UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION
BOARD REPORT

MQ-9A, T/N 13-4231
432d WING
CREECH AFB, NEVADA

LOCATION: UNITED STATES AFRICA COMMAND AREA OF RESPONSIBILITY

DATE OF ACCIDENT: 11 FEBRUARY 2024

BOARD PRESIDENT: COLONEL BRAD S. HUEBINGER

Accident Investigation Board conducted under Air Force Instruction 51-307

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND

OFFICE OF THE DEPUTY COMMANDER
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SEP 2 0 2024

ACTION OF THE CONVENING AUTHORITY

The report of the accident investigation board conducted under the provisions of Air Force Instruction 51-307, *Aerospace and Ground Accident Investigations*, that investigated the 11 February 2024 mishap in the U.S. Africa Command Area of Responsibility, involving an MQ-9A, T/N 13-4231, and operated by the 12th Expeditionary Special Operations Squadron, complies with applicable regulatory and statutory guidance, and is hereby approved.

MICHAEL G. KOSCHESKI
Lieutenant General, USAF
Deputy Commander

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

MQ-9A, T/N 13-4231
UNITED STATES AFRICA COMMAND AREA OF RESPONSIBILITY
11 FEBRUARY 2024

On 11 February 2024, at approximately 20:32 Zulu time (Zulu), an MQ-9A Reaper, tail number (T/N) 13-4231 assigned to the 432d Wing, Creech Air Force Base (AFB), Nevada impacted the ground just beyond the departure end of the runway in an undisclosed location within the United States Africa Command (AFRICOM) area of responsibility (AOR). The Mishap Aircraft (MA) was operated by the Launch and Recovery Element (LRE) mishap crew (MC) comprised of the mishap pilot (MP) and the mishap sensor operator (MSO) deployed with the 12th Expeditionary Special Operation Squadron (12 ESOS) assigned to Air Force Special Operations Command (AFSOC). The mishap resulted in no damage to civilian property, no injuries, and no fatalities. The MA was destroyed upon impact; the loss of government property was valued at $25,840,037.00.

When launching the MA, the MC employed the Automatic Takeoff and Landing Capability (ATLC) to takeoff under automated control. To begin the takeoff, the MP engaged the ATLC function. The ATLC engaged successfully, commanding engine power to 100%, and the MA began the takeoff roll. The MC did not complete or communicate the next step of the TAKEOFF checklist, "22. [ATLC] Throttle – 100% (P)," which directed the pilot to set the throttle control to 100% to match the power setting commanded by the ATLC. The MP throttle control remained set at 0%. When climbing after takeoff, the MP turned off ATLC via the Head-Down Display (HDD), taking manual control of the aircraft. This action resulted in the engine power reducing to 0%, matching the manually set throttle power level command. The MA initially continued to climb and decelerate and then it began to descend. The MA impacted the ground 23 seconds after the MP turned off the ATLC. One second before impact, the MP increased the throttle command to 100%, too late for the engine to increase power. The MA impacted the ground just past the departure end of the runway.

The Accident Investigation Board (AIB) President (BP) found, by a preponderance of the evidence, the causes of the mishap were: (1) the MP failed to comply with the takeoff checklist guidance to move the throttle control to 100% after initiating an ATLC takeoff, causing thrust to decrease to flight idle at the transition from ATLC to manual control; and (2) the MP failed to accurately analyze the cause of the MA deceleration in time, and subsequently increased the throttle control too late to recover from a low altitude thrust-deficient descent, resulting in the aircraft impacting the ground. The BP found, by a preponderance of the evidence, the following two factors substantially contributed to the mishap: (1) ineffective crew resource management and (2) low ATLC disengagement altitude.

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 by the United States or by any person referred to in those conclusions or statements.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-9A, T/N 13-4231
UNITED STATES AFRICA COMMAND AREA OF RESPONSIBILITY
11 FEBRUARY 2024

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ACRONYMS AND ABBREVIATIONS

12 ESOS	12th Expeditionary Special Operations Squadron
12 SOS	12th Special Operations Squadron
406 AEW	406th Air Expeditionary Wing
432 WG	432d Wing
449 AEG	449th Air Expeditionary Group
ACC	Air Combat Command
AFB	Air Force Base
AFE	Aircrew Flight Equipment
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFRICOM	Africa Command
AFSOC	Air Force Special Operations Command
AGL	Above Ground Level
AIB	Accident Investigation Board
AOR	Area of Responsibility
ATLC	Automatic Takeoff and Landing Capability
A3	Operations Directorate
BP	Accident Investigation Board President
Capt	Captain
CENTCOM	US Central Command
Col	Colonel
DAFI	Department of the Air Force Instruction
DAFMAN	Department of the Air Force Manual
DoD	Department of Defense
ft	Feet
GCS	Ground Control Station
HDD	Head-Down Display
HFACS	Human Factors Analysis and Classification System
HUD	Head-Up Display
KIAS	Knots Indicated Airspeed
LRE	Launch and Recovery Element
MA	Mishap Aircraft
MAJCOM	Major Command
MC	Mishap Crew
MEF	Mission Execution Forecast
MGCS	Mishap Ground Control Station
MLRECC	Mishap Launch and Recovery Element Commander
MP	Mishap Pilot
MS	Mishap Sortie
MSO	Mishap Sensor Operator
P	Pilot
PIC	Pilot in Command
PM	Pilot Member
PPE	Personal Protection Equipment
RPA	Remotely Piloted Aircraft
SEGT	Single Red Line Exhaust Gas Temperature
SAR	Search and Rescue
SIM	Simulator
SME	Subject Matter Expert
SOCOM	US Special Operations Command
TO	Technical Order
TOLD	Takeoff and Landing Data
T/N	Tail Number
U.S.C.	United States Code
Zulu	Zulu Time

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 17 May 2024, the Deputy Commander, Air Combat Command (ACC), appointed Colonel Brad S. Huebinger as the Accident Investigation Board (AIB) President (BP) to investigate a mishap that occurred on 11 February 2024, involving an MQ-9A aircraft in the United States Africa Command (AFRICOM) area of responsibility (AOR) (Tab Y-2). The AIB was conducted in accordance with Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations* (Tab Y-2). The investigation was conducted from 3 June 2024 to 16 July 2024 (Tab Y-6). The AIB convened at Creech Air Force Base (AFB), Nevada to conduct an in-person investigation from 3 June 2024 to 14 June 2024 (Tabs Y-2 and Y-6). From 15 June 2024 to 16 July 2024, AIB members conducted the investigation remotely (Tabs Y-6 to Y-8). The Deputy Commander, ACC, appointed four additional board members to the AIB to include a MQ-9A Pilot Member (PM) (Captain), Legal Advisor (Capt), Maintenance Member (Technical Sergeant), and a Recorder (Staff Sergeant) (Tab Y-2). Two subject matter experts (SME) were detailed to advise the AIB to include a Medical SME (Capt) and a Sensor Operator SME (Senior Airman) (Tabs Y-4 to Y-5).

b. Purpose

In accordance with AFI 51-307, *Aerospace and Ground Accident Investigations*, this AIB 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 Y-2).

2. ACCIDENT SUMMARY

On 11 February 2024, at approximately 20:32 Zulu time (Zulu), an MQ-9A Reaper, tail number (T/N) 13-4231 belonging to the 432d Wing, Creech AFB, Nevada impacted the ground just beyond the departure end of the runway in an undisclosed location within the AFRICOM AOR (Tabs D-4 and J-3 to J-4). The Mishap Aircraft (MA) was operated by the Launch and Recovery Element (LRE) mishap crew (MC) comprised of the mishap pilot (MP) and the mishap sensor operator (MSO) assigned to the 12th Expeditionary Special Operation Squadron (12 ESOS) under Air Force Special Operation Command (AFSOC) (Tab K-2). When launching the MA, MC employed the Automatic Takeoff and Landing Capability (ATLC) system to takeoff under automated control (Tabs J-3 to J-4, V-2.7, and V-4.3). To begin the takeoff, the MP engaged the ATLC function (Tabs J-3 to J-4). The ATLC engaged successfully, and the MA began the takeoff roll (Tab J-4). The MC did not complete or communicate the next step of the TAKEOFF checklist, "22. [ATLC] Throttle – 100% (P)," which directed the pilot to set the throttle control to 100% (matching the power setting commanded by the ATLC) (Tabs J-4 to 5, N-20, and BB-22 to BB-23). The MP throttle control remained set at 0%, which is also known as flight idle (Tabs J-3 and N-20). 21

seconds after liftoff, the MP turned off ATLC via the Heads Down Display (HDD), taking manual control of the aircraft in accordance with step 27 of the TAKEOFF checklist (Tabs J-4, N-20 to N-21, V-2.8, and BB-23). As shown by parametric data, this action resulted in the engine power reducing to 0% matching the manually set throttle power level command (Tabs J-4 and N-20). The MA briefly continued to climb and decelerate and then began to descend (Tabs J-5 and N-20 to N-21). The MA impacted the ground 23 seconds after the MP turned off the ATLC (Tab N-21). One second before impact, the MP increased the throttle command to 100% (Tab J-4). The MA impacted the ground just past the departure end of the runway (Tab J-4). The MA was destroyed upon impact resulting in the total loss of government property valued at $25,840,037.00 (Tab P-2). The mishap resulted in no damage to civilian property, no injuries, and no fatalities (Tab P-2).

3. BACKGROUND

a. Air Combat Command

Headquartered at Joint Base Langley-Eustis, Virginia, ACC is one of nine major commands (MAJCOMs) in the United States Air Force (Tab CC-6). ACC is the primary provider of combat air forces to America's warfighting commanders (Tab CC-6). ACC organizes, trains, and equips Airmen who fight in and from multiple domains to control the air, space, and cyberspace (Tab CC-6). 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-6).

b. Air Force Special Operations Command

Headquartered at Hurlburt Field, Florida, AFSOC is another of the nine MAJCOMs and the Air Force component of the U.S. Special Operations Command (SOCOM), a unified command (Tab CC-8). AFSOC's mission includes battlefield air operations; agile combat support; aviation foreign internal defense; information operations and military support operations; precision strike; specialized air mobility; command and control; and intelligence, surveillance and reconnaissance (Tab CC-8).

c. 432d Wing

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

d. 406th Air Expeditionary Wing

The 406th Air Expeditionary Wing (406 AEW) is comprised of two groups, 10 squadrons, and four airfields within Europe and Africa which remain committed to AFRICOM, U.S. Central Command (CENTCOM), and SOCOM missions, to include assisting our African partners in protecting their borders with matters of national security (Tab CC-2). The 406 AEW provides secure, reliable, flexible power projection platforms by means of persistent attack, intelligence, surveillance and reconnaissance, tactical airlift, personnel recovery, casualty evacuation, and base operations support (Tab CC-2).

e. 449th Air Expeditionary Group

The 449th Air Expeditionary Group (449 AEG), headquartered at a location in AFRICOM, provides personnel recovery task forces; intra-theater airlift; base operating support integrator; intelligence, surveillance, and reconnaissance capabilities; and aircraft launch and recovery elements in support of CENTCOM and AFRICOM mission requirements (Tab CC-5). The 449th AEG activated in 2005 and currently consists of six squadrons, including 12th Expeditionary Special Operations Squadron (Tab CC-5).

f. 12th (Expeditionary) Special Operations Squadron

The 12th Special Operations Squadron (12 SOS) launches and recovers the MQ-9A Reaper aircraft, enabling operational employment by conventional and special operations Mission Control Element squadrons (Tab CC-10). To avoid the inherent delay in transmitting commands through satellite communications to remotely piloted aircraft (RPA) from distant stations, the squadron deploys to locations where it can control the aircraft during takeoff and landing using line-of-sight communications (Tab CC-10). The 12 SOS maintains unique equipment and training enabling a rapid deployment capability (Tab CC-10). When deployed to a Combatant Command area of responsibility, the 12 SOS is designated as the 12th Expeditionary Special Operations Squadron (12 ESOS) (Tab CC-5).

g. MQ-9A Reaper

The MQ-9A Reaper is an armed, multi-mission, medium-altitude, long-endurance RPA that is employed primarily against dynamic execution targets and secondarily as an intelligence collection asset (Tab CC-14). 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-14). 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-14). The MQ-9A's capabilities make it uniquely qualified to conduct irregular warfare operations in support of combatant commander objectives (Tab CC-14).

4. SEQUENCE OF EVENTS

a. Mission

On 11 February 2024, the MA was scheduled to conduct an operational mission at an undisclosed location within the AFRICOM AOR (Tabs K-2 to K-3 andY-2). A LRE from the 12 ESOS was tasked by the Mishap Launch and Recovery Element Commander (MLRECC) to launch the aircraft (Tabs K-2 to K-3). No evidence indicates the mission profile was a factor in this mishap.

b. Planning

The MC arrived at their squadron around 2200 local time (1900 Zulu) and upon arriving were briefed by the outgoing aircrew about the status of operations (Tabs V-2.3 to V-2.5). The MC filled out their Operational Risk Management worksheets and flight authorizations prior to the mission (Tabs K-6 and V-4.3). Upon review, the MC found the paperwork for the MA and Mishap Ground Control Station (MGCS) to be in order (Tabs N-8 to N-19, V 2.3, and V-4.3). The MC received a weather brief and conducted pre-flight briefs (Tabs V-2.4 and V-4.3 to V-4.4). The MC reported no anomalies with flight authorizations, paperwork, weather, or operational briefs (Tabs V-2.3 to V-2.4, and V-4.4). Squadron leadership was not present at the crew briefing because they were working a different shift (Tabs V-3.2 and V-3.5). No evidence indicates the planning was a factor in this mishap.

c. Preflight

The MC conducted required preflight briefings prior to stepping to the MGCS and assuming control of the MA (Tabs V-2.3 to V2.4 and V-4.3 to V-4.4). The MP did not report any anomalies with the MA during their preflight inspection or in the MA maintenance forms (Tab V-2.3). The MC completed all applicable checklist steps and procedures to prepare both the MGCS and MA for flight (Tabs N-8 to N-19, V-2.3, and V-4.5). No evidence indicates the preflight procedures were a factor in this mishap.

d. Summary of Accident

At 20:11:57 Zulu, the MC started the MA engine (Tabs N-12 to N-13). The MP cleared the mishap crew chief to disconnect after engine start (Tab N-13). At this point, the MP and MSO discussed checklist execution (Tabs N-13 to N-14, V-4.3, and V-4.8 to V-4.9). The MSO told the MP, “I don’t like when you – if you’re talking about just running through the checklist skipping [REDACTED] and stuff, no I don’t like it at all [laugh]” (Tab N-13). This was in response to the MP executing checklist steps ahead of the MSO’s challenge-and-response communication (Tabs V-4.8 to V-4.9). At 20:16:14 Zulu, the MSO attempted to brief Takeoff and Landing Data (TOLD), but the MP cut off the brief saying, “we’ll get it on the roll” (Tab N-15). Prior to taxi, the MC was initially uncertain what data to load into the MA from network sources to enable the follow-on mission post-takeoff due to confusion between similar mission callsigns (Tab N-15). The MC determined the correct operational mission data after internal discussion and a phone call to the mission crew (Tab N-15). At 20:18:12 Zulu, the MP asked the MSO, "What step are we on" (Tab N-15). The MSO replied, "We're on TOLD, so you wanted to get on the roll?" (Tab N-15). The MP replied, "Alright, let's go taxi" (Tab N-15).

The MP began taxi for the active runway at 20:20:47 behind another MQ-9A on a different mission (Tabs N-16 to N-17). During taxi, the MSO switched the MP's Head-Up Display (HUD) view to infrared for the nose camera per the MP's request (Tabs N-17 and V-2.9). At 20:23:05 Zulu, while holding short of the runway on the taxiway, the MP briefed the MSO on takeoff emergency considerations, including loss of thrust after takeoff; the MP stated, "Anything thrust related right after takeoff we will get to a safe unpopulated area, straight ahead or just to the right outside of [REDACTED] airfield" (Tab N-18). The MP next asked the MSO for TOLD, "Go ahead with TOLD, he's probably cleared me onto the runway" (Tab N-18). The MSO replied, "did you go high" (referring to transmitter power) and then clarified "he didn't clear you onto the runway" (Tab N-18). The MP acknowledged that the radio setup was not allowing the MC to hear tower controller instructions (Tab N-18). The MP next adjusted radio settings and clarified and confirmed with the tower controller that the MA was cleared onto the runway (Tab N-18). At 20:25:00 Zulu, the MP taxied the MA onto the runway (Tab N-18). The MC did not complete the TOLD briefing directed by the PRE-TAXI checklist until later during the takeoff roll (Tab N-20).

While taxiing onto the runway, the MP and MSO agreed that the quality of their camera views was poor (Tabs N-18 to N-19). The airfield configuration required the MP to back-taxi the MA for a portion of the runway and then turn around 180 degrees to line up at the approach end for takeoff (Tabs N-18 to N-19). During this back-taxi, the MP asked the MSO about their next mission for a different aircraft; the MP asked, "are we just gonna flip to forty-nine for this next launch or what?" (Tab N-19). At 20:29:22 Zulu, the MP turned the MA 180 degrees to line up for takeoff and told the tower the MA was turning (Tab N-19). At 20:30:07 Zulu, the tower controller cleared the MA for takeoff (Tab N-19).

At 20:30:20 Zulu, the MC continued the TAKEOFF checklist (Tabs N-20 and BB-22 to BB-23). At 20:30:40 Zulu, the MP verbalized TAKEOFF checklist step 21, "[ATLC] ATLC - ON (P)" (Tabs N-20 and BB-22). The MP told the MSO they had takeoff clearance (Tab N-20). At 20:30:47 Zulu, the MP engaged the ATLC function (Tabs J-3 to J-4, N-20, and V-2.7). The ATLC engaged successfully, commanding engine power to 100%, and the MA began the takeoff roll at 20:30:47 (Tab N-20). The MC did not complete or communicate challenge and response for step 22 of the TAKEOFF checklist, "[ATLC] Throttle – 100% (P)," which directed the pilot to set the throttle to 100%, matching the power setting commanded by the ATLC (Tabs J-6, N-20, and BB-22). The designation "(P)" in the checklist indicates this step is a pilot responsibility (Tab BB-22). Air Force Manual 11-2MQ-9 Volume 3, *MQ-9 OPERATIONS PROCEDURES*, paragraphs 3.4.1 and 3.4.5.1 provide that "The PIC [pilot in command] is responsible for checklist completion" (Tab BB-3) and "checklists must be completed by aircrew using challenge and response to maximum extent possible" (Tab BB-3). The MP throttle control remained set at 0%, which is also known as flight idle, throughout the takeoff role and lift off (Tabs J-4 and J-6).

When performing the acceleration check, the MSO communicated, "copy, accel check sixteen seconds…oh [REDACTED], what is that…good accel check" (Tab N-20). The MSO's statements referred to a momentary heading change where the MA turned slightly off runway centerline temporarily and then corrected back to runway heading (Tabs V-2.7 and V-4.5 to V-4.6). The MC did not comment or act further on the question (Tabs N-20, V-2.7, and V-4.6). During the takeoff roll, the MSO communicated a portion of the TOLD (Tab N-20).

The MA reached rotation speed at 20:31:20 Zulu, when it began to pitch up for takeoff (Tab N-20). At 20:31:23 Zulu, the MA became airborne and climbed (Tabs J-4 and N-20). While climbing, the MP verbalized, "ATLC coming off" (Tabs N-20). In an interview with the AIB, the MP stated that the MP intended to turn off ATLC at a higher altitude than actually executed (Tab V-2.9). In an interview with the AIB, the MLRECC stated that the 12 ESOS aircrew from Cannon AFB, NM typically turn ALTC off at a low altitude due to airspace constraints at Cannon AFB (Tab V-3.8). In an interview with the AIB, the MP stated that unit standards directed crews to delay turning off ATLC until at least above a specified altitude (Tab V-2.9). The MP turned off ATLC via the HDD 21 seconds after liftoff (20:31:44 Zulu) (Tabs N-20 and V-2.8). This action was followed by the HUD indications of the "ATLC Takeoff Active" caution light extinguishing, the Torque Command indicator displaying 0% torque, and the Single Red Line Exhaust Gas Temperature (SEGT) and airspeed and climb rate beginning to decrease rapidly (Tab J-4). At 20:31:48 Zulu, the MP commanded the landing gear to retract (Tab N-21). At 20:31:52, eight seconds after the MP commanded the ATLC to "OFF," the MSO said, "one hundred, why are we going so slow?" (Tab N-21). The MA continued to climb and decelerate (Tab N-21). At 20:31:56 Zulu, the MA reached a maximum altitude and then started to descend (Tabs J-4 and N-21). In response to the sudden dive, the MSO stated, "our torque is three percent, same thing's happening" (Tabs N-21, V-2.10, V-4.6, and V-4.11). In their respective interviews with the AIB, both members of the MC told AIB members they believed that the MA was experiencing a similar mechanical failure the MP believed to have occurred in a previous mishap after turning off the ALTC function (Tabs V-2.10, V-4.6, and V-4.11). In an interview with the AIB, the MP stated that the MP assessed decreasing airspeed and low thrust and intended to recover by activating the autopilot altitude and airspeed hold (Tabs V-2.3, V-2.7, and V-2.8). The MP did not begin to increase the throttle control position to 100% until 22 seconds after commanding ATLC off, or 14 seconds after the MC communicated recognition of slowing airspeed (Tab N-21). Four seconds prior to impact, at 20:32:03, the MP declared an emergency with the control tower (Tab N-21). One second prior to impact, at 20:32:06, the MP manually commanded throttle to 100% as the MA was at a 10-degree nose-low pitch attitude (Tabs J-4 and N-21). Pitch attitude refers to the vertical angle between the aircraft's nose and the horizon. This is the first time in the flight that the MP throttle was increased above 0% commanded thrust (Tab J-4).

e. Impact

The MA continued to descend, and it impacted the ground at 20:32:07 Zulu with a 10-degree nose-low attitude at a slow airspeed (Tabs J-4 and N-21). At this time, the landing gear was still in transit toward the up position (Tab J-5). The engine was still near idle thrust; the throttle command increase did not occur in time to result in any engine thrust increase before impact due to the spool-up delays inherent in the engine (Tab J-6). Turbine engines experience a 'spool-up' lag between throttle input and the resulting thrust increase as the turbomachinery must change angular momentum (Tab EE-3). The MA impact location was just beyond the end of the runway (Tab J-3). The impact destroyed the MA (Tab P-2). At impact, the MSO said, "we're down, same thing happened" (Tab N-21).

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 (SAR)

Search and rescue are not applicable.

h. Recovery of Remains

Recovery of remains is not applicable.

5. MAINTENANCE

a. Forms Documentation

A review of maintenance records for the MA leading up to the day of the mishap indicated no significant discrepancies, concerns, or issues. (Tabs D-4 to D-70). All required preflight inspections, postflight inspections, and release procedures were successfully conducted and documented accordingly by maintenance personnel (Tab D-6). No evidence suggests that maintenance forms or documentation were contributing factors in this mishap.

b. Inspections

At the time of the mishap, the MA accumulated over 10,000 flight hours (Tab D-6). Not all required maintenance inspections were current; there were five 28-day battery reconditioning checks that were not conducted within the specified time interval as required (Tab U-2). During the preflight inspection, the MP and maintenance members verified flight controls were operational and accurate (Tabs N8 to N-19). The 7-day GCS inspection was completed on 9 February 2024 (Tab D-55). The 7-day GCS inspection results indicated that there was no malfunction due to there being no follow-up maintenance needed after the 7-day GCS inspection (Tab D-55). There were no relevant discrepancies or concerns with MA inspections (Tabs D-9 to D-11).

c. Maintenance Procedures

All maintenance procedures were conducted in accordance with applicable guidance (Tabs D-6 to D-70). No evidence indicates the maintenance procedures executed were a factor in this mishap.

d. Maintenance Personnel and Supervision

No evidence indicates that the training, qualifications, or supervision of the maintenance personnel were a factor in this mishap (Tabs G-8 to G-81).

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

No evidence indicates that fuel, hydraulic, oil, or oxygen were factors in this mishap (Tab D-7).

f. Unscheduled Maintenance

There is no evidence that unscheduled maintenance was a factor in this mishap (Tabs D-9 to D-11, D-20 to D-30, and D-48).

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

There is no evidence to indicate that any MA or MGCS systems were operating abnormally at any time during the mishap sequence (Tab J-6). Structures analyses of the MA were not conducted because all relevant components were destroyed by the crash and subsequent fire (Tabs J-4 and P-2). Following the mishap, General Atomics and the Air Force Safety Center completed post-mishap data and analysis of the ATLC, engine, and the throttle quadrant (Tabs J-5 to J-6 and DD-4 to DD-5). Analysis of these systems and flight data records indicated there was no evidence of ATLC, engine, or throttle quadrant malfunctions that would have contributed to the mishap (Tabs J-6 and DD-7).

(1) **ATLC –** The ATLC system performs safe, controlled takeoffs and landings under preset conditions defined in the system (Tab J-5). Using ATLC facilitates takeoff procedures without any pilot-derived commands (Tab J-5). When initiated, the ATLC automatically accelerates the aircraft and commands an upward angle to allow for takeoff without the need for pilot manual commands (Tab J-5). Once ATLC is engaged, the pilot's throttle and engine speed commands are ignored, and the ATLC autopilot commands are used (Tab J-5). Following a successful takeoff, after the aircraft achieves a predefined altitude and airspeed, the ATLC will automatically execute a pre-planned pattern around the airfield until the pilot takes manual command of the aircraft (Tab J-6).

(2) **Throttle Quadrant –** The throttle quadrant is a physical lever in the GCS used to control the MQ-9A engine thrust (Tabs J-6 and DD-6). MQ-9A pilots use the throttle quadrant to manually control the engine thrust (Tabs J-6 and DD-6). The throttle lever is located to the left of the keyboard and is part of the throttle quadrant (Tabs J-6 and DD-6). The throttle lever has positions where it stops (called detents) including flight idle and ground idle (Tabs J-6 and DD-6).

b. Evaluation and Analysis

(1) **Engineering Evaluation** – General Atomics analyzed both the MA's engine and the ATLC system (Tab J-6). The analysis determined that both the engine and the ATLC system were functioning normally (Tab J-6). The data logs were corroborated by video and audio from MGCS (Tab J-6). During takeoff, the engine was responding to ATLC takeoff power settings (Tab J-6). After takeoff, the engine responded to the pilot-commanded throttle position (Tab J-6). The MP-commanded throttle position was left in flight idle (Tab J-6). Without sufficient thrust, the MA was unable to climb or maintain altitude (Tab J-6). Shortly before impact, when the pilot throttle position was increased to 100%, parametric data logs indicated that the throttle was functioning and calibrated appropriately and sending the appropriate signal to the MA (Tab J-4).

(2) **Throttle Analysis** – General Atomics analyzed the throttle quadrant from the MGCS (Tab DD-5). The throttle quadrant passed General Atomics' functional check (Tab DD-7). The analysis determined that the throttle quadrant was functioning normally and responding to MP commands (Tab DD-7).

7. WEATHER

a. Forecast Weather

On 11 February 2024, the Mission Execution Forecast (MEF) from 20:00 Zulu until 22:00 Zulu was light winds at 120 degrees and 6 knots (Tab F-8). The MEF predicted a sky condition with a layer of few clouds from 2,000 to 4,000 ft AGL and a broken layer from 4,000 to 7,000 ft AGL (Tab F-12). Visibility was forecasted as 7 statute miles with no forecasted precipitation (Tab F-12). There is no evidence to indicate the forecasted weather was a factor in this mishap.

b. Observed Weather

At the time of the MA's takeoff, the weather observation indicated winds from 120 degrees and 3 knots (Tab F-15). The reported cloud layers were few at 2,000 ft AGL and broken at 4,000 ft AGL (Tab F-15). The outside temperature was 26 degrees Celsius (Tab F-15). There was no significant change in weather post-mishap (Tab F-15). The mishap occurred at night, with both the sun and moon down, with 2% illumination (Tab F-12). There is no evidence to indicate the observed weather was a factor in this mishap.

c. Space Environment

The space environment is not applicable.

d. Operations

There is no evidence to indicate the MA was being operated outside of prescribed operational weather limitations. There is no evidence to indicate weather played any part in the mishap.

8. CREW QUALIFICATIONS

a. Mishap Pilot (MP)

The MP was an intermediate experienced MQ-9A pilot, current and qualified to conduct launch and recovery duties using ALTC at the time of the mishap (Tabs G-89 to G-92, G-111, V-3.6 to 3.7, and V-2.5). DAFMAN 11-401, *Aviation Management*, Air Force Special Operations Command Supplement, Attachment 5, provides three flight training levels: "A," "B," and "C" (Tab BB-11). The MP was characterized as training level "B" (Tabs G-90 and V-2.5 to V-2.6). The MP had 180.6 hours of MQ-9A flight time and 125.4 hours of MQ-9A simulator time at the time of the mishap (Tab G-90). The total flying hours/sorties for the previous 30, 60, and 90 days are set forth below (Tab G-93).

Table 1. Mishap Pilot Hours and Sorties (G-93).

	Flight Hours	Flight Sorties
Last 30 Days	19.7	39
Last 60 Days	34.6	64
Last 90 Days	38.6	76

b. Mishap Sensor Operator (MSO)

The MSO was an experienced MQ-9A instructor sensor operator, current and qualified to instruct and conduct launch and recovery duties using ALTC at the time of the mishap (Tabs G-113, G-127, G-130, and G-147). As defined under DAFMAN 11-401, the MSO was characterized as training level "B" (Tabs G-128, V-3.5, and BB-11). The MSO had 217.4 hours of MQ-9A flight time and 276.6 hours of MQ-9A simulator time around the time of the mishap (Tab G-128). The total flying hours/sorties for the previous 30, 60, and 90 days are set forth below (Tab G-131).

Table 2. Mishap Sensor Operator Hours and Sorties (G-131).

	Flight Hours	Flight Sorties
Last 30 Days	20.1	40
Last 60 Days	32.2	65
Last 90 Days	36.7	78

9. MEDICAL

a. Qualifications

All crew members were medically qualified for their specific duties at the time of the mishap (Tab EE-2).

b. Health

No evidence indicates that any members' health contributed to the mishap (Tab EE-2).

c. Pathology

Toxicology test samples were collected from crew members after the mishap (Tabs G-2 to G-3). The reports indicate that toxicology was not a factor in the mishap (Tabs G-2 to G-3).

d. Lifestyle

No evidence indicates that lifestyle was a factor in the mishap (Tabs R-17 to R-27, R-43 to R-55, V-2.12, and V-4.9).

e. Crew Rest and Crew Duty Time

At the time of the mishap, AFMAN 11-202, Volume (V) 3, *Flight Operations*, 10 January 2022, required aircrew members have proper crew rest prior to performing any duties involving aircraft operations (Tab BB-5). 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-5). Its purpose is to ensure the aircrew members adequately rest before performing duties or flight related duties (Tab BB-5). Crew rest is defined as "free time and includes time for meals, transportation, and an opportunity for at least 8 hours of uninterrupted sleep" (Tab BB-5). The MC verified they received adequate crew rest before the mishap on the required Operational Risk Management form (Tabs R-19, R-47, V-2.12, and V-4.9).

10. OPERATIONS AND SUPERVISION

a. Operations

The mishap group commander, MLRECC, and MP all stated in interviews that the operations tempo was not abnormal or otherwise notable (Tabs V-2.12 to 2.13, and V-3.3 to 3.4). The MSO stated that the operations tempo was a concern, and the work schedule over the length of the deployment was conducive to "burnout" and "complacency" (Tabs V-4.9 to V-4.10). The MSO also stated that shifts were four days of nine hours and two days of 13 hours with one day off (Tab V-4.9).

b. Supervision

Due to the small size of the 12 ESOS, each crew, including the MC, supervised their own operations without an additional designated person performing the supervision role (Tab V-3.5). This was an approved practice at the time of the mishap, in accordance with local operations supervision governing directives (Tab V-3.5). There is no evidence to indicate operations supervision was a factor in this mishap (TabsV-1.5, V-2.2 to V-2.3, and V-3.5).

11. HUMAN FACTORS ANALYSIS

a. Introduction

The Department of Defense (DoD) Human Factors Analysis and Classification System (HFACS) 8.0 lists potential human factors that can play a role in aircraft mishaps and identifies potential areas of assessment during an accident investigation (Tab BB-14). A human factor is any environmental, technological, physiological, psychological, psychosocial, or psycho-behavioral factor a human being experiences that contributes to, or influences performance during a task (Tabs BB-14 to BB-18).

The framework is divided into four main categories: Acts, Preconditions, Supervisions, and Organization Influences (Tabs BB-14 to BB-18). The categories allow for a complete analysis of all levels of human error and demonstrate how such errors may interact together to contribute to a mishap (Tabs BB-14 to BB-18). Seven human factors were identified as relevant to this mishap. This section also addresses simulator re-creation, and MC perceptions of a previous MQ-9A mishap.

b. Relevant Factors Identified by the AIB

(1) PC105 Negative Habit Transfer: is when the individual reverted to a highly learned behavior used in a previous system or situation and that was inappropriate for current task demands, resulting in a hazardous condition or unsafe act (Tab BB-16).

(2) PC106 Distraction/Interruption: is when the individual had an interruption of attention or inappropriate redirection of attention by either an environmental cue, technology, a mental process, or other human influence, which resulted in a hazardous condition or unsafe act. This may include a momentary interruption which resulted in a subsequent failure to complete the original task or resulted in skipping steps in the original task (Tab BB-16).

(3) PC110 Change Blindness/Inaccurate Expectation: is when an individual's expectations contributed to not perceiving the change or to false interpretation of perceived stimuli. The stimulus would be easily noticed by the individual if he/she were directed to the change/reality. This is a universal limitation of human attention (Tab BB-16).

(4) PP101 Ineffective Team Resource Management (Crew, Bridge, Fighter, Maintenance, etc.): is when crew/team members failed to actively maintain an accurate and shared understanding of the evolving task, or manage their distribution of tasks, which resulted in a hazardous condition or

unsafe act. This includes communication breakdowns (e.g. standardized terms, phrases, hand signals or language/lexicon barriers), critical information not shared, rank/position intimidation, lack of assertiveness or other teamwork functions (Tab BB-17).

(5) AE102 Procedure or Checklist Not Followed Correctly: is when the mishap individual did not follow correct procedure which resulted in the near-miss or mishap. (Examples include: failed to execute proper sequence, learned maneuver or proper emergency procedures; failed to follow a published checklist, Technical Manual , or Standard Operating Procedure to perform an inspection or maintenance of aircraft/vehicle/vessel/equipment, etc.) (Tab BB-14).

(6) AE201 Inadequate Real-Time Risk Assessment/Action: is when the mishap individual, through inexperience, faulty logic, poor judgment, or insufficient information, selected or proceeded with the wrong course of action based on an ineffective real-time assessment of immediate hazards during execution of a task/mission/activity, which resulted in the near-miss or mishap. (Examples include: made an incorrect decision or action regarding immediate hazardous conditions, objects or situation; misjudged speed, distance, degree of angle or time; drove too fast for conditions, misjudged changes in surrounding environment; attempted task without needed or required assistance; omitted use of personal protection equipment (PPE) or safety devices; used PPE or safety devices improperly; pulled or pushed improperly; mounted or dismounted a vehicle, equipment, obstacle or platform improperly, etc.) This faulty reasoning or erroneous expectation is the result of any one or a combination of: physical or mental conditions of the individual, environmental conditions, crew/team influence, supervisory influence and/or ineffective training (Tab BB-15).

(7) AE202 Ineffective Task Prioritization: is when the mishap individual did not effectively organize and accomplish the tasks required to manage a situation, which resulted in the near miss or mishap (Tab BB-15).

c. Simulator Re-creation

The AIB re-created the mishap in the MQ-9A simulator using the same airfield, aircraft configuration/weight, and weather conditions present in the mishap (Tabs EE-3 to EE-4). The MQ-9A simulator replicates parameters, displays, and conditions in an experience similar to what the MP would have experienced in real time (Tab EE-3 to EE-4). The simulator re-creation showed that, if the throttle were left in idle when ATLC was turned off at the same altitude and airspeed as in the mishap, the simulated MQ-9A impacted the ground at the same time and conditions as in the mishap (Tabs EE-4 to EE-5). The AIB simulated this scenario twice (Tabs EE-4 to EE-5).

The AIB also performed several hypothetical simulation scenarios attempting to recover the aircraft (Tabs EE-3 to EE-5). In one hypothetical simulation scenario, the PM increased the throttle to 100% as soon as possible after hearing a sensor operator say, “why are we going so slow,” eight seconds after turning ATLC off (Tabs EE-4 to EE-5). In this case, the simulated MQ-9A successfully recovered from the dive with a sizeable altitude margin above the ground (Tab EE-5). The AIB simulated this scenario twice (Tabs EE-4 to EE-5).

In another hypothetical scenario, the PM attempted to recover the simulated aircraft as late as possible (Tabs EE-4 to EE-5). In this case, the PM waited 18 seconds after turning ATLC off before increasing the throttle to 100% (four seconds earlier than the MP in the mishap), and the simulated MQ-9A recovered safely, but just slightly above the ground by placing the nose a few degrees above the horizon (Tab EE-5). The AIB simulated this scenario four times (Tabs EE-4 to EE-5). The simulator re-creation indicated that there was a window of approximately 18 seconds after turning ATLC off during which the MA was still recoverable by applying 100% throttle (Tab EE-5). Additionally, based on the hypothetical simulation scenarios, a higher altitude of ATLC disengagement (including as little as 100 ft higher) would have resulted in the aircraft recovering above the ground even with the delayed throttle input that occurred in the mishap (Tab EE-6).

In an interview with the AIB, the MP stated that the MP assessed decreasing airspeed and low thrust and intended to recover by activating the autopilot altitude and airspeed hold (Tab V-2.3). To complete this, the MP would have had to command it with multiple presses on Head-Down Display (HDD) buttons, then held the stick forward, then depressed the trim switch on the stick to hold the new airspeed (Tab EE-6).

d. Perceptions of a Previous Mishap

Interviews with the MC and voice recordings from the MA indicated that the MC was aware of a previous MQ-9A mishap (Tabs N-22, V-2.8 to 2.9, V-2.11 V-4.6, and V-4.11). The MC perceived that this previous mishap involved a loss of thrust due to a hardware malfunction (Tabs V-2.8 to 2.9, V-2.11 V-4.6, and V-4.11).

e. Crew Resource Management

During MQ-9A pilot training, crew resource management concepts are taught to pilots to recover during emergency situations (EE-6). One concept is, "Aviate, Navigate, Communicate" (EE-6). This concept aims to help pilots prioritize tasks in all phases of flight whether it be normal operation or an emergency (EE-6). The underlying idea is that flying the airplane (Aviate) always takes priority over all other tasks (EE-6). Abiding by this concept generally alleviates the PIC becoming task saturated by deferring non-critical tasks or delegating them to other members of the crew (EE-6).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

(1) AFMAN 11-202, Volume 3, *Flying Operations*, 10 January 2022 *incorporating Change 1*, dated 1 January 2022.
(2) Air Force Manual (AFMAN) 11-2MQ-9, Volume 3, *MQ-9 Operations Procedures*, dated 12 January 2023.
(3) DAFMAN 11-401_AFSOC Supplement, *Aviation Management*, dated 27 October 2020 *incorporating change 1*, dated 14 December 2021.
(4) AFI 21-101, *Aircraft and Equipment Maintenance Management*, dated 22 August 2023.

(5) AFI 51-307, *Aerospace and Ground Accident Investigations*, dated 18 March 2019.
(6) Department of the Air Force Instruction (DAFI) 91-204, *Safety Investigations and Reports*, dated 10 March 2021

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 the Mishap

(1) Department of Defense, *Human Factors Analysis and Classifications System 8.0.*
(2) Technical Order (TO), 1Q-9(M)A-1, dated 15 October 2023.

c. Known or Suspected Deviations from Directives or Publications

Technical Order 1Q-9(M)A-1, *Flight Manual USAF Series 2400 Software and Above MQ-9A Aircraft*, lists step 22 in the TAKEOFF checklist as "22. [ATLC] Throttle – 100% (P)" (Tab BB-22). The "(P)" indication in this step designates the pilot as the crewmember responsible for executing the step (Tab BB-22). The MP did not complete this step and the MC never verbalized challenge and response for this step (Tabs J-4, J-6, and N-20).

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28 August 2024

BRAD S. HUEBINGER, Colonel, USAF
President, Accident Investigation Board

STATEMENT OF OPINION

MQ-9A, T/N 13-4231
AFRICOM AOR
11 February 2024

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

1. OPINION SUMMARY

On 11 February 2024, at approximately 20:32 Zulu time (Zulu), an MQ-9A Reaper, tail number (T/N) 13-4231 belonging to the 432d Wing (432 WG), Creech Air Force Base (AFB), Nevada impacted the ground just beyond the departure end the runway in an undisclosed location within the United States Africa Command (AFRICOM) Area of Responsibility (AOR). The Mishap Aircraft (MA) was operated by the Launch and Recovery Element (LRE) mishap crew (MC) comprised of the mishap pilot (MP) and the mishap sensor operator (MSO) deployed with the 12th Expeditionary Special Operation Squadron (12 ESOS) assigned to Air Force Special Operations Command (AFSOC). When launching the mishap sortie (MS), the mishap crew (MC) employed the Automatic Takeoff and Landing Capability (ATLC) to takeoff under automated control. To begin the takeoff, the MP engaged the ATLC function. The ATLC engaged successfully, commanding engine power to 100%, and the MA began the takeoff roll. The MC did not complete or communicate the next step of the TAKEOFF checklist, "22. [ATLC] Throttle – 100% (P)," which directed the pilot to set the throttle control to 100% (matching the power setting commanded by the ATLC). The MP throttle control remained set at 0%. When climbing after takeoff, the MP turned off ATLC via the Head Down Display (HDD), taking manual control of the aircraft. This action resulted in the engine power reducing to 0% matching the manually set power level command. The MA continued to climb briefly and decelerate until it started to descend. One second before impact, the MP increased the throttle command to 100%, too late for the engine to increase power. 23 seconds after the MP turned off ATLC and the engine went to idle power, the MA impacted the ground just beyond the departure end of the runway, resulting in a total loss of government property valued at $25,840,037.00. The mishap resulted in no damage to civilian property, no injuries, and no fatalities.

2. CAUSES

As the Accident Investigation Board President, I find, by a preponderance of the evidence, that the causes of the mishap were: (1) the MP failed to comply with the takeoff checklist guidance to move the throttle control to 100% after initiating an ATLC takeoff, causing thrust to decrease to flight idle at the transition from ATLC to manual control; and (2) the MP failed to accurately analyze the resulting situation in time and subsequently increased the throttle control too late to recover from a low altitude thrust-deficient descent, resulting in the aircraft impacting the ground.

a. Takeoff Checklist Compliance

The first causational event occurred after the MP engaged the ALTC function in accordance with the TAKEOFF checklist. This action initiated normal forward motion in the takeoff roll. Technical Order 1Q-9(M)A-1, *Flight Manual USAF Series 2400 Software and Above MQ-9A Aircraft*, lists the next step in the TAKEOFF checklist as "22. [ATLC] Throttle – 100% (P)." The "(P)" indication in this step designates the pilot as the crewmember responsible for executing the step. Parametric data indicates that the throttle control position remained set at flight idle (0%) throughout the takeoff roll and liftoff. The MC never verbalized challenge and response for checklist step 22 regarding the throttle position. Air Force Manual 11-2MQ-9 Volume 3, *MQ-9 OPERATIONS PROCEDURES*, states that "The PIC [pilot in command] is responsible for checklist completion" (para. 3.4.1) and "checklists must be completed by aircrew using challenge and response to maximum extent possible" (para. 3.4.5.1). During the portion of the takeoff and climb when ATLC was on, the ATLC system held the power commanded to the engine at 100% as programmed, despite the pilot throttle position staying at flight idle (0%).

At 21 seconds after liftoff, the MP commanded ATLC to "OFF" in accordance with step 27 of the TAKEOFF checklist. This action caused the power commanded to the engine to transition from the ATLC-commanded 100% to the pilot throttle control-commanded 0%. This reduction in thrust initially caused the MA airspeed and climb rate to decrease. The Head-Up Displays (HUD) for both the MP and MSO displayed the Torque Command indicator at 0% torque, and the Single Red Line Exhaust Gas Temperature (SEGT) and airspeed beginning to decrease rapidly. Eight seconds after the MP commanded the ATLC to "OFF," the MSO communicated recognition that the MA was slowing, stating "why are we going so slow." The MA then entered a 10-degree nose-low descent due to lack of thrust.

The thrust-deficient descent was caused by the MP's failure to place the throttle control at 100% during the ATLC takeoff. Engineering analysis showed that the pilot throttle control in the MGCS was functioning correctly, that the MA was receiving accurate throttle command information, that the engine was performing normally, and that the MA was responding to MP commands.

b. Dive Recovery

The second causational event occurred in response to MC recognition that MA airspeed and altitude were decreasing. The MP did not begin to increase the throttle control position to 100% until 22 seconds after commanding ATLC off, or 14 seconds after the MC communicated recognition of slowing airspeed. During this time, the MP transmitted over the radio to tower "emergency," mis-prioritizing communication over maintaining aircraft control. The MP's eventual throttle command increase occurred one second before the MA impacted the ground, too late to recover from the dive.

After takeoff, it is my opinion that the MP failed to recognize the throttle was still in flight idle due to insufficient instrument/control scan, confirmation bias from another MQ-9A mishap, and mis-prioritization of the emergency radio call. The MP should have been able to analyze the situation by performing a scan of the engine instruments and airspeed indications in the HUD. The MP should have recognized the indications of the Torque Command indicator displaying 0% torque, and the Single Red Line Exhaust Gas Temperature (SEGT) and airspeed beginning to decrease rapidly. If the MP recognized these indications, the MP should have analyzed them and concluded that the 0% Torque Command called for a throttle increase. If the MP suspected (via confirmation bias) that the MA was experiencing a similar issue the MP believed to have occurred in a previous mishap, the MP should have confirmed that suspicion with the instrument indications, which showed a different condition. In the priority scheme taught in MQ-9A training of "aviate, navigate, communicate," the MP should have prioritized analyzing the situation and flying the MA over transmitting the emergency radio call. Simulator re-creation demonstrated that the MP had an approximately 18-second period during which the MP could have increased throttle and recovered from the descent. It is reasonable to expect that MP analysis of the situation and execution of the appropriate response should have required less than 18 seconds.

In an interview with the AIB, the MP stated that the MP assessed decreasing airspeed and low thrust and intended to recover by activating the autopilot altitude and airspeed hold. These methods require several manual steps and taking a hand off the stick or throttle, all of which requires more time than manually flying the aircraft. For example, to turn on altitude and airspeed hold, the MP would have had to command it with multiple presses on Head-Down Display (HDD) buttons, then held the stick forward, then depressed the trim switch on the stick to hold the new airspeed. In this time-critical situation, those would not have been the appropriate actions to quickly recover from the descent.

The ground impact was caused by the MP failing to recognize the idle descent and recover in a timely manner. The MP should have recognized decreasing airspeed and 0% torque command in the HUD and reacted by manually moving the throttle control to 100% throttle and placing the MA nose three-to-five degrees above the horizon within 18 seconds. These actions would have recovered the MA above the ground and prevented the impact.

3. SUBSTANTIALLY CONTRIBUTING FACTORS

Further, as the Accident Investigation Board President, I find, by a preponderance of the evidence, the following two factors substantially contributed to the mishap: (1) ineffective crew resource management; and (2) ATLC disengagement altitude.

a. Ineffective Crew Resource Management

Throughout ground operations, the MC encountered and discussed distractions. The MC was distracted before taxi by confusion over which mission data to load into the MA. The MC was distracted by missing the control tower's clearance onto the runway, the transmitter power setting, and the takeoff and landing data (TOLD). The MC was distracted when the MP asked about a future mission event during taxi-back before takeoff. The MC was also distracted by the momentary heading change when the MSO asked "what is that" during the takeoff roll.

While performing pre-takeoff checklists, the MC got out of synchronization on checklist steps. The MP performed steps while the MSO was still communicating the challenge and response for previous steps. During ground operations, the MSO told the MP that the MSO did not like the MP getting ahead on steps. This indicated tension between the MC on their checklist execution effectiveness.

Before takeoff, the MSO asked to brief TOLD twice and the MP asked the MSO for it once. However, the MC never discussed TOLD until during the takeoff roll after the acceleration check.

When the MSO recognized a loss of airspeed, the MSO communicated "why are we going so slow?" to the MP. The MSO failed to communicate anything to the MP related to checking or changing the control inputs. An appropriate response from the MSO would have included recognition of the idle power command and verbal communication to the MP about the throttle setting.

The MC exhibited confirmation bias when responding to decreasing airspeed and the ensuing dive. During the dive, the MSO communicated "our torque is 3%, same thing's happening." At impact, the MSO communicated "we're down…same thing happened." In these statements, the MSO said "same thing" referring to the perception of a hardware-related loss of thrust having occurred in another mishap. The MC incorrectly analyzed the situation and assumed an incorrect conclusion. This bias diverted attention from the inadequate throttle setting.

The combination of distractions, lack of checklist synchronization, missed TOLD, inadequate crew communication regarding throttle position, and confirmation bias represent a trend of ineffective crew resource management throughout the MS.

b. ATLC Disengagement Altitude

The MP turned ATLC off 21 seconds after takeoff at a low altitude. This resulted in a 23-second dive before ground impact. Of note, the MP stated in an interview with the AIB that the MP's intent was to turn ATLC off at a higher altitude. The MP understood that unit standards directed crews to delay turning off ATLC until at least above a specified altitude. To be able to react to contingencies, emergencies, or automation failures, MQ-9 crews must be capable of taking manual control at any point during the takeoff. The MP was not in violation of any guidance by taking over manually at the altitude of execution, however, delaying turning ATLC off until a higher altitude would have provided more time to recover manually from any anomalies during the transition from automatic to manual control. Assuming the 23-second throttle reaction time as executed by the MP, an additional 100 ft of climb before turning ATLC off would have prevented the ground impact (based on simulator re-creation data). 12 SOS crews were habitually accustomed to turning ATLC off at a low altitude due to airspace requirements at Cannon AFB (where they train) driving turns shortly after takeoff. There were no factors that would have prevented the MP from turning off ATLC at a higher altitude.

Turning ATLC off at a higher altitude would have allowed for a longer reaction time for the MC to have recovered from the thrust-deficient descent. This is a substantially contributing factor and not a cause because, as discussed above in section 2.b., the aircraft was still recoverable at the altitude where the ATLC was disengaged, which was an acceptable altitude per existing guidance.

4. CONCLUSION

I have reviewed aircraft data logs, aircraft maintenance documentation, cockpit video and audio recordings, air traffic control communications, crewmember testimony, training records, technical analysis reports, and operational and maintenance practices and conducted a simulator recreation. I find, by a preponderance of the evidence, the cause of the mishap was the MP's failure to set the throttle to 100% during the ATLC takeoff, and subsequently, the MP's failure to analyze a low-power dive and recover by increasing throttle in a timely manner. These failures resulted in the MA catastrophically impacting the ground. Further, I find, by a preponderance of the evidence, the following two factors substantially contributed to the mishap: (1) ineffective crew resource management; and (2) ATLC disengagement altitude.

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28 August 2024

BRAD S. HUEBINGER, Colonel, USAF
President, Accident Investigation Board

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