UNITED STATES AIR FORCE
ABBREVIATED AIRCRAFT ACCIDENT
INVESTIGATION BOARD REPORT

MQ-9A, T/N 16-4332

489TH ATTACK SQUADRON
432ND WING
CREECH AIR FORCE BASE, NEVADA

LOCATION: CREECH AIR FORCE BASE, NEVADA

DATE OF ACCIDENT: 28 SEPTEMBER 2022

BOARD PRESIDENT: COLONEL PAUL E. SHEETS

Abbreviated Accident Investigation, conducted pursuant to
Chapter 12 of Air Force Instruction 51-307

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND

OFFICE OF THE DEPUTY COMMANDER
205 DODD BOULEVARD, SUITE 203
JOINT BASE LANGLEY-EUSTIS VA 23665

APR 14 2023

ACTION OF THE CONVENING AUTHORITY

The report of the abbreviated accident investigation board conducted under the provisions of Air Force Instruction 51-307, *Aerospace and Ground Accident Investigations*, that investigated the 28 September 2022 mishap involving a MQ-9A, T/N 16-4332, operated by the 489th Attack Squadron, complies with applicable regulatory and statutory guidance, and on that basis it is approved.

RUSSELL L. MACK
Lieutenant General, USAF
Deputy Commander

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

MQ-9A, T/N 16-4332
CREECH AIR FORCE BASE, NEVADA
28 SEPTEMBER 2022

On the afternoon of 28 September 2022, the mishap aircraft (MA) impacted Runway 08 at Creech Air Force Base (AFB), Nevada, the MA subsequently caught fire and was destroyed. The MA was operated by a Launch and Recovery Element (LRE) comprised of the mishap pilot (MP), the mishap instructor pilot (MIP), the mishap sensor operator (MSO), and the mishap instructor sensor operator (MISO). The crew was assigned to the 489th Attack Squadron and belonged to the 432nd Wing. At the time of the mishap both the crew and MA were located at Creech AFB, Nevada. The mishap resulted in no reported damage to civilian property, no injuries, and no fatalities. The loss of government property was valued at $16,604,363.00.

After completing several training approaches, the MSO switched the MP's Heads Up Display (HUD) to the Multi-Spectral Targeting System (MTS) for the next planned touch and go approach. On final approach, as the MA was descending towards the runway, the MTS slewed rapidly downward from its original forward-looking position. The MP called, "going around," and pitched for a nose high attitude. Disoriented from the uncommanded MTS movement, the MP incorrectly positioned the throttle to flight idle. While the MA climbed away from the runway, the MIP directed the MSO to switch the MP's view from the MTS to the nose camera. As the MA climbed, airspeed decreased. Simultaneously, several crewmembers called to watch airspeed and to increase the throttle. In response, the MP immediately applied full throttle as the stalled MA began descending. After impact, the MA's right main landing gear separated from the aircraft. The MA entered a decelerating spin before coming to a stop on the side of the runway. The MA caught fire and was destroyed.

The Abbreviated Accident Investigation Board (AAIB) President (BP) found, by a preponderance of the evidence, that the cause of the mishap was the MP incorrectly executing a go around procedure. The MP raised the nose of the aircraft, but erred by reducing the throttle to idle. These actions resulted in an unpowered climb, stall, and decent to impact on the runway. Further, the AAIB BP found, by a preponderance of the evidence that three factors substantially contributed to the mishap: (1) the MTS failure at a critical phase of flight caused disorientation and distraction for all four crewmembers; (2) the MP did not reference the MSO's HUD or the flight instruments to reorient and confirm the MA's position over the runway; and, (3) the MIP prioritized the correction of the MP's video display over ensuring go around procedures were being properly performed.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-9A, T/N 16-4332
CREECH AIR FORCE BASE, NEVADA
28 SEPTEMBER 2022

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ACRONYMS AND ABBREVIATIONS

432 WG	432nd Wing
489 ATKS	489th Attack Squadron
AAIB	Abbreviated Accident Investigation Board
AAIB BP	Abbreviated Accident Investigation Board President
ACC	Air Combat Command
AFB	Air Force Base
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFTTP	Air Force Tactics, Techniques, and Procedures
AGL	Above Ground Level
ATC	Air Traffic Control
ATLC	Automatic Takeoff and Landing Capability
AV	Air Vehicle
CAPS	Critical Action Procedures
Capt	Captain
CAS	Close Air Support
Col	Colonel
DAFI	Department of the Air Force Instruction
DoD	Department of Defense
ER	Extended Range
EU	Electronics Unit
FCIF	Flight Crew Information File
ft	Feet
GCS	Ground Control Station
GLS	GPS Landing System
HFACS	Human Factors Analysis Classification System
HDD	Heads-Down Display
HUD	Heads-Up Display
IAW	In Accordance With
IFOC	In-Flight Operation Check
IP	Instructor Pilot
ISR	Intelligence, Surveillance, Reconnaissance
LA	Legal Advisor
LOS	Line of Sight
LRE	Launch and Recovery Element
Lt Col	Lieutenant Colonel
MA	Mishap Aircraft
Maj	Major
MAJCOM	Major Command
MC	Mishap Crew
MGCS	Mishap Ground Control Station
MIP	Mishap Instructor Pilot
MISO	Mishap Instructor Sensor Operator
MO	Mishap Observer
MP	Mishap Pilot
MQT	Mission Qualification Training
MSgt	Master Sergeant
MSO	Mishap Sensor Operator
MSQCC	Mishap Squadron Commander
MTS	Multi-Spectral Targeting System
NC	Nose Camera
NOTAMs	Notices to Airmen
NV	Nevada
OG	Operations Groups
PCA	Permanent Change of Assignment
PFO	Preflight Officer
PM	Pilot Member
PWM	Pulse Width Module
RCM	Redundant Control Module
Rec	Recorder
RF	Radio Frequency
SARM	Squadron Aviation Resource Management
SEO	Simulated Engine Out
SFO	Simulated Flame Out
SIB	Safety Investigation Board
SII	Special Interest Item
SME	Subject Matter Expert
SMSgt	Senior Master Sergeant
SOF	Supervisor of Flying
SrA	Senior Airman
TCTO	Time Compliance Technical Order
T/N	Tail Number
TO	Technical Order
USAF	United States Air Force
V	Volume
VVI	Vertical Velocity Indicator

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 2 February 2023, the Air Combat Command (ACC) Deputy Commander appointed Colonel Paul E. Sheets as President of the Abbreviated Accident Investigation Board (AAIB) for the mishap that occurred on 28 September 2022 involving an MQ-9A at Creech Air Force Base (AFB), Nevada (Tab Y-2). Other board members included a Lieutenant Colonel (Lt Col) Legal Advisor, a Captain (Capt) Pilot Member, a Senior Master Sergeant (SMSgt) Maintenance Member, and a Senior Airman (SrA) Recorder (Tab Y-2). On 2 March 2023, one Master Sergeant (MSgt) Maintenance Subject Matter Expert was detailed to advise the board (Tab Y-4). The AAIB conducted its investigation in accordance with Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, Chapter 12, remotely from 27 February 2023 to 28 March 2023 (Tab Y-2).

b. Purpose

In accordance with AFI 51-307, *Aerospace and Ground Accident Investigations*, this AAIB 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. This investigation was an abbreviated accident investigation, conducted pursuant to Chapter 12 of AFI 51-307.

2. ACCIDENT SUMMARY

During the afternoon of 28 September 2022, the mishap aircraft (MA) impacted Runway 08 at Creech AFB, Nevada (Tab N-8). After impact, the MA's right main landing gear failed, and the MA entered a decelerating spin before coming to a stop on the side of the runway near a taxiway intersection (Tabs N-8 and DD-6). The MA subsequently caught fire and was destroyed (Tabs N-8 and DD-6). The MA was operated by a Launch and Recovery Element (LRE) comprised of the mishap pilot (MP), the mishap instructor pilot (MIP), the mishap sensor operator (MSO), and the mishap instructor sensor operator (MISO) (Tab K-112). The crew was assigned to the 489th Attack Squadron and belonged to the 432nd Wing. Both the crew and MA were located at Creech AFB, Nevada (Tab K-12). The crash resulted in no reported damage to civilian property, no injuries, and no fatalities. The loss of government property is valued at $16,604,363.00 (Tab P-2).

After completing several approaches, the MSO switched the MP's heads up display (HUD) to the Multi-Spectral Targeting System (MTS) from the nose camera (NC) for the next planned touch and go approach (Tabs V-1.2, V-2.2, and DD-6). On short final, the MA was descending through 25 feet when the MTS slewed downward from a look angle of straight forward to straight down (Tabs V-1.2 and DD-6). The MP called, "Going around," and pitched the MA up for a nose high attitude but reduced the throttle to flight idle due to disorientation from the uncommanded MTS

movement (Tabs V-1.2 and DD-6). Aircraft "attitude" is the relative positions of the nose and wings to the natural horizon (Tab BB-61). The MA climbed away from the runway and the MIP directed the MSO to switch the MP's view from the MTS to the NC (Tabs V-2.2, V-3.1, and DD-6). As the MA climbed airspeed bled off quickly (Tabs V-2.2 and V-3.1). Several crewmembers called to watch airspeed and to increase the throttle (Tabs V-2.2, V-3.1, and V-4.2). The MP immediately applied full throttle as the MA began descending toward the runway (Tab V-1.2). At this point the MA had entered a stall and was descending (Tabs V-2.2 and DD-6). The MA's right main landing gear failed due to the force of the impact and subsequently separated from the MA (Tabs V-2.2 and DD-5). The MA entered a decelerating spin before coming to a stop on the side of the runway near a taxiway intersection (Tabs N-8 and DD-5). Subsequently, the MA caught fire and was destroyed (Tabs N-8, P-2, and V-4.2).

3. BACKGROUND

a. Air Combat Command (ACC)

ACC, headquartered at Joint Base Langley-Eustis, Virginia, is one of ten major commands (MAJCOMs) in the United States Air Force (Tab CC-2). For more than seven decades, ACC has served as the primary provider of air combat forces to America's warfighting commanders (Tab CC-2). ACC organizes, trains, and equips Airmen who fight in and from multiple domains to control the air, space, and cyberspace (Tab CC-2). As the lead command for fighter, command and control, intelligence, surveillance and reconnaissance, personnel recovery, persistent attack and reconnaissance, electronic warfare, and cyber operations, ACC is responsible for providing combat air, space, and cyber power and the combat support that assures mission success to America's warfighting commands (Tab CC-2).

b. 432nd Wing (432 WG)

The 432 WG is located at Creech AFB, Nevada (Tab CC-4). The 432 WG was returned to active service in May 2007 as the U.S. Air Force's first unmanned (and later remotely piloted) aircraft systems wing (Tab CC-5). The wing's mission is to conduct unmanned precision attacks and intelligence, surveillance, and reconnaissance combat missions in support of overseas contingency operations (Tab CC-5).

c. 489th Attack Squadron (489 ATKS)

The 489 ATKS was redesignated as the 489 ATKS on 1 December 2016 and activated on 2 December 2016 (Tab CC-6). The unit is located at Creech AFB, Nevada (Tab CC-6). The 489 ATKS conducts MQ-1 and MQ-9 launch and recovery training; deploys aircrews into areas of responsibility to execute takeoff, departure, arrival, and landing of air tasking order missions; and delivers immediate persistent attack and reconnaissance combat operations in response to emerging base threats (Tab CC-7).

d. MQ-9A Reaper

The MQ-9A Reaper is employed primarily as an intelligence-collection asset and secondarily against dynamic execution targets (Tab CC-8). Given its significant loiter time, wide-range sensors, multi-mode communications suite, and precision weapons, it provides a unique capability to perform strike, coordination, and reconnaissance against high-value, fleeting, and time-sensitive targets (Tab CC-8). Reapers can also perform the following missions and tasks: intelligence, surveillance and reconnaissance, close air support, combat search and rescue, precision strike, buddy-lase, convoy and raid overwatch, route clearance, target development, and terminal air guidance (Tab CC-8). The MQ-9A's capabilities make it uniquely qualified to conduct irregular warfare operations in support of combatant commander objectives (Tab CC-8).

4. SEQUENCE OF EVENTS

a. Mission

During the afternoon of 28 September 2022, a launch and recovery element (LRE) from the 489 ATKS was tasked by the mishap squadron commander (MSQCC) with launching an ACC MQ-9A, T/N 16-4332 (Tabs G-303 and K-112). In addition to the launch, the mishap crew (MC) intended to accomplish “Simulated Engine Out” (SEO) approaches, “Touch and Go” landings (both MTS and NC), “Automatic Takeoff and Landing Capability” (ATLC) approaches, and other related training requirements (Tab G-303). The MC consisted of the mishap instructor pilot (MIP), mishap instructor sensor operator (MISO), mishap pilot (MP), mishap sensor operator (MSO), and Mishap Observer (MO) (Tab K-112). The MO was scheduled to replace the MSO as the student in the sensor operator seat after the MSO completed required training items to regain currency (Tab V-4.1). The MO had no impact on the mishap and provides no additional information relevant to this report (Tab V-4.1).

b. Planning

As part of the LRE’s planned training mission, the MP was accomplishing an abbreviated mission qualification training (MQT) syllabus, consistent with the MP’s previous flying experience and as directed by the MSQCC (Tabs G-303 and R-31). This sortie was the first live flight in the MQT syllabus for the MP since being assigned to the 489 ATKS. While the MP was new to the unit, the MP was experienced in MQ-9 launch and recovery operations (Tab R-30). The event included launch procedures, SEO approaches, “Touch and Go” landings (both MTS and nose camera), ATLC approaches, recognition and performance of go around procedures as required, departure, “Intelligence, Surveillance, and Reconnaissance” (ISR), and "Close Air Support” (CAS) (Tab G-303). The MSO was experienced, but non-current and required basic LRE events to be conducted with an instructor (Tab V-4.1). The MC arrived prior to the scheduled briefing time to gather applicable pre-briefing materials and prepare for the flight (Tab V-1.1 to V-4.2). The MP conducted the pre-flight brief in accordance with the squadron briefing guide (Tab O-11). The MIP counseled the MP on needing to include the special interest items and training rules, due to those items being omitted in the initial crew brief (Tabs O-3 to O-4, O-11, and V-2.1).

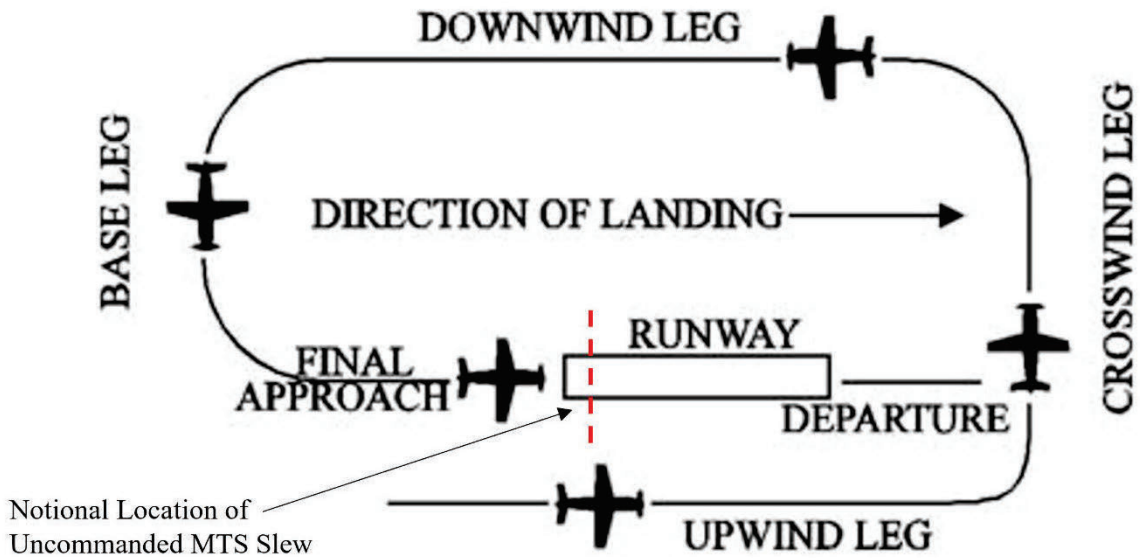
c. Preflight

The MC accomplished all applicable checklist steps and procedures correctly to prepare the mishap ground control station (MGCS) and MA for flight (Tabs V-1.1 and BB-56 to BB-59). No evidence indicate the preflight procedures were a factor in this mishap.

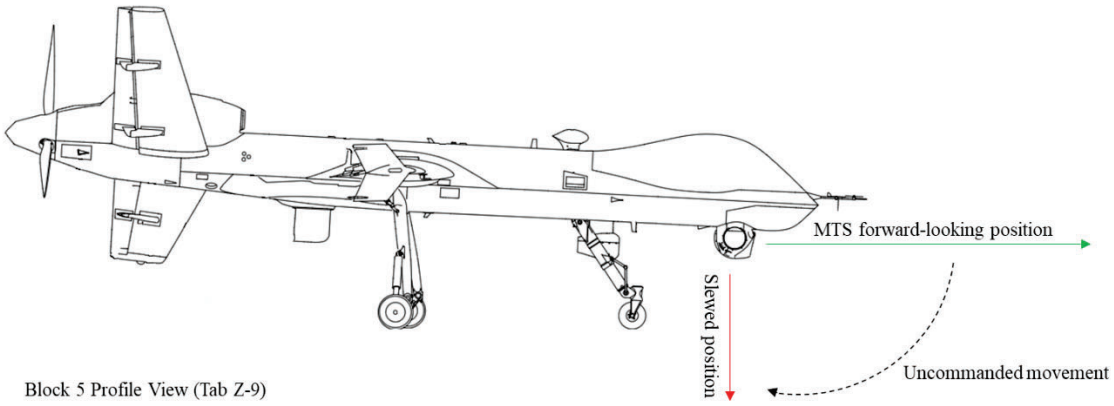
d. Summary of Accident

Prior to the mishap, the MC completed several approaches utilizing the Mishap Aircraft's (MA) forward-looking nose camera (NC) to the runway (Tab V-1.1). During the downwind leg, in preparation for the mishap touch and go approach, the MP requested the MSO to switch the MP's HUD to the multi-spectral targeting system (MTS) (Tab V-4.1). The "downwind leg" is the flight path parallel to the landing runway in the direction opposite the landing direction (Tab BB-63).

Components of a Traffic Pattern (Tab Z-10)



On final approach to the runway, the MA was descending on glide path when the MTS slewed rapidly downward from its original forward-looking position (Tab DD-3).



Block 5 Profile View (Tab Z-9)

The MP pitched the MA up for a nose high attitude but reduced the throttle to flight idle due to disorientation from the uncommanded MTS movement (Tabs V-1.2 and DD-3). The MP then called, "Going around" (Tabs V-1.2 and DD-3). The MA climbed away from the runway utilizing the remaining kinetic energy (Tab V-1.2). While the MA was climbing, the MIP utilized the MSO's view of the NC to maintain awareness of the aircraft's attitude and positive rate of climb (Tab V-2.2). Once the MIP verified the MA was climbing, the MIP directed the MSO to switch the MP's view back from the MTS to the NC (Tab V-2.2). As the MSO was reconfiguring the MP's primary video source, the MISO called out, "Airspeed," as the instrument-indicated airspeed was rapidly decaying below stall speed (Tab V-4.2). The MIP heard the airspeed callout and leaned forward to check the physical position of the throttle (Tab V-2.2). The MIP called, "Throttle, throttle forward, throttle forward," which was also repeated by the MSO (Tab V-4.2). The MP immediately applied full throttle, but the MA had slowed to more than 10 knots below stall speed and began descending toward the runway (Tabs V-1.2 and DD-5).

e. Impact

Prior to impact, the MA managed to accelerate back to stall speed (Tab DD-5). When the MA struck the ground, the right main landing gear failed due to the force of impact and separated from the aircraft (Tabs V-2.2, Z-4 to Z-6, and Z-8). Despite attempts to control the MA using rudder, the MP could not maintain runway centerline, resulting in a decelerating spin before coming to a stop on the side of the runway (Tabs V-1.2 and Z-7). During the spin on the runway, the MP pulled the condition lever aft, which feathered the propeller and terminated fuel flow to the engine (Tabs V-1.2 and Z-7). The MA came to a complete stop at the intersection of the main runway and a taxiway, caught fire, and was destroyed (Tabs R-16, V-1.2, V-2.2, and Z-2 to Z-3).

f. Egress and Aircrew Flight Equipment (AFE)

Not applicable.

g. Search and Rescue (SAR)

Not applicable.

h. Recovery of Remains

Not applicable.

5. MAINTENANCE

a. Forms Documentation

A review of the maintenance records for the MA and MGCS leading up to the mishap revealed two relevant MTS discrepancies (Tabs D-214 to D-217, D-267 to D279, D-463 to D-484, and D-500 to D-506). The discrepancies are described below in paragraph 5.f. There were no overdue time compliance technical orders (TCTO) (Tabs D-50 to D-52, D-347). All preflight inspections and release procedures were accomplished (Tabs D-13 to D-25, D-342 to D-347, and D-518 to D-520).

b. Inspections

All MA and MGCS maintenance inspections were current and complied with all relevant authorities (Tabs D-527 to D-534 and D-572 to D-577). No evidence indicates the MA or MGCS maintenance inspections were a factor in this mishap.

c. Maintenance Procedures

Maintenance personnel conducted all maintenance procedures in accordance with applicable technical orders (TOs) and guidance (Tab U-2). No evidence indicates that the maintenance procedures executed were a factor in this mishap.

d. Maintenance Personnel and Supervision

No evidence indicates that the training, qualifications, and supervision of the maintenance personnel were a factor in this mishap (Tab T-1 to T-225).

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

No evidence indicates that the fuel, hydraulic, oil, and oxygen were a factor in this mishap (Tab J-2 to J-3).

f. Unscheduled Maintenance

A review of the maintenance records for the MA and MGCS leading up to the mishap revealed two relevant MTS discrepancies. First, several days prior to the mishap, the MTS had no video, symbology, or control (Tab DD-46). A faulty Radio Frequency (RF) tray was identified, and the redundant control module was replaced (Tab DD-46). After installation, all components passed operational checks (Tab DD-46). Second, approximately one month prior to the mishap, two uncommanded MTS movements were reported during flight (Tab DD-46). After testing, maintenance technicians documented that the discrepancies could not be duplicated on the ground (Tab DD-46). MTS operational checks were performed by maintenance technicians and an in-flight operational check (IFOC) was accomplished by aircrew personnel approximately four weeks

prior to the mishap (Tab D-273 to D-279). All operational checks rendered satisfactory results (Tab D-273 to D-279). Subsequently, the aircraft then had multiple flights without MTS discrepancies prior to the uncommanded MTS movement the day of the mishap (Tab D-542 to D-550).

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

Structures and systems analysis were not conducted because all relevant components from the MA were destroyed post-crash and subsequent fire (Tab DD-47).

b. Evaluation and Analysis

The MA experienced an MTS error prior to crash (Tab V-1.2 and V-2.2). The mishap data logs indicate the MTS anomaly and downward slew were uncommanded and caused by a gimbal disabled condition (Tab DD-11). This error is generated by the pulse width modulation board in the Electronics Unit (EU) and indicates an elevation drive control error (Tab DD-11). Due to the EU being damaged in the post-crash fire, the cause of the error could not be determined (Tab DD-11). The failure was likely intermittent, as evidenced by the same error occurring twice on a prior flight and clearing after power cycles (Tab DD-11). Additionally, a momentary MTS anomaly appeared only on the MP's HUD during the mishap flight, occurring less than a second before the uncommanded MTS slew (Tab DD-6 and DD-11).

7. WEATHER

a. Forecast Weather

The forecasted weather provided to the MA by weather personnel (Tab F-4 to F-7):

- Winds: 120 at 15 knots, gusting to 26 knots
- Visibility: Clear
- Significant Weather: Light to moderate turbulence from the surface to 120

b. Observed Weather

Weather observed at the initiation of the mishap sequence (Tab F-8 to F-13):

- Winds: 090 at 16 knots
- Visibility: Clear
- Significant Weather: None
- Outside Air Temperature: 26 Celsius

c. Space Environment

Not applicable.

d. Operations

No evidence indicates the MA operated outside of prescribed operational weather limits (Tab F-8 to F-13).

8. CREW QUALIFICATIONS

a. Mishap Instructor Pilot (MIP)

MIP was current and qualified to instruct and conduct launch and recovery duties in the MQ-9A at the time of the mishap (Tabs G-463 to 482, K-112, K-119 to K-122). MIP had 231.6 hours of MQ-9A flight time and 193.2 hours of MQ-9A simulator time around the time of the mishap (Tab G-463 to G-464). The total instructor, flight time, and simulator flying hours/sorties for the previous 30, 60, 90 days are set forth below (Tab G-463 to G-464):

	Flight Hours	Flight Sorties
Last 30 Days	21.7	9
Last 60 Days	41.9	19
Last 90 Days	51	23

b. Mishap Pilot (MP)

MP was current and qualified to conduct launch and recovery duties in the MQ-9A (Tabs G-319 to G-324, K-112, and K-119 to K-122). MP was a student in the squadron's mission qualification training at the time of the mishap in order to get retrained for squadron specific flights (Tabs G-319 to G-324, K-112, and K-119 to K-122). MP had 718.8 hours of MQ-9A flight time and 342.7 hours of MQ-9A simulator time around the time of the mishap (Tab G-310 to G-311). The total instructor, flight time, and simulator flying hours/sorties for the previous 30, 60, 90 days are set forth below (Tab G-310 to G-311):

	Flight Hours	Flight Sorties
Last 30 Days	5.0	2
Last 60 Days	7.5	3
Last 90 Days	12.1	5

c. Mishap Instructor Sensor Operator (MISO)

MISO was current and qualified to conduct launch and recovery duties in the MQ-9A at the time of the mishap (Tabs G-787 to G-802, K-112 and K-119 to K-122). MISO had 180.4 hours of MQ-9A flight time and 158.8 hours of MQ-9 A simulator time around the time of the mishap (Tab G-724 to G-725). The total instructor, flight time, and simulator flying hours/sorties for the previous 30, 60, 90 days are set forth below (Tab G-724 to G-725):

	Flight Hours	Flight Sorties
Last 30 Days	18.8	10
Last 60 Days	28.3	15

Last 90 Days	36.4	19

d. Mishap Sensor Operator (MSO)

MSO was qualified but non-current to conduct LRE duties in the MQ-9A at the time of the mishap (Tabs G-593 to G-617, K-112, and V-3.2). MSO was on the sortie in order to get recurrent for a deployment (Tab V-4.1). MSO had 1650.5 hours of MQ-9A flight time and 146.5 hours of MQ-9A simulator time around the time of the mishap (Tab G-593 to G-594). The total instructor, flight time, and simulator flying hours/sorties for the previous 30, 60, 90 days are set forth below (Tab G-593 to G-594):

	Flight Hours	Flight Sorties
Last 30 Days	5.5	2
Last 60 Days	5.5	2
Last 90 Days	5.5	2

9. MEDICAL

a. Qualifications

All members were medically qualified for their specific duties at the time of the mishap (Tabs G-6, G-363, G-622, and K-112).

b. Health

No evidence indicates the member's health contributed to the mishap (Tabs G-2, G-624, and T-10).

c. Pathology

The medical clinic collected toxicology test samples from members after the mishap (Tab G-8, G-367, G-502, G-628, and G753). The reports indicate that toxicology was not a factor in the mishap (Tab G-8, G-367, G-502, G-628, and G-753).

d. Lifestyle

No evidence indicates that lifestyle was a factor in the mishap (Tab G-9 to G-20, G-368 to G-380, G-503 to G-515, G-629 to G-641, and G-754 to G-766).

e. Crew Rest and Crew Duty Time

At the time of the mishap, AFMAN 11-202, Volume (V) 3, Flight Operations, 10 June 2022, required aircrew members have proper crew rest prior to performing any duties involving aircraft operations (Tab BB-54). Paragraph 3.1 of the applicable version of AFMAN 11-202 V3 defined crew rest periods as a minimum 12-hour non-duty period before the flight duty period begins (Tab BB-54). Its purpose was to ensure the aircrew member adequately rests before performing flight duties or flight related duties (Tab BB-54). Crew rest is defined as, "free time that includes time

for meals, transportation, and rest" (Tab BB-54). MC verified they received adequate crew rest before the mishap (Tabs G-9 to G-20, G-368 to G-380, G-503 to G-515, G-629 to G-641, G-754 to G-766, K-107, and K-112).

10. OPERATIONS AND SUPERVISION

a. Operations

When the MA experienced an MTS anomaly, the MC was approximately 36 minutes into their planned two-hour sortie (Tabs K-2 and M-2 to M-3). No evidence indicates that the MC's operations tempo contributed to the mishap.

b. Supervision

No evidence indicates that operations supervision contributed to the mishap.

11. HUMAN FACTORS ANALYSIS

a. Introduction

The Department of Defense Human Factors Analysis and Classification System 7.0 (DoD HFACS 7.0) lists potential human factors that can play a role in aircraft mishaps and identifies potential areas of assessment during an accident investigation (Tab BB-2 to BB-14). Four human factors were identified as relevant to this mishap:

b. Relevant Factors Identified by AAIB

(1) Procedure Not Followed Correctly (AE103) is a factor when a procedure is performed incorrectly or accomplished in the wrong sequence (Tab BB-7). During this mishap, MP failed to follow the appropriate go around procedures, as outlined in MQ-9A TOs, by reducing the throttle versus advancing to full fly (Tabs V-1.2 and V-2.2). During execution of the go around procedure, MP did not crosscheck the MSO's display for visual reference (Tab V-1.2). Crosschecking the MSO's display would have confirmed whether the MA was still flying as expected or at an unusual attitude (Tab DD-9). An unusual attitude is an aircraft attitude which occurs inadvertently, is not normally required for instrument flight, or is not anticipated (Tab BB-55).

(2) Breakdown of Visual Scan (AE105) is a factor when the individual fails to effectively execute visual scan patterns (Tab BB-7). During this mishap, MP, MIP, MSO focused on the loss of visual references when the MTS slewed straight down (Tab V-1.1 to V-4.2). The MP did not reference the sensor operators display once the MP's primary display failed (Tab V-1.2). Additionally, the crew focused on switching the camera to regain visual references versus crosschecking MA instruments (Tab V-1.2, V-2.2, and V-3.2). As a result, no one on the crew confirmed the throttle position or observed the airspeed decrease in time to take corrective action (Tab V-2.2 and V-3.2).

(3) Visibility Restrictions (not weather related) (PE203) is a factor when the lighting system, windshield/windscreen/canopy design, or other obstructions prevent necessary visibility (Tab BB-11). During the mishap the MP lost all visual references due to an uncommanded downward slew

of the MTS (Tab V-1.2). During this critical phase of flight, short final for a landing, it was unexpected and initially disorienting (Tab V-1.2). Additionally, the MGCS layout is not suitable for other crewmembers to easily reference the throttle positions (Tab V-2.3 and V-3.2). The MIP and MSO needed to lean forward in order to see what position the MP had moved the throttle to (Tab V-2.3 and Tab V-3.2).

(4) Spatial Disorientation (PC508) is a factor when an individual fails to correctly sense a position, motion, or attitude of the aircraft/vehicle/vessel or of oneself (Tab BB-14). Spatial Disorientation may be unrecognized and/or result in partial or total incapacitation (Tab BB-14). During this mishap, the unexpected movement of the MTS, as the MP's primary reference, created a sense of unexpected movement of the MA and thus was disorienting to the MP (Tab V-1.2). When the MA's MTS slewed down it gave a sense that the MA was pitching forward at a critical phase of flight (Tab V-1.2). There is no "seat of the pants" feel when remotely flying an aircraft, so it was difficult for the MP to sense the MAs position and attitude when the MA provides inaccurate visual references to how the MA is performing (Tab V-1.2).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

(1) Human Factors Analysis and Classification System, Version 7.0, available at https://www.safety.af.mil/Divisions/Human-Factors-Divisions/HFACS/

(2) Human Factors Analysis and Classification System Handbook, available at https://safety.army.mil

(3) AFI 51-307, *Aerospace and Ground Accident Investigations*, 18 March 2019, available at https://www.e-publishing.af.mil

(4) AFI 51-307, Air Combat Command Supplement, *Aerospace and Ground Accident Investigations*, 3 December 2019, available at https://www.e-publishing.af.mil

(5) Department of the Air Force Instruction (DAFI) 91-204, *Safety Investigations and Reports*, 10 March 2021, available at https://www.e-publishing.af.mil

(6) AFMAN 11-202, V3, *Flight Operations*, 10 January 2022, available at https://www.e-publishing.af.mil

(7) AFMAN 11-2MQ-9 V3, *Flying Operations*, 1 October 2020 (previous version), current version available at https://www.e-publishing.af.mil

(8) Airplane Flying Handbook, FAA-H-8083-3C, 29 March 2022, Figure 3-4, available at https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/04_afh_ch3.pdf

(9) Aeronautical Information Manual (AIM) Basic with Change 1, 2, and 3, 3 November 2022, available at www.faa.gov/air_traffic/publications/atpubs/aim_html/chap4_section_3.html

b. Other Directives and Publications Relevant to the Mishap

(1) TO 1Q-1(M)A-1, *Flight Manual*, 11 July 2022

(2) TO MTS, *General*, accessed 4 March 2023

(3) TO MTS, *Fault Isolation*, accessed 4 March 2023

(4) 489 ATKS Squadron Standards, April 2021

(5) 489 ATKS SII 20-02, *Go Around Criteria and Execution*, 29 June 2020

(6) 489 ATKS FCIF 21-02, *Go Around Criteria and Execution*, 24 March 2021

(7) 432 OG FCIF 21-32R, *Approach And Landing CRM Guidance*, 2 November 2021

(8) AFMAN 11-2MQ-9V3, 432 Operations Group Supplement, *Flying Operations*, Chapter 8, Local Procedures, 2 May 2018

(9) AFTTP 3-3.MQ-9, *Combat Fundamentals MQ-9*, 9 April 2021

c. Known or Suspected Deviations from Directives or Publications

(1) TO 1Q-9(M)A-1, Flight Manual, Missed Approach/Go Around, paragraph 2.46

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4 April 2023

PAUL E. SHEETS, Colonel, USAF
President, Abbreviated Accident Investigation Board

STATEMENT OF OPINION

MQ-9A, T/N 16-4332
CREECH AIR FORCE BASE, NEVADA
28 SEPTEMBER 2022

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 28 September 2022, the mishap aircraft (MA), an unmanned MQ-9A, tail number (T/N) 16-4332, impacted Runway 08 at Creech Air Force Base, Nevada. On impact the right main landing gear failed, causing the MA to enter a decelerating spin on the runway. The MA came to a stop at the intersection of a taxiway, caught fire, and was destroyed. The crash resulted in no reported damage to civilian property, no injuries, and no fatalities. The loss of government property was valued at $16,604,363.00.

While on approach for a touch and go landing, the mishap pilot (MP) was utilizing the Multi-spectral Targeting System (MTS) for primary visual cues. In close proximity to the ground, the MA experienced an MTS malfunction, which slewed the MTS from a forward-looking position to a straight-down view of the runway. As a result of this malfunction, the MP initiated a go around by increasing the pitch angle of the MA but throttled back to idle. The MA began to climb, and the MP verified that MA was visually climbing from the airfield, but did not crosscheck throttle position, engine RPM, or airspeed. Due to lack of thrust and positive climb rate, the MA's airspeed bled off to approximately 10 knots below stall speed, while the aircraft climbed. Nine seconds after the go around was called, the mishap instructor pilot (MIP) identified the lack of airspeed and called for the throttle to be moved forward. The lack of airspeed and increased pitch angle caused the MA to stall. Three seconds after stall the MP increased the throttle to full, but the MA had already begun to descend. The MA impacted the runway. Due to the force, the MA's right main landing gear failed, and the MA entered a decelerating spin on the runway. The MA came to a stop near the intersection of a taxiway, caught fire, and was destroyed.

2. CAUSES

As the Abbreviated Accident Investigation Board President, I find, by a preponderance of the evidence, that the cause of the mishap was the MP incorrectly executing a go around procedure as outlined in MQ-9A technical orders, by raising the nose of the aircraft and reducing the throttle to idle. These actions resulted in an unpowered climb, stall, and subsequent unrecoverable decent to impact with the runway.

The specific cause of the mishap was that the throttle of the aircraft was moved aft to idle as the control stick was also moved aft to pitch the aircraft to a nose-high attitude. Per applicable go around procedures, the MP should have advanced the throttle to full while, at the same time, raising the nose of the aircraft above the horizon.

Review of the MA data files, witness testimonies, and mission video of the mishap show, by a preponderance of evidence, that the MP placed the throttle in idle while raising the MA's nose. These actions decelerated the aircraft below stall speed and the MA began an unintended descent. Due to the low altitude, there was not enough time to recover the aircraft prior to impact.

Additionally, during interviews with all mishap crewmembers, it was confirmed that at the altitude and critical phase of flight the MTS malfunction was disorienting and distracting. The unexpected slew of the MTS hindered normal flight instrument and cockpit crosschecks, which delayed the appropriate response for the go around.

3. SUBSTANTIALLY CONTRIBUTING FACTORS

Further, I find, by a preponderance of the evidence that the following three factors substantially contributed to the mishap: (1) the MTS failure at a critical phase of flight caused disorientation and distraction for all four crewmembers; (2) the MP did not reference the mishap sensor operator's (MSO) Heads Up Display (HUD) or the flight instruments to reorient and confirm the MA's position over the runway; and, (3) the MIP prioritized the correction of the MP's video display over ensuring go around procedures were being properly performed.

First, during the mishap approach, both the MP and MIP were utilizing the MTS for visual references in order to land the aircraft. Just prior to MA touchdown, a critical phase of flight, the MTS slewed straight down to the runway. Though the MP called a go around, the MP was disoriented due to the unexpected movement of primary visual references. The board finds that it is logical for a crewmember to be disoriented when the primary visual reference moves, giving the sense of an unusual attitude at a critical phase of flight. This circumstance contributed to MP's incorrect application of throttle position to execute a procedural go around. Additionally, the MTS failure provided a distraction for MIP, MSO, and mishap instructor sensor operator (MISO). The MIP directed the MSO to change cameras to regain visual references, which resulted in a delayed crosscheck of the throttle position, airspeed, and altitude by the MIP. While the MSO and MISO were distracted with changing the camera, their ability to perform a proper crosscheck on throttle position, was hindered.

Second, the MP did not reference the MSO's HUD or the flight instruments to reorient and confirm the MA's position over the runway. This action would have confirmed that the MA was not flying in an unusual attitude. Had MP performed an appropriate visual scan of the MSO's HUD or the flight instruments, the MP may have reoriented himself and regained control of the MA.

Third, the MIP did not prioritize monitoring MP's performance of go around procedures over correcting MP's video display. While visual references were lost, primary flight instruments were still available and providing accurate flight information to the MP and MIP. Given the low altitude of the MA and the fact that the MP announced, "go around," the MIP failed to visually verify the

position of the throttle. Instead, the MIP focused attention on getting the MSO to change the camera to gain visual references. Due to the MA's proximity to the runway, the MIP should have prioritized ensuring the appropriate steps were taken to conduct a go around.

Finally, although not a substantially contributing factor, the board notes that due to the layout of the MGCS it is difficult for the MIP or MISO to verify all flight controls and verify the throttle position. The amount of space around the cockpit seats limits both the MIP and the MISO from observing the throttle position.

4. CONCLUSION

Aircraft data logs, maintenance records, witness testimony, technical reports, and maintenance practices prove, by a preponderance of evidence, the cause of the mishap was the MP reducing throttle to idle, instead of pushing forward to full throttle, while executing a low altitude go around procedure. Further, I find, by a preponderance of the evidence that the following factors substantially contributed to the mishap: the MTS failure at a critical phase of flight caused disorientation and distraction for all four crewmembers; the MP did not reference the MSO's HUD to regain visual references and confirm that the MA was not flying in an unusual attitude; and, the MIP prioritized the correction of the MP's video display over ensuring go around procedures were being properly performed.

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4 April 2023

PAUL E. SHEETS, Colonel, USAF
President, Abbreviated Accident Investigation Board

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