UNITED STATES AIR FORCE ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

MQ-9A T/N 14-4263

27TH SPECIAL OPERATIONS WING
CANNON AIR FORCE BASE (AFB), NEW MEXICO

LOCATION: UNDISCLOSED LOCATION IN THE CENTCOM AOR

DATE OF ACCIDENT: 13 JUNE 2021

BOARD PRESIDENT: LIEUTENANT COLONEL WILLIAM K. SCHAEFFER

Abbreviated Accident Investigation conducted pursuant

to Chapter 12 of Air Force Instruction 51-307

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SPECIAL OPERATIONS COMMAND

JAN 2 7 2022

ACTION OF THE CONVENING AUTHORITY

The report of the abbreviated accident investigation board, conducted under the provisions of AFI 51-307, *Aerospace and Ground Accident Investigations,* that investigated the 13 June 2021 mishap at an undisclosed location in the CENTCOM area of responsibility involving an MQ-9, T/N 14-4263, assigned to the 27th Special Operations Wing and operated by the 361st Expeditionary Attack Squadron in the United States Central Command area of responsibility, substantially complies with the applicable regulatory and statutory guidance and on that basis is approved.

ERIC T. HILL
Major General, USAF
Deputy Commander

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION

MQ-9A, T/N 14-4263
UNDISCLOSED LOCATION IN CENTCOM AOR
13 June 2021

On 13 June 2021, at approximately 2300 local time (L), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 14-4263, assigned to the 27th Special Operations Wing (27 SOW), Cannon AFB, New Mexico (NM), crashed approximately 3,000 feet down a runway during takeoff at an undisclosed location in the CENTCOM AOR. At the time of the incident, the 361 Expeditionary Attack Squadron (361 EATKS) Launch and Recovery Element (LRE) crew had control of the MA. The MA's Ground Control Station (GCS) (S/N 07-6128) experienced downlink failure during takeoff when another GCS (S/N 06-6113) crew communicated to their Crew Chief to apply aircraft power to another launching MQ-9 (T/N 13-4604). Downlink is the signal the aircraft sends to the Ground Data Terminal (GDT) in route to the GCS. The GDT is a hardwired antenna attached to the GCS and is responsible for sending and receiving signals to remotely piloted/operated aircraft. The GCS is where the pilot and sensor operator sit to control the aircraft.

During takeoff, but prior to leaving the ground, MA passed its 50-knot acceleration check during which the MA pilot experienced multiple link degradation visuals, video interference, and other video frames scrolling across the head up display (HUD). Simultaneously, the MA pilot corrected a known left turn bias several times which is a common handling characteristic of the MQ9. A left turn bias causes an aircraft to naturally drift left and requires pilot correction by entering right steering/rudder commands toward centerline. MA's left turn bias continued uncorrected after lost downlink preventing the MA from maintaining centerline and resulted in MA departing the runway to the left. The MA has software called lost link logic which is designed to continue the aircraft's takeoff without pilot instruction when the aircraft achieves 50 knots and determines there is no uplink signal from the controlling GCS. MA's acceleration data showed MA reached 61-80 knots, the lost link logic software properly triggered and prepared the MA for takeoff. However, prior to takeoff, MA veered left off the runway, impacted a runway sign at 80-90 knots, caught fire, and was destroyed. There were no reported fatalities or injuries. The loss of United States Government property was valued at approximately $18,000,000.00.

The Abbreviated Accident Investigation Board President found, by a preponderance of the evidence, that the mishap was caused by the mishap crew (MC1) failing to follow checklist warnings and cautions. Specifically, MC1 failed to de-conflict their aircraft's (T/N 13-4604) power-on process while in close proximity of MA's GDT during MA's critical phase of flight—takeoff. Thus, T/N 13-4604's power-on caused a downlink loss for MA.

SUMMARY OF FACTS AND STATEMENT OF OPINION

MQ-9A, T/N 14-4263

13 June 2021

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

12 AF	12th Air Force
42 ATKS	42d Attack Squadron
432 WG	432d Wing
A1C	Airman First Class
AAIB	Abbreviated Accident Investigation Board
ACC	Air Combat Command
ADC	Area Defense Counsel
AFB	Air Force Base
AFETS	Air Force Engineering Technical Service
AFI	Air Force Instruction
AFTO	Air Force Technical Order
AOR	Area of Responsibility
ASI	Air Speed Indicator
ATC	Air Traffic Control
CAP	Critical Action Procedure
Capt	Captain
CAS	Close Air Support
CC	Commander
CRM	Crew Resource Management
DEEC	Digital Electronic Engine Control
DO	Director of Operations
DoD	Department of Defense
EFIU	Engine and Fuel Interface Unit
EGT	Exhaust Gas Temperature
EP	Emergency Procedure
FCU	Fuel Control Unit
FT	Feet
GA-ASI	General Atomics Aeronautical Systems, Inc.
GCS	Ground Control Station
HAT	Height Above Target
HDD	Heads-Down Display
HFACS	Human Factors Analysis and Classification System
HUD	Head-Up Display
HVI	High Value Individual
IFE	In-Flight Emergency
IR	Infrared
ISR	Intelligence, Surveillance, and Reconnaissance
L	Local Time
LR	Launch and Recovery
LRE	Launch and Recovery Element
Lt	Lieutenant
MA	Mishap Aircraft
MC	Mishap Crew
MCC	Mission Control Commander
MCE	Mission Control Element
MMSO	Mishap Mission Safety Observer
MP	Mishap Pilot
MSO	Mishap Sensor Operator
NM	Nautical Miles
Ops	Operations
Ops Sup	Operations Supervisor
ORM	Operational Risk Management
OSS	Operation Support Squadron
PAROC	Persistent Attack and Reconnaissance Operations Center
PG	Propeller Governor
PIC	Pilot in Command
RL	Return Link
RPA	Remotely Piloted Aircraft
RPM	Revolutions per Minute
RTB	Return to Base
SAR	Search and Rescue
SIB	Safety Investigation Board
SIM	Simulator
SIPR	Secure Internet Protocol Router
SOAP	Spectrometric Oil Analysis Program
TCTO	Time Compliance Technical Order
T/N	Tail Number
TO	Technical Order
UCMJ	Uniform Code of Military Justice
USAF	United States Air Force
US CENTCOM	United States Central Command
VIT	Variable Information Tables
VVI	Vertical Velocity Indication
Z	Zulu Time

The above list derives from the Summary of Facts, the Statement of Opinion, the Index of Tabs, and Witness Testimony (Tab V).

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 10 September 2021, Major General Eric T. Hill, Deputy Commander, Air Force Special Operations Command (AFSOC), appointed Lieutenant Colonel William K. Schaeffer as the Abbreviated Accident Investigation Board (AAIB) President to investigate a 13 June 2021 MQ-9A aircraft accident involving an MQ-9A aircraft, tail number (T/N) 14-4263 (Tab A-1). The AAIB conducted their investigation at Hurlburt Field, Florida (FL), from 10 September 2021 to 27 October 2021, and then remotely from their respective duty locations until 13 October 2021, in accordance with the provisions of Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, Chapter 12 (Tab AE-1). A legal advisor (Major) was also appointed to the AAIB (Tab A-1.1). Two subject matter experts were also appointed to advise the board: a pilot (Captain), and a maintainer (Master Sergeant) (Tab A-1.1).

b. Purpose

In accordance with AFI 51-307, 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 (Tab AE-1). This investigation was an abbreviated accident investigation, conducted pursuant to Chapter 12 of AFI 51-307 (Tab AE-1).

2. ACCIDENT SUMMARY

On 13 June 2021, at approximately 2300 local time (L), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 14-4263, assigned to the 27th Special Operations Wing (27 SOW), Cannon Air Force Base, NM, crashed approximately 3,000 ft down a runway while in the process of takeoff at an undisclosed location in the CENTCOM AOR (Tabs M-1, Z-2). At the time of the incident, the 361 EATKS Launch and Recovery Element (LRE) was in control of the MA (Tab Z-2). The MA experienced downlink failure while on takeoff roll before departing the runway (Tabs O-1.2, V-2, Z-4). Takeoff roll means that the aircraft was on the ground and gaining speed for takeoff. During takeoff, the MA pilot corrected a known left turn bias of the aircraft toward center of the runway by commanding the MA to steer and rudder to the right before downlink was lost (Tabs O-1.2, V-2). A left turn bias means the aircraft tended to naturally drive left without human interference. The left turn bias continued uncorrected after C-Band (frequency) uplink from the Ground Data Terminal (GDT) was lost (Tabs O-1.2, Z-4). C-Band uplink is the connection between the GDT and the aircraft that allows an RPA crew to control the aircraft. After departing the runway, the aircraft impacted a runway sign damaging the landing gear. The MA caught fire and was destroyed. The total loss of Government property was valued at $18,000,000.00 (Tab AB-1.1).

3. BACKGROUND

a. Air Force Special Operations Command (AFSOC)

AFSOC's primary mission is to organize, train, and equip Airmen to execute global special operations as America's Air Commandos. AFSOC is one of ten Air Force major commands (MAJCOM) and is the Air Force component of United States Special Operations Command. AFSOC has more than 20,800 active duty, Air Force Reserve, Air National Guard, and civilian personnel (Tab AA-1.2). The core missions of AFSOC include battlefield air operations, agile combat support, precision strike, information operations, specialized air mobility, command and control, special tactics, aviation foreign internal defense, and intelligence, surveillance and reconnaissance (Tab AA-1.2).

b. 27th Special Operations Wing (27 SOW)

The 27 SOW is located at Cannon Air Force Base, New Mexico and conducts infiltration/exfiltration, combat support, tilt-rotor operations, helicopter aerial refueling, close air support, unmanned aerial vehicle operations, and other special missions (Tab AA-1.16). It directs the deployment, employment, training, and planning for squadrons that operate the AC-130W, MC-130J, CV-22B, U-28A, MQ-9 and provides operational support to flying operations (Tab AA-1.16).

c. United States Central Command (USCENTCOM)

USCENTCOM, at MacDill Air Force Base, Florida, covers the central area of the globe, including the European, Africa, and Indo-Pacific Commands (Tab AA-1.4). USCENTCOM's primary mission is to direct and enable military operations and activities with allies to increase regional security and stability in support of enduring U.S. interests (Tab AA-1.4). USCENTCOM's priorities are to (1) deter Iran; (2) negotiate resolution of the conflict in Afghanistan: (3) maintain a defeat-ISIS campaign in Syria and Iraq; (4) countering the Unmanned Aircraft System threat; and (5) weaponization of internally displaced persons and refugees (Tab AA-1.4). Established on 1 January 1983, USCENTCOM has played a pivotal role in every military operation in that region from the Iranian mining operations in the Persian Gulf to the recent wars on terrorism (Tab AA-1.4).

d. 332d Air Expeditionary Wing (332 AEW)

The 332 AEW is a provisional wing that Air Combat Command activated in 2002 at Ahmed Al Jaber Air Base, Kuwait (Tab AA-1.7). The 332 AEW helped enforce the no-fly zone in southern Iraq during Operation SOUTHERN WATCH, and then went on to participate in Operation's ENDURING FREEDOM and IRAQI FREEDOM (Tab AA-1.7). During IRAQI FREEDOM, the wing moved to Tallil Air Base, Iraq, in 2003 and then to Joint Base Balad, Iraq, in 2004 to provide airpower for the USCENTCOM combatant commander (Tab AA-1.7). The wing participated in Operation NEW DAWN until inactivated in May 2012 (Tab AA-1.7). In May 2014, the wing stood back up and in May 2016 moved to its current location in Southwest Asia (Tab AA-1.7). With more than 2,000 Airmen across three continents, the wing includes a wide array of combat capabilities including aerial refueling, Intelligence, Surveillance, and Reconnaissance (ISR), space, combat search and rescue, and precision strike in support of theater operations (Tabs AA-1.7 to AA-1.8). The wing operates F-15E, MQ-9, and KC-135R aircraft as well as HH-60G helicopters. (Tab AA-1.8).

e. 361st Expeditionary Attack Squadron (361 EATKS)

On 19 May 2016, the 361 EATKS became an operational MQ-9 Reaper Squadron (Tab AA-1.9). The squadron is currently assigned to the 332 AEW supporting the Iraq and Syria area of operation (Tab AA-1.9). The squadron's primary mission is to provide armed ISR in its assigned area of operation (Tab AA-1.10).

f. MQ-9A Reaper

The MQ-9A Reaper is an armed, multi-mission, medium-altitude, long-endurance remotely piloted aircraft (RPA) employed primarily against dynamic execution targets and secondarily as an intelligence collection asset (Tab AA-1.12 to AA-1.13). Given its significant loiter time (meaning its ability to remain in flight over a specific area), wide-range sensors, multi-mode communications suite, and precision weapons, the MQ-9A is uniquely capable to perform strike, coordination, and reconnaissance against high-value, fleeting, and time-sensitive targets (Tab AA-1.13). MQ-9As can perform the following missions and tasks: intelligence, surveillance, reconnaissance, close air support, combatsearch and rescue, precision strike, buddy-lase, convoy/raid overwatch, target development, and terminal air guidance (Tab AA-1.13).

4. SEQUENCE OF EVENTS

a. Mission

On 13 June 2021, two crews from the 361 EATKS, LRE1 and mishap crew (MC1), were tasked with launching two AFSOC MQ-9As, T/N 14-4263 and T/N 13-4604. After launch, LRE1 and MC hand over control to the Mission Control Element (MCE) to perform authorized missions in an undisclosed location within the US CENTCOM area of responsibility (AOR) (Tab Z-2). The LRE1 crew consisted of the Instructor Pilot (IP), Pilot (P), and sensor operator (SO) (Tabs Q-1 and Z-2). The mishap crew (MC1) consisted of a Mishap Instructor Pilot (MIP), Mishap Instructor Sensor Operator (MISO), Mishap Pilot (MP), and Mishap Sensor Operator (MSO) (Tabs R-2 and Z-2).

b. Planning

As part of the LRE mission planning, LRE1 and MC1 attended a mass briefing at the beginning of the shift to receive turnover from the operations supervisor (Tabs P-1.4, P-2.3, P-3.2, and P-6.5). The shift was briefed weather, airfield status, and Notice to Air Missions (NOTAMs) (Tabs P-1.4, P-2.3, P-3.2, P-4.5, P-5.3, and P-6.5). The shift reviewed an emergency procedure, completed Operational Risk Management (ORM), and signed the flight authorization (Tabs P-1.4, P-2.3, P-3.2, P-4.5, P-5.3, and P-6.5). LRE1 P, MP, and MSO recently arrived in country and were in the process of completing local area orientation (LAO) (Tabs P-4.3, P-5.3, and P-7.2). LAO is a process to educate new crew members to operations at airfields they are unfamiliar with in the local area or the area they will be operating. During the turnover brief, the instructors on shift (LRE1 IP, MIP, and MISO) scheduled crews for launches and lands and determined crew pairings for the shift's events (Tab P-3.2, P-6.5).

c. Preflight

LRE1 completed all applicable checklist steps on T/N 14-4263 up to the "Takeoff" checklist with no significant actions contributing to the mishap (Tab V-2). MC1 completed the "GCS Preflight" checklist before proceeding to the "Air Vehicle (AV) Power-Up" checklist (Tabs H-3.1 and V-1). MC1 completed steps 1 through 12 of the "AV Power-Up" checklist before holding checklist at step 13, "Aircraft - PREPARE FOR POWER," (Tabs H-3.1, V-1, and V-3). MIP and MISO instructed MP and MSO to hold checklist because the required crew chief was still performing launch procedures with the MA (Tabs V-1 and V-3). During the pause in checklist, MP asked MIP if power-up is delayed until the MA took off (Tabs V-1 and V-3). MP received confirmation and checklist paused for approximately 14 minutes (Tabs V-1 and V-3). Prior to proceeding with the checklist, MISO instructed MSO on what to expect in the proceeding checklist steps (Tabs V-1 and V-3). MISO verbalized a technique combining step 13, "Aircraft - PREPARE FOR POWER," and step 18, "Aircraft power – ON," of the "AV Power-Up" checklist (Tabs H-3.3, V-1 and V-3). In response to MISO, MIP vocalizes to MP and MSO to ensure the GDT is on prior to turning on T/N 13-4604's aircraft power. (Tabs V-1 and V-3).

d. Summary of Accident

At approximately 2300L, the MC1 radioed the crew chief requesting aircraft power on for T/N 13-4604 (Tabs V-1 and V-3). The crew chief proceeded to turn on the aircraft batteries and responded back to MC1 confirming aircraft power was on (Tabs V-1 and V-3). In response, the MC1 turned on the GDT and began the process of establishing link with T/N 13-4604 (Tabs V-1 and V-3). During this time, the MA was taxiing on to the runway for takeoff and received degraded link and video interference (Tabs V-2 and V-3). At 23:02:49L the MA began takeoff roll, which means the MA was placed in proper position and gaining speed for takeoff but still on the ground (Tabs V-2 and V-3). During takeoff roll, LRE1 P corrected the MA's left turn bias towards the centerline of the runway (Tabs V-2 and V-3). Approximately 10 seconds after beginning takeoff and while still on the ground and gaining speed, LRE1 SO vocalized "50 knots, good acceleration check" (Tab V-2). The 50-knot acceleration check indicated that the MA was operating within normal parameters and could continue takeoff. The MA accelerated to 61 knots and at approximately 23:03:05L LRE1 received a loss of video and telemetry downlink, which prevented LRE1 from controlling the MA aircraft. (Tabs V-2 and V-3). Approximately five seconds after receiving downlink loss, LRE1 turned the GDT off and LRE1 P radioed operating tower notifying them of the MA's lost link status (Tab V-2). MSAB tower responded that the MA departed the runway and to standby (Tab V-2).

e. Impact

Prior to impact, the MA accelerated to approximately 61 knots at 2000 feet from initial takeoff position (Tab O-1.4). The MA departed the runway to the left, crossed a taxiway, and impacted a runway marker sign damaging the aircraft's landing gear approximately 2,400 feet from its initial takeoff position (Tab O-1.2). The MA then lost its landing gear, slid on the infield of the runway. The MA subsequently caught fire and ended its slide approximately 3,200 feet from its takeoff position, 270 feet from runway centerline (Tab O-1.10). The MA eventually burned and was destroyed (Tabs M and O-1.10).

f. Egress and Aircrew Flight Equipment

Not applicable.

g. Search and Rescue (SAR)

Not applicable.

h. Recovery of Remains

Not applicable.

5. MAINTENANCE

a. Forms Documentation

A review of MA's maintenance records leading up to the mishap day revealed no relevant discrepancies, issues, overdue Time Compliance Technical Orders (TCTOs), time change items, or special inspections (Tab S-2.1). Prior to the attempted takeoff, the Exceptional Release (ER) was complied with and the MA cleared pre-flight inspections (Tab S-2.1). ER means that maintenance supervisors approved the aircraft for flight.

b. Inspections

At the time of the mishap, the MA accumulated 6,463.1 total flight hours and it was not overdue for any inspections (Tab S-2.1). All maintenance inspections were current and complied with relevant authorities (Tab S-2.1). An Air Force Technical Order (AFTO) Form 781H, dated 13 June 2021, indicated maintenance personnel inspected the MA prior to its last flight (Tab S-2.1).

c. Maintenance Procedures

Maintenance personnel conducted all maintenance procedures in accordance with applicable Technical Orders (TOs) and guidance (Tab S-2.1).

d. Maintenance Personnel and Supervision

Personnel involved with the MA's preparation for flight were properly and adequately trained, experienced, certified, and supervised to perform their assigned tasks (Tab S-2.1). Maintenance personnel documented all pre-flight servicing and maintenance (Tab S-2.1). No evidence to suggests that the training, qualifications, and maintenance personnel supervision were a factor in this mishap (Tab S-2.1).

e. Fuel, Hydraulic, and Oil Inspection Analyses

According to the MA's AFTO 781H forms, fluid levels were inspected and were adequate to conduct the mishap mission (Tab S-2.1). A sample of the aircraft lubricating oil sent for testing and analysis, indicated the sample was consistent with MIL-PRF-23699 lubricating oil with no detectable volatile contamination (Tab I-1.2).

f. Unscheduled Maintenance

General Atomics Aeronautical Systems, Inc. (GA-ASI) technical report of the incident identified a left turn bias (Tab O-1.10). The data logs and video from GCS 6128 indicated that the left turn bias caused the MA to drift left of the centerline of the runway while accelerating, resulted in the pilot inputting right steering and rudder to correct the MA toward the centerline (Tab O-1.10). The MA's two prior flights had similar left fuel pod weight and total weight values and showed a similar left drift on takeoff (and right steering/rudder corrections to centerline) (Tab O-1.10). The Mission Control Element payload video showed the drift left returned after the LRE1 head up display and payload video were lost (Tabs O-1.10 and V-3). This drift was most likely from the left turn bias, as

there was no roll or braking commands to correct the bias (Tab O-1.10). The was one steering input of a slight right input several seconds after downlink was lost (this timing approximately matched the portion of the MCE payload video when the left drift briefly paused) (Tab O-1.10).

The MA landing gear, brakes, and network communication signals revealed no anomalous behavior or errors during the attempted takeoff (Tab O-1.10). Flight Analytics (FLAX) analysis is in work to examine a possible trend in steering inputs depending on the fuel tank configuration (Tab O-1.10).

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

Structures and systems analysis were not conducted because the MA was destroyed (Tab M).

b. Evaluation and Analysis

Following the mishap, the LRE1 and MC1 data logs from GCS 6128 and 6113, and the MCE payload video, was sent to GA-ASI for review (Tab O-1). The GCS 6113 data logs revealed T/N 13-4604 transmitted on a radio frequency (RF) of 10 megahertz (MHz) from MA's downlink frequency (Tab O-1). T/N 13-4604 also transmitted its frequency on high power as its directional antenna was pointed in the direction of both GCS 6128's and GCS 6113's GDT (Tabs D-1 and O-1). Additionally, T/N 13-4604 was located 650 feet from the MA GDT (the MA was 2,350 to 2,800 feet away from the MA GDT) and RF strength changes exponentially with distance (Tab O-1). The high-power downlink from T/N 13-4604, lack of RF separation between the aircraft, close proximity of T/N 13-4604's to both GDTs, and T/N 13-4604's antenna pointing in the direction of both aforementioned GDTs resulted in T/N 13-4604's downlink from T/N 13-4604 interfering with the MA's downlink during takeoff roll (Tab O-1). The interference is evidenced by the GCS video interference artifacts (scrolling frames, distortion from interference, and bleed-over) (Tabs O-1 and Z-4).

7. WEATHER

a. Forecast Weather

Weather forecast was briefed to the aircrew by weather personnel as follows: (Tab X-1)

- Winds: 310 at 10 knot gusting 20 knots
- Visibility: Clear
- Significant Weather: None

b. Observed Weather

Weather observed at the initiation of the mishap sequence: (Tab X-2)

- Winds: 318 at 6 knots
- Visibility: Clear

- Significant Weather: Wind advisory for observed surface winds >=17 knot but <26 knots
- Outside Air Temperature: 27 Celsius

c. Space Environment

Not applicable.

d. Operations

No evidence suggests the MA operated outside of prescribed operational weather limits (Tab X).

8. CREW QUALIFICATIONS

a. LRE1 Instructor Pilot GCS 6128 (LRE1 IP)

LRE1 IP was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab Q-1.3). LRE1 IP had 799.7 hours of MQ-9A flight time around the time of the mishap (Tab Q-1.5). Recent flight hours were as follows (Tab Q-1.6):

	Flight Hours	Flight Sorties
Last 30 Days	21.5	64
Last 60 Days	33.6	108
Last 90 Days	35.8	116

b. LRE1 Pilot GCS 6128 (LRE1 P)

LRE1 P was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab Q-1.12). LRE1 P had 1,206.1 hours of MQ-9A flight time around the time of the mishap (Tab Q-1.14). Recent flight hours were as follows (Tab Q-1.15):

	Flight Hours	Flight Sorties
Last 30 Days	3.5	4
Last 60 Days	3.5	4
Last 90 Days	5.5	6

c. LRE1 Sensor Operator GCS 6128 (LRE1 SO)

LRE1 SO was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab Q-1.19). LRE1 SO had 61.9 hours of MQ-9A flight time and 115.5 hours of MQ-9A simulator time around the time of the mishap (Tab Q-1.20). Recent flight hours were as follows (Tab Q-1.21):

	Flight Hours	Flight Sorties
Last 30 Days	10.4	17
Last 60 Days	17.9	21
Last 90 Days	24.3	24

d. MC1 Mishap Instructor Pilot GCS 6113 (MIP)

MIP was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab R-1.3). MIP had 382.3 hours of MQ-9A flight time and 222.8 hours of MQ-9A simulator time around the time of the mishap (Tab R-1.4). Recent flight hours were as follows (Tab R-1.5):

	Flight Hours	Flight Sorties
Last 30 Days	10.5	13
Last 60 Days	14.2	14
Last 90 Days	25.2	21

e. MC1 Mishap Pilot GCS 6113 (MP)

MP was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab R-1.8). MP had 86.5 hours of MQ-9A flight time and 106.3 hours of MQ-9A simulator time around the time of the mishap (Tab R-1.11). Recent flight hours were as follows (Tab R-1.9):

	Flight Hours	Flight Sorties
Last 30 Days	1.3	1
Last 60 Days	14.5	8
Last 90 Days	15.9	9

f. MC1 Mishap Instructor Sensor Operator GCS 6113 (MISO)

MISO was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab R-1.44). MISO had 526.5 hours of MQ-9A flight time around the time of the mishap (Tab R-1.46). Recent flight hours were as follows (Tab R-1.47):

	Flight Hours	Flight Sorties
Last 30 Days	7.5	16
Last 60 Days	7.5	16
Last 90 Days	10.9	24

g. MC1 Mishap Sensor Operator GCS 6113 (MSO)

MSO was current and qualified to conduct LRE duties in the MQ-9A at the time of the mishap (Tab R-1.52). MSO had 70.7 hours of MQ-9A flight time and 94.4 hours of MQ-9A simulator time around the time of the mishap (Tab R-1.55). Recent flight hours were as follows (Tab R-1.53):

	Flight Hours	Flight Sorties
Last 30 Days	0.8	2
Last 60 Days	11.0	9
Last 90 Days	15.7	12

9. MEDICAL

a. Qualifications

All members were medically qualified for their specific duties at the time of the mishap (Tabs J1 to J19).

b. Health

There was no evidence to suggest the member's health contributed to the mishap (Tabs J1 to J19).

c. Pathology

The medical clinic collected toxicology test samples from members after the mishap (Tabs J2, J4, J6, J8, J10, J12, J14, J16, J18). The reports indicated toxicology was not a factor in the mishap (Tabs J2, J4, J6, J8, J10, J12, J14, J16, J18).

d. Lifestyle

There was no evidence to suggest lifestyle was a factor in the mishap (Tabs J1 to J19).

e. Crew Rest and Crew Duty Time

At the time of the mishap, AFMAN 11-202, Volume (V) 3, Flight Operations, 9 June 2020, indicated aircrew members must have proper crew rest prior to performing any duties involving aircraft operations (Tab AE-2.31). 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 AE-2.31). Its purpose was to ensure the aircrew member adequately rests before performing flight duties or flight related duties (Tab AE-2.31). Crew rest was defined as free time that includes time for meals, transportation, and rest (Tab AE-2.31). LRE1 and MC1 crews verified they received proper crew rest before the mishap (Tab Z-2).

10. OPERATIONS AND SUPERVISION

a. Operations

The operational tempo at the operating location was high, but steady (Tabs P-1.3 and P-6.8). A high operational tempo was considered normal for the squadron (Tabs P-1.3 and P-6.8). The mishap occurred more than nine hours into MIP's shift and seven hours into LRE1 and the remainder of MC1's shift (Tab P-6.5). There is no evidence to suggest the operational tempo contributed to the mishap.

b. Supervision

LRE1 IP, LRE1 P, LRE1 SO, MIP, MISO, MP, and MSO were fully qualified in Launch and Recovery (LR) operations (Tabs Q-1 and R-1). LRE1 P, MP, and MSO were in the process of completing local area orientation (LAO) and completed all the prerequisites prior to their flights

(Tabs Q-1 and R-1). Training records show LRE1 IP, LRE1 SO, MIP, and MISO received all required training (Tabs Q-1 and R-1).

11. HUMAN FACTORS ANALYSIS

The AAIB considered all human factors as prescribed in the Department of Defense Human Factors Analysis and Classification System (DoD HFACS), Version 7.0, to determine whether any human factors were directly related to the mishap (Tab AE-3.2 to AE-3.4). The AAIB identified two human factors relevant to the mishap: (1) Checklist Not Followed Correctly and (2) Ignored a Caution/Warning (Tab AE-3.5).

The "Checklist Not Followed Correctly" is a PERFORMANCE-BASED ERROR (AE100): A performance-based error is defined as factors that occur when a specific action is performed in a manner that leads to a mishap. "Ignoring a Caution/Warning" is considered a JUDGMENT & DECISION-MAKING ERROR (AE200). Judgment and decision-making errors are defined as factors that occur when individual proceeds as intended, yet the plan proves inadequate or inappropriate for the situation (e.g. an "honest mistake") (Tab AE-3.5 to AE-3.6).

a. Checklist Not Followed Correctly

Checklist Not Followed Correctly: is a factor when the individual, either through an act of commission or omission, makes a checklist error or fails to run an appropriate checklist (DoD HFACS) (Tab AE-3.5).

MC1 failed to follow the "AV Power-Up" checklist steps in order as they are listed and applied power to T/N 13-4604 prior to applying GDT power, while the MA was in a critical stage of flight (Tabs H-2.3 and V-1). T/N 13-4604's C-band antenna then overpowered the MA's downlink during takeoff due to its close proximity to the MA's GDT (Tab O-1.10).

b. Ignored a Caution/Warning

Ignored a Caution/Warning is a factor when a caution or warning is perceived and understood by the individual but is ignored by the individual (DoD HFACS) (Tab AE-3.6).

MC1 ignored a caution/warning in their checklist TO 1Q-9(M)A-1 (Tabs V-1, AD-1.1, and AD-2.1). MC1 failed to de-conflict with other aircraft on the ground prior to requesting aircraft power on with the crew chief (Tab V-1). The lack of de-confliction caused a loss of downlink on the MA during a critical stage of flight (takeoff) (Tab V-1 through V-3).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

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

(2) AFMAN 11-202, Volume 3, *Flight Operations*, 9 June 2020 (available on http://www.e-

publishing.af.mil)

(3) DAFI 91-204, *Safety Investigations and Reports,* 09 March 2021 (available on http://www.e-publishing.af.mil)

(4) AFMAN 11-2MQ-9, Volume 1, *MQ9—Aircrew Training*, 26 March 2020 (available on http://www.e-publishing.af.mil)

(5) AFMAN 11-2MQ-9, Volume 3, *MQ9—Operations Procedures*, 30 September 2020 (available on http://www.e-publishing.af.mil)

(6) AFMAN 11-2MQ1&9V3 CH 8, 361 EATKS Supplement, *361 EATKS – Local Operating Procedures*, 30 November 2020

(7) USAFCENT Operational Guidance, 08 August 2019

(8) 361 EATKS Operating Instruction, *Squadron Operating Procedures*, 02 December 2020

(9) AFMAN 13-204 Volume 3, *Air Traffic Control*, 21 July 2020 (available on http://www.e-publishing.af.mil)

(10) DAFI 21-101, *Aircraft and Equipment Maintenance Management,* 16 January 2020 (available on http://www.e-publishing.af.mil)

(11) AFTTP3-3. *Combat Fundamentals MQ-9*, 9 April 2021

b. Other Directives and Publications to the Mishap (not publicly releasable)

(1) DoD Human Factors Classification System (DOD HFACS), Version 7.0

(2) TO 1Q-1(M)A-1

(3) TO 1Q-1(M)A-1CL-1_AV_Power-Up_Checklist

(4) TO 1Q-1(R)B-2-1_GDT_Placement_-_Spacing

(5) AFI 11-202, Volume 1, *AIRCREW TRAINING*, 3 May 2018

c. Known or Suspected Deviations from Directives or Publications

(1) TO 1Q-1(M)A-1, warning and caution, pgs 2-14.

10 November 2021

WILLIAM K. SCHAEFFER, Lt Col, USAF
President, Abbreviated Accident Investigation Board

STATEMENT OF OPINION

MQ-9A, T/N 14-4263
UNITED STATES CENTRAL COMMAND AREA OF RESPONSIBILITY
13 June 2021

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 conclusionsor statements.

1. OPINION SUMMARY

On 13 June 2021, at approximately 2300L, the Mishap Aircraft (MA), an MQ-9A, tail number (T/N) 14-4263, a 27th Special Operations Wing asset operated by the 361st EATKS, 332d Air Expeditionary Wing (AEW) and under the control of a Ground Control Station (GCS), crashed approximately 3,200 feet after beginning initial takeoff roll at an undisclosed location in the Central Command Area of Responsibility (CENTCOM AOR). The MA caught fire after drifting left off the runway and hitting a runway distance remaining marker. The loss of Government property was valued at approximately $18,000,000.00. There were no reported fatalities, injuries, or damage to civilian property.

The Launch and Release Element (LRE1) was responsible for Launch and Recovery (LR) operations for the MA. The LRE1 crew consisted of the Instructor Pilot (IP), Pilot (P), and sensor operator (SO). The LRE1 crew performed all applicable checklist steps from "Power Up" to "Takeoff." The Mishap Crew (MC1) consisted of a Mishap Instructor Pilot (MIP), Mishap Instructor Sensor Operator (MISO), Mishap Pilot (MP), and Mishap Sensor Operator (MSO).

The MA was equipped with software programing referred to as "lost link logic." The lost link logic commanded the MA to continue takeoff after the MA accelerated past 50 knots and the lost link logic detected loss of C-Band uplink. The MA also had a known left turn bias meaning the aircraft tended to steer left without human interference. The left turn bias required the LRE1 P to correct the bias by providing right steering/rudder inputs to counterbalance the bias and keep the plane centered and straight.

At approximately 2245L the MC1 began their initial GCS setup for T/N 13-4604. The MC1 was aware of the LRE1 crew's scheduled earlier takeoff and elected to hold their "AV Power Up" checklist to allow time for LRE1 to taxi and takeoff. Both the Technical Orders (T.O.) 1Q-9(M)A-1 and 1Q-9(M)A-1CL-1 have WARNINGS and CAUTIONS annotated concerning powering on an aircraft in an area where multiple aircraft are operating. The WARNINGS and CAUTIONS explain to notify other GCSs before applying power to Ground Data Terminal (GDT) to prevent interference during critical phases of flight. Critical phases of flight are Taxi, Takeoff, and Landing. At approximately 2300L the LRE1 was given a line-up and wait taxi clearance to take the active runway from the air control tower. Line up and wait clearance is where an aircraft is given permission by the air control tower to take the active runway but not cleared to takeoff. Subsequently, the MA taxied onto the active runway and held its position. At 2301L, the LRE1 was given a takeoff clearance from the air control tower. Additionally, at 2301L, MISO calls for power on to aircraft Tail Number (T/N) 13-4604, thereby ignoring published

warnings and cautions about powering on aircraft while nearby aircraft are in critical phases of flight. MC1 should have notified other GCS's before powering on T/N 13-4604 and receive confirmation back from LRE1 whether the MC1 was cleared to power up. Instead of waiting for confirmation, MC1 powered up anyway. The subsequent downlink energy from T/N 13-4604 overpowered LRE1's GDT disrupting the link between LRE1's GCS and the MA, which started its takeoff roll at 2302:49L.

On takeoff, the LRE1 crew completed the 50- knot acceleration check and approximately five seconds later the MA lost C-Band downlink. Once the aircraft attained 50 knots and the aircraft detected the lost C-Band downlink, the lost link logic program triggered, and the MA attempted to accelerate to liftoff speed of 107 Knots Indicated Air Speed (KIAS). After loss downlink from the MA to A13-4604 the LRE1 P could not correct MA's left turn bias. The LRE1 P required a downlink connection from the GCS to the MA to correct the left turn bias. Upon the MA rolling off the runway, the MA veered to the left and collided with a runway distance remaining marker. The MA collision with the runway marker likely caused damage to the left landing gear and prevented further acceleration and takeoff. The MA subsequently caught fire and was destroyed.

2. CAUSE

I find by preponderance of the evidence the cause of the mishap was failure to heed cautions and warnings associated with powering up aircraft while nearby aircraft are in critical phases of flight as listed in required technical orders.

Specifically, the preponderance of the evidence shows that MC1 did not notify the other GCS and obtain confirmation clearance prior to powering up Tail Number 13-4604. As a result, MC1's aircraft overpowered LRE1's GDT and created a lost link between the LRE's 1 GCS and the MA. The MA's lost link prohibited LRE1 P from left turn bias corrections. After the lost link logic program triggered and during the takeoff process the MA's left bias returned. The uncorrected left turn bias caused the MA to veer left and hit a distance marker at approximately 80-85 Knots Ground Speed (KGS). As a result of the impact, the landing gear was damaged, and the MA burned causing total destruction. All four crew members of MC1 were qualified in LR operations for the MQ-9. All crew members were aware of the warnings and cautions annotated in the checklist. MC1 called for power on to T/N 13-4604 prior to confirming the MA was not in a critical phase of flight. Therefore, but for MC1's failure to follow the posted warnings and cautions, the mishap would not have occurred.

3. SUBSTANTIALLY CONTRIBUTING FACTOR

I find there was insufficient evidence indicating any substantially contributing factors.

4. CONCLUSION

I find by a preponderance of the evidence the cause of the mishap was MC1's failure to heed annotated warnings and cautions in the appropriate technical orders.

10 November 2021

WILLIAM K. SCHAEFFER, Lt Col, USAF
President, Abbreviated Accident Investigation Board

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