ACTION OF THE CONVENING AUTHORITY

The report of the accident investigation board investigating the 5 September 2023 mishap at Cannon Air Force Base, New Mexico, involving MQ-9, T/N 13-4244, assigned to the 27th Special Operations Wing, Cannon Air Force Base, NM, complies with applicable regulatory and statutory guidance, and on that basis is approved.

REBECCA J. SONKISS
Major General, USAF
Deputy Commander

1 MAR 24
Date

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

MQ-9, T/N 13-4244
CANNON AFB, NM
5 SEPTEMBER 2023

On 5 September 2023 an unmanned MQ-9, T/N 13-4244, departed the prepared landing surface at Cannon Air Force Base (AFB), New Mexico (NM). The mishap aircraft (MA) was assigned to and operated by the 12 Special Operations Squadron Launch and Recovery Element (LRE) located at Cannon AFB, NM. Upon departure from the runway, the MA nose landing gear (NLG) collapsed, and the Multi-Spectral Targeting System Turret Unit (MTS-TU) was destroyed. The mishap resulted in no damage to civilian property. The mishap resulted in no injuries or fatalities. The damage to government property was valued at $2,939,388.00.

The MA was operated by a mishap crew (MC) comprised of mishap pilot (MP) 1, MP 2, and the mishap sensor operator (MSO). Flying a routine training mission, MP 1 controlled the MA for the first hour of the sortie. MP 1 accomplished six approaches before handing off controls to MP 2. MP 1 remained in the mishap Containerized Dual Control Segment (MCDCS) with the MC to observe MP 2. Within two minutes of gaining control of the MA, MP 2 attempted approach 7, intending to perform a "touch and go" landing with significant crosswinds. On approach 7, the MA touched down approximately 35 feet left of runway centerline, and the MA continued a left-side trajectory towards the asphalt shoulder of the runway. The MA struck three runway-shoulder illumination lights before lifting off. Due to the collision with the runway-shoulder illumination lights, the MA's nose wheel steering failed, and the right main landing gear (MLG) hydraulic brake line was severed. The MC began their troubleshooting process, citing a NLG malfunction. Approximately three hours after the impact to the runway-shoulder illumination lights, MP 2 attempted a controlled landing. When MP 2 touched down, MP 2 was unable to control the MA's trajectory due to inoperable nosewheel steering and no ability to utilize differential braking. The MA ultimately travelled off the prepared runway surface into terrain. The MA's nose landing gear collapsed, causing the nose of the aircraft to strike the ground. The MA's MTS-TU detached from the MA and was destroyed.

The Accident Investigation Board (AIB) President found, by a preponderance of the evidence, the cause of the mishap was pilot error. The AIB President further found, by a preponderance of the evidence the cause of the mishap was poor Crew Resource Management (CRM). The AIB President further found, by a preponderance of the evidence, the cause of the mishap was environmental conditions. Further, the AIB President found, by a preponderance of the evidence, that each of the following factors substantially contributed to the mishap: (1) Operational Risk Management (ORM), (2) Unwritten Practices, and (3) Organizational Culture.

SUMMARY OF FACTS AND STATEMENT OF OPINION

MQ-9, T/N 13-4244
CANNON AFB, NM
5 SEPTEMBER 2023

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

27 SOSS	27th Special Operations Support Squadron
27 SOW	27th Special Operations Wing
12 AMU	12th Aircraft Maintenance Unit
12 SOS	12 Special Operations Squadron
A1C	Airman First Class
AFB	Air Force Base
AFE	Aircrew Flight Equipment
AFI	Air Force Instruction
AIB	Accident Investigation Board
AFMAN	Air Force Manual
ATLC	Auto-takeoff and Land Capabilities
AV	Air Vehicle
Capt	Captain
C	Celsius
CMR	Combat Mission Readiness
Col	Colonel
CSE	Chief of Standards and Evaluation
DEOCS	Defense Equal Opportunity Climate Surveys
DoD	Department of Defense
ECS	Environmental Control System
FPM	Flight Path Marker
ft	Feet
FTL	Flight Training Level
g	Gravitational Force
HQ	Headquarters
HUD	Heads-Up Display
IAW	In Accordance With
IG	Inspector General
IP	Instructor Pilot
K	Thousand
KCAS	Knots Calibrated Airspeed
KTAS	Knots True Airspeed
kts	Knots
L	Local Time
lbs	Pounds
LOS	Line of Sight
LRE	Launch and Recovery Element
LR	Launch and Recovery
Lt Col	Lieutenant Colonel
MA	Mishap Aircraft
Maj	Major
MAJCOM	Major Command
MAM	Mishap Airfield Manager
MATC	Mishap Air Traffic Controller
MC	Mishap Crew
MCDCS	Mishap Containerized Dual Control Segment
MCE	Mission Control Element
MDO	Mishap Director of Operations
MLG	Main Landing Gear
MOS	Mishap Operations Supervisor
MP	Mishap Pilot
MSC	Mishap Squadron Commander
MSgt	Master Sergeant
MSO	Mishap Sensor Operator
MTS-TU	Multi-Spectral Targeting System Turret Unit
ND	Nose Down
NLG	Nosewheel Landing Gear
NM	New Mexico
NOTAMs	Notices to Airmen
ORM	Operational Risk Management
PIC	Pilot in Charge
PR	Pre-Flight
QA	Quality Assurance
RPA	Remotely Piloted Aircraft
RWD	Right Wing Down
SrA	Senior Airman
TOLD	Take-Off Landing Data
TCTO	Time Compliance Technical Order
T/N	Tail Number
TO	Technical Order
UEI	Unit Effectiveness Inspection
USAF	United States Air Force
VVI	Vertical Velocity Indication
Z	Zulu

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 2 October 2023, the Deputy Commander, Air Force Special Operations Command (AFSOC), appointed Lieutenant Colonel (Lt Col) Alberto Y. Gilroy as the Aircraft Investigation Board President to investigate a mishap that occurred on 5 September 2023 involving an MQ-9 aircraft at Cannon Air Force Base, New Mexico (Tab Y-2). The AIB was conducted in accordance with Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, Chapter 4, from 9 November 2023 to 15 December 2023 (Tab Q-2). Additional board members included a Captain (Capt) MQ-9 Pilot Member, Captain (Capt) Legal Advisor, Master Sergeant (MSgt) Maintenance Member, and Senior Airman (SrA) Recorder (Tab Y-2).

b. Purpose

In accordance with AFI 51-307, *Aerospace and Ground Accident Investigations*, this Accident Investigation Board conducted a legal investigation to inquire into all the 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 5 September 2023 an unmanned MQ-9, T/N 13-4244, departed the prepared landing surface at Cannon Air Force Base (AFB), New Mexico (NM) (Tab V-2.18). The mishap aircraft (MA) was assigned to and operated from the 12 Special Operations Squadron (12 SOS) Launch and Recovery Element (LRE) located at Cannon AFB, NM (Tab K-5). Upon departure from the runway, the MA nosewheel landing gear (NLG) collapsed, and the Multi-Spectral Targeting System Turret Unit (MTS-TU) was destroyed (Tabs J-6, J-25, Z-2, and Z-4 to Z-7). The mishap resulted in no damage to civilian property (Tab P-2). The mishap resulted in no injuries or fatalities (Tab P-2). The damage to government property was valued at $2,939,388.00 (Tab P-3).

The MA was operated by a mishap crew (MC) comprised of mishap pilot (MP) 1, MP 2, and the mishap sensor operator (MSO) (Tab K-5). Flying a routine training mission, MP 1 controlled the MA for the first hour of the sortie (Tabs K-5 and R-12). MP 2 accomplished six approaches before handing off controls to MP 2 (Tab R-19 and R-63). MP 1 remained in the mishap Containerized Dual Control Segment (MCDCS) with the MC to observe MP 2 (Tab V-1.16, V-5.4, V-5.14, V-8.8). Within two minutes of gaining control of the MA, MP 2 attempted approach 7, intending to perform a "touch and go" landing with significant crosswinds (Tabs N-7, J-5, R-3, R-36, and V-2.17 to V-2.18). On final approach, the MA touched down approximately 35 feet left of runway centerline, and the MA continued a trajectory towards the asphalt shoulder of the runway (J-5, R-57, V-1.18, V-1.19, V-2.18, V-3.7, V-4.20, and V-4.23). The MA struck three runway-shoulder illumination lights before lifting off (Tabs J-5, V-11.1,

and V-12.1). Due to the collision with the illumination lights, the MA's nose wheel steering failed, and the right main landing gear (MLG) hydraulic brake line was severed (Tab V-4.11, V-4.21, V-5.7, and V-8.18). The MC began their troubleshooting process, citing an NLG malfunction (Tab V-1.27 and V-3.18). Approximately three hours after the impact to the runway-shoulder illumination lights, MP 2 attempted a controlled landing (Tab V-2.26, V-5.12, V-5.14, and V-7.13). When MP 2 touched down, MP 2 was unable to control the MA's trajectory due to inoperable nosewheel steering and no ability to utilize differential braking (Tab J-5, V-2.22, V-3.15, and V-9.18). The MA ultimately travelled off the prepared runway surface into terrain (Tabs J-5, V-2.22, V-3.15, and V-9.18). The MA's nose landing gear collapsed, causing the nose of the aircraft to strike the ground (Tabs J-6, V-9.18, and AA-5). The MA's MTS-TU detached from the MA and was destroyed (Tabs J-6, J-25, V-9.18 to V-9.19, and V-10.2).

3. BACKGROUND

a. Air Force Special Operations Command

AFSOC's primary mission is to provide the nation's specialized airpower, capable across the spectrum of conflict… Any place, anytime, anywhere (Tab CC-2). The command's forces are organized under five active-duty wings, including the 27th Special Operations Wing (Tab CC-3).

b. 27th Special Operations Wing

The 27th Special Operations Wing (27 SOW) develops, sustains, and employs professional Air Commandos who execute specialized airpower and combat support to achieve the nation's security objectives (Tab CC-4). 27 SOW is located at Cannon Air Force Base in eastern New Mexico, eight miles west of Clovis, New Mexico (Tab CC-4). 27 SOW is comprised of 26 squadrons, including the 12th Special Operations Squadron (12 SOS) (Tab CC-15).

c. 12th Special Operations Squadron

12 SOS launches and recovers the MQ-9 Reaper Aircraft, enabling operational employment by conventional and special opererations Mission Control Element (MCE) squadrons (Tab CC-10). To avoid the inherent delay in transmitting commands through satellite communications to remotely piloted aircrafts (RPA) from distant stations, the squadron deploys to locations where it can control the aircraft during takeoff and landing using line of sight (LOS) communications (Tab CC-10). The 12 SOS maintains unique equipment and training enabling a rapid deployment capability (Tab CC-10).

d. MQ-9 Reaper

The MQ-9 Reaper is a medium-to-high altitude, long endurance unmanned aircraft system (Tab CC-13). The Reaper's primary missions are close air support, air interdiction, and intelligence, surveillance, and reconnaissance, or intelligence, surveillance, target acquisition, and reconnaissance (ISR) (Tab CC-13). It acts as a Joint Forces Air Component Commander-owned theater asset for reconnaissance, surveillance and target acquisition in support of the Joint Forces Commander (Tab CC-13). The basic crew of an MQ-9 consists of a rated pilot to control the aircraft and command the mission, and an enlisted aircrew member to operate sensors and weapons, plus a mission coordinator when required (Tab CC-13). The MQ-9 baseline system carries the Multi-spectral Targeting System, or MTS, which has a robust suite of sensors for targeting (Tab CC-13).

4. SEQUENCE OF EVENTS

a. Mission

On 5 September 2023, an LRE assigned to and operated at 12 SOS, Cannon AFB, NM, was scheduled for a 13GA Continuation Training mission (Tab K-4). The MC was tasked by the mishap squadron commander (MSC) with launching an AFSOC MQ-9A, T/N 13-4244 (Tab K-4). In addition to the launch, the MC intended to accomplish "simulated flame out" (SFO) approaches and "touch-and-go" landings (Tab G-9, G-60, and G-141). The MC consisted of MP 1, MP 2, and the MSO (Tab K-4). MP 1 controlled the aircraft for the first hour of the sortie and accomplished six approaches (Tab R-19 and R-63). After MP 1's first successful touch and go, the MC completed a crew swap where MP 1 handed control of the MA to MP 2 (Tabs R-3, V-1.17, V-2.17, V-3.5, and V-5.4). The MSO remained the same (Tab V-5.15, V-8.8). At the time of approach 7 and the mishap final landing, MP 2 was the pilot in command (PIC) while MP 1 observed (Tabs R-3, V-1.16, V-5.4, V-5.14, V-8.8).

b. Planning

Initially, only MP 1 and the MSO were scheduled to take part in the training sortie, as MP 2 was scheduled for standby crew duty (Tabs V-2.9, V-7.9, V-9.5, V-9.33, and AA-61). Prior to the crew brief, MP 2 sought approval from the mishap Director of Operations (MDO) to add himself to the flight authorization to accomplish currencies (Tabs K-4, V-6.4, and V-7.3). The MC, now including MP 2, conducted a crew briefing at 0530L to satisfy LRE mission planning requirements (Tabs R-36 and V-1.9). The MC briefed for a routine training sortie utilizing the 12 SOS line-up-card (Tab V-1.8, and V-2.5). MP 1, as the PIC, briefed the MC on weather, airfield status, special interest items, and Notice to Airmen (NOTAMs) (Tab V-1.8). MP 1 briefed he intended to accomplish specific currencies, which included launch, SFO approaches, "touch-and-go" landings, and go-around procedures as required (Tab V-1.5, V-2.5). MP 2 intended to accomplish a touch and go landing event but did not lead any part of the mission brief (Tab V-3.3). Neither squadron leadership nor squadron supervisory personnel were present at the crew briefing (Tab R-36). The crew brief took approximately 30 minutes to complete (Tab V-1.8 and V-2.6). After the crew brief, the MC met with the mishap Operations Supervisor

(MOS) and the MDO to conduct final pre-flight stepping procedures (Tab V-1.10 to V-1.11 and V-9.11). The MC highlighted several Operational Risk Management (ORM) concerns on their ORM sheet, including MP 1's chronic fatigue, circadian rhythm shifts, and projected winds between 15 and 30 knots (Tabs K-8 and V-4.16). The MDO conversed with the MC regarding the risks noted in their ORM sheet, which included chronic fatigue for MP 1 (Tab V-1.10, V-9.5). The MDO was satisfied with the MC's mitigation and allowed the MC to proceed with their flight (Tab V-9.5).

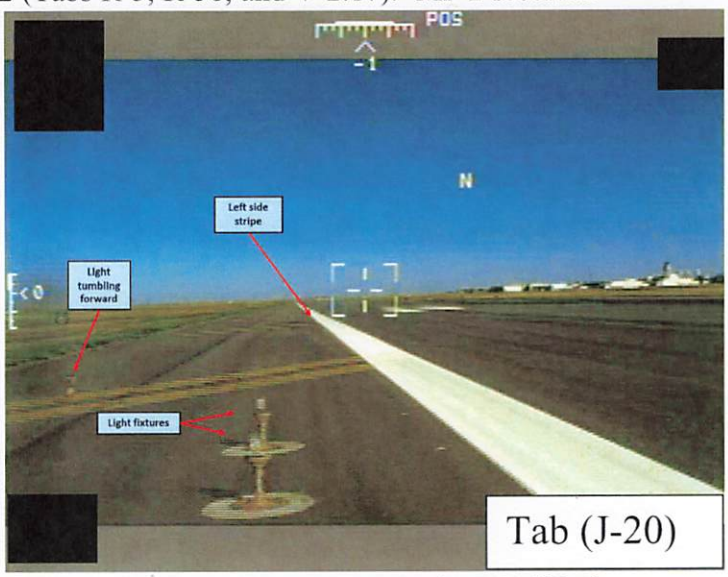
c. Preflight

The MC accomplished all applicable checklist steps and procedures to prepare the MCDCS and the MA for flight (Tab V-1.11, V-1.15, and V-3.5). No evidence indicates the preflight procedures were a factor in this mishap (Tabs J-4 and V-1.15).

d. Summary of Accident

MP 1 taxied the MA for takeoff from runway 31 at Cannon AFB, NM (Tabs R-12, V-2.13, and V-10.2). At 0815L, MP 1 launched the MA (Tab J-4, R-12, V-1.11, and V-3.5, V-11.1). The MC's training sortie consisted of eight total approaches between MP 1 and MP 2 (Tabs J-8 and R-56). In addition to the launch, MP 1 completed six approaches while in control of the MA: three SFO's, two go-arounds, and one touch-and-go landing (Tabs R-46, J-4, and V-1.17). Prior to attempting approach 6, the successful touch-and-go landing, MP 1 contacted the Air Traffic Control Tower (ATC) to receive clearance and check current winds (Tab N-6). During approach 6, the crosswinds were approximately 17 knots (Tab N-6). MP 1 completed the touch-and-go, landing an estimated 11 feet left of centerline (Tabs V-1.17, V-3.5, and Z-13). MP 1 then continued in the pattern, positioning the MA on the downwind leg (Tab R-40, V-1.17, and V-2.17). The downwind leg is where the aircraft has completed a full turn and is facing the opposite direction of the landing runway (Tab BB-720). At this point, the MC completed the Before Landing Checklist (Tabs R-19, V-1.17, V-1.18, V-2.7, and V-2.17). They confirmed the nose wheel steering was visually functional with no other aircraft anomalies (Tabs J-4 and V-1.18). Due to the nature of the CDCS, no communications between the MC were recorded (Tab V-4.31).

MP 1 and MP 2 completed a crew swap at 0901L (Tabs R-3, R-36, and V-2.17). MP 2 received clearance from the ATC for a touch-and-go landing with crosswinds at 16.45 knots (Tabs N-7 and V-2.18). MP 2 then initiated approach 7 (Tab V-2.18). Just prior to touchdown, MP 2 released crosswind controls (Tabs J-4, V-2.18, and AA-7). At 09:03:43L, the MA touched down and began drifting to the far-left side of the runway (Tabs J-5, R-56, R-69, V-1.18, V-1.19, V-2.18, V-3.7, V-4.20, and V-4.23). Once the MA crossed the left side runway edge stripe, the runway-shoulder illumination lights were visible from the MTS-TU camera feed as they are located on the asphalt shoulder of the runway (Tabs J-8 and V-2.24). While traveling along the shoulder, the MA struck three runway-shoulder illumination lights (Tabs J-5, V-11.1, and V-12.1). At 09:03:53L, the MA lifted off and returned to pattern altitude (Tabs V-2.18 and AA-4).



Tab (J-20)

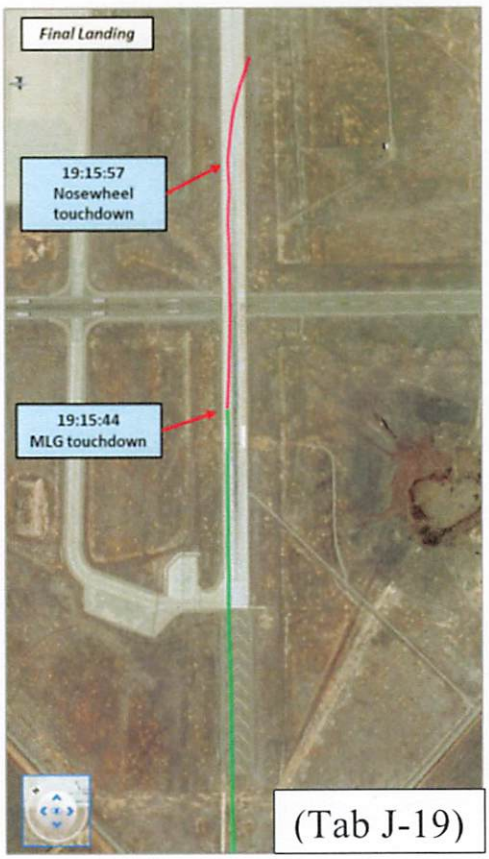
When the MA regained altitude, the MC started execution of the before landing checklist as MP 2 intended to complete a second touch-and-go (Tab V-2.20). When the MC attempted to test the nosewheel steering, the nosewheel did not respond to commands and appeared stuck to the right (Tabs J-6, V-2.23, and V-3.8).

The MC departed the terminal airspace to troubleshoot before attempting a final landing (Tab V-2.26, V-5.12, V-5.14, and V-7.13). "Terminal airspace" or "the range" refers to a large area approximately ten minutes away from the airfield (V-2.27). MP 1 and the MSO had internal opinions about the cause of the nosewheel steering malfunction, but the MC did not discuss potential causes (Tab V-1.32, V-2.19, V-2.21, V-3.13 to V-3.14, V-3.16, V-3.18). An impact to runway edge lights was not part of the troubleshooting process until approximately 35 minutes prior to the mishap final landing when the MC identified the right main hydraulic brake line had been severed (Tabs R-37, V-3.16, V-4.21, V-4.25, V-4.30, V-5.7, V-5.13, V-8.18, V-8.20, V-12.1). During the mishap final landing, approach 8 of the sortie, MP 2 was unable to control the MA's trajectory and did not have differential braking capabilities (Tab J-4, V-1.28, V-2.22, V-3.15, V-7.19, and V-9.18). The MA ultimately departed the prepared surface of the runway, entered terrain, and struck

Tab (J-22)

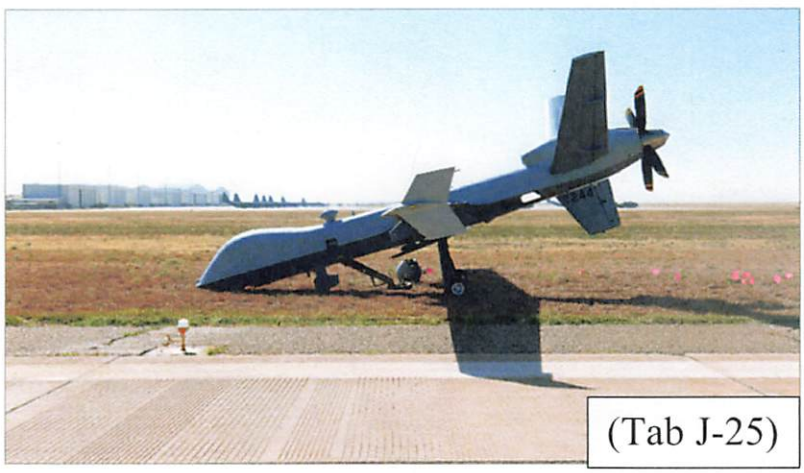
the ground (Tabs J-5 to J-7, V-1.28, V-4.21, V-4.32, V-8.21, and V-9.18). The MA's MTS-TU detached from the aircraft and was destroyed (Tabs J-6, J-25, V-9.18 to V-9.19, and V-10.2).

e. Impact



(Tab J-19)

After approximately three hours of troubleshooting while orbiting at high altitude, the MC prepared to land the MA (Tabs R-37, V-1.27, V-2.22, and V-3.16). The MA elected to return to base (RTB) with 1000 pounds (lbs) of fuel rather than the minimum 400lbs (Tab V-1.28 and V-2.27). This may have reduced the landing distance by approximately 300 feet (ft) as the weight difference would have allowed the MA to stop sooner (Tab AA-2). The MA approached Runway 04, the runway with more favorable winds (Tab V-8.21, V-10.5, and V-11.1). The MC referenced the Nosewheel Steering Malfunction emergency procedure checklist and aligned toward the left edge the runway to account for the direction of the deviated NLG (Tabs R-37, R-57, V-1.27, V-2.22 and V-8.10). At 13:15:44L, the MLG touched down (Tab J-4). At 13:15:59, the NLG touched down and the MA began veering toward the right side of the runway (Tabs V-9.18, V-11.1, and Tab AA-5). At 13:16:07L, the MA departed the paved surface and entered terrain (Tabs V-1.28 and AA-5). Approximately 27ft from the runway, the NLG completely collapsed, causing the MA to come to a full stop (Tabs J-19, V-9.18, and AA-5). Without the NLG strut, the MA's nose was unsupported, tipped forward to hit ground (Tabs J-3, J-25, and V-9.18). Hitting the ground caused the MTS-TU to detach from the forward fuselage and land on the ground next to the MA (Tabs J-6 and V-9.19). The MC completed the air vehicle (AV) shutdown procedures and 27 SOW emergency responders were dispatched to the crash site (Tab V-1.28, V-2.22, and V-10.2).


(Tab J-25)

f. Egress and Aircrew Flight Equipment (AFE)

As the MA is a remotely piloted aircraft, egress and AFE are not applicable.

g. Search and Rescue

Not applicable.

h. Recovery of Remains

Not applicable.

5. MAINTENANCE

a. Forms Documentation

Review of the maintenance records for the MA and MCDCS leading up to the mishap day revealed no relevant discrepancies or issues and showed no overdue Time Compliance Technical Orders (TCTOs) (Tab U-4 to U-6). All preflight inspections and release procedures were followed and documented accordingly by the 727th Special Operations Aircraft Maintenance Squadron (727 SOAMXS) (Tab D-2 and D-125). No evidence indicates that maintenance forms documentation was a factor in this mishap.

b. Inspections

At the time of the mishap the MA accumulated 3,462.4 hours (Tab D-2). All MA and MCDCS maintenance inspections were current and complied with by qualified authorities (Tabs D-2, D-125, and T-30). 727 SOAMXS maintenance personnel inspected the MA on 30 August 2023 prior to its last flight (Tab D-2). A 2,000-hour airframe inspection was accomplished 24.3 flying hours (5 sorties) prior to the mishap (Tab U-1). The MCDCS 28-day Periodic Maintenance Inspection (PMI) was accomplished on August 8, 2023 (Tab D-122). No evidence indicates the inspection history for the MA or MCDCS was a factor in this mishap.

c. Maintenance Procedures

Maintenance procedures were conducted in accordance with applicable guidance (Tab D-2 to D-111 and D-121 to D-145). No evidence indicates the maintenance procedures executed were a factor in this mishap.

d. Maintenance Personnel and Supervision

No evidence indicates the training, qualifications, or supervision of 727 SOAMXS maintenance personnel were a factor in this mishap.

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

Fuel, hydraulic fluid, and engine oil samples were taken from the MA post-mishap and sent for testing with no abnormal findings (Tab D-112 to D-120). There is no evidence the fuel, hydraulic, or engine lubricating oil were a factor in this mishap.

f. Unscheduled Maintenance

A review of maintenance documentation revealed no significant unscheduled maintenance was performed on the MA since its completion of the last 2,000-hour scheduled inspection (Tab D-2 to D-111). No significant unscheduled maintenance was performed on the MCDCS since its last 28-day PMI on August 8, 2023 (Tab D-112 to D-145). There is no evidence that unscheduled maintenance was a factor in this mishap.

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

(1) **Heads up Display** – The MQ-9 is controlled from a CDCS, where the PIC and sensor operator input and view telemetry data on a Heads-up Display (HUD) (Tab V-1.12, V-2.17, V-3.9, and V-15.2). The Flight Path Marker (FPM) and "whiskey marker" work in tandem to provide a visual representation of the vector the aircraft is on based on current aircraft performance and control settings (Tab V-1.12 to V-1.13, and V-1.17).

(2) **MTS-TU** – The NLG collapsed when the aircraft departed the paved surface of the runway, causing the MTS-TU to detach from the aircraft and hit the ground (Tabs J-25, Z-1, and Z-4 to Z-7). Once the MTS-TU was detached from the MA, it rolled approximately 15 feet back and to the right, causing severe damage to the enclosure of the MTS-TU and shattering the optical glass windows (Tab Z-4 and Z-6).

(3) **NLG**.– A visual inspection of the NLG assembly post-mishap was performed (Tab J-6). The upper bridge and the four screws that secure the side plates to the bridge were sheared, causing the gear to collapse on the back side (Tab J-26). On the assembly, the right fork had impact marks on the forward side and a portion of the fork had been fractured off the assembly (Tab J-28). The nosewheel axle was crooked, consistent with an unsupported right side (J-27). The left fork of the assembly was deformed toward the center (Tab J-28). The right sidewall of the tire had a large puncture as well as slices and gouges to the tread (Tab J-28). The tire was completely deflated (J-28).

(4) **Retract Servo** – The retract servo motor cover and motor were severely damaged (Tab J-31). The motor shaft was bent, and the fasteners holding the motor assembly together had failed (Tab J-31).

(5) **Steering Servo** – The steering servo was removed from the NLG assembly for further inspection (Tab J-7). The only noted damage within the steering servo was a failed internal gear set (Tab J-33). This caused the spindle to loosen and caused a loss of nosewheel steering control (Tab J-6 and J-33).

(6) **Braking System** – Each MLG hydraulic brake set-up has a separate cylinder assembly, containing a servo motor and a master cylinder (Tab BB-724). Each cylinder assembly can be individually activated, allowing differential braking (Tab BB-724). Prior to the mishap final landing, the MC conducted an inspection of the MLG with the MTS-TU (Tab Z-12). In-flight video from the MTS-TU feed showed the right hydraulic brake line appeared to be severed about halfway up the MLG strut (Tab Z-8 and Z-13). Upon inspection of the MA post-mishap, there was a large impact witness mark on the right MLG strut at approximately the same height of where the brake line was severed (Tab Z-3, Z-9, and Z-10). Two brake line clamps were damaged (Tab Z-8). Finally, there was what appeared to be yellow paint transfer on the severed steel braided brake line consistent with the yellow color of the damaged runway-shoulder illumination lights (Tab Z-8 to Z-10).

(7) **MLG Assembly** – The MLG wheel track distance is 11 ft wide (Tab BB-724). The severed brake line with associated broken line clamps were the extent of the visible damage (Tab J-8 to J-9). Additionally, yellow paint transfer was imbedded into the right Main Landing Gear lower strut assembly consistent with the yellow color of the damaged runway-shoulder illumination lights (Tab Z-9 and Z-11).

b. Evaluation and Analysis

(1) Right Steering Fork Fracture. The impact mark on the upper portion of the right fork appears to be the approximate height of the runway-shoulder illumination lights installed on runway 31 at Cannon AFB, NM, the location of approach 7 (Tab Z-2, Z-7, and Z-10).

(2) Internal Steering failure. Upon impact, a gear set internal to the steering servo assembly broke (Tab J-7). The MA was communicating properly with the steering servo to move the nosewheel to the commanded position, but the MA was not able to carry out those commands due to the broken internal gear (Tab J-8 to J-9).

(3) Nosewheel Axle Tilt. Due to the fracture to the right steering fork, touching down on the runway caused the right steering fork to collapse entirely (Tab J-29). Without support from the right steering fork, the axle tilted completely to the left (Tab J-27). The unsupported right side of the axle and the significant tire deflection caused the nosewheel to tilt (Tab J-27). The nosewheel tire contacted the inside surface of the left fork, preventing it from self-aligning even though the assembly was free to turn (Tab J-28).

(4) Braking. With the right hydraulic steel braided brake line severed, the hydraulic fluid in the right brake system likely leaked out of the open line while the MA was at altitude (Tabs V-5.7 and Z-7). All functionality of the right side MLG brake was lost (Tabs J-4 and V-5.7). Upon the mishap final landing, MP 2 lacked the ability to utilize differential braking to control the MA's trajectory without the right side MLG brake (Tab J-4). All indications showed the left brake was unaffected and operating as designed (Tab V-4.20).

7. WEATHER

a. Forecast Weather

The 27 SOSS/OSW Mission Execution Forecast (MEF) indicated gusty winds from 1300Z to 1700Z (Tab F-2). A wind advisory for observed surface winds was issued for at or below 25 knot gusts (Tab N-3).

b. Observed Weather

Winds were observed from 010 at 19 knots during approaches 5, 6 and 7, calculating to approximately 17 knots of crosswind (Tab N-5). The outside temperature was 24 Celsius (C) (Tab F-3). Winds were observed from 130 at 3 knots during the mishap final landing (Tab F-12).

c. Operations

No evidence suggests the MA operated outside of prescribed operational weather limits (Tabs N-5, R-36, V-9.20, BB-729). Crosswind component for takeoff and landing is 20 knots (Tab BB-729). Maximum total winds for piloted and automatic takeoff and landing is 30 knots and the maximum gust factor is 20 knots (Tab BB-729).

8. CREW QUALIFICATIONS

a. Mishap Pilot 1

MP 1 was current and qualified to conduct LRE duties in the MQ-9 at the time of the mishap (Tab G-9 to G-11). In total, MP 1 had 124.2 hours of MQ-9 flight time and 142 hours of MQ-9 simulator time (Tab G-3). Flight time for the months preceding the mishap is as follows (Tab G-4 to G-7):

	Flight Hours	Sorties
Last 30 days	8	3
Last 60 days	14.7	8
Last 90 days	18.3	11

	Simulator Hours	Sorties
Last 30 days	4.0	2
Last 60 days	4.3	3
Last 90 days	4.8	4

b. Mishap Pilot 2

Review of flight hours for the previous 30/60/90 days indicate that MP2 was current and qualified to conduct LRE duties at the time of the mishap (Tab G-60 to G-62). MP 2 had a total of 220.9 hours of MQ-9 flight time and a total 221.4 hours of MQ-9 simulator time (Tab G-55). 30 days prior to the mishap, MP 2 was scheduled three times for standby pilot duties and twice for sorties,

however he only logged .5 flight hours of "other time" (Tabs G-56, AA-16, AA-20, AA-21, AA-22, and AA-27). Flight time for the three months preceding the mishap is as follows (Tab G-56 to G-59):

	Flight Hours	Sorties
Last 30 days	0	0
Last 60 days	2.6	3
Last 90 days	6.2	6

	Simulator Hours	Sorties
Last 30 days	2.0	2
Last 60 days	5.8	5
Last 90 days	8.8	6

c. Mishap Sensor Operator

The MSO was current and qualified to conduct LRE duties in the MQ-9 at the time of the mishap (Tab G-141 to G-143). The MSO was fully qualified in Launch and Recovery (LR) operations on 2 March 2023 and completed AFSOC LR Combat Mission Readiness (CMR) on 14 Jun 2023, 83 days prior to the mishap (Tab G-144). The MSO is coded as Flight Training Level (FTL)-C (Tab G-141). In total, the MSO has 64.2 hours of MQ-9 flight time and 130.7 hours of MQ-9 simulator time (Tab G-136). Flight time for the three months preceding the mishap is as follows (Tab G-137 to G-140):

	Flight Hours	Sorties
Last 30 days	2.4	2
Last 60 days	2.4	2
Last 90 days	8.1	5

	Simulator Hours	Sorties
Last 30 days	5.8	3
Last 60 days	5.8	3
Last 90 days	5.8	3

9. MEDICAL

a. Qualifications

There is no evidence any member of the MC was medically disqualified for duty on the day of the mishap.

b. Health

There is no evidence any member of the MC had any health issues relevant to this mishap.

c. Pathology

Toxicology testing was performed on each member of the MC with negative results (Tab B-2 to B-4).

d. Lifestyle

12 SOS personnel had a 4-day weekend due to the Labor Day Holiday from 1 September 2023 through 4 September 2023 (Tab V-1.7, V-2.8, V-7.2, and V-9.5).

MP 1. Review of MP 1's 7-day history revealed unusual lifestyle changes in the days leading up to the mishap (Tabs R-15, V-1.7, V-1.10, and V-1.35 to V-1.36). On 1 September, MP 1 drove to San Antonio, Texas (TX) (Tab V-1.7, V-1.35). On 2 or 3 September, MP 1 then drove to Houston, TX (Tab V-1.7). On 4 September, MP 1 drove from Houston, TX back to Clovis, NM (Tab V-1.7 and V-1.35). The drive from Houston, TX to Clovis, NM is approximately ten hours (Tab V-1.7). MP 1 stated he left Houston, TX around 1100L and returned to Clovis, NM around 2100L (V-1.36). MP 1 reported five hours of sleep prior to the mishap (Tab R-11).

MP 2. Review of MP 2's 7-day history revealed some unusual lifestyle changes in the days leading up to the mishap (Tabs R-31 and V-2.26 to V-2.27). On a flying day, MP 2 normally goes to bed nine or ten hours prior to showtime (Tab V-2.26). The weekend preceding the mishap, MP 2 went to bed at approximately 0000L every night from 31 August 2023 to 3 September 2023 (Tab V-2.26 to V-2.27). On 4 September MP 2 went to bed at 1830L and slept from sundown until 0000L, reporting between three and four hours of sleep (Tab R-27).

MSO. Review of the MSO's testimony revealed unusual lifestyle changes in the days leading up to the mishap as he was preparing for deployment (Tab R-73). There is no evidence the MSO's unusual lifestyle changes contributed to the mishap.

e. Crew Rest and Crew Duty Time

MP 1. In accordance with Air Force Manual (AFMAN) 11-202 Volume 3, immediately preceding duty, crew rest for MP 1 required twelve hours off from work and the opportunity to achieve eight hours of uninterrupted sleep (Tab BB-392). The maximum allowed flight duty period for MP 1 was 12 hours (Tab BB-392). Review of MP 1's 72-hour history confirms he did not meet crew rest requirements as he did not afford himself the opportunity to achieve eight hours of uninterrupted sleep (Tabs R-10, R-11, V-1.7, and V-1.35 to V-1.36).

MP 2. In accordance with AFMAN 11-202 Volume 3, immediately preceding duty, crew rest for MP 2 required twelve hours off from work and the opportunity to achieve eight hours of uninterrupted sleep before showing (Tab BB-392). The maximum allowed flight duty period for MP 2 was 12 hours (Tab BB-329). Review of MP 2's 72-hour history and testimony confirms he met crew rest duty period requirements (Tab R-26 and R-27).

MSO. In accordance with AFMAN 11-202 Volume 3, immediately preceding duty, crew rest for the MSO required twelve hours off from work and the opportunity to achieve 8 hours of uninterrupted sleep before showing (Tab BB-392). The maximum allowed flight duty period for the MSO was 12 hours (Tab BB-329). Review of the MSO's 72-hour history confirms he met crew rest and duty period requirements (Tab R-46 and R-47).

10. OPERATIONS AND SUPERVISION

a. Operations

12 SOS is currently in a period of transition (Tab V-8.11). Line-of-Sight (LOS) LRE operations are coming to an end with the advancement of Auto-takeoff and Land Capabilities (ATLC) (Tab V-8.6). On a monthly basis, 12 SOS and the 12 Aircraft Maintenance Unit (12 AMU) generate aircraft for the entire AFSOC Remotely Piloted Aircraft (RPA) enterprise (Tab AA-28). 12 SOS is the only LR unit in AFSOC (Tab CC-5). As a result, 12 SOS and 12 AMU have supported MCE squadrons while supporting their own training requirements and operational tasks (Tab V-8.11). For the month of September 2023, 12 AMU generated 428 hours of flight time, but only 128.5 hours were attributed to 12 SOS since they are only responsible for the launch and landing portion of the flights (Tab AA-28). The remaining 299.5 flight hours were allocated to the MCE squadrons (Tab AA-28). Analysis of the operational personnel qualifications and status report of 12 SOS indicate that 58% of 12 SOS Sensor Operators are on their first assignment and 65% of 12 SOS pilots are on their first assignment (Tab T-87 to T-202 and T-203 to T-326).

b. Supervision

Operations supervision was provided by an on-duty unit Operations Supervisor, MOS (Tab AA-61). Operations Supervisor training covered procedures, duties, and responsibilities of the Operations Supervisor, to include flight authorizations, Go/No-go, handing mission changes, and general expectations (Tab V-7.2 and V-9.4). On the day of the mishap, the MOS was conducting Operations Supervisor training for the MDO (Tab V-7.2 and V-9.4). The MDO is the approval authority for adding members to the crew roster prior to the flight and approving flights with "medium" ORM risk (Tab V-1.10, V-7.3, V-7.8, V-9.11, and V-9.20). On the day of the mishap, the MC completed their ORM worksheet and the overall risk was rated as "low" (Tab K-8). Although he was not required to provide approval to proceed since the overall risk was "low," the MDO conversed with the MC regarding the risks noted in their ORM sheets since MP 1 was noted as experiencing chronic fatigue (Tab V-1.10, V-9.5). The MDO was satisfied with the MC's mitigation and allowed the MC to proceed with their flight (Tab V-9.5).

11. HUMAN FACTORS ANALYSIS

a. Introduction

The Department of Defense Human Factors Analysis and Classification System 8.0 (DoD HFACS 8.0) lists potential human factors that can play a role in aircraft mishaps and identifies potential areas of assessment during the accident investigation (Tab BB-728). Seven human factors were identified as relevant to the mishap: (1) Under-Controlled Aircraft; (2) Breakdown in Visual Scan

or Instrument Cross-Check; (3) Fatigue; (4) External Force; (5) Lack of Proficiency/Experience; (6) Allowed Unwritten Practices to Become Standard; (7) Organizational Culture Created Increased Risk.

(1) Under-Control Aircraft (AE104): the mishap individual(s) inappropriately reacted to conditions by under-controlling the aircraft which resulted in the mishap (Tab BB-733).

(2) Breakdown in Visual Scan or Instrument Cross-check: (AE105): the mishap individual did not effectively execute learned/practiced internal or external visual scan patterns (Tab BB-733). During MP 2 touch and go landing, the MA drifted 35 feet left of runway centerline (Tab AA-25). Reconstruction of the mishap in the MQ-9 MALET Stand Alone Trainer (MSAT) utilizing the same wind conditions indicate the HUD FPM was two degrees left of runway centerline (Tab AA-2).

(3) Fatigue (PC307): acute or chronic sleep deprivation or circadian rhythm disruption due to shiftwork/lag, extended duty periods, jet lag, or poor sleeping conditions (Tab BB-740).

(4) External Force (PE108): accelerative forces, wind, sea-state, objects, aircraft/vehicle/vessel structures, etc. impeded individual movement (Tab BB-742).

(5) Lack of Proficiency/Experience (PT104): an individual's level of fluency or expertise did not match skills required for safe execution, regardless of his or her familiarity with the process, task, system, or mission (Tab BB-745).

(6) Allowed Unwritten Practices to Become Standard (SD002): a supervisor/leader chronically condoned the use of unwritten/unofficial procedures by subordinates (Tab BB-748). Out of ten 12 SOS personnel interviewed, including MSC and MDO, eight cited the "half of the half" landing technique as their go-around criteria for centerline control (Tabs V-1.22, V-2.15, V-2.18, V-2.22, V-3.4 to V-3.7, V-3.9, V-3.15, V-4.6, V-4.20, V-4.22 to V-4.23, V-4.32, V-4.34, V-4.40, V-5.13, V-6.3, V-7.16, and V-15.6). The "half of the half" technique will trigger crewmembers to call a go-around when the FPM is more than halfway between centerline and runway edge and not trending back, or significant divergence between FPM and the "whiskey marker" immediately prior to touchdown (Tab BB-768). This informal "half of the half" landing technique is in the 11th Attack Squadron (ATKS) squadron standards (Tab BB-768).

(7) Organizational Culture Created Increased Risk (OC001): explicit or implicit actions, statements, attitudes, or techniques at an organizational level facilitated an environment where demands or pressures existed (Tab BB-752). 27 SOW received an overall grade of Ineffective during the 2023 Headquarters (HQ) AFSOC Inspector General (IG) Unit Effectiveness Inspection (UEI) (Tab C-4). 12 SOS had 19 deficiencies relating to training and managerial oversight of squadron programs (Tab C-8). Additionally, 12 SOS experienced a change in squadron leadership on May 12, 2023. (Tab V-8.11 and V-8.13).

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) Department of the Air Force Instruction (DAFI) 91-204, *Safety Investigations and Reports*, dated 10 March 2021.

(3) Air Force Manual (AFMAN) 11-2 MQ-9, Volume 3, *Flying Operations MQ-9 – Operations Procedures*, dated 12 January 2023.

(4) AFMAN 11-202 Volume 3, *Flying Operations* , 10 January 2022 *incorporating Change 1*, dated 1 January 2022.

(5) AFSOC Supplement, AFMAN 11-202 Volume 3, *Flying Operations*, dated 4 April 2023.

(6) AFI 21-101, *Aircraft and Equipment Maintenance Management,* dated 22 August 2023.

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

b. Other Directives and Publications Relevant to the Mishap

(1) Department of Defense, *Human Factors Analysis and Classifications System 8.0.*

(2) 11th Attack Squadron, *Squadron Standards*, dated July 2022.

(3) Technical Order (TO) 1Q-9(M)A-1, dated 15 October 2023.

(4) Air Force Tactics, Techniques, and Procedures (AFTTP) 3-3, *Combat Fundamentals MQ-9*, dated 14 April 2023.

(5) TO-00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures*, dated 21 June 2021

c. Known or Suspected Deviations from Directives or Publications

No other known or suspected deviations not already listed in the report are noted.

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20 DECEMBER 2023

ALBERTO Y. GILROY, Lt Col, USAF
President, Accident Investigation Board

STATEMENT OF OPINION

MQ-9, T/N 13-4244
CANNON AFB, NM
5 SEPTEMBER 2023

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 5 September 2023 an unmanned MQ-9, T/N 13-4244, departed the prepared landing surface at Cannon Air Force Base (AFB), New Mexico (NM). The mishap aircraft (MA) was assigned to and operated by the 12 Special Operations Squadron Lauch and Recovery Element (LRE) located at Cannon AFB, NM. Upon departure from the runway, the MA nose landing gear (NLG) collapsed, and the Multi-Spectral Targeting System Turret Unit (MTS-TU) was destroyed. The mishap resulted in no damage to civilian property. The mishap resulted in no injuries or fatalities. The damage to government property was valued at $2,939,388.00.

The MA was operated by a mishap crew (MC) comprised of mishap pilot (MP) 1, MP 2, and the mishap sensor operator (MSO). Flying a routine training mission, MP 1 controlled the MA for the first hour of the sortie. MP 1 accomplished six approaches before handing off controls to MP 2. MP 1 remained in the mishap Containerized Dual Control Segment (MCDCS) with the MC to observe MP 2. Within two minutes of gaining control of the MA, MP 2 attempted approach 7, intending to perform a "touch and go" landing with significant crosswinds. On approach 7, the MA touched down approximately 35 feet left of runway centerline, and the MA continued a left-side trajectory towards the asphalt shoulder of the runway. The MA struck three runway-shoulder illumination lights before lifting off. Due to the collision with the runway-shoulder illumination lights, the MA's nose wheel steering failed, and the right main landing gear (MLG) hydraulic brake line was severed. The MC began their troubleshooting process, citing an NLG malfunction. Approximately three hours after the impact to the runway-shoulder illumination lights, MP 2 attempted a controlled landing. When MP 2 touched down, MP 2 was unable to control the MA's trajectory due to inoperable nosewheel steering and no ability to utilize differential braking. The MA ultimately travelled off the prepared runway surface into terrain. The MA's nose landing gear collapsed, causing the nose of the aircraft to strike the ground. The MA's MTS-TU detached from the MA and was destroyed.

2. CAUSES

I find, by a preponderance of the evidence, the cause of the mishap was pilot error resulting in a pre-mishap impact to three runway-shoulder illumination lights. I further find, by a preponderance of the evidence, the cause of the mishap was environmental conditions resulting in a pre-mishap

impact to three runway-shoulder illumination lights. Finally, I find by a preponderance of the evidence, the cause of the mishap was poor Crew Resource Management (CRM). The pre-mishap incident during approach 7 caused severe damage to the MA, ultimately leading to the MA's departure from the prepared surface upon final landing.

a. Pilot Error

Under Controlling of the MA. The forecasted winds on 5 September indicated that crosswinds would be high. Furthermore, MP 1 experienced difficulties managing crosswinds while attempting touch-and-go landings on approaches 4, 5, and 6. MP 1 executed two go-arounds on approaches 4 and 5 due to insufficient crosswind control and performed a substandard touch and go on approach 6 by allowing the MA to touchdown 11 ft left of runway centerline. Following approach 6, MP 2 took control of the MA. Despite MP 1's crosswind difficulty, MP 2 attempted approach 7 a mere two minutes after taking control of the MA. As the MA approached the runway 31, MP 2 reduced wing-low pressure while straightening the nose of the MA onto runway centerline. As a result, MP 2 did not have sufficient crosswind input to control the MA once it touched down, and the wind blew the MA onto the asphalt shoulder of the runway. MP 2 had the requisite training for this scenario, but it was MP 2's inadequate application of crosswind controls that led to excessive lateral drift and impact to runway-shoulder illumination lights.

Lack of Proficiency. Review of MP 2's flight hours for the 30 days preceding the mishap indicate that MP 2 lacked recency. Although MP 2 is a Flying Training Level (FTL)-B coded, experienced LR pilot, he severely lacked recent flight time. Due to MP 2's lack of recency, he likely suffered from decreased proficiency as well. As such, he did not have the opportunity to practice skills such as crosswind control and crosschecks for manual landings. This is evident by the mistakes MP 2 made during approach 7. The evidence indicates MP 2 lacked sufficient crosswind controls to combat the high winds and he performed insufficient crosschecks after he released crosswind controls in preparation to touch down. I assess that, during approach 7, MP 2 was focused on the centerline of the runway and did not recognize the Heads-up Display (HUD) Flight Path Marker (FPM) had shifted to the left side of the runway once crosswind controls were reduced. Had MP 2 flown more in the days prior to the accident, it is likely he would have been more proficient and cognizant of crosschecks on approach 7.

b. Crew Resource Management

CRM should have assisted the crew in identifying risk and threats for their training profile, and it should have identified mitigation measures to help prevent a mishap. However, the overall communication within the MC severely lacked cohesion and openness. This began with the MC's inability to address concerns about fatigue. MP 1 was not forthcoming about why he was chronically fatigued, and MP 2 never addressed his own fatigue. Then, there was no discussion during the crew swap about the significant environmental conditions and how to mitigate risks associated with high winds. MP 2 had time to conduct multiple low approaches to assess the wind conditions, the performance of the MA, and his overall personal performance before attempting a touch-and-go landing. Rather than assessing the winds by executing a low approach, MP 2 elected to immediately execute a touch-and-go two minutes after the pilot swap.

After striking three runway-shoulder illumination lights, the MC did not discuss the potential impact. When the MSO mentioned the possibility of an impact to a runway-shoulder light during climb-out from approach 7, MP 1 and MP 2 dismissed his concerns. Yet, when the MC saw the nosewheel and both MP 1 and the MSO strongly suspected the defect was caused by an impact, neither brought this to the attention of MP 2 or any other member who assisted with troubleshooting. When Witness (WIT) 1 and WIT 2 arrived to provide additional assistance to the MC, the MC never told WIT 1 or WIT 2 about their previous landing issues. During WIT 1's interview, WIT 1 expressed frustration with the lack of the conversation about the cause of the nosewheel malfunction as it would have affected the troubleshooting process. While I assess the MSO was hindered in this regard by his inexperience and the confidence of MP 1 and MP 2, the MSO could have been forthcoming and honest about the possibility of an impact during troubleshooting. Similarly, MP 1 should have felt comfortable addressing the possibility with MP 2, particularly after he saw the nosewheel "malfunction" and had a sense it was caused by an impact. Had 12 SOS leadership been made aware of the impact, they could have spent their time planning for the final landing instead of troubleshooting a seemingly random NLG malfunction.

Finally, the MC did not properly discuss the benefits of reducing their fuel load to minimum fuel to decrease the MA's overall weight. During the final mishap approach, the MC elected to land with 1000 pounds (lbs) of fuel instead of the minimum 400 lbs. Had the MA been 600 lbs lighter, the MA would have required 300 feet (ft) less landing distance. As a result, the MA may have been able to stop on the runway during the final mishap landing. The lack of cohesion and openness between MC was detrimental to CRM. Had the MC ensured adequate CRM, it is likely they could have avoided the mishap in approach 7 or, alternatively, avoided some of the damage to the MA during the mishap final landing.

c. External Force, Environmental Conditions:

The environmental conditions on 5 September were at the high end of the crosswind limitations applicable to MQ-9 manual landings. With such high crosswinds, the MA was at a greater risk of being blown off course. When high winds were assessed and caused significant issues for MP 1 during approaches 4, 5, and 6, the MC could have executed low approaches or departed to the range to wait for more favorable winds prior to MP 2 attempting approach 7. Had the crosswinds been lower, or nonexistent, it is more likely than not MP 2 would have maintained centerline and avoided a collision with the runway-shoulder illumination lights during approach 7.

3. SUBSTANTIALLY CONTRIBUTING FACTORS

I find, by a preponderance of evidence, the following factors substantially contributed to the mishap: (a) Operational Risk Management (ORM), (b) Unwritten Practices, and (c) Organizational Culture.

a. Operational Risk Management

The 12 SOS ORM worksheet did not allow the crew to properly assess and address risk. The worksheet in use at the time allowed calculation of individual risks separate from overall risk based on a personal assessment. This is of particular importance to this mishap as, due to the Labor Day

holiday weekend, the MC had a 4-day weekend from 1 September to 4 September 2023. Review of MP 1's 72-hour history and testimony indicates he did not meet crew rest duty period requirements due to travel over the holiday weekend immediately preceding the mishap flight. The 12 SOS met their organizational crew rest responsibility by providing the requisite twelve hours of rest time. However, it is still the individual's responsibility to ensure there is an opportunity to receive eight hours of continuous, uninterrupted sleep. MP 1 had traveled outside the squadron's 8-hour distance limitation to Houston, TX and only allowed himself one day to drive home. The time distance from Houston, TX to Clovis, NM is approximately a 10-hour drive. Assuming MP 1 made limited stops on the trip and experienced no other delays, and assuming MP 1 went to bed immediately upon returning home at 2100L, he would have only afforded himself the opportunity to receive seven hours of continuous, uninterrupted sleep. I find this sequence of events improbable based on the evidence, and I suspect it is more likely that MP 1 drove longer and received less sleep than he reported. Additionally, MP 2 reported that he received 3 to 4 hours of sleep between the hours of 1830 local (L) and 0000L and was unable to fall back to sleep prior to his 0400L showtime. While MP 2 stayed in the local area, MP 2 established himself on a circadian rhythm for a sleep cycle of 0000L and did not prepare his body for a sleep cycle starting at 1830L.

The fatigue levels of MP 1 and MP 2 are concerning. The ORM worksheet should have acted as a preventative measure, forcing the crew to discuss risk and seek higher approval for elevated risk. The ORM worksheet did not accurately highlight the fatigue level of the MP 1 and MP 2 and assessed overall risk as "low." While the MC did speak with the MDO regarding MP 1's chronic fatigue, no details were presented about MP 1's travel outside the local area, his long drive the day prior, or other pertinent details that would have raised the risk level of the sortie. MP 2's fatigue was not discussed with the MDO and there was no mitigation plan in place should MP 2 feel fatigued during the sortie.

Due to the unsatisfactory ORM worksheets, MP 1 and MP 2 were comfortable enough to disregard their fatigue during the crew brief, which led to improper mitigation techniques and downplaying overall fatigue levels in order to accomplish the sortie. Although MP 1 was not in control of the MA during approach 7 or the mishap final landing, his fatigue contributed to the MC's overall ORM and their ability to properly maintain CRM. This is of particular importance as it relates to the MSO and his comfortability in the seat with MP 1 and MP 2. MP 1 and MP 2 are both FTL-B coded and are considered experienced pilots. The MSO, while current and qualified, was not an experienced sensor operator. Based on my review of the evidence and my observations during the AIB interviews, MP 1 and MP 2 are confident in their ability to fly the MQ-9. Their experience and confidence likely masked their overall fatigue, and the MSO was not experienced enough to be concerned. Without a sufficient ORM worksheet or crew brief properly covering ORM, the MSO was able to step with a false sense of security about MP 1 and MP 2's ability to fly the aircraft. The MSO, relying on his sense of security, ignored warning signs of fatigue from both pilots. When the MSO was uncomfortable with approach 6, he did not voice his concerns to the rest of the MC and did not call the MA around. He also did not call the MA around on approach 7 despite the clear drift left of centerline. Had the MC had a better ORM product and properly discussed ORM in their crew brief, it is likely the MSO would have been more cognizant of potential warning signs and may have taken a more conservative approach when determining whether to call a go-around.

b. Allowed Unwritten Practices to Become Standard

The MQ-9 lacks codified stabilization approach criteria for centerline control when conducting manual landings. At the time of the mishap, centerline control standards were technique based. If the FPM is outside of the inner half of the runway, aircrew members are expected to call a go-around. Members of 12 SOS attend LR initial qualification training at the 11th Attack Squadron (11 ATKS), the LR Formal Training Unit (FTU). Although it is not an official stabilization approach criteria for centerline control, the "half of the half" landing technique is informally captured in the 11 ATKS squadron standards and taught to students. However, the "half of the half" technique is not written in the AFTTP 3-3.MQ-9, 14 April 2023 and is not written in the MQ-9 Technical Order, 1Q-9(M)A-1 dated 15 October 2023. Additionally, the "half of a half" technique is not written in any 12 SOS mission products.

The "half of the half" landing technique was mentioned numerous times by the MC and other 12 SOS instructors, pilots, and sensor operators when asked about go-around criteria. Many of the individuals interviewed could not specifically state where exactly the "half of the half" falls on Runway 31. More importantly, utilizing the "half of the half" landing technique did not trigger any member of the MC to call a go-around, despite clear indications during approach 7 the MA was drifting to the left of centerline and continuing to vector left prior to touchdown. By allowing this unwritten, informal practice to become standard in the 12 SOS, squadron leadership allowed an insufficient technique to guide the MC. As a result, the MC allowed the MA to touchdown 35ft left of runway centerline without calling the MA around.

c. Organizational Culture Created Increased Risk

MP 2's lack of flying hours, particularly while he was in instructor upgrade training, highlights concern with squadron processes, individual motivation, and oversight of training and scheduling. Analysis of the evidence indicates the 12 SOS is in a period of transition, both with their identity and their organizational culture.

The 12 SOS has experienced a period of uncertainty due to the advent of Auto-takeoff and Land Capabilities (ATLC) and the retiring of Line of Sight (LOS) LRE operations. ATLC incorporates increased autopilot safety limitations. With the squadron now in full transition to become an MCE unit, the 12 SOS is focused on two separate mission areas, both of which require experienced pilots and extensive training requirements. This transition, coupled with the squadron's low absorption rate and low MCE experience levels, means there is more strain than usual within the 12 SOS. The strain is exacerbated as the squadron is focused on correcting deficiencies from their most recent Unit Effectiveness Inspection (UEI). In March 2023, the 27th Special Operations Wing (27 SOW) received an overall grade of Ineffective during its UEI conducted by the Air Force Special Operations Command (AFSOC) Inspector General (IG). The most critical and significant deficiencies focused on poor unit processes related to oversight of training and review of the status of training. Additionally, the squadron did not have an established squadron training plan to drive operational training rhythms. Corrective actions take time to be fully implemented and take effect. These factors ultimately effected overall squadron performance and attitudes leading up to the mishap.

Following the UEI inspection, new squadron leadership took command on 12 May 2023. They identified issues with accountability and standards. During his interview, the MDO stressed squadron personnel would constantly leave early without completing tasks, shop duties, or personal responsibilities. He highlighted issues dealing with procrastination and personnel stating they are flying too much despite data showing individuals flying once a week or less. Interview statements from Witness (WIT) 1, WIT 2, Chief of Standards and Evaluation (CSE), and the mishap Operations Supervisor (MOS), personnel who have been assigned to other commands prior to 12 SOS, were consistent with the MDO about squadron culture and issues surrounding accountability. Poor squadron accountability and oversight over training at any supervisory level creates increased risks in a flying environment. Coupled with the uncertainty of the squadron's future and the pressure to learn a new skillset with few experienced MCE pilots, the risk of a mishap was higher than normal. In a squadron that relies on peer-to-peer instruction, critique, and communication, culture has a direct effect on performance. While correction of the deficiencies in the squadron may not have prevented the mishap from happening, the overall lack of accountability, poor oversight of training, and general uncertainty of the future of the squadron likely contributed to the communication issues within the MC and their overall ability to properly fly their training mission on 5 September.

4. CONCLUSION

I reviewed the data logs, aircraft maintenance forms, witness testimony, video evidence, photographic evidence, engineering reports, individual training records, and technical reports. I find, by a preponderance of the evidence, the causes of the mishap were pilot error, CRM, and environmental conditions. MP 2 did not employ sufficient crosswind controls to properly account for the high crosswinds and the MC did not call the MA to go-around, causing the MA to strike three runway-shoulder illumination lights. Although MP 2 performed the mishap final landing according to accepted procedures, the damage to the MA from the impact to the runway-shoulder illumination lights ultimately caused the MA to depart the runway surface during final landing.

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20 DECEMBER 2023

ALBERTO Y. GILROY, Lt Col, USAF
President, Accident Investigation Board

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