secures our ability to implement the National Defense Strategy today and into the future (Tab CC-3).

b. 7th Air Force (7 AF)

The men and women of 7 AF and Air Component Command are privileged to serve in Korea as a key part of a proud and powerful joint/combined team. The mission of 7 AF is exciting, challenging and clear... deter, protect and defend the Republic of Korea from attack from North Korea. 7 AF provides "ready to fight tonight" air power - precise, intense, and overwhelming - whenever and wherever needed (Tabs CC-5 to CC-6).

c. 8th Fighter Wing (8 FW)

Kunsan Air Base is located on the western side of the Republic of Korean peninsula bordered by the yellow sea. It is approximately 150 miles south of Seoul. The base is named after Gunsan City, a port town seven and a half miles east of the installation, with population of approximately 300,000 people. Kunsan Air Base is home to the 8 FW made up of two F-16 fighter squadrons, the 35 FS, and the 80 FS. Many interesting sites, to include temples and historical landmarks are within an easy driving distance (Tabs CC-7 to CC-8).

d. 35th Fighter Squadron (35 FS)

The "Pantons" provide combat-ready F-16 C/D fighter aircraft to conduct air operations throughout the Pacific theater as tasked by United States and coalition combatant commanders. The squadron performs air and space control and force application roles including counter air, strategic attack, interdiction, and close-air support missions. It employs a full range of the latest state-of-the-art precision ordnance, day or night, all weather (Tabs CC-9 to CC-10).

e. F-16C Fighting Falcon

The F-16 Fighting Falcon is a compact, multi-role fighter aircraft. It is highly maneuverable and has proven itself in air-to-air combat and air-to-surface attack. It provides a relatively low-cost, high-performance weapon system for the United States and allied nations. In an air combat role, the F-16's maneuverability and combat radius (distance it can fly to enter air combat, stay, fight and return) exceed that of all potential threat fighter aircraft. It can locate targets in all weather conditions and detect low flying aircraft in radar ground clutter. In an air-to-surface role, the F-16 can fly more than 500 miles (860 kilometers), deliver its weapons with superior accuracy, defend itself against enemy aircraft, and return to its starting point. An all-weather capability allows it to accurately deliver ordnance during non-visual bombing conditions (Tab CC-11).

4. SEQUENCE OF EVENTS

a. Mission

The Mishap Sortie (MS) was planned and briefed without mishap and had a valid flight authorization signed off by the designated personnel responsible for plans, operation, and scheduling (also known as "Top 3") (Tab K-3). The MS involved two formations which included four F-16C aircraft (16 total aircraft) conducting air interdiction training in the Western Complex, also known as tactical targeting of enemy targets (Tab AA-52).

b. Planning

Flight products (i.e., required paper documents for the MS to include planned route of flight, fuel considerations, and mission coordination with other flights flying in the same airspace) were provided to the MP on the day of the mishap (Tabs AA-5). Prior to the MS, all flight members attended a mass briefing conducted by the squadron's operations supervisor and the mission commander (Tabs AA-10 to A-55). The mass briefing adequately covered forecasted weather conditions, notice to airmen (NOTAM), and other routine items (Tabs AA-10 to A-55). The mishap flight lead, the pilot in charge of the formation, also conducted a coordination brief and a tactical brief for the MS (Tabs AA-10 to A-55). An Operational Risk Management (ORM) worksheet was also completed prior to the MS (Tab K-3).

c. Preflight

After the flight briefings, the MP involved in the MS was assigned an aircraft along with the entire MF once aircraft were ready for flight, also known as "crew ready." (Tabs V-1.2, V-1.4 and AA-3). Upon MP showing at the aircraft, maintenance was still being performed on the MA (Tab V-1.4 and V-1.5). The maintenance actions were completed IAW technical orders with appropriate oversight to ensure repairs were completed and panels were replaced (Tab V-1.5). The preflight inspection, start procedures, and ground operations were uneventful and IAW applicable checklists (Tab V-1.5). The MP noted no significant maintenance fault lists (MFLs), (i.e., errors displayed to the pilot in the form of specific system failure and fault number) and verified all instrumentation was working normally prior to takeoff (Tab V-1.5 and V-3.33).

d. Summary of Accident

The Mishap Flight (MF) taxied together with the MP following behind (Tabs V-1.5 and V-3.33). The flight departed together with MP getting airborne at approximately 08:00:00 a.m. KST (Tabs V-1.5 and Z-13). At 08:28:05 a.m. KST, MA was astern the KC-46 ready for refueling operations in R-88, the designated air refueling airspace (Tabs V-8.4 and Z-13). From 08:28:05 a.m. until 08:32:31 a.m., the MP made three contacts with the KC-46, onloading 1,700 pounds of total fuel (Tabs V-1.8, V-8.5 and Z-13). After the third contact at 08:32:31 a.m. the MP disconnected from the KC-46, and the MP indicated he felt and heard a "loud bang" from the MA (Tabs V-1.7 to V-1.9, and Z-13). According to the MP and other MF aircraft witness testimonies, the MA was seen to emit a flash from the nose and tail section of the MA, as well as a puff of black smoke from the engine exhaust (Tabs V-2.4, V-3.5, and V-4.4). The MP separated from the KC-46 with a subsequent ENGINE MACH FAIL light illuminated on MP's instrument panels (Tab V-1.10). Subsequently, the MA experienced a loss of engine power, which made the MP unable to maintain altitude and airspeed (Tab V-1.8). The MP stated at 08:32 a.m. "I felt a pretty loud bang here. What happened?" At 08:32 a.m., the MP stated he had an ENGINE MACH FAIL failure indication in the MA, which he followed up with 40 seconds later by stating "RPMs at 40% rolling back." During the interview with the MP, he noted FTIT "pegged" around 950. At the time of the mishap the MA was 64 nm from the closest airfield. The glide distance for the F-16C without an operational engine was only 30 nm. At 08:33:18 a.m., the MP indicated his Revolutions Per Minute (RPMs) were rolling back (Tabs V-1.11 to V1.12, and Z-13) and high fan turbine inlet temperature (FTIT) causing the MA to maintain airspeed and altitude. Viper 23 trailing one nautical mile behind MA directed MP to punch MPs tanks (Tab V-5.5). At approximately 08:33:29 a.m., the MP jettisoned his gas tanks from the MA (Tabs V-1.10 and Z-13). At 08:34:01 a.m., Viper 23 declared he will chase MA for mutual support during MP's emergency (Tabs V-5.4, V-5.7 and Z-13).

The mishap event affected multiple essential navigation systems, preventing the pilot from being able to accurately tell heading direction. Specifically, the MA Horizontal Situation Indicator (HSI) depicted invalid data with directional heading frozen at 060 degrees (Tab V-1.10). Also, the Heads-Up Display (HUD) (i.e., the display the pilot predominately uses for navigation, altitude, and attitude while flying) was inoperable. It showed incorrect symbology, making it impossible for the pilot to determine direction and altitude through the HUD (Tab V-1.10). The MP pilot received heading indications from chase aircraft Viper 23, and altitude and airspeed from MA standby instruments (Tab V-1.11).

At 08:34:13 a.m., the MP indicated the jet fuel starter (JFS) was running at an altitude of 16,000 feet Mean Sea Level (MSL) at 250 knots airspeed (Tabs V-1.12 and Z-13). At 08:35:34 a.m., the MP indicated loss of avionics and engine loss (Tab Z-5 and Z-14). After multiple engine restart attempts, at 08:37:14 a.m. at 7,000 feet MSL and 220 knots, the MP determined the need to eject since the MA did not have enough altitude or airspeed to reach any airport for landing (Tab Z-14).

At 08:38:38 a.m., the MP indicated he was at 4,000 feet (Tab Z-5). In a controlled descent at 215 knots, the MP elected to eject over the Yellow Sea at approximately 61 nm from Kunsan Air Base (Tabs V-1.14, Z-5, and Z-14). The MP ejected at 08:39:38 a.m. at approximately 2,000 feet Above Ground Level (AGL). The MP successfully ejected before the MA stalled over the Yellow Sea. (Tabs V-1.14, Z-5, and Z-14).

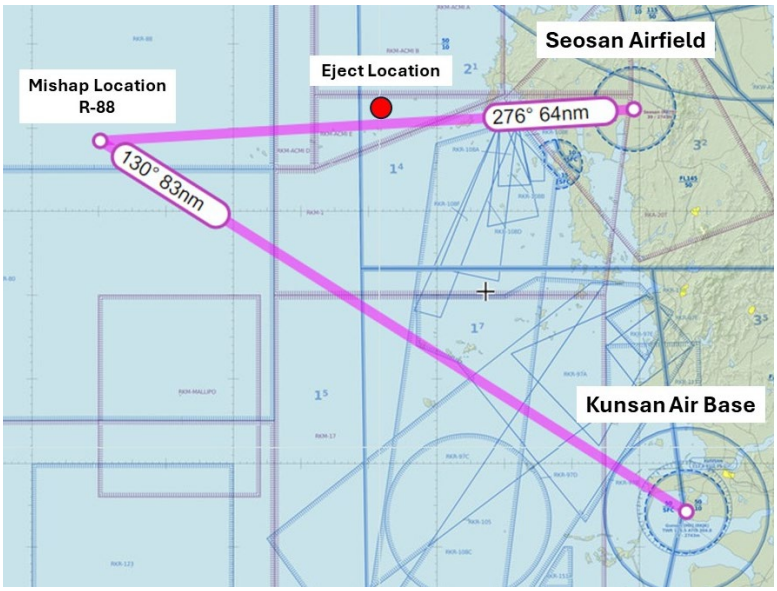

Figure 1: Approximate locations of Mishap and Eject Locations (Tab Z-15)

e. Impact

The last communicated distance from the MF to Kunsan Air Base was radial 310 at 83 nm (Tabs Z-5 and Z-14). This placed MA at 64 nm west from Seosan Airfield, the closest recoverable airfield. Total range for the F-16C at 24,000 feet MSL (air refueling altitude) without an operative engine is approximated 34 nm. This leaves a distance disparity of 30 nm between when the MP declared engine failure and potential recovery to Seosan Airfield (Tab Z-13). The MA crashed 30 nm west of Seosan Airfield (Tabs Z-3 and Z-13). The MP initiated a steep pitch up of the MA at 1,500 feet AGL to bleed off airspeed, climbed to ejection altitude of approximately 2,000 feet AGL and ejected from a stable aircraft (Tab V-1.14). The MA was never recovered from the Yellow Sea.

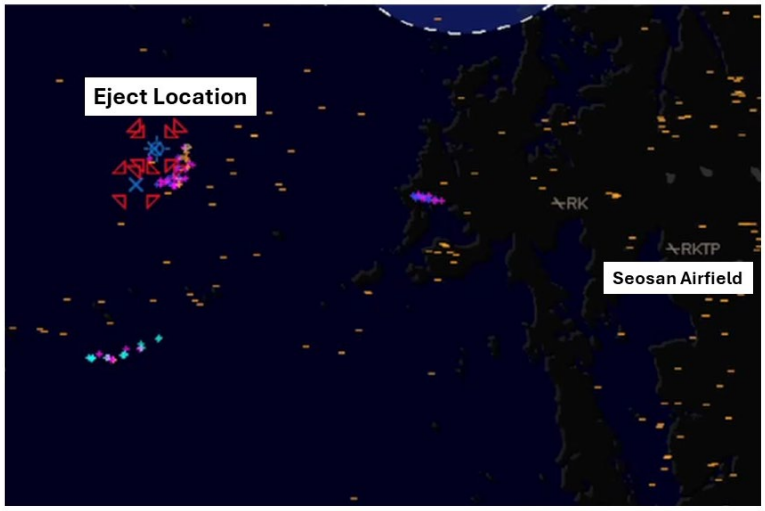

Figure 2: Screenshot of MP Eject Location (Tab Z-17)

f. Egress and Aircrew Flight Equipment

The MP commanded ejection by pulling the handle at 08:39:38 a.m. (Tabs V-1.14, V-5.8, and Z-5 and Z-14). The MA airspeed was approximately 250 knots at ejection altitude of 2,000 feet AGL (Tabs V-1.14 and V-5.8).

g. Search and Rescue (SAR)

The MA impacted the Yellow Sea at approximately 08:41 a.m. (Tabs Z-5 and Z-14). Multiple rescue attempts of the MP by a nearby container ship were unsuccessful (Tabs V-1.17 and V-1.18). A Republic of Korea Coast Guard H-60 helicopter was dispatched from Seosan Airfield and performed a water extraction of the MP at 09:17:11 hoist system (Tabs V-1.18, V-1.19, and Z-10). The helicopter flew to United States Army Garrison (USAG) Humphreys with the MP (Tab V-1.20). Upon landing at USAG Humphreys, the MP was transported to the garrison hospital, treated for hypothermia and remained overnight for medical observation (Tab V-1.20).

5. MAINTENANCE

a. Forms Documentation

The Air Force Technical Order (AFTO) 781 series of forms collectively document maintenance actions, inspections, servicing, configurations, aircraft status, and flight activities (Tabs D-7 to D-13). The AFTO 781 forms, in conjunction with the Integrated Maintenance Data System (IMDS), provide a comprehensive database used to track and record maintenance actions, flight activity, and to schedule future maintenance actions (Tabs D-7 to D-13).

A comprehensive review of the historical AFTO 781 forms (26 January 2024 and before) and IMDS (up to 30 January 2024) revealed no discrepancies, overdue inspections, or overdue Time Compliance Technical Orders (TCTOs) that would ground the MA from flight operations (Tab D-30. Active AFTO 781 forms (27 January 2024 and after) were unable to be reviewed due to being located on the MA at time of the mishap (Tab V-9.3). A thorough review of the AFTO 781 forms (26 January and before) and IMDS (up to 30 January) historical records for the

40 days preceding the mishap revealed no missed recurring maintenance (Tab D-3). Additionally, the MA was operating as designed, and there was no indication of mechanical, electrical, or structural failure prior to MA take-off (Tabs H-3 to H-19).

b. Inspections

The Pre-Flight (PR) inspection and Basic Post-Flight (BPO) inspections include visually examining the aircraft and operationally checking systems and components to ensure no serious defects or malfunctions existed (Tabs V-11.3 and V-16.3). Abbreviated PR and walk-around inspections were completed as required prior to launch IAW applicable AFTOs (Tabs V-10.6, V-11.3, and V-16.3).

The total airframe operating time of the MA at takeoff was 8,262.5 hours (Tab D-5). The last documented PR/BPO inspection occurred on 25 January 2024 at 1:00 a.m. KST with no discrepancies noted (Tabs D-66 to D67). A PR inspection was completed on 23 January 2024 at 1:00 a.m. KST with no discrepancies noted during the inspection (Tab D-66 to D-67). Prior to the mishap, the MA had no relevant reportable maintenance issues, and all inspections were satisfactorily completed (Tabs D-33 to D-64)

c. Maintenance Procedures

A review of the MA's historical AFTO 781 forms series and IMDS revealed all maintenance actions complied with approved standard maintenance procedures and AFTOs (Tabs D-7 to D-13). Active 781 series forms were lost at sea and unrecovered.

d. Maintenance Personnel and Supervision

The 35th Fighter Generation Squadron (35 FGS) personnel performed all required inspections, documentation, and servicing for the MA prior to flight. Personnel involved with the MA's preparation for flight had proper and adequate training, experience, expertise, and supervision to perform their assigned tasks.

e. Fuel, Hydraulic, Oil, and Oxygen Inspection Analyses

Due to the nature of impact, all fluid samples were lost at sea and not tested. Crash Survivable Memory Unit (CSMU) and Digital Flight Control Computer (DFLCC) data were not recovered from the MA due to being lost at sea. The investigation was unable to analyze the fuel system, hydraulic system, and engine operations of the MA at the time of the mishap. It is unknown if the MP's inputs prior to ejection and through time of impact were effective. A sample of hydraulic fluid recovered from the servicing equipment used prior to takeoff was analyzed with no discrepancies reported (Tabs D-83 and D-84). Fuel samples from the fuel storage tank, fuel truck, and KC-46 that serviced the MA were tested with no discrepancies reported (Tabs D-71 to D-82 and D-84 to D-90). An oil sample form the servicing cart was analyzed with no discrepancies reported (Tabs D-69 to D-70).

f. Unscheduled Maintenance

Unscheduled maintenance is any maintenance action taken that is not the result of a scheduled inspection (Tabs D-22 to D-32). This is normally the result of a pilot-reported discrepancy (PRD) during flight operations, or a condition discovered by ground maintenance personnel (Tabs D-22 to D-32). There was one unscheduled maintenance action performed prior to the mishap (Tabs D-15 and D-17 to D-20).

On 30 January 2024, a fault was discovered in the standby generator. Further analysis revealed a faulty right-hand nacelle ejector valve (Tabs V-9.3, and V-11.4 to V-11.5). The valve was replaced, and an engine run was performed prior to takeoff without any aircraft faults (Tabs V-9.3, and V-11.4 to V-11.5). Personnel performed maintenance IAW applicable AFTOs, and MA functioned without MFLs from start, taxi, takeoff, flight to air refueling airspace and three contacts with the KC-46.

According to the Air Force Life Cycle Management Center (AFLCMC) Propulsion Directorate Data Review for Engine #545499 on MA, there were no early warning signs or significant areas of concern identified (Tabs J-4 to J-19). The last engine fault on MA was for low oil on 17 January 2024 without any other issues noted in the engine history database (Tab J-18).

There is no evidence to indicate that any of the unscheduled maintenance items were relevant to the mishap.

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

A limited number of debris was retrieved from the Yellow Sea. Most of the MA was never recovered. Pieces retrieved from the MA ranged in size from a few inches to four feet and only represented parts of the MA without retrievable historical flight data (i.e. leading edge). Debris recovered did not assist in the AIB findings and were irrelevant to the mishap.

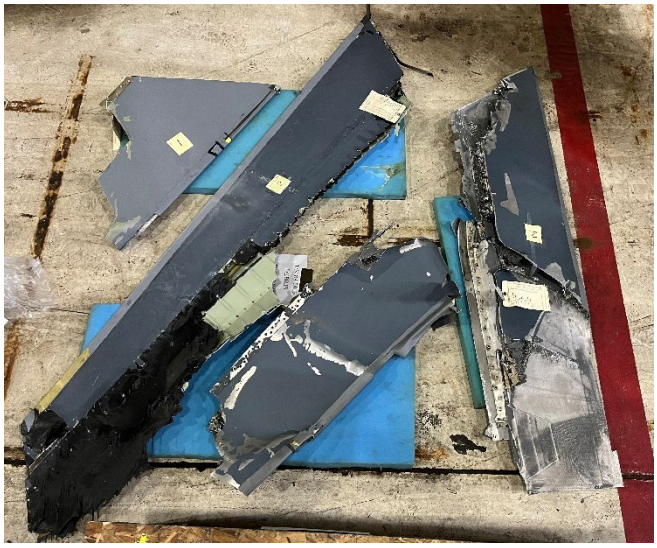

Figure 3: MA debris collected from Yellow Sea (Tab Z-19)

b. Evaluation and Analysis

The Crash Survival Flight Data Recorder (CSFDR) system consists of two units. The first is the CSMU, which contains non-volatile memory, and the second component of the system is the Signal Activation Unit (SAU), which contains engine data and service life monitoring. Both components were never recovered and lost at sea. According to MP, there were no indications of degraded or inoperable flight control surfaces (Tabs V-1.1-V1.21). The MP was able to fly the MA engine to a safe ejection altitude out without issue (Tab V-1.15). The MA was equipped with an ejection seat which was actuated by the pilot pulling the ejection handle located on the forward part of the seat (Tab V-1.15). Once this occurred, the canopy separated from the aircraft and the ejection seat left the aircraft milliseconds later (Tab V-1.15). The escape system functioned as designed according to the MP (Tab V-1.15). Following the loud bang, the MP states indications on his HUD were lost and returned without any usable symbology (Tab V-1.10). The MA did not display usable HSI since it was frozen at heading 060 (Tab 1.11). The standby compass was unreadable due to the MA flying into the sun (Tab V-1.11). The MP utilized standby instruments to maintain airspeed and altitude and chase aircraft to provide aircraft heading (Tab V-1.13).

7. WEATHER

a. Forecasted Weather

On 31 January 2024, the forecast for Kunsan Air Base had winds out of the east at 6 knots, 8,000 meters of visibility with haze, clouds overcast at 3,500 feet AGL (Tabs F-3, F-9 and F-75). The forecast hazards included rain showers over the airfield, ceilings at 1,000 feet AGL, and ceilings broken at 2,800 feet AGL (Tabs F-3, F-9 and F-75).

b. Observed Weather

A Meteorological Aerodrome Report (METAR) was generated at 0055 ZULU (0755L) reporting the winds variable, 5 statute miles visibility with haze, clouds broken at 3,600 feet AGL, and clouds overcast at 9,000 feet AGL (Tabs F-3 and F-9). The MF reported the ceiling between 8,000 feet AGL and 10,000 feet AGL (Tabs V-1.13, and V-5.6).

c. Space Environment

Not Applicable.

d. Operations

The MP was operating within the prescribed weather requirements for Category I, Pilot Weather Category (PWC) minimums (Tab G-3).

8. CREW QUALIFICATIONS

a. Mishap Pilot

The MP was non-combat mission ready (NCMR) for aerial refueling, air combat training (ACT), and night sortie (Tabs G-5 and G-8). The MP was current in all other flying mission categories (Tabs G-5 to G-12). With training in the F-16C dating back to May 2008 (Tab G-21), the MP's previous mission qualification checkride with the 35 FS was on 15 September 2023 (Tab G-23). No discrepancies or downgrades were noted during the MP evaluation (Tab G-24).

From September 2023 until January 2024, the MP was qualified to fly the F-16C as a wingman (Tab T-35). The MP received engine out simulations during simulator emergency procedures training (SEPT), and as part of yearly instrument proficiency training and certification (Tabs G-28 to G-29). The MP was weather category I qualified, and therefore, qualified to fly instrument approaches with weather better than or equal to approach minimums (Tab T-35). MP's total time was 2,086.5 total flight hours with 1,352.4 hours in the F-16C (Tabs T-28 to T-29 and T-31 to T-32).

Recent flight time is as follows (Tabs T-27 to T-28):

	MP Hours	Sorties
Last 30 Days	4.3	4
Last 60 Days	23.3	17
Last 90 Days	33.6	25

The MP's most recent flight was on 24 January 2024 where the MP executed basic fighter maneuvers (BFM) and navigated to and from the Kunsan Air Base (Tab G-9). The most recent simulator flight prior to the mishap was on 26 January 2024 where MP executed a training air interdiction mission (Tab G-7).

b. Other USAF Pilots

Not applicable.

9. MEDICAL

a. MP Qualifications

At the time of the mishap, the MP was medically qualified for flying duty (Tab T-33).

b. MP Health Prior to Mishap

The MP's most recent periodic health assessment (PHA) was on 01 January 2024 (Tab T-34). The MP had no disqualifying conditions or pre-existing medical conditions affecting the outcome of the mishap. When interviewed, the MP reported no recent health issues that affected his reactions during the mishap (Tab V-1.3).

c. Pathology

Not applicable.

d. Toxicology

Toxicology samples were obtained and submitted to the Armed Forces Medical Examiner System, Division of Forensic Toxicology for analysis (Tab O-3). The MP and all mishap aircrew and maintenance members were tested, and the toxicology screens showed nothing of relevance (Tabs O-3 to O-30).

e. Lifestyle

Based upon the interview with the MP, as well as a review of the past year's medical records, there is no evidence to suggest lifestyle factors contributed to the mishap in any way (Tab V-1.3).

f. Crew Rest and Crew Duty Time

Crew rest and crew duty time requirements are detailed in Air Force Manual (AFMAN) 11-202V3, *Flight Operations*, dated 10 January 2022 (Tab BB-3). Crew rest is compulsory for aircrew members prior to performing any duties involving aircraft operations. Minimum crew rest consists of 12 non-duty hours of rest before the flight duty period (FDP) begins (Tab BB-5). Crew rest is defined as free time and includes time for meals, transportation, and rest (Tab BB-4). Crew rest time must include an opportunity for at least 8 hours of uninterrupted sleep (Tab BB-4). The MP had 12 hours of crew rest prior to the mishap FDP, and the opportunity for at least 8 hours of uninterrupted sleep, IAW AFMAN requirements (Tab V-1.3).

MP met crew rest and crew sleep requirements prior to the mishap (Tab V-1.3). MP stated fatigue did not affect reaction time or decision-making abilities (Tab V-1.3). MP obtained 8 hours of sleep prior to the mishap, had slept well, and felt rested the day of the mishap (Tab V-1.3).

g. Maintenance Personnel Rest Periods and Health Review

Medical Records for the prior year, 72-hour and 7-day histories, and toxicological analysis were reviewed. Nothing was identified that could have led, or contributed to, the mishap (Tab O-3).

10. OPERATIONS AND SUPERVISION

a. Operations

The operations tempo during a readiness exercise attempts to replicate a wartime situation with combat focused mission planning, briefings, and flight execution (Tabs AA-10 to AA-55). As in wartime, pilots fly longer sorties and multiple times a day. The day of the mishap was the third flying day of the exercise, and the MF was the first flight of the day (Tabs AA-5 and AA-7). The MP previously flew on the 18th, 19th, 23rd, 26th of January (Tab G-3). The MP attended a mass briefing prior to the first take-off of the day and received a coordination briefing from the Mission Commander (MC) for the first go of the day (Tabs AA-5 and AA-7). MF was briefed IAW Air Force regulation guidance (Tabs AA-10 to AA-55).

b. Supervision

The ORM process in the squadron identified the risk for the mission to be deemed low risk or in the "green" (Tab K-3). The Top 3 approved the sortie based on their risk assessment with no other supervisory approval required (Tab K-3). The ORM assessment worksheet identified hazards as bird-watch moderate or alert, air refueling, hot pit refueling, and complex mission due to multiple aircraft taking part in the exercise (K-3). The mission commander addressed hazard mitigation during the mission brief (Tabs AA-19, AA-21, and K-3). The MP indicated light fatigue and light distractors (Tab K-3).

11. HUMAN FACTORS ANALYSIS

The AIB considered all human factors as prescribed in the Department of Defense Human Factors Analysis and Classification System 7.0 (Tab BB-7). The mishap did not identify any human factors as casual or contributory factors.

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

(1) AFI 51-307, Aerospace and Ground Accident Investigations, dated 18 March 2019
(2) DAFI 21-101, Aircraft and Equipment Maintenance Management, dated 8 November 2022
(3) DAFI 91-204, Safety Investigations and Reports, dated 10 March 2021
(4) AFMAN 11-2F-16 V3, F-16--Operations Procedures, dated 4 February 2020
(5) AFMAN 11-202 V3, Flight Operations, dated 10 January 2022
(6) NATO Standard ATP-3.3.4.5. Air-to-Air (Aerial) Refuelling Equipment: Boom-Receptacle System and Interface Requirements, dated June 2022
(7) AFMAN 11-2KC-46 V3, KC-46 Operations Procedures, dated 2 May 2024
(8) AFI 11-202 V1, Aircrew Training, dated 10 June 2019
(9) Department of Defense Human Factors Analysis and Classification System 7.0 (DoD HFACS 7.0), available at: https://www.safety.af.mil/Divisions/Human-FactorsDivision/HF ACS
(10) Federal Aviation Administration, Pilot's Handbook of Aeronautical Knowledge, FAA, H-8083-25B, 2016, available at: https://www.faa.gov/regulations_policies/handbooks_ manuals/aviation/phak/

NOTICE: All directives and publications listed above are digitally available on the Department of the Air Force publishing website at: https://www.e-publishing.af.mil.

b. Other Relevant Directives Not Publicly Available

(1) 1F-16CM-1, Flight Manual, dated 1 August 2022, Interim Supplement 10 January 2023
(2) 1F-16CM-34-1-1, Avionics and Nonnuclear Weapons Delivery Flight Manual, dated 1 September 2022, Interim Supplement 1 February 2023

5 March 2025

DANIEL A. ROESCH, Colonel, USAF
President, Accident Investigation Board

STATEMENT OF OPINION

F-16C, T/N 89-2013
KUNSAN AIR BASE, REPUBLIC OF KOREA
31 JANUARY 2024

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

1. OPINION SUMMARY

On 31 January 2024, the Mission Pilot (MP), flying an F-16C, Tail Number (T/N) 89-2013, assigned to the 35 Fight Squadron (FS), "the Pantons," 8 Fighter Wing (FW), Kunsan Air Base, Republic of Korea, conducted a routine training sortie as part of the wing's local readiness exercise BEVERLY MORNING. Approximately 40 minutes after an 08:00 a.m. Korea Standard Time (KST) takeoff, the MP ejected from the Mishap Aircraft (MA) with minor injuries. The MA was destroyed upon impact in the Yellow Sea at approximately 08:41 a.m. KST, 61 nautical miles (nm) northwest of Kunsan Air Base. The mishap resulted in the loss of a $25,764,648.00 United States government asset.

The Mishap Flight (MF) was planned and authorized as a training mission within local training airspace. The MP was flying as the fourth aircraft in a 4-ship formation. During the air refueling portion of the mission, MP was fourth to refuel from a KC-46 aircraft. The prevailing weather was clear with no clouds in the refueling airspace. The MP accomplished three successful contacts with the KC-46, onboarding approximately 1,700 pounds of fuel. On the third contact attempt with the KC-46 aircraft, MP heard a loud bang inside the MA. The MP separated from the KC-46 aircraft to monitor the condition of the MA. Coincident with separating from the MA, MP noticed low engine revolutions per minute (RPMs), and high fan turbine inlet temperature (FTIT) causing the MA to maintain airspeed and altitude. At this juncture, the MA was 64 nm to the closest airfield for landing. The MA did not have enough glide distance to land at the closest airfield. Unable to maintain airspeed, the MP descended the MA to maintain 250 knots airspeed. The MP attempted multiple restarts of the engine without success. The MP continued to descend to 1,500 feet Above Ground Level (AGL) to gain airspeed to perform a final climb to 2,000 feet AGL. Once the MA reached approximately 2,000 feet AGL, the MA successfully ejected 30 nm west of Seosan Airfield, Republic of Korea.

The MP was an F-16C pilot with 2,086.5 total flying hours and 1,352.4 flying hours in the F-16C. The MP was noncurrent for aerial refueling and flew as the wingman of an assigned and current instructor pilot. The MP was current and qualified for all other mission events to be flown. This was the MP's first flight in six days and the MP was the sole pilot of the MA.

The Accident Investigation Board President found, by a preponderance of the evidence, the cause of the mishap was an engine stall due to hardware failure. The initial engine stall was unrecoverable by the MP after several attempts to restart the engine from 24,000 feet Mean Sea Level (MSL) to approximately 8,000 feet MSL. MA displayed unreliable and inaccurate data with multiple failure indications. The MP ejected over water from the MA. The MA crashed approximately 30 nm west of Seosan Airfield into the Yellow Sea. The MA was never recovered.

I developed my opinion by carefully considering the standard of proof for the preponderance of evidence and requirements for causes and substantially contributing factors. The Board F-16C Pilot and I analyzed available flight data, witness testimonies, engineering analysis, Air Force Technical Orders, and other information provided by technical and subject matter experts (SMEs).

2. CAUSE

Engine Stall Caused by Hardware Failure

No flight data was used from the crash survivable memory unit (CSMU) or any other component from the MA due to being lost at sea and never recovered. All conclusions were drawn from witness statements and audio recordings from the MP, other MF aircraft, and ground control agencies. Due to the MA not being recovered, I could not definitively determine what caused the engine stall by hardware failure. While the cause of the engine stall is inconclusive, the MP's witness statement indicates a loss of engine power to maintain attitude and airspeed. The MP stated at 08:32 a.m. "I felt a pretty loud bang here. What happened?" At 08:32 a.m., the MP stated he had an ENGINE MACH FAIL failure indication in the MA, which he followed up with 40 seconds later by stating "RPMs at 40% rolling back." During the interview with the MP, he noted FTIT "pegged" around 950. At 08:34 a.m., the MP stated, "I got my JFS started." At 08:35 a.m., the MP radioed, "I am at 16,000 feet, 250 knots." At 08:36 a.m., the MP relayed, "engine lost." At 08:37 a.m., the MP called out, "7,000 feet." At 08:38 a.m. the MP indicates via radio call, MA is at 4,000 feet AGL and descending. Finally, at 08:40 a.m. MP ejects from MA.

3. SUBSTANTIALLY CONTRIBUTING FACTOR

I find, by a preponderance of the evidence, the engine stall and distance to the nearest airfield to land substantially contributed to the mishap.

Based on data provided by other aircraft in the area, the air refueling airspace was over water and time of mishap placed the MA 64 nm distance from the closest airfield. Without an operational engine, the MP was unable to recover to an airfield due to limited glide range of the F-16C.

4. CONCLUSION

I find by a preponderance of evidence that the cause of the mishap was an engine stall after the MP heard an audible bang inside the MA followed by indications of high FTIT and low RPM readings on the MP's instruments. Due to distance from the nearest airport the MP was unable to glide and execute a successful landing without an engine. The MP attempted multiple air restarts of the engine without success, leading to a successful ejection from the MA. The MA crashed into the Yellow Sea and was never recovered.

5 March 2025

DANIEL A. ROESCH, Colonel, USAF
President, Accident Investigation Board

United States Air Force Accident Investigation Board Report

Class A, Kunsan Air Base

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