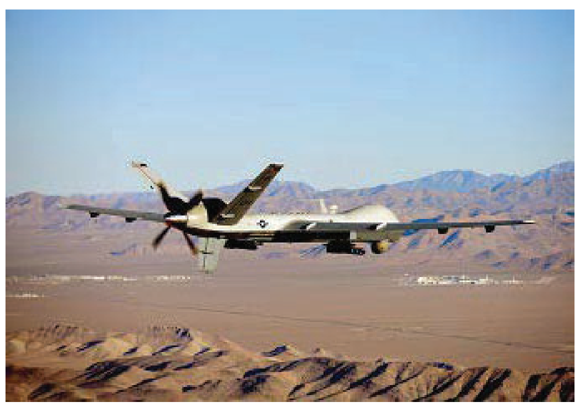
# UNITED STATES AIR FORCE
# ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

**MQ-9A, T/N 10-4108**

**REMOTELY PILOTED SOLUTIONS**
**432D WING**
**ALI AL SALEM AIR BASE, KUWAIT**



**LOCATION: ALI AL SALEM AIR BASE, KUWAIT**

**DATE OF ACCIDENT: 24 September 2020**

**BOARD PRESIDENT: COLONEL RONNIE HAWKINS**

**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

OFFICE OF THE DEPUTY COMMANDER
205 DODD BOULEVARD SUITE 203
JOINT BASE LANGLEY-EUSTIS VA 23665-2788

OCT 12 2021

# 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 24 Septmember 2020 mishap involving an MQ-9A, T/N 10-4108, operated by Remotely Piloted Solutions, complies with applicable regulatory and statutory guidance, and on that basis it is approved.**

RUSSELL L. MACK
Lieutenant General, USAF
Deputy Commander

**EXECUTIVE SUMMARY**
**UNITED STATES AIR FORCE**
**ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION**

**MQ-9, T/N 10-4108**
**ALI AL SALEM AIR BASE, KUWAIT**
**24 September 2020**

On 24 September 2020, at approximately 0433 Zulu (Z), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 10-4108, departed the runway surface during landing rollout on an airfield at Ali Al Salem Air Base, Kuwait. The MA was government-owned, contractor-operated (GOCO); the MA was assigned to the 432d Wing with contractors for Remotely Piloted Solutions (RPS) flying it at the time of the mishap. The mishap crew (MC) consisted of the Mishap Pilot (MP), Mishap Sensor Operator (MS), and the Mishap Safety Observer (MSO). Another unit, the Other Unit (OU)'s ground data terminal (GDT) and ground control station (GCS) and MQ-9 were in use during the MA's landing and were transmitting on the same frequency as the MA's uplink. The interfering GDT was transmitting on the wide beam during the landing then subsequently changed to the narrow beam. The MA entered the interfering GDT's beam and the MA lost uplink with its GDT. The MA's nose wheel maintained the last received command (slight left), and the MA veered left. The MA then departed the side of the runway. The MA was destroyed. Total loss to the Government is valued at $42,520,806.00; there were no injuries or other damages.

The OU had earlier coordinated to switch from using the SPURS frequencies to the CHARGERS frequencies due to interference on the SPURS downlinks. But rather than use the new CHARGERS downlinks and the paired uplink, the OU used the CHARGERS downlinks while it continued to use the MOSPORT uplink. The other MQ-9 units assumed that when the OU switched downlinks from SPURS to CHARGERS, they would also switch the associated uplinks.

The MC executed the launch and recovery mission and landed the MA, even while the OU GDT and MQ-9 were in use and transmitting on the same uplink frequency. As the MA decelerated during landing rollout, the OU's GDT switched to the narrow beam and the MA entered this beam. The MA received data from the much stronger beam of the OU's GDT, and, though it discarded them, the MA was prevented from receiving data from its own GDT, resulting in the loss of uplink. The MA departed the prepared surface of the runway and came to a stop on the ground.

The Abbreviated Accident Board President found by a preponderance of the evidence, the causes of the mishap, both of which were necessary, are: (a) the OU improperly using the MOSPORT uplink frequency to launch and land aircraft after the frequency allocation plan had been adjusted and distributed; and (b) during landing rollout, the MA entered the beamwidth for the OU GDT, causing the MA to receive two different uplink signals on the same frequency, preventing it from receiving data from its own GDT and resulting in the loss of uplink.

*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 10-4108**
**ALI AL SALEM AIR BASE, KUWAIT**
**24 September 2020**

## TABLE OF CONTENTS


ACRONYMS AND ABBREVIATIONS ........ iii
SUMMARY OF FACTS ........ 1
1. AUTHORITY AND PURPOSE ........ 1
   a. Authority ........ 1
   b. Purpose ........ 1
2. ACCIDENT SUMMARY ........ 1
3. BACKGROUND ........ 2
   a. Air Combat Command (ACC) ........ 2
   b. 15th Air Force (15 AF) ........ 2
   c. 432d Wing (432 WG) ........ 2
   d. Remotely Piloted Solutions (RPS) ........ 3
   e. MQ-9A Reaper ........ 3
4. SEQUENCE OF EVENTS ........ 3
   a. Mission ........ 3
   b. Planning ........ 4
   c. Preflight ........ 5
   d. Summary of Accident ........ 5
   e. Impact ........ 5
5. MAINTENANCE ........ 5
   a. Forms Documentation ........ 5
   b. Inspections ........ 5
   c. Maintenance Procedures ........ 6
   d. Maintenance Personnel and Supervision ........ 6
   e. Fuel, Hydraulic, Oil, and Oxygen Inspection Analyses ........ 6
   f. Unscheduled Maintenance ........ 6
6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS ........ 6
   a. Structures and Systems ........ 6
   b. Evaluation and Analysis ........ 6
7. WEATHER ........ 6
   a. Forecast Weather ........ 6
   b. Observed Weather ........ 6
   c. Space Environment ........ 7
   d. Operations ........ 7
8. CREW QUALIFICATIONS ........ 7
   a. Mishap Pilot (MP) ........ 7
   b. Mishap Sensor Operator (MS) ........ 7
   c. Mishap Safety Observer (MSO) ........ 7
9. MEDICAL ........ 8
   a. Qualifications ........ 8

b. Health ..... 8
c. Pathology ..... 8
d. Lifestyle ..... 8
e. Crew Rest and Crew Duty Time ..... 8
10. OPERATIONS AND SUPERVISION ..... 8
a. Operations ..... 8
b. Supervision ..... 8
11. HUMAN FACTORS analysis ..... 8
a. Introduction ..... 8
b. Failure to Effectively Communicate ..... 9
12. GOVERNING DIRECTIVES AND PUBLICATIONS ..... 9
a. Publically Available Directives and Publications Relevant to the Mishap ..... 9
b. Other Directives and Publications Relevant to the Mishap ..... 9
c. Known or Suspected Deviations from Directives or Publications ..... 9
STATEMENT OF OPINION ..... 10
1. Opinion Summary ..... 10
2. Causes ..... 10
a. Other Unit's Improper Use of MOSPORT Uplink Frequency ..... 10
b. Loss of Uplink ..... 11
3. Substantially Contributing Factor ..... 12
4. Conclusion ..... 12
INDEX OF TABS ..... 13

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| 15 AF | 15th Air Force |
| 1 Lt | First Lieutenant |
| 432 WG | 432d Wing |
| 46 EATKS | 46th Expeditionary Attack Squadron |
| ACC | Air Combat Command |
| ACO | Air Control Order |
| AB | Air Base |
| AF | Air Force |
| AFB | Air Force Base |
| AFI | Air Force Instruction |
| AFTO | Air Force Technical Order |
| AIB | Accident Investigation Board |
| AAIB | Abbreviated Accident Investigation Board |
| ATO | Air Traffic Order |
| CAOC | Combined Air Operations Center |
| CAP | Combat Air Patrol |
| CRM | Crew Resource Management |
| DoD | Department of Defense |
| DVR | Digital Video Recorder |
| EP | Emergency Procedure |
| FAP | Frequency Allocation Plan |
| FCF | Functional Check Flight |
| FCIF | Flight Control Information File |
| FTU | Formal Training Unit |
| DO | Director of Operations |
| DoD | Department of Defense |
| GA | General Atomics |
| GCS | Ground Control Station |
| GDT | Ground Data Terminal |
| GOCO | Government-Owned, Contractor-Operated |
| HDD | Heads Down Display |
| HFAC | Human Factors Analysis & Classification System |
| HUD | Heads Up Display |
| IO | Investigating Officer |
| IP | Instructor Pilot |
| ISB | Interim Safety Board |
| ISR | Intelligence, Surveillance, & Reconnaissance |
| IR | Infrared |
| LAO | Local Area Orientation |
| LNO | Liaison Officer |
| LOS | Line of Sight |
| LR | Launch & Recovery |
| LRE | Launch & Recovery Element |
| LRQT | Launch & Recovery Qualification Training |
| Lt | Lieutenant |
| Lt Col | Lieutenant Colonel |
| MA | Mishap Aircraft |
| Maj | Major |
| MAJCOM | Major Command |
| MC | Mishap Crew |
| MCE | Mission Control Element |
| MD | Maryland |
| MP | Mishap Pilot |
| MS | Mishap Sensor Operator |
| MSO | Mishap Safety Observer |
| mIRC | Internet Relay Chat |
| MOA | Memorandum of Agreement |
| MRP | Mission Response Procedures |
| MTS | Multi-spectral Targeting System |
| NOTAMs | Notices to Airmen |
| NV | Nevada |
| OG | Operations Group |
| OU | Other Unit |
| OU2 | Other Unit 2 |
| OUP | Other Unit Pilot |
| OUS | Other Unit Sensor Operator |
| OU DETCO | Other Unit Detachment Commander |
| OS | Operations Supervisor |
| PAROC | Persistent Attack & Reconnaissance Operations Center |
| PIC | Pilot-in-Command |
| PLL | Phased Lock Loop |
| PSO | Pilot/Sensor Operator Station |
| RF | Radio Frequency |
| ROZ | Restricted Operating Zone |
| RPA | Remotely Piloted Aircraft |
| RPS | Remotely Piloted Solutions |
| RTB | Return to base |

| | |
|---|---|
| SARM | Squadron Aviation Resource Manager |
| SEO | Simulated Engine Out |
| SIB | Safety Investigation Board |
| SPINs | Special Instructions |
| T/N | Tail number |
| T.O. | Technical Order |
| TTPs | Techniques, Tactics, and Procedures |
| UAS | Unmanned Aerial System |
| UAV | Unmanned Aerial Vehicle |
| USAF | United States Air Force |
| VIT | Variable Information Table |
| VSI | Vertical Speed Indicator |
| Z | Zulu |

# SUMMARY OF FACTS

## 1. AUTHORITY AND PURPOSE

### a. Authority

On 22 December 2020, Lieutenant General Christopher P. Weggeman, Deputy Commander, Air Combat Command (ACC), appointed Colonel Ronnie D. Hawkins as the Board President for an Abbreviated Accident Investigation Board (AAIB) to investigate the 24 September 2020 accident involving an MQ-9A aircraft, tail number (T/N) 10-4108 (Tab Y-2 to Y-4). A legal advisor (Captain) and a recorder (Captain) were also appointed to the AAIB (Tab Y-2). The AAIB conducted the investigation remotely at Creech Air Force Base (AFB), Nevada (NV); Nellis AFB, NV; and Andrews AFB, Maryland (MD) from 8 January 2021 to 19 February 2021, and, because this investigation was an abbreviated accident investigation, it was done so in accordance with the provisions of Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, Chapter 12 (Tab Y-2).

### b. Purpose

In accordance with AFI 51-307, *Aerospace and Ground Accident Investigations*, this AAIB conducted a legal investigation to inquire into all the facts and circumstances surrounding this Air Force aerospace accident, prepare a publicly releasable report, and obtain and preserve all available evidence for use in litigation, claims, disciplinary action, and adverse administrative action.

## 2. ACCIDENT SUMMARY

On 24 September 2020, at approximately 0433 Zulu (Z), the mishap aircraft (MA), an MQ-9A, T/N 10-4108, departed the runway surface during landing rollout on an airfield at Ali Al Salem Air Base, Kuwait (Tabs J-7, J-10, J-12, and Q-3). The MA was government-owned, contractor-operated (GOCO); the MA was assigned to the 432d Wing with contractors for Remotely Piloted Solutions (RPS) flying it at the time of the mishap (Tabs Q-3, R-3, V-2.1, and V-2.5). The mishap crew (MC) consisted of the Mishap Pilot (MP), Mishap Sensor Operator (MS), and the Mishap Safety Observer (MSO) (Tabs R-3 to R-4 and V-10). Another unit's ground data terminal (GDT) and ground control station (GCS) and MQ-9 were in use during the MA's landing and were transmitting on the same frequency as the MA's uplink (Tab J-10). The interfering GDT was transmitting on the wide beam during the landing then subsequently changed to the narrow beam (Tab J-10). The MA entered the interfering GDT's beam and the MA lost uplink with its GDT (Tab J-10). The MA's nose wheel maintained the last received command (slight left), and the MA veered left (J-10). The MA then departed the side of the runway (Tab J-10). The MA was destroyed (Tab Q-4). Total loss to the Government is valued at $42,520,806.00; there were no injuries or other damages (Tab P-2).

## 3. BACKGROUND

### a. Air Combat Command (ACC)

As the direct successor to Tactical Air Command, ACC is a major command (MAJCOM) of the United States Air Force (USAF) and the primary provider of air combat forces to America's warfighting commanders (Tab CC-2). ACC's mission is to support global implementation of national security strategy (Tab CC-2). ACC operates fighter, reconnaissance, battle-management and electronic-combat aircraft (Tab CC-2). It also provides command, control, communications and intelligence systems, and conducts global information operations (Tab CC-2). As the Combat Air Forces lead agent, ACC develops strategy, doctrine, concepts, tactics, and procedures for air, space, and cyber power employment (Tab CC-2). The command provides conventional and information warfare forces to all combatant commands to ensure air, space, cyber, and information superiority for warfighters and national decision-makers (Tab CC-2). The command can also be called upon to assist national agencies with intelligence, surveillance, and crisis response capabilities (Tab CC-2).

### b. 15th Air Force (15 AF)

The 15th Air Force, headquartered at Shaw Air Force Base, South Carolina, is a Numbered Air Force under ACC and activated on 20 August 2020 (Tab CC-7). Fifteenth AF trains Airmen to deliver combat airpower worldwide and provides light, lean, and agile Air Force, Joint, or Combined Task Force Headquarters (Tab CC-7). As a force provider, 15 AF is at the core of many force structural changes that will continue to advise, assist, and advocate to ensure the readiness of subordinate troops (Tab CC-7). Fifteenth AF is responsible for ensuring the agile combat support capabilities of 13 wings and three direct reporting units, preparing Airmen for dynamic requirements of air, space, cyberspace of the future (Tab CC-7). These units encompass about 600 aircraft and more than 45,000 active duty and civilian members (Tab CC-7).

### c. 432d Wing (432 WG)

Located at Creech AFB, NV, the 432d Wing consists of about 3,000 military and civilian members (Tab CC-8). They employ remotely piloted aircraft in combat air patrols to support combatant commander needs and deploy combat support forces worldwide (Tab CC-8). This includes combat command and control, tactics, development, intelligence support, weather support and standardizations and evaluation oversight for ACC and other remotely piloted aircraft units (Tab CC-8).

**d. Remotely Piloted Solutions (RPS)**

RPS provides comprehensive unmanned aerial system (UAS) services (Tab CC-16). From LRE (Launch and Recovery Element) and MCE (Mission Control Element) operations to logistics support, training development and conduct, and test planning and execution, RPS uses military training and thousands of hours of experience to provide these services (Tab CC-16). RPS also offers a variety of commercial solutions including training, requirements, surveying, disaster and emergency response, infrastructure and emissions inspections, thermal imaging, 3D- and 4D-mapping, and security (Tab CC-16).

**e. MQ-9A Reaper**

The MQ-9A Reaper is an armed, multi-mission, medium-altitude, long-endurance remotely piloted aircraft (RPA) employed primarily against dynamic execution targets and secondarily as an intelligence collection asset (Tab CC-18). Due to its significant loiter time, wide-range sensors, multimodal communication suite, and precision weapons, the MQ-9A provides a unique capability to perform strike, coordination, and reconnaissance against high-value, fleeting, and time-sensitive targets (Tab CC-18). MQ-9As perform the following missions and tasks: intelligence, surveillance, reconnaissance, close air support, combat search and rescue, precision strike, buddy-lase, convoy/raid overwatch, target development, and terminal air guidance (Tab CC-18).

## 4. SEQUENCE OF EVENTS

**a. Mission**

In addition to RPS, there were other MQ-9 organizations at the deployed location at the time of the mishap (Tab V-3.3 to V-3.5). Among them was the 46th Expeditionary Attack Squadron (46 EATKS), United States Air Force (USAF), as well as the Other Unit (OU), both performing Launch & Recovery (LR) operations (Tabs R-107 and V-3.3). The 46 EATKS was the de facto lead MQ-9 organization on the base, liaising on behalf of the other MQ-9 units (Tab V-3.3). At the time of the mishap, there was no proper line of authority or command authority between the 46 EATKS and the other MQ-9 units on the base, but the others understood the 46 EATKS' position as coordinating frequencies between them (Tab V-2.3, V-3.3, and V-6.2 to V-6.3).

In the summer of 2020, the 46 EATKS initiated an update of the C-band datalink frequency allocation plan (FAP) (Tab R-102 and R-109). In order to fly and operate MQ-9s in the LR phase, each GDT and aircraft utilize two line-of-sight (LOS) uplink frequencies (a primary and a backup) and two LOS downlink frequencies (Tab R-5 to R-6). The uplink frequencies send commands from the GDT to the aircraft, while the downlink frequencies provide telemetry and video from the aircraft to the GDT (Tab R-5 to R-6).

At Ali Al Salem Air Base, C-band frequencies were organized in pairs of uplinks and downlinks and given names (Tab V-3.5). Uplink frequencies were named after race tracks and downlink frequencies were named after professional sports teams (Tab V-2.8). On 8 August 2020, 46 EATKS released the updated FAP showing frequency pairings, names, and who was assigned to use them (Tab R-102). The 46 EATKS received no questions or negative comments after distributing the new FAP to the MQ-9 units at the base (Tab V-3.6). RPS was allocated one set of frequencies and the OU MQ-9s were assigned two (Tabs R-74 to R-75 and V-3.7). The OU had a primary and a spare frequency set, as depicted in Figure 1 (Tabs V-3.5, V-3.7, and Z-2).

| Downlink Name | Downlinks | | Uplink Name | Uplinks | | Unit Assigned |
|---|---|---|---|---|---|---|
| TITANS | 1122 | 2233 | NURBURGRING | 9911 | 9922 | RPS |
| SPURS | 3344 | 4455 | MOSPORT | 8811 | 8822 | OU Primary |
| CHARGERS | 5566 | 6677 | TALLADEGA | 7711 | 7722 | OU Spare |

*Figure 1*, (Tab Z-2)

Despite having names for both uplinks and downlinks, units referred only to downlink names as a means of shorthand (Tab V-2.7 and V-3.5). With the exception of the OU, crews knew that reference to a downlink also included its paired uplinks (Tab V-2.7, V-3.5, V-4.6, V-5.6 to V-5.7, and V-6.4 to V-6.5). Instead, the OU operators believed the single name referred to that specific uplink or downlink (Tab V-5.6 to V-5.7 and V-6.4 to V-6.5).

The OU coordinated with the 46 EATKS to switch from using SPURS to CHARGERS due to interference on the SPURS downlinks (Tab V-3.5 and V-6.3). But rather than use the new CHARGERS downlink frequency and its paired uplink, the OU continued to use MOSPORT uplinks while using the CHARGERS downlinks (Tab V-5.4 and V-6.4). Additionally, the other non-OU MQ-9 units assumed that when the OU switched from SPURS to CHARGERS, they would also switch the associated uplinks, as depicted in Figure 1 (Tabs V-2.7, V-3.8, and Z-2).

The MC's mission, as authorized by RPS, was recovering the MA (Tabs R-184 and V-2.3 to V-2.4).

**b. Planning**

The MP and the MS accomplished all standard and required mission planning including weather updates and individual crew briefs (Tabs R-23 to R-24, R-42, and V-2.3 to V-2.5). They were notified of an earlier-than-expected landing for the MA (Tab V-2.3 to V-2.4). The decision to land early was based on forecasted wind speeds exceeding the limits of the MQ-9A during its projected landing time (Tab V-2.3 to V-2.4 and V-8). Another RPS MQ-9 was attempting to launch while the MA was returning to base, so the MA needed an additional set of datalink frequencies as the MQ-9 that was launching was already using RPS's frequency, TITANS (Tab V-2.3 and V-2.7). The RPS operations supervisor contacted the 46 EATKS to acquire the additional frequency (Tab V-2.7 and V-8). In turn, the 46 EATKS contacted the OU to inquire about their additional frequency, and the OU reported that they were not using the SPURS frequency and it was available to be used (Tab V-5.6 to V-5.7 and V-7). The 46 EATKS then informed RPS that the SPURS frequency was available for use at that time (Tab R-90).

### c. Preflight

The MC consisted of the MP, MS, and the MSO (Tabs R-3 to R-4 and V-10). The MP stepped and went to swap out control of the MA from the Mission Control Element (MCE) pilot, taking control of the MA approximately an hour and a half prior to landing (Tab R-3).

### d. Summary of Accident

The MC executed their LR mission and landed the aircraft using the SPURS downlinks and its associated uplinks (Tabs R-4, V-2.3, and V-2.7). At this same time, the OU GDT and MQ-9 were in use during the MA's landing (Tabs J-10, R-121, and V-4.3). The OU's GDT was pointed toward the approach end of the mishap runway and was transmitting on the same frequency as the MA GDT's uplink (Tabs J-10, V-4.7, and V-5.4 to V-5.5). At the time, the mishap GDT and the OU GDT were both transmitting on the wide beam (Tab J-10). The MA touched down normally (Tab J-10). As the MA decelerated during landing rollout, the interfering OU's GDT switched to the narrow beam (Tab J-10). When the MA entered the more focused beam of the OU's GDT, it began to receive a much stronger signal from the OU's GDT; and, though it discarded that, the MA was prevented from receiving data from its own GDT, resulting in the loss of uplink (Tab J-18). After losing its uplink, the nose wheel maintained the last received command of slight left (Tab J-10). The MP noticed that the MA began veering left and did not respond to the MP's attempts to return the MA to center line (Tabs J-10, R-4, and V-10).

### e. Impact

A full-power climb was commanded, but the airspeed was too low for the MA to lift off before it departed the side of the runway (Tab J-10). At approximately 0433Z, the MA departed on the left side of the prepared runway surface and came to a rest on the ground (Tabs J-10, J-12, and R-4 to R-5).

## 5. MAINTENANCE

### a. Forms Documentation

A review of the maintenance records for the MA leading up to the mishap day revealed no significant maintenance issues (Tab D-226 to D-227 and D-241 to D-246). Additionally, there were no relevant discrepancies or issues and no overdue Time Compliance Technical Orders, time change items, or special inspections (Tab D-341 to D-346). Prior to launch, the MA was released for flight and cleared pre-flight inspections (Tab D-227).

### b. Inspections

At the time of the mishap, the MA accumulated 11,065.8 total flight hours and was not overdue for any inspections (Tab D-234). All maintenance inspections were current and complied with relevant authorities (Tab D-341 to D-346). An Air Force Technical Order (AFTO) Form 781H, dated 23 September 2020, indicated maintenance personnel inspected the MA prior to its last flight (Tab D-227).

### c. Maintenance Procedures

Maintenance personnel conducted all maintenance procedures in accordance with applicable Technical Orders (T.O.s) and guidance (Tab D-226 to D-227 and D-241 to D-246).

### d. Maintenance Personnel and Supervision

Maintenance personnel documented all pre-flight servicing and maintenance (Tab D-241 to D-246). There was no evidence to suggest that the training, qualification, and supervision of the maintenance personnel were a factor in this mishap (Tab G-203 to G-407).

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

On the day of the mishap, fuel, hydraulic and oil samples were collected from the MA (Tab D-837). Analysis of the samples indicated that there were no detectable volatile contaminations (Tab D-837 to D-852).

### f. Unscheduled Maintenance

Maintenance documentation revealed no unscheduled maintenance prior to the mishap (Tab D-226 to D-227 and D-241 to D-246).

## 6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

### a. Structures and Systems

Structures and systems analysis were not conducted because the MA was destroyed (Tab Q-4).

### b. Evaluation and Analysis

Following the mishap, General Atomics performed a review of the available data (Tab J-6 and J-10). The data revealed that the uplink signal from the interfering GDT prevented the MA from receiving data from its own GDT (Tab J-8 and J-10).

## 7. WEATHER

### a. Forecast Weather

The forecast for the airfield was for clear skies and unlimited visibility (Tab F-2). Winds were forecasted out of the north-northwest at 15 knots with potential gusts up to 25 knots (Tab F-2).

The weather information briefed to the MP indicated that the forecasted winds would be out of limit during the originally scheduled land time (Tab V-2.3).

### b. Observed Weather

No significant weather was reported or observed at the time of the mishap (Tab V-2.3).

### c. Space Environment

Not applicable.

### d. Operations

No evidence suggests the MA operated outside of prescribed operational weather limits.

## 8. CREW QUALIFICATIONS

### a. Mishap Pilot (MP)

The MP was current and qualified to conduct LR duties in the MQ-9A at the time of the mishap (Tab G-35). The MP had 190.7 hours of total MQ-9A flight time around the time of the mishap (Tab G-12). Recent LR flight hours were as follows (Tab G-2):

| | Hours | Sorties |
|---|---|---|
| 30 days | 6.4 | 13 |
| 60 days | 7.2 | 16 |
| 90 days | 7.2 | 16 |

### b. Mishap Sensor Operator (MS)

The MS was current and qualified to conduct LR duties in the MQ-9A at the time of the mishap (Tab G-80). The MS had 915.4 hours of total MQ-9A flight time around the time of the mishap (Tab G-79). Recent LR flight hours were as follows (Tab G-2):

| | Hours | Sorties |
|---|---|---|
| 30 days | 3.4 | 8 |
| 60 days | 4.1 | 10 |
| 90 days | 4.1 | 10 |

### c. Mishap Safety Observer (MSO)

The MSO was current and qualified to conduct LR duties in the MQ-9A at the time of the mishap (Tab G-142). The MSO had 526.8 hours of total MQ-9A flight time around the time of the mishap (Tab G-141). Recent flight hours were as follows (Tab G-2):

| | Hours | Sorties |
|---|---|---|
| 30 days | 6.5 | 14 |
| 60 days | 7.3 | 16 |
| 90 days | 8.8 | 18 |

## 9. MEDICAL

### a. Qualifications

All members were medically qualified for their duties at the time of mishap (Tab G-409 to G-410).

### b. Health

There is no evidence to suggest the MC's health contributed to the mishap (Tab G-409 to G-410).

### c. Pathology

The medical clinic collected toxicology test samples from the MC after the mishap, and the reports indicated toxicology was not a factor in the mishap (Tab G-422 to G-424).

### d. Lifestyle

There is no evidence to suggest lifestyle was a factor in this mishap (Tab G-409 to G-410).

### e. Crew Rest and Crew Duty Time

There is no evidence to suggest crew rest or duty time were factors in this mishap and the MC reported they were rested on the day of the mishap (Tab G-409 to G-410).

## 10. OPERATIONS AND SUPERVISION

### a. Operations

There is no evidence to suggest operations were a factor in the mishap (Tabs G-409 to G-410 and V-2.3 to V-2.4).

### b. Supervision

There is no evidence to suggest supervision of the MC was a factor in the mishap, and the MC included a safety observer to assist and ensure safe operation of the aircraft (Tab R-12).

## 11. HUMAN FACTORS ANALYSIS

### a. Introduction

The Department of Defense Human Factors Analysis and Classification System 7.0 (DoD HFACS 7.0) model presents a systematic, multidimensional approach to error analysis and mishap prevention by focusing on human factors, a leading cause of DoD mishaps (Tab BB-57). The AAIB identified one human factor as relevant to the mishap: failure to effectively communicate (PP108).

**b. Failure to Effectively Communicate**

A failure to effectively communicate is a factor when communication is not understood or is misinterpreted as the result of behavior of either sender or receiver, and it may include failure in backing up, supportive feedback, or acknowledgement to ensure that personnel correctly understood announcements or directives (Tab BB-60).

## 12. GOVERNING DIRECTIVES AND PUBLICATIONS

**a. Publically Available Directives and Publications Relevant to the Mishap**

(1) AFI 51-307AFGM2020-01, *Aerospace and Ground Accident Investigations*, 26 February 2020
(2) AFI 91-204, *Safety Investigation and Hazard Reporting*, 27 April 2018
(3) AFI 10-220_AFMCSUP, *Contractor's Flight and Ground Operations*, 6 September 2017
(4) AFI 11-202v2_AFMCSUP, *Aircrew Standardization and Evaluation Program*, 6 April 2020

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

**b. Other Directives and Publications Relevant to the Mishap**

(1) DoD HFACS, Version 7.0

**c. Known or Suspected Deviations from Directives or Publications**

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

HAWKINS.RONNIE.D. Digitally signed by HAWKINS.RONNIE.D Date: 2021.09.07 13:26:50 -07'00'

07 SEPTEMBER 2021

RONNIE D. HAWKINS, Colonel, USAF
President, Abbreviated Accident Investigation Board

## STATEMENT OF OPINION

**MQ-9A, T/N 10-4108**
**ALI AL SALEM AIR BASE, KUWAIT**
**24 September 2020**

*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 24 September 2020, at approximately 0433 Zulu (Z), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 10-4108, departed the runway surface during landing rollout on an airfield at Ali Al Salem Air Base, Kuwait. The MA was government-owned, contractor-operated (GOCO); the MA was assigned to the 432d Wing with contractors for Remotely Piloted Solutions (RPS) flying it at the time of the mishap. The mishap crew (MC) consisted of the Mishap Pilot (MP), Mishap Sensor Operator (MS), and the Mishap Safety Observer (MSO). Another unit, the Other Unit (OU)'s ground data terminal (GDT) and ground control station (GCS) and MQ-9 were in use during the MA's landing and were transmitting on the same frequency as the MA's uplink. The interfering GDT was transmitting on the wide beam during the landing then subsequently changed to the narrow beam. The MA entered the interfering GDT's beam and the MA lost uplink with its GDT. The MA's nose wheel maintained the last received command (slight left), and the MA veered left. The MA then departed the side of the runway. The MA was destroyed. Total loss to the Government is valued at $42,520,806.00; there were no injuries or other damages.

## 2. CAUSES

I find, by a preponderance of the evidence, the causes of the mishap, both of which were necessary, are: (a) the OU improperly using the MOSPORT uplink frequency to launch and land aircraft after the frequency allocation plan (FAP) had been adjusted and distributed by the 46th Expeditionary Attack Squadron (46 EATKS); and (b) during landing rollout, the MA entered the beamwidth for the OU GDT, causing the MA to receive two different uplink signals on the same frequency, preventing it from receiving data from its own GDT and resulting in the loss of uplink.

### a. Other Unit's Improper Use of MOSPORT Uplink Frequency

In order to fly and operate MQ-9s in the launch and recovery (LR) phase, each GDT and aircraft utilize two line-of-sight (LOS) uplink frequencies (a primary and a backup) and two LOS downlink frequencies. The uplink frequencies send commands from the GDT to the aircraft, while the downlink frequencies provide telemetry and videos from the aircraft to the GDT.

At Ali Al Salem Air Base, frequencies were organized in pairs of uplinks and downlinks and given names. Uplink frequencies were named after race tracks and downlink frequencies were named after professional sports teams. On 8 August 2020, the 46 EATKS released an updated FAP showing frequency pairings, names, and who was assigned to use them. The 46 EATKS received no questions or negative comments after distributing the new FAP to the MQ-9 units at the base. RPS had one set of frequencies and the OU MQ-9s were assigned two. The OU had a primary and a spare frequency set. The primary set was the SPURS downlink with its paired MOSPORT uplink. The spare set was the CHARGERS downlink with its paired TALLADEGA uplink.

Despite having names for both uplinks and downlinks, units referred only to downlink names as a means of shorthand. With the exception of the OU, crews knew that reference to a downlink also included its paired uplinks. Instead, the OU operators believed the single name referred to that specific uplink or downlink.

The OU coordinated with the 46 EATKS to switch from using SPURS to CHARGERS frequencies due to interference on the SPURS downlinks. But rather than use the new CHARGERS downlink frequency and its paired uplink, the OU continued to use MOSPORT uplinks while using the CHRAGERS downlinks. Additionally, the other non-OU MQ-9 units assumed that when the OU switched from SPURS to CHARGERS, they would also switch the associated uplinks.

I find by a preponderance of the evidence that this improper use of the MOSPORT uplink with the use of the CHARGERS downlink is a cause of this mishap.

**b. Loss of Uplink**

The MC was notified of an earlier-than-expected landing for the MA. The decision to land early was based on forecasted wind speeds exceeding the limits of the MQ-9A during its projected landing time. Another RPS MQ-9 was attempting to launch while the MA was returning to base, so the MA needed an additional set of frequencies as the MQ-9 that was launching was already using RPS's frequency, TITANS.

The RPS operations supervisor contacted the 46 EATKS to acquire the additional frequency for the MA. In turn, the 46 EATKS contacted the OU to inquire about their additional frequency, and the OU reported that they were not using the SPURS frequency and it was available to be used. The 46 EATKS then informed RPS that the SPURS frequency was available for use at that time.

The MC executed the LR mission and landed the aircraft using the SPURS downlink and its associated uplink. At this same time, the OU GDT and MQ-9 were in use and transmitting on the same uplink frequency, MOSPORT. The OU's GDT was also pointed toward the approach end of the mishap runway. As the MA decelerated during landing rollout, the interfering OU's GDT switched to the narrow beam. When the MA entered the more focused beam of the OU's GDT, it began to receive a much stronger signal from the OU's GDT; and, though it discarded that, the MA was prevented from receiving data from its own GDT, resulting in the loss of uplink. After losing its uplink, the nose wheel maintained the last received command of slight left. The MP noticed that the MA began veering left and did not respond to the MP's attempts to return the MA to center line.

A full-power climb was commanded, but the airspeed was too low for the MA to lift off before it departed the side of the runway. At approximately 0433Z, the MA departed on the left side of the prepared runway surface and came to a rest on the ground.

I find by a preponderance of the evidence that a cause of this mishap is also that the MA entered the beamwidth for the OU GDT, causing the MA to receive two different uplink signals on the same frequency, preventing it from receiving data from its own GDT and resulting in the loss of uplink.

## 3. SUBSTANTIALLY CONTRIBUTING FACTOR

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

## 4. CONCLUSION

I find, by a preponderance of the evidence, the causes of the mishap, both of which were necessary, are: (a) the OU improperly using the MOSPORT uplink frequency to launch and land aircraft after the frequency allocation plan had been adjusted and distributed by the 46 EATKS; and (b) during landing rollout, the MA entered the beamwidth for the OU GDT, causing the MA to receive two different uplink signals on the same frequency, preventing it from receiving data from its own GDT and resulting in the loss of uplink.

HAWKINS.RONNIE.D.1 Digitally signed by HAWKINS.RONNIE.D Date: 2021.09.07 13:27:32 -07'00'

07 SEPTEMBER 2021

RONNIE D. HAWKINS, Colonel, USAF
President, Abbreviated Accident Investigation Board

## INDEX OF TABS

Distribution Memorandum and Safety Investigator Information ................................................ A

Not Used .................................................................................................................B

Not Used ................................................................................................................C

Maintenance Report, Records, and Data................................................................................ D

Not Used .................................................................................................................E

Weather and Environmental Records and Data ...................................................................... F

Personnel Records................................................................................................................ G

Not Used ................................................................................................................. H

Not Used .................................................................................................................. I

Releasable Technical Reports and Engineering Evaluations..........................................................J

Not Used ................................................................................................................. K

Not Used .................................................................................................................L

Not Used ................................................................................................................M

Not Used ................................................................................................................ N

Not Used ................................................................................................................ O

Damage Summaries ............................................................................................................. P

AIB Transfer Documents........................................................................................................ Q

Releasable Witness Testimony ................................................................................................R

Releasable Photographs, Videos, Diagrams, and Animations ...................................................... S

Personnel Records Not Included in Tab G .................................................................................T

Maintenance Report, Records, and Data Not Included in Tab D ................................................. U

Witness Testimony And Statements ........................................................................................ V

Not Used ........................................................................................................................ W

Not Used ........................................................................................................................ X

Legal Board Appointment Documents ........................................................................... Y

Photographs, Videos, Diagrams, and Animations Not Included in Tab S .................................... Z

Flight Documents ........................................................................................................ AA

Applicable Regulations, Directives, and Other Government Documents .................................. BB

Additional Unit and Company Information ..................................................................... CC