UNITED STATES AIR FORCE ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

MQ-9A T/N 12-4201

62D EXPEDITIONARY ATTACK SQUADRON
455TH AIR EXPEDITIONARY WING
INSTALLATION WITHHELD

LOCATION: UNITED STATES CENTRAL COMMAND AREA OF RESPONSIBILITY

DATE OF ACCIDENT: 27 JUNE 2018

BOARD PRESIDENT: COLONEL BARTON D. KENERSON

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

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
JOINT BASE LANGLEY-EUSTIS VA

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ACTION OF THE CONVENING AUTHORITY

The report of the abbreviated accident investigation board conducted under the provisions of Air Force Instruction 51-307, *Aerospace and Ground Accident Investigations*, that investigated the 27 June 2018 mishap involving an MQ-9A, T/N 12-4201, operated by 62d Expeditionary Attack Squadron in the United States Central Commander area of responsibility, complies with applicable regulatory and statutory guidance; on that basis it is approved.

CHRISTOPHER P. WEGGEMAN
Lieutenant General, USAF
Deputy Commander

People First... Mission Always...

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION

MQ-9A, T/N 12-4201
US CENTCOM AOR
27 JUNE 2018

On 27 June 2018, at about 1823 Zulu Time, the mishap aircraft (MA), an MQ-9A, tail number (T/N) 12-4201, impacted the ground short of the runway in the United States Central Command Area of Responsibility (US CENTCOM AOR). Assigned to the 432d Wing, Creech Air Force Base, Nevada, the MA was operated by the 62d Expeditionary Attack Squadron Launch and Recovery Element in the deployed environment at the time of the mishap. The aircraft was destroyed and the loss of Government property was valued at $11,848,814. There was no reported damage to civilian property, injuries, or fatalities.

Approximately 20 minutes after a successful launch, the mishap crew (MC) discovered an oil level and pressure warning; the oil was at 76 percent and dropping rapidly. The MC declared an in-flight emergency, notified the Mishap Mission Safety Observer (MMSO), and turned the MA back towards the airfield. The mishap pilot (MP) declared his intention to move the MA to a position above the airfield (high key) which would provide the pilot more time to assess the situation and more opportunities to land the aircraft.

Once the MMSO arrived in the Ground Control Station, he assessed the situation and recommended the MP not to go for high key but rather to head straight to the field for a straight-in approach. A straight-in approach is a quicker option to land the aircraft, but the pilot has only one opportunity to land the aircraft. The MP altered course to head for a straight-in approach, reasoning a high key approach may result in loss of life if he lost link with the MA.

About 10 nautical miles from the airfield, the MA experienced un-commanded high torque, making it difficult for the MC to slow the MA. The MP subsequently shut down the engine. As the MA approached the runway, the MC assessed the MA's altitude to be too high and the MA's energy to be too fast for a successful landing. Therefore, the MP, at the direction of the MMSO, took two corrective actions. First, the MP slipped the aircraft, reducing the MA's altitude. Second, the MP activated the MA's flaps to slow the MA. The MA slowed, stalled, and crashed just short of the runway, within the fence line. The MA caught fire upon impact, and it was destroyed.

The Abbreviated Accident Investigation Board (AAIB) President found, by a preponderance of the evidence, the cause of the mishap was the MC's deviation from preferred simulated flame out emergency procedures following an oil leak. In addition, the AAIB President determined, by a preponderance of the evidence, the MP's lack of assertiveness was a substantially contributing factor in the mishap.

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.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-9A, T/N 12-4201
27 JUNE 2018

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ACRONYMS AND ABBREVIATIONS

12 AF	12th Air Force
62 EATKS	62d Expeditionary Attack Squadron
432 WG	432d Wing
455 AEW	455th Air Expeditionary Wing
AAIB	Abbreviated Accident Investigation Board
ACC	Air Combat Command
ADC	Area Defense Counsel
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFSOC	Air Force Special Operations Command
AFTO	Air Force Technical Order
AOHE	Air/Oil Heat Exchanger
AOR	Area of Responsibility
Capt	Captain
CC	Commander
Col	Colonel
CRM	Crew Resource Management
DNIF	Duty Not Involving Flying
DO	Director of Operations
DoD	Department of Defense
EOR	End of Runway
EP	Emergency Procedure
ER	Extended Range
FARM	Fielded Automation Requirements Management
Ft	Feet
GA-ASI	General Atomics Aeronautical Systems
GCS	Ground Control Station
GLS	Government Landing System
HFACS	Human Factors Analysis and Classification System
HUD	Heads Up Display
IFE	In-Flight Emergency
IKO	Installation Knowledge Online
ILS	Instrument Landing System
LRE	Launch and Recovery Element
LREP	Launch and Recovery Element Pilot
LT	Lieutenant
Lt Col	Lieutenant Colonel
Lt Gen	Lieutenant General
MA	Mishap Aircraft
Maj	Major
MATC	Maintain Aircraft Control
MC	Mishap Crew
MCE	Mission Control Element
MSO	Mishap Sensor Operator
MMSO	Mishap Mission Safety Observer
MP	Mishap Pilot
NM	Nautical Miles
Ops Tempo	Operations Tempo
OSS	Operation Support Squadron
OTS	Officer Training School
PIC	Pilot in Command
RL	Return Link
RPA	Remotely Piloted Aircraft
RTB	Return to Base
SEO	Simulated Engine Out
SFO	Simulated Flame Out
SIB	Safety Investigation Board
SIM	Simulator
SOAOS	Special Operations Air Operations Squadron
SrA	Senior Airman
TO	Technical Order
TCV	Temperature Control Valve
T/N	Tail Number
USAF	United States Air Force
US CENTCOM AOR	U.S. Central Command Area of Responsibility
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 6 June 2019, Lieutenant General (Lt Gen) Christopher P. Weggeman, Deputy Commander, Air Combat Command, appointed Colonel Barton D. Kenerson as the Abbreviated Accident Investigation Board (AAIB) President to investigate the 27 June 2018 accident involving an MQ-9A aircraft, tail number (T/N) 12-4201 (Tab Y-2 to Y-3). The AAIB conducted their investigation at Creech Air Force Base, Nevada, from 11 June 2019 to 21 August 2019, in accordance with the provisions of Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, Chapter 12 (Tab Y-2 to Y-3). Lt Gen Weggeman also appointed a Captain (Capt) as a legal advisor and a Technical Sergeant as a recorder to the AAIB, and detailed two subject matter experts (SMEs) to advise the AAIB, a Capt experienced in launch and recovery element (LRE) operations and a Staff Sergeant experienced in MQ-9 aircraft maintenance(Tab Y-2, Y-4 and Y-5).

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. This investigation was an abbreviated accident investigation, conducted pursuant to Chapter 12 of AFI 51-307.

2. ACCIDENT SUMMARY

On 27 June 2018, at about 1823 Zulu time (Z), the mishap aircraft (MA), an MQ-9A, tail number 12-4201, impacted the ground short of the runway in the United States Central Command Area of Responsibility (US CENTCOM AOR) (Tabs N-16, Q-5 to Q-6, S-8, S-24 to S-25, and Y-2). At the time of the incident, the 62d Expeditionary Attack Squadron's LRE was in control of the MA (Tab V-6.1). Approximately 20 minutes after takeoff, the MA experienced a decrease in engine oil level and oil pressure (Tab N-7 and N-11). The mishap crew (MC) turned the MA back to the airfield (Tab N-11). With engine torque increasing, the MC shut down the engine in an effort to glide the MA back to the runway (Tab N-24). Upon direction from the mishap mission safety officer (MMSO), the MC opted for a straight-in approach (Tabs N-12, R-5, and R-8). To reduce the MA's height, the MC slipped the MA, a maneuver whereby the pilot inputs aileron in one direction and rudder in the opposite direction in an effort to lose altitude (Tabs N-14 to N-15, V-1.58, and FF-3). To reduce the MA's speed, the MC lowered the MA's flaps to add extra drag to the aircraft (Tabs N-15, V-1.58, and FF-3). The MA impacted the ground short of the runway, catching fire and sustaining severe damage (Tabs J-12, Q-5 to Q-6, S-8, and V-1.59). The MA was determined to be a total loss (Tab Q-5 to Q-7). Loss of Government property was valued at $11,848,814 (Tab GG-2). There were no reported fatalities, injuries or damage to civilian property (Tabs Q-5 to Q-6, and GG-2).

3. BACKGROUND

a. Air Combat Command (ACC)

ACC is a major command of the United States Air Force (USAF) and the primary force provider of combat airpower to America's warfighting commands, established to support global implementation of national security strategy (Tab CC-2). ACC operates fighter, bomber, reconnaissance, battle management and electronic aircraft (Tab CC-2). It also provides command, control, communications and intelligence systems, and conducts global information operations (Tab CC-2). As a force provider and Combat Air Forces lead agent, ACC organizes, trains, equips and maintains combat-ready forces for rapid deployment and employment while ensuring strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense (Tab CC-2). ACC numbered air forces provide the air component to United States Central, Southern and Northern Commands, with Headquarters ACC serving as the air component to Joint Forces Commands (Tab CC-2). ACC also augments forces to United States European, Pacific, Africa-based and Strategic Commands (Tab CC-2).

b. Twelfth Air Force (12 AF)

12 AF (Air Forces Southern) controls ACC's conventional fighter and bomber forces based in the western United States and serves as the air component for United States Southern Command (Tab CC-5). 12 AF is responsible for United States air and space operations in Central America, South American and the Caribbean and its subordinate commands operate more than 800 aircraft with more than 64,000 uniformed and civilian Airmen (Tab CC-6).

c. 432d Wing (432 WG)

Falling under 12 AF, 432 WG consists of combat-ready Airmen who fly and maintain the MQ-1 Predator and MQ-9 Reaper remotely piloted aircraft (RPA) in direct support of the United States total force components and combatant commanders (Tab CC-9). 432 WG also trains aircrew, intelligence, weather, and maintenance personnel for RPA operations (Tab CC-9). The RPA systems provide real-time intelligence, surveillance, and reconnaissance, as well as precision attack against fixed and time-critical targets (Tab CC-9).

d. 455th Air Expeditionary Wing (455 AEW)

455 AEW is comprised of approximately 2,000 Airmen at Bagram Airfield, Afghanistan (Tab CC-11). The wing consists of five groups - 455th Expeditionary Mission Support Group, the 455th Expeditionary Operations Group, 455th Expeditionary Maintenance Group, 455th Expeditionary Medical Group, and the 451st Air Expeditionary Group (CC-12). The wing's priorities are "Defend the Base, Support the Fight, and Win" (Tab CC-11).

e. 62d Expeditionary Attack Squadron (62 EATKS)

62 EATKS provides combat support to the US CENTCOM AOR (Tab CC-16). The squadron, through its use of the MQ-9A Reaper, provides combatant commanders uninterrupted persistent attack and reconnsaissaince capabilities (Tab CC-16).

f. MQ-9A Reaper

The MQ-9A Reaper is an armed, multi-mission, medium altitude, long endurance remotely piloted aircraft employed secondarily as an intelligence-collection asset and primarily against dynamic execution targets (Tab CC-14). The MQ-9A's capabilities, including its significant loiter time, wide-range sensors, multi-mode communications suite, and precision weapons, make it uniquely qualified to conduct irregular, time-sensitive warfare operations in support of the combatant commander objects (Tab CC-14). Reapers can perform the following missions and tasks: intelligence, surveillance, reconnaissance, close air support, combat search and rescue, precision strike, buddy-laser, convoy/raid overwatch, route clearance, target development, and terminal air guidance (Tab CC-14).

4. SEQUENCE OF EVENTS

a. Mission

On 27 June 2018, the responsibility of the LRE MC, consisting of a mishap pilot (MP) and mishap sensor operator (MSO), was to launch and return aircraft to the airfield, which was located in an undisclosed deployed location (Tabs N-2 to N-16 and V-2.1). At the time of the mishap, the MC's mission was to launch and transfer the MA to the mission control element (MCE) (Tab V-1.3).

b. Planning

The MC believed the flight authorizations and paperwork for the MA and mishap ground control station (GCS) were in order (Tabs R-5, R-8, and V-1.49 to V-1.50). They received all the required weather and ops briefs prior to launch (Tab V-1.31 to V-1.32).

c. Preflight

The MC entered the GCS and completed their standard preflight and takeoff procedures at the GCS (Tab R-5 and R-8). As part of the preflight procedures, the MC performed a walk around the aircraft, checked forms, and once satisfied, stepped in to the aircraft to begin pregaming and initiating launch procedure (Tab V-1.50 and V-2.1). The aircraft forms/GCS forms noted no discrepancies prior to launch and neither the MC nor the maintenance personnel found an issue with MA or GCS (Tabs D-1, D-4, R-40 to R-66, and FF-5). There were no issues identified by the MC after they performed the proper preflight procedures (Tab V-1.51 and V-2.1).

d. Summary of Accident

At approximately 1731Z, LRE began normal preflight and launch procedures with the MA (Tab N-2). The MA took off from the airfield without incident around 1747Z (Tab N-7). Once the MC had good rotation and climb, the MC began the checklist to get the aircraft on heading and altitude for transfer to the MCE crew (Tab N-7). At approximately 1807Z, the MSO noticed the oil pressure was at 76%, and dropping rapidly to 36% within approximately 30 seconds. (Tab N-11 to N-12). The MP turned off the preprogram mode and maneuvered the MA back to the field (Tab N-11). The MC began running the checklist and called the operations supervisor's desk to inform them of the emergency around 1808Z (Tab N-12). The MP informed air traffic control (ATC) they were returning to the field with an engine oil problem. (Tab N-12). At this point, 1810Z, the MP stated his intention to go direct over the airfield, or get to "high key," which is a position high over the airfield (Tabs N-12, V-1.54 and FF-2).

Around 1811Z, the MMSO, who was at the operations supervisor's desk, arrived in the GCS (Tab N-12). Upon assessment, he advised the MC not to go to high key but rather to head directly for the airfield to conduct a "straight-in" approach (Tabs N-12, V-1.54, and V-2.2). The MP acknowledged the MMSO, concurred, and changed course (Tabs N-12 and V-1.54).

Once the MC reached 10-13 nautical miles (NM) final for the runway, the MP lowered the landing gear to prep the MA for landing (Tab N-13). The MC turned for final approach at 1819Z, where the MC experienced an increase in engine torque, resulting in the MP cutting the engine off to regain control of the altitude and speed (Tabs N-14, V-1.56 to V-1.57). At this point, the MC calculated the MA's altitude to be too high and the speed too fast to complete a successful landing (Tab V-1.57 to V-1.58). At around 1820Z, the MP subsequently slipped the MA to lower the MA's altitude (Tab N-14). To slip an aircraft is a maneuver whereby the pilot inputs aileron in one direction and the rudder in the opposite direction, in an attempt to lose altitude (Tab FF-3). Further, the MMSO directed the MP to put in full flaps, a maneuver for increasing lift, push the nose over, and get the MA back on glide path (Tabs N-15 and FF-3). The MP acknowledged and executed the directive (Tab N-15). In this instance, putting in full flaps is a technique designed to slow down the MA (Tab FF-3). The MSO called out the MA was still 300 feet (ft) too high, resulting in the MP continuing to slip the MA (Tab N-15). Three minutes later, around 1822Z, the MP took the MA out of the slip, returning the flaps back into neutral (Tab N-15). Unfortunately, the MP left the aircraft in the slip for approximately 88 seconds too long (Tab FF-4). At this time, the MSO stated the MA, which was about 2.1 NM from the end of the runway, was getting low on energy and was approximately 200 ft low (Tab N-15 to N-16). At approximately 1823Z, the MA lost too much speed and altitude, impacting the ground short of the runway at 1823:50Z (Tabs N-16 and FF-4).

e. Impact

The MA impacted the ground short of the runway in US CENTCOM AOR, approximately 37 minutes after take-off (Tabs N-7, N-16, Q-5 to Q-6, S-8, S-24 to S-25, V-1.3, and CC-11). The MA caught fire upon impact, and came to rest on the runway (Tab S-5 and V-1.59).

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 the maintenance records for the MA leading up to the mishap day revealed no relevant discrepancies or issues, and showed no overdue Time Compliance Technical Orders, time change items, or special inspections (Tabs D-2 to D-37, and FF-5). Prior to launch, the MA was properly released for flight and post- and pre-flight inspections were completed (Tabs D-6 and FF-5).

b. Inspections

At the time of the mishap, the MA accumulated 7904 total flight hours (Tab D-1 to D-4). All maintenance inspections were current and complied with by relevant authorities (Tabs D-11 to D-14, and FF-5). Maintenance personnel properly inspected the MA prior to its last flight, as seen on the Air Force Technical Order (AFTO) Form 781H (Tabs D-12 to D-13, and FF-5).

c. Maintenance Procedures

Maintenance personnel properly conducted all maintenance procedures in accordance with applicable TOs and guidance (Tabs D-1 to D-19, and FF-5).

d. Maintenance Personnel and Supervision

Maintenance personnel properly documented all pre-flight servicing and maintenance (Tabs D-3 to D-4, D-12 to D-13, and FF-5). No evidence exists that the training, qualifications, and supervision of the maintenance personnel were a factor in this mishap (Tabs D-3 to D-4, D-12 to D-13, and FF-5).

e. Fuel, Hydraulic, and Oil Inspection Analyses

According to the MA's AFTO 781H forms, fluid levels were properly inspected and adequate to conduct the mishap mission, though the MA was awaiting an oil sample from the lab at the time of mishap (Tabs D-8, D-14, DD-8, and FF-5). When the oil sample analysis returned, the report revealed some metal particles within the sample (Tab DD-8). However, it was determined not to be a factor to this mishap. (Tab DD-4).

f. Unscheduled Maintenance

Maintenance documentation revealed no unscheduled maintenance prior to the mishap (Tabs D-12 to D-19, and FF-5).

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

The MA sustained substantial damage when the MA impacted the ground short of the runway causing significant fire damage to the MA (Tabs Q-5, S-8, V-1.59, and DD-3). General Atomics Aeronautical Systems (GA-ASI) inspected the aft portion of the MA fuselage, which included: engine, propeller governor, air/oil heat exchanger (AOHE), temperature control valve (TCV), and oil hoses (Tab DD-2 to DD-54).

b. Evaluation and Analysis

Maintenance personnel pulled the LRE data logs from the GCS following the impact and sent those logs to GA-ASI for review (Tab DD-4 to DD-6). GA-ASI's analysis concluded the system was operating normal until the MA began to lose oil (Tab DD-16). Honeywell Aerospace inspected the engine core, but there was no indication of major oil loss or consumption (Tab DD-3). The only abnormal wear found was in the engine compressor, but they determined all were indicative of oil loss or starvation caused by the oil leak (Tab DD-3, DD-15, and DD-19).

GA-ASI did find chafing in the aft fuselage, specifically on the hose that connects the TCV to the AOHE (Tab DD-17). The TCV to AOHE hose is not closely examined during the 200-hour or 400-hour routine maintenance inspection (Tab FF-5 to FF-6). The post-mishap examination of this hose revealed a pinhole that could explain the rapid loss of engine oil (Tabs DD-17 and FF-5). The oil line runs through a hole near the exhaust eductor (Tab FF-5). The hole has a rubber protector to prevent the hose from chafing against its unprepared bulkhead edges (Tab FF-5). Once the rubber protector falls off the bulkhead, the hose can chafe against the unprepared edge, cutting a hole for oil to escape (Tab FF-5).

7. WEATHER

a. Forecast Weather

The weather slides briefed prior to the mishap flight indicate the forecast was clear skies with 9000 ft visibility (Tab F-2). Winds were forecasted as variable with the potential for 5-knot crosswinds (Tab F-2).

b. Observed Weather

No significant weather was reported or observed at the time of the mishap (Tab F-4). Weather observations included no wind, clear skies with visibility of 9000 meters, a mention of widespread dust, a temperature of 31 degrees Celsius (approximately 87.8 degrees Fahrenheit), and a normal altimeter setting of 29.59 inches (Tab F-4). The MP indicated he felt the weather conditions were pretty good, particularly for nighttime (Tab V-1.32).

c. Space Environment

Not applicable.

d. Operations

No evidence suggests the MA operated outside of prescribed operational weather limits (Tabs F-2 to F-3 and FF-3).

8. CREW QUALIFICATIONS

a. Mishap Pilot

The MP was current and qualified to conduct launch and recovery in the MQ-9A at the time of the mishap (Tabs G-44 to G-47 and V-1.23 to V-1.24). However, the MP felt he was not properly trained to handle this unique emergency with the current heavy weight configuration (Tab V-1.54). The MP had 220.2 hours of MQ-9A flight time and 78.7 hours of MQ-9A simulator time around the time of the mishap (Tab G-15). Recent flight hours were as follows (Tab G-6 to G-12):

	Flight Hours	Flight Sorties
Last 30 Days	55.3	84
Last 60 Days	89.2	143
Last 90 Days	90.9	145

b. Mishap Sensor Operator

The MSO was current and qualified to conduct launch and recovery in the MQ-9A at the time of the mishap (Tab G-61 to G-64). The MSO had 226.9 hours of MQ-9A flight time and 62.1 hours of MQ-9A simulator time around the time of the mishap (Tab G-28). Recent flight hours were as follows (Tab G-19 to G-25):

	Flight Hours	Flight Sorties
Last 30 Days	58.2	100
Last 60 Days	92.6	162
Last 90 Days	100.2	166

c. Mishap Mission Safety Observer

While not a direct member of the MC, the MMSO's flight qualifications are listed below. The MMSO was current and qualified to conduct launch and recovery in the MQ-9A at the time of the mishap (Tab G-75 and G-76). The MMSO had 171.6 hours of MQ-9A flight time around the time of the mishap (Tab G-42). Recent flight hours were as follows (Tab G-32 and G-39):

	Flight Hours	Flight Sorties
Last 30 Days	29.2	71
Last 60 Days	62	144
Last 90 Days	87.2	202

9. MEDICAL

a. Qualifications

At the time of the mishap, the MC was medically qualified for flying duty (Tab EE-28 to EE-29).

b. Health

No evidence exists to suggest the MC members' health contributed to the mishap (Tab EE-2 to EE-30).

c. Pathology

The medical clinic in the deployed location collected blood and urine samples from both members of the MC after the mishap (Tab EE-2 and EE-15). All toxicology testing resulted in negative findings (Tab EE-2 and EE-15).

d. Lifestyle

There is no evidence to suggest lifestyle was a factor in the mishap (Tabs V-1.29, V-2.1, EE-3 to EE-14, and EE-17 to EE-27).

e. Crew Rest and Crew Duty Time

At the time of the mishap, aircrew members were required to have proper rest, as defined in then-current AFI 11-202, Volume (V) 3, *General Flight Rules*, ACC Supplement, dated 28 November 2012, prior to performing in-flight duties (Tab BB-6 to BB-7). Paragraph 9.4.5 of AFI 11-202 V3, ACC Supplement, defined normal crew rest as a minimum of a 12-hour non-duty period before the designated flight duty period begins (Tab BB-7). Crew rest was defined as free time, and it included time for meals and transportation, as well as the opportunity to sleep (Tab BB-7). A review of the 72-hour and 7-day history of both the MP and MSO do not suggest any crew rest abnormalities (Tab EE-3 to EE-14, EE-17 to EE-27). At the time of the mishap, the MP felt a little fatigued, but he was cleared to fly (Tab V-1.29 to V-1.30, and V-1.40). The MSO verified he received the proper crew rest before the mishap flight (Tab V-2.1).

10. OPERATIONS AND SUPERVISION

a. Operations

The operational tempo at the deployed location was high at the time of the mishap (Tabs V-6.1 and R-76 to R-90). The mishap occurred at the beginning of the shift for the MP and MSO. Both the MP and MSO felt tired, but this was to be expected with the pace of the deployed operations tempo (Tab V-1.31 and V-2.2). The stress level was high amongst MCs due to recent aircraft mishaps that had occurred in the past couple of weeks (Tab V-1.5, V-2.1, and V-2.3). Specifically, there was a concern with airframes having links issues (Tab V-1.25 and V-2.2). A review of the GCS data logs did not reveal any link issues between the LRE and the MA at the time of the mishap (Tab J-12 to J-13).

b. Supervision

The MP and MSO were fully qualified in LRE Operations (Tab V-1.23 and V-2.3). The MC had conducted these launch operations in the past on multiple occasions prior to the mishap (Tab V-2.3). The training records show the MC had received all the required training (Tab G-3 and G-16). The MC believed they had received the proper training to accomplish this operational task (Tab V-1.23 to V-1.24 and V-2.2). The squadron leadership for the MP and MSO did not identify any significant issues prior to the mishap (Tab V-6.3).

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 (AE103), to determine whether any human factors were directly related to the mishap (Tab BB-3 to BB-4). The AAIB identified two human factors relevant to the mishap: (1) Procedures Not Followed Correctly, (2) Lack of Assertiveness (Tab BB-3 to BB-4).

a. Procedures Not Followed Correctly

The definition of "Procedure Not Followed Correctly", is when a procedure is performed incorrectly or accomplished in the wrong sequence in accordance with DoD HFACS version 7.0(AE103) (Tab BB-3). When faced with a simulated flame out emergency, variants of the MQ-9A Technical Order directs crews to land as soon as possible and to attempt to achieve an overhead approach key position, such as high key (Tab FF-2). The reasoning for getting to a high key position is it allows crews more opportunities to assess and manage the aircraft's energy state (Tab FF-2).

The LRE SME ran the same mission profile that the MC experienced on the day of the mishap (Tab FF-3). The LRE SME reenacted the scenario with the same fuel amount, aircraft weight, and wind conditions (Tab FF-3). The LRE SME triggered oil loss at the same moment as the MC, and turned the aircraft at the same distance back to the airfield (Tab FF-3). However, instead of heading for a straight-in approach, the LRE SME followed preferred emergency procedures and went to a high key position (Tab FF-3). The LRE SME shut the engine down at the same time as the MC (Tab FF-3). The LRE SME reached the overhead high key position with excess energy (Tab FF-3). The LRE SME then proceeded to execute standard procedures (Tab FF-3). By using a high key approach, The LRE SME safely landed the simulated MA even with the oil loss (Tab FF-3).

b. Lack of Assertiveness

The definition of "Lack of Assertiveness" is when an individual failed to state critical information or solutions with appropriate persistence and/or confidence in accordance with DoD HFACS version 7.0 (PP105) (Tab BB-4).

Assertiveness is particularly useful when establishing Crew Resource Management (CRM). CRM is the establishment of procedures to optimize and utilize crew effectiveness in order to achieve a common mission (Tab FF-2 to FF-3). CRM hinges upon employing effective communication to establish a shared mental model in order to ensure the entire crew knows how to execute the mission (Tab FF-2). A failure to assert CRM can lead to halo effect (Tab FF-3). Halo effect is when a less-experienced crew member acquiesces to another crew member because of rank, experience or uncertainty (Tab FF-3).

When changing course, the MP did not articulate his reasoning at the time of the mishap (Tabs N-2 to N-16, R-5, and FF-2 to FF-3). However, in the past, the MP had experience with losing link when in "low key," another overhead approach position that is lower in altitude than high key. This experience, along with his concern of preventing loss of life, led to him opting for a straight-in approach (Tab V-1.54 and V-2.3). The pilot in command has the last say in the cockpit (Tab V-6.5).

At the time of the mishap, the MP was considered a good pilot who sometimes lacked confidence, due to his inexperience (Tab V-6.3). Conversely, the MMSO was one of the most experienced MQ-9A pilots (Tab V-6.4). For non-standard issues, the MP was prepared to lean on those with more experience, such as the MMSO when he entered the GCS (Tab V-1.61 to V-1.62). The MSO also had confidence in the MMSO (Tab V-2.3). After recommending the straight-in approach, the MMSO proceeded to coach the MP on what to do next (Tabs N-12 to N-16 and V-4.2).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publically Available Directives and Publications Relevant to the Mishap

(1) AFI 51-307, *Aerospace and Ground Accident Investigations*, 18 March 2019

(2) AFI 11-202, Volume 3, *General Flight Rules,* ACC Supplement, 28 November 2012, Chapter 9
(3) AFI 91-204, *Safety Investigations and Reports*, 27 April 2018

b. Other Directives and Publications Relevant to the Mishap

(1) DoD Human Factors Analysis and Classification System, Version 7.0

c. Known or Suspected Deviations from Directives or Publications

There is no evidence to suggest that any directive or publication deviations occurred during this mishap.

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20 December 2019

BARTON D. KENERSON, Colonel, USAF
President, Abbreviated Accident Investigation Board

STATEMENT OF OPINION
MQ-9A, T/N 12-4201
US CENTCOM AOR
27 JUNE 2018

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 27 June 2018, at about 1823 Zulu Time (Z), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 12-4201, assigned to the 62d Expeditionary Attack Squadron (EATKS), 455th Air Expeditionary Wing, under the control of the launch and recovery element (LRE), impacted the ground short of the runway in the United States Central Command Area of Responsibility (US CENTCOM AOR). The MA was destroyed and the loss of Government property was valued at $11,848,814. There were no reported fatalities, injuries or damage to civilian property.

The LRE mishap crew (MC) was responsible for the MA's launch and recovery operations to and from the airfield, which was located in an undisclosed deployed location. The LRE consists of a mishap pilot (MP) and a mishap sensor operator (MSO), who were assigned to the 62 EATKS. A mishap mission safety observer (MMSO) was also present. The MP and MSO were on their first deployment and recently upgraded to a seasoned MC. Unbeknownst to the MC, the MA had a chafed TCV to AOHE hose with a pinhole through which oil could leak out.

The LRE MC launched the MA without incident and began running their prepared checklist for transfer to the mission control element (MCE). This transfer occurs once the MC has established link with the MCE to perform the mission portion of the operations. At approximately 1807Z, 30 minutes into the flight, the MC started to experience simultaneous oil level and pressure loss. The MC turned the MA towards the airfield and declared an inflight emergency.

Shortly after turning the MA back towards the airfield, the MC declared to Air Traffic Control their intentions to perform an overhead approach, by going to high key. The MQ-9 Technical Order dictated for crews to attempt to achieve an overhead position, such as high key. The predominant purpose of going to high key is to allow the MC to have the altitude and time to assess the emergency. The MC contacted the operations desk to inform the MMSO of the emergency. The on-duty MMSO proceeded to the ground control station (GCS) to advise and monitor the MC. The purpose of the MMSO is to provide guidance to the MC as they deal with an emergency, not to lead the MC. Upon arrival, the MMSO began to direct the MP to perform a straight-in approach to the airfield and get to the field as soon as possible. The MC unquestionably followed the directions of the more experienced MMSO and changed course to attempt a straight-in approach.

Once the MC reached 10-13 nautical miles from the runway, the MA experienced uncommanded high torque from the engine. The MP shut down the engine in response. Calculating the MA's altitude to be too high and the energy too fast, the MP proceeded to perform two maneuvers at the direction of the MMSO. To slow the MA, the MP inputted full flaps. To lose altitude, the MP went into a slip. The MP slipped the MA for approximately three minutes. When the MP took the MA out of the slip, the MC realized the MA had lost too much speed and altitude from these two maneuvers. At 1823Z, 16 minutes after the oil loss, the MA impacted the ground short of the runway, and it was destroyed.

2. CAUSE

I find by preponderance of the evidence the cause of the mishap was the MP's deviation from preferred simulated flame out (SFO) emergency procedures following an oil leak. When crews experience a SFO, the preferred course of action is to get to an overhead approach, such as high key, to provide maximum altitude and time to assess the emergency. At the beginning of the in-flight emergency, the inexperienced MP properly assessed the in-flight emergency by attempting to return to the airfield to make a course for high key. However, the MP deviated from the preferred SFO procedures when he diverted to a straight-in approach. The MP stated he changed course due to his focus on *potential* loss of life that could result from *potential* loss of link with the MA. While it is important to minimize the loss of life, there did not appear to be evidence to indicate loss of link concerns from a high key position.

Two subsequent decisions led to the crash. First, the MP prematurely shut down the engine, increasing the difficulty for a straight-in approach. Second, the MP calculated the MA's altitude and speed to be too high and too fast. This calculation led to two maneuvers, slipping the MA and applying the flaps. Due to no engine power and a straight-in approach, absolute precision was required in order to manage speed and altitude. Unfortunately, the MP left the MA in the slip for too long, resulting in the aircraft losing too much altitude and speed to reach the runway. The MP could not recover from the loss of altitude and speed, resulting in the crash. The reenactment, with the same mission profile, revealed that if the MP had followed the preferred SFO procedures, he should have been able to land the plane. If the mishap crew had stayed with the preferred SFO procedures and got to high key, where they would have had substantially more time to assess altitude and speed, the preponderance of the evidence shows the MP could have made the airfield and landed the MA safely. Therefore, but for the MP's decision to deviate from the preferred SFO procedures, the mishap would not have occurred.

3. SUBSTANTIALLY CONTRIBUTING FACTOR

I find by a preponderance of the evidence the MP's lack of assertiveness substantially contributed to the mishap. In reviewing the totality of the evidence, the MP allowed the more experienced MMSO to take over flight decisions. The principal decision to deviate from getting to high key took the MP outside of the level of training he received prior to experiencing this mishap. By taking himself out of his comfort zone, the MP's lack of assertiveness took root in the GCS. The lack of assertiveness allowed for crew resource management (CRM) to break down and the halo effect to grab hold, resulting in the MP acquiescing to the MMSO's suggestions, even though the MP was not skilled enough to complete the MMSO's more advanced maneuvers. The CRM breakdown is most evident in the MP's failure to articulate his reasoning for deviating from SFO procedures. He did not tell his MSO why he was deviating. He did not tell his MSO he was concerned with potential loss of life from a potential loss of link. He simply surrendered to the

MMSO's orders. While he was a relatively novice MP, it is the responsibility of the MP, as the individual who is principally flying the aircraft, to lead the GCS and to make those close-in-time decisions. By allowing himself to be overruled by the MMSO, the preponderance of the evidence shows the MP's lack of assertiveness was a substantially contributing factor to the mishap.

4. CONCLUSION

I find by a preponderance of the evidence the cause of the mishap was the MP's deviation from preferred SFO emergency procedures following an oil leak. I further find by a preponderance of the evidence the MP's lack of assertiveness was a substantially contributing factor in the mishap.

K

20 December 2019

BARTON D. KENERSON, Colonel, USAF
President, Abbreviated Accident Investigation Board

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