

**UNITED STATES AIR FORCE**  
**ABBREVIATED ACCIDENT INVESTIGATION**  
**BOARD REPORT**



**MQ-1B, T/N 07-3204**

**20th Reconnaissance Squadron  
432d Air Expeditionary Wing  
Whiteman Air Force Base, Missouri**



**LOCATION: Afghanistan**

**DATE OF ACCIDENT: 5 June 2011**

**BOARD PRESIDENT: Lieutenant Colonel James J. O'Connell**

**Conducted pursuant to Chapter 11 of AFI 51-503.**

## **EXECUTIVE SUMMARY**

### **ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION**

**MQ-1B, T/N 07-3204  
Jalalabad Air Base, Afghanistan  
5 June 2011**

On 5 June 2011, the mishap remotely piloted aircraft (MRPA), an MQ-1B Predator T/N 07-3204, was flying an operational mission supporting Operation Enduring Freedom. The MRPA was assigned to the 432d Wing but was being flown by the 20<sup>th</sup> Reconnaissance Squadron (20 RS) out of Whiteman AFB, Missouri. The MRPA was presumed to have crashed northeast of Jalalabad Air Base (AB) after flying 19.5 hours of a tasked surveillance mission. There are no known injuries and there was no known damage to other government or private property. The estimated loss is valued at \$4.4M and includes the MRPA and one Hellfire missile.

After normal maintenance and pre-flight checks, the MRPA taxied and departed Jalalabad AB at approximately 1648Z on 4 June 2011. The Launch and Recovery Element at Jalalabad AB accomplished an uneventful hand-off to the Mission Control Element (MCE) at Whiteman AFB at 1702Z. On 5 June 2011, at 12:18Z, 19.5 hours into flight, the MCE lost satellite link with the MRPA. At that time the MRPA was supporting troops on the ground who were in contact with the enemy, and was flying in clouds near convective activity. The last known position of the MRPA was approximately 60 nautical miles northeast of Jalalabad Air Base in a mountainous area that is known for the rapid development of thunderstorms. The MRPA's datalogs showed that it was in controlled flight and that all systems, to include the engine and datalink, were operating normally right up until the time of the loss of the satellite link. Subsequent intermittent data updates showed that the MRPA was out of control and descending rapidly. The MRPA was not found and was presumed to have crashed in a remote mountainous area of Afghanistan before it could complete its emergency return-to-base profile.

The Abbreviated Accident Investigation Board president found by clear and convincing evidence that hazardous weather and, specifically, a lightning strike during the MRPA's sortie, caused the loss of communications and subsequent crash. Historical weather data showing the high potential for the rapid development of hazardous weather in the MRPA's operating area, weather forecasts on the day of the mishap, satellite imagery showing the rapid development of thunderstorms, witness statements, and the analysis of the MRPA's datalogs indicated "several factors that were the characteristics of a lightning strike as determined by analysis and prior lightning strike events" all support this conclusion.

*Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report 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-1B, T/N 07-3204**  
**5 JUNE 2011**

**TABLE OF CONTENTS**

TABLE OF CONTENTS.....	i
COMMONLY USED 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. 432d Wing.....	2
b. 20th Reconnaissance Squadron.....	2
c. MQ-1B Predator.....	2
4. SEQUENCE OF EVENTS .....	3
a. Mission.....	3
b. Planning .....	3
c. Preflight.....	3
d. Summary of Accident .....	3
e. Impact .....	5
f. Egress and Aircrew Flight Equipment.....	5
g. Search and Rescue (SAR).....	5
h. Recovery of Remains .....	5
5. MAINTENANCE .....	5
a. Forms Documentation.....	5
b. Inspections .....	5
c. Maintenance Procedures .....	6
d. Maintenance Personnel and Supervision .....	6
e. Fuel, Hydraulic and Oil Inspection Analyses .....	6
f. Unscheduled Maintenance .....	6
6. AIRCRAFT AND AIRFRAME .....	6
a. Condition of Systems.....	6
b. Testing.....	6
c. Functionality of Equipment .....	7
7. WEATHER.....	7
a. Forecast Weather .....	7
b. Observed Weather.....	7
c. Operations.....	7

8. CREW QUALIFICATIONS.....	8
a. Mishap Pilot 1 .....	8
b. Mishap Sensor Operator 1 .....	8
c. Mishap Pilot 2.....	8
d. Mishap Sensor Operator 2 .....	9
9. MEDICAL .....	9
a. Qualifications .....	9
b. Health.....	9
c. Pathology .....	10
d. Lifestyle .....	10
e. Crew Rest and Crew Duty Time .....	10
10. OPERATIONS AND SUPERVISION .....	10
a. Operations .....	10
b. Supervision .....	10
11. HUMAN FACTORS .....	10
12. GOVERNING DIRECTIVES AND PUBLICATIONS.....	10
a. Primary Operations Directives and Publications .....	10
b. Maintenance Directives and Publications.....	10
c. Known or Suspected Deviations from Directives or Publications.....	11
13. ADDITIONAL AREAS OF CONCERN .....	11
STATEMENT OF OPINION .....	12
1. OPINION SUMMARY .....	12
2. DISCUSSION OF OPINION .....	12
INDEX OF TABS.....	14

## COMMONLY USED ACRONYMS AND ABBREVIATIONS

20 RS – 20th Reconnaissance Squadron	MC – Mishap Crew
432 WG – 432d Wing	MCC – Mission Control Center
432 OG – 432d Operations Group	MCE – Mission Control Element
AAIB – Abbreviated Accident Investigation Board	MP – Mishap Pilot
AB – Air Base	MPRA – Mishap Remotely Piloted Aircraft
ACC – Air Combat Command	MSO – Mishap Sensor Operator
AEW – Air Expeditionary Wing	MX – Maintenance
AF – Air Force	OG – Operations Group
AFB – Air Force Base	ORM – Operational Risk Management
AFI – Air Force Instruction	PPSL – Predator Primary Satellite Link
AIB – Accident Investigation Board	RPA – Remotely Piloted Aircraft
ATC – Air Traffic Control	RPM – Revolutions Per Minute
Dash 1 – T.O. 1Q-1(M)B-1 Flight Manual	RS – Reconnaissance Squadron
GA-ASI – General Atomics Aeronautical Systems Inc.	RTB – Return to Base
GCS – Ground Control Station	SAR – Search and Rescue
GDT – Ground Data Terminal	SIB – Safety Investigation Board
FAE – Functional Area Expert	TCU – Towering Cumulus Unit
FL – Flight Level	TO – Technical Order
HUD – Head Up Display	T/N – Tail Number
ISR – Intelligence, Surveillance and Reconnaissance	TDY – Temporary Duty Location
LOS – Line of Sight	UAS – Unmanned Aerial System
MAP – Manifold Air Pressure	UAV – Unmanned Air Vehicle
	USAF – United States Air Force
	Z – Zulu

The above list was compiled 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 21 July 2011, Lieutenant General William J. Rew, Vice Commander, Air Force Combat Command (ACC), appointed Lieutenant Colonel James J. O'Connell, to investigate a mishap that occurred on 5 June 2011 involving an MQ-1B Predator aircraft, tail number (T/N) 07-3204, northeast of Jalalabad Air Base (AB), Afghanistan. Lt Col O'Connell conducted an abbreviated aircraft accident investigation, pursuant to Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*, 26 May 2010, Chapter 11, at Nellis Air Force Base (AFB), Nevada, from 25 July 2011 through 5 August 2011. The abbreviated accident investigation board (AAIB) comprised three members: Lt Col O'Connell (President), (Legal Advisor) and (Recorder). (Y-3 and Y-5) Functional area expertise for maintenance was provided by , and for weather by . (Tab Y-6)

### b. Purpose

This is a legal investigation convened to inquire into the facts surrounding the aircraft accident, to prepare a publicly-releasable report, and to gather and preserve all available evidence for use in litigation, claims, disciplinary actions, administrative proceedings, and for other purposes.

## 2. ACCIDENT SUMMARY

On 5 June 2011, the mishap remotely-piloted aircraft (MRPA), an MQ-1B Predator T/N 07-3204, was flying an operational mission supporting Operation Enduring Freedom (OEF). The MRPA was assigned to the 432d Wing (432 WG) at Creech AFB, Nevada, but was being flown by the 20th Reconnaissance Squadron (20 RS) out of Whiteman AFB, Missouri. (Tabs C-3, V-3 through V-5, V-7 and V-9) At approximately 12:19Z, 19.5 hours into flight, the crew in the ground control station (GCS) at Whiteman lost satellite link with the MRPA. (Tabs N-7 and CC-4) At that time the MRPA was supporting troops on the ground and was flying in clouds near thunderstorms and had received an Icing Condition Detection Warning. (Tabs N-7, V-3 through V-5, V-7 and CC-4) The last known position of the MRPA was approximately 60 nautical miles (nm) northeast of Jalalabad AB. (Tab CC-4) The MRPA was not found and was presumed to have crashed in a remote mountainous area of Afghanistan before it could complete its return to base (RTB) profile. (Tabs V-6, V-8 and CC-4) The loss, which included the aircraft and one Hellfire missile, is valued at \$4.4M. There was no known damage to private or other government property. (Tab P-2)

### 3. BACKGROUND

As mentioned above, the MRPA was operated by the 20 RS. The 20 RS is a geographically separated unit of the 432 WG. The 432 WG has reporting responsibilities to Twelfth Air Force, ACC, and USAF Central Command at Shaw AFB, South Carolina (Tab DD-10).

#### a. 432d Wing

The 432 WG, also known as the 432d Air Expeditionary Wing "Hunters," consists of combat-ready Airmen who fly the MQ-1B Predator and MQ-9 Reaper aircraft to support United States and Coalition warfighters. Additionally, the 432 WG conducts remotely piloted aircraft (RPA) initial qualification training for aircrew, intelligence, weather, and maintenance personnel. The 432 WG oversees operations of the 432d Operations Group (432 OG), which includes the 20 RS, and the 432d Maintenance Group. The 432 WG is the Air Force's first RPA wing. (Tab DD-4)



#### b. 20th Reconnaissance Squadron



The 20 RS provides combatant commanders with persistent Intelligence, Surveillance and Reconnaissance (ISR), full-motion video, and precision weapons employment. Its global operations support continuous MQ-1B Predator missions, providing actionable intelligence, strike, interdiction, close air support and special missions to deployed warfighters. (Tab DD-10)

#### c. MQ-1B Predator

The MRPA was an MQ-1B Predator. The Predator is a medium-altitude, long endurance unmanned aerial system. The Predator's primary missions are close air support, air interdiction, and intelligence, surveillance and reconnaissance (ISR). It acts as a Joint Forces Air Component Commander-owned theater asset for reconnaissance, surveillance and target acquisition in support of the Joint Forces Commander. (Tab DD-11) The MRPA was valued at \$4.2M. (Tab P-2)

The operational system consists of four aircraft (with sensors and weapons), a GCS, a Predator Primary Satellite Link (PPSL), and spare equipment along with operations and maintenance crews for deployed 24 hour operations. A basic Predator crew consists of a rated pilot and a sensor operator. They fly the MQ-1B Predator from inside the GCS via a line-of-sight (LOS) radio data link and via a satellite data link for beyond LOS flight. A ground data terminal antenna provides LOS communications for takeoff and landing while the PPSL provides beyond LOS communications during the remainder of the mission. (Tab DD-11)



The MQ-1B is equipped with a color nose camera (generally used by the pilot for flight control), a day variable-aperture television camera, a variable aperture infrared camera (for low light/night), and other sensors as required. The cameras produce full-motion video. The MQ-1B Predator also carries the Multi-Spectral Targeting system which integrates electro-optical infrared, laser designator and laser illuminator into a single sensor package. The aircraft can carry up to two laser-guided Hellfire missiles. The MRPA carried one such missile at the time the GCS lost the data link. (Tabs DD-12 and P-2)

The MQ-1B Predator is manufactured by General Atomics Aeronautical Systems Inc. (GA-ASI), headquartered in San Diego, California (Tab DD-12).

## **4. SEQUENCE OF EVENTS**

### **a. Mission**

The mishap sortie was an ISR mission flown in support of OEF and was authorized by an Air Tasking Order. (Tab V-9) The mishap involved two crews and took place approximately 10 minutes after a scheduled crew change-over while providing support for troops in contact with the enemy, known as “troops in contact” or TIC. (Tabs N-3 through N-7 and V-5 through V-7) The first mishap crew (MC1) included a pilot (MP1) and sensor operator (MSO1). (Tab V-3 and V-5) The second mishap crew (MC2) also included a pilot (MP2) and sensor operator (MSO2). (Tab V-4 and V-7) The mission commander (MCC), who oversaw all squadron sorties on the day of the mishap, was an experienced MQ-1B instructor pilot. (Tab V-9) All individuals participating in the mission were correctly listed on the flight orders. (Tab K-2)

### **b. Planning**

MC1 and MC2 members accomplished pre-mission planning and pre-briefs the day of the mission. (Tab V-3 through V-5, V-7 and V-9) All members were present and ORM scores did not reflect any indications of undue concern during the pre-brief. (Tab K-7) Both crews discussed the mission changes and weather concerns with the MCC. (Tab V-3 through V-5, V-7 and V-9) By all accounts, initial planning followed appropriate unit norms.

### **c. Preflight**

There were no significant issues or deviations noted upon aircraft or GCS preflight. The Launch and Recovery Element (LRE), consisting of a pilot and sensor operator at Jalalabad AB, conducted a normal preflight, launch and take-off. (Tab CC-31)

### **d. Summary of Accident**

After normal maintenance and pre-flight checks, the MRPA taxied and departed Jalalabad AB at approximately 1648Z on 4 June 2011. The LRE conducted the preflight checks and takeoff. (Tab CC-31) At 1702Z, the LRE accomplished an uneventful hand-off to the Mission Control Element (MCE). (Tab CC-31) The MCE consisted of members of the 20 RS at Whiteman. The MRPA began executing a surveillance mission with no abnormalities. (Tab CC-31)



On 5 June 2011, at approximately 1040Z, MC1 checked with the wing operations center's (WOC) weather personnel on the status of the weather. (Tab N-7 and CC-31) The WOC stated that there was a potential for hazardous weather near where the MRPA was flying due to isolated thunderstorms. (Tabs V-3, V-5 and CC-31) The WOC advised that these were "see and avoid" areas, but at that point there were no restrictions on where the MRPA could fly. (Tabs V-3, V-5 and CC-31)

At approximately 0500Z on 5 June 2011, MC1 began providing critical support for TIC events that continued until the MRPA lost satellite link. (Tab V-3 and V-5) The MRPA was at FL230 (Flight Level, i.e., altitude of approximately 23,000 feet) (Tab CC-4) operating in and around clouds. At one point, MP1 requested to descend to clear air to avoid the clouds. The airspace controllers denied his request because of altitude restrictions due to close air support aircraft operating just below the MRPA's altitude who were also supporting TIC events. (Tabs V-5 and CC-31)

Also, at approximately 1100Z, MC2 arrived in the squadron and started their pre-mission briefings with the MCC. The MCC informed MC2 of the nature of the MRPA's mission and apprised them of the weather conditions. (Tab V-7 and V-9) MP2 entered the Ground Control Station early to start exchange of command of the MRPA, or "change-over," early and to obtain better awareness of the mission and weather situations prior to assuming control of the mission. (Tab V-6 and V-7)

Also, during this period, both crews did frequent scans of the area for weather and checked that the MRPA's pitot heat was "on." (Tabs N-3 through N-7, V-3-5 and V-7) The pitot heat helps keep the pitot tube clear of ice and is key to having an accurate airspeed indication.

Starting at approximately 1200Z on 5 June 2011, MC1 began the change-over with MC2. The changeover was delayed approximately ten minutes because of the ongoing support to the TIC. (Tab V-5 and V-7) Once the change-over was complete, MC2 continued to work support of the TIC while trying to avoid weather. (Tabs N-3 through N-7, V-4 and V-7) At 12:12Z, MSO2 continued to scan the area using the MRPA's sensors in an attempt to identify the location of the hazardous weather and to find a clear area to operate. He observed cumulonimbus build-ups south of their position and coordinated with MP2 to fly the MRPA to the northeast where the sky appeared clearest. (Tabs N-5 through N-7, V-4 and V-7)

At 12:18:09Z, the MRPA indicated an Icing Conditions Detected warning. (Tabs N-7 and CC-4) This was not particularly surprising to the crews given the altitude at which they were flying and the MRPA's proximity to thunderstorm activity. The MRPA's icing indicator had already gone off at least twice earlier in the morning. (Tab V-6) Each time the MSOs would do a weather sweep of the MRPA and find no icing on the wings.

At 12:18:49Z, approximately 19.5 hours into the mission, MC2 lost satellite link with the MRPA and notified command and control. (Tabs N-7 and CC-4) The last known position of the MRPA was approximately 60 nm to the northeast of Jalalabad Air Base. (Tab CC-4 and CC-31) Approximately 90 seconds later, MC2 observed a momentary flash of data from the MRPA on

the heads-up display (HUD), which indicated to them that the MRPA was out of control. (Tabs V-6, V-7 and CC-5 through CC-8)

When an RPA loses its satellite link with a GCS, it is programmed to return to base after a set period of time where the LRE can land it. In this case the MRPA should have loitered for approximately 30 minutes and returned to Jalalabad AB at approximately 1438Z. (Tab CC-31 ) It never arrived. An MC-12 aircrew was directed to fly to the last known location of the MRPA. The MC-12 could not get to that location due to weather. (Tab R) The crew confirmed that the MRPA was operating in an area of “large thunderstorms painting ‘magenta’ [high intensity weather] on their weather radar. The thunderstorm was large and building, with virga and moderate turbulence around it.” (Tab R-2) A fireball was reported in the vicinity of its last known location but the MRPA was never located. (Tab CC-31)

Because of deteriorating weather conditions, at 1317Z, a weather recall was issued for Jalalabad AB for all airborne aircraft return to base. Less than ten minutes later, a stop launch was issued. (Tab CC-31)

**e. Impact**

No point of impact was located.

**f. Life Support Equipment, Egress and Survival**

Not applicable.

**g. Search and Rescue (SAR)**

Not applicable.

**h. Recovery of Remains**

Not applicable.

**5. MAINTENANCE**

**a. Forms Documentation**

The MRPA had a total of 6700.5 hours of flight time prior to departure on the mishap mission. (Tab D-3) The AIB reviewed past and current AFTO Form 781 series in accordance with Technical Order 00-20-1, and discovered no relevant discrepancies. (Tab U-3)

**b. Inspections**

The most recent aircraft inspection was a 150 Hour Aircraft Periodic Inspection, which was complied with on 2011 0520. Engine Serial Number (S/N) GTA6772999 was installed on 20110426. (Tab U-3) Routine inspections were completed with the most recent being a 60 Hour

Engine Inspection, complied with on 20110528. (Tab U-3) Engine operation or performance did not contribute to the mishap.

### **c. Maintenance Procedures**

Review of maintenance documents revealed that the overall maintenance practices of the MRPA's maintenance personnel were in compliance with technical orders and safety guidelines. (Tab U-3)

### **d. Maintenance Personnel and Supervision**

Review of maintenance documents revealed that the overall maintenance practices of the MRPA's maintenance personnel were in compliance with technical orders and safety guidelines. (Tab U-3)

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

There is no evidence to suggest fuel contributed to the mishap. A nalysis of oil and other lubricants could not be accomplished as the MRPA was never located.

### **f. Unscheduled Maintenance**

There were no unscheduled maintenance actions on the MRPA.

## **6. AIRCRAFT AND AIRFRAME**

### **a. Condition of Systems**

No aircraft wreckage was recovered.

### **b. Testing**

Since the MRPA was not found and has not been recovered, no components have been retrieved for testing. The MRPA architecture does have a data logger system which captures and retains information throughout every flight. GA-ASI was able to analyze the data logs for this sortie. (Tab CC-3) Immediately prior to the lost link event, there was no evidence of loss of control of the MRPA, or any improper function. (Tab CC-5) The datalogs do show that the MRPA was operating in significant turbulence. (Tab CC-4) Just before lost link, the MRPA was performing a "tight loiter pattern" and was responding to all of the pilot's commands. (Tab CC-5)

At 1219Z, all primary control module nodes reported simultaneous communication failures. (Tab CC-4) The logs also show a "drop in 28V bus voltage" to 22V, which is a significant power loss consistent with a lightning strike. (Tab CC-4 and CC-9) The GA-ASI report goes on to identify two previous known lightning strikes of MQ-1B aircraft in which the consequences were very similar (e.g., 28V bus drop in power, all nodes simultaneously failing). (Tab CC-8)

A few intermittent data updates immediately following lost link showed that the MRPA was out

of control and descending rapidly. For example, two such data updates show a sudden, rapid descent of 16,500 feet over 136 seconds. (Tab CC-5 through CC-8) The report concludes that the likely cause of the lost link was a lightning strike. (Tab CC-4 and CC-10)

### **c. Functionality of Equipment**

Prior to the mishap event, all evidence indicates that the aircraft and GCS systems were functioning properly. (Tabs V-7, CC-5)

## **7. WEATHER**

### **a. Forecast Weather**

The Mission Execution Forecast (MEF) showed the weather to be marginal in the MRPA's operating area where the potential for hazardous weather conditions existed, but with sufficient clear areas for the crews to work around. (Tab CC-31) The forecast hazards along the MRPA's route of flight included: Trace to Light icing between 17,000 feet to 21,000 feet outside of thunderstorms Mean Sea Level (MSL) (Tabs F-9 and F-10); isolated thunderstorms with maximum tops of 40,000 feet MSL (Tab F-14); and no turbulence. (Tab W-3)

Terminal Area Forecasts for the various airfields near the MRPA's operating location indicated the potential for thunderstorms, rain showers, virga (precipitation that does not reach the ground), and blowing dust/strong winds from thunderstorm outflows. (Tabs F-16, F-17 and W-3)

### **b. Observed Weather**

The both mishap crews observed that they were in the clouds at FL230 and observed "build-ups" (developing thunderstorms) in their vicinity. (Tab N-6) An aircrew from an MC-12 aircraft that was sent to search for the MRPA observed that the MRPA was operating in an area of "large thunderstorms painting 'magenta' [intense storms with heavy rainfall and turbulence] on our [the MC-12's] weather radar. The thunderstorm was large and building, with virga and moderate turbulence around it." (Tab R-2)

Satellite imagery indicated the presence of rain showers and thunderstorm activity in the vicinity of the MRPA's operating area. (Tab W-3) The thunderstorm cells were developing rapidly along the mountainous terrain due to orographic effects, and intense surface heating in the afternoon hours. (Tabs F-4 through F-9 and W-3) Orographic effect occurs when an air mass approaches a mountain range and is rapidly forced upward, causing any moisture to cool and create precipitation in the form of rain or snow. Observations in the vicinity of the operating area were reporting light rain showers, virga, blowing dust/strong winds and thunderstorms in the vicinity. (Tabs F-18 through F-20 and W-3)

### **c. Operations**

Weather affected flight operations near Jalalabad AB on 5 June 2011. (Tabs V-5, V-6 and CC-4) It proved hazardous enough to prompt a weather recall to all aircraft in the local area and a stop-

launch. (Tab CC-31) The MRPA specifically operated in close proximity to thunderstorm activity. (Tabs V-6 and F-9) Air Force Handbook (AFH) 11-203, *Weather for Aircrews*, discusses the potential for lightning strikes in such locations. Paragraph 13.5.4.3 states that the majority of lightning strikes occur “in non-stormy clouds and in areas outside of active thunderstorm cells.” Encountering the hazardous weather conditions, to include precipitation, icing and turbulence could have exposed the MRPA to this kind of lightning strike. (W-3)

## 8. CREW QUALIFICATIONS

### a. Mishap Pilot 1 (MP1)

#### (1) Training

MP1 successfully completed training as a pilot the MQ-1B on 12 August 2010. (Tab G-4)

#### (2) Experience

MP1’s total flight time is 1960.5 hours, which includes 1509.0 hours in the MQ-1B. Prior to flying the MQ-1B, the MP was an F-15C/D and T-38C pilot (Tab G-6).

MP	Hours	Sorties
Last 30 Days	26.8	7
Last 60 Days	54.2	17
Last 90 Days	69.4	24
(Tab G-8)		

### b. Mishap Sensor Operator 1 (MSO1)

#### (1) Training

MSO1 completed qualification training as a sensor operator on 12 March 2009. (Tab T-73)

#### (2) Experience

MSO1 has a total of 1111.6 hours in RPAs, all in the MQ-1B. (Tab T-75 and T-76)

MSO	Hours	Sorties
Last 30 Days	11.5	7
Last 60 Days	33.5	15
Last 90 Days	52.0	22
(Tab T-79)		

### c. Mishap Pilot 2 (MP2)

**(1) Training**

MP2 successfully completed training as a pilot the MQ-1B on 6 April 2010. (Tab G-17).

**(2) Experience**

MP2 has a total of 743.3 hours, all of which were in the MQ-1B. (Tab G-19)

MP	Hours	Sorties
Last 30 Days	64.3	15
Last 60 Days	153.0	42
Last 90 Days	226.0	58
(Tab G-20)		

**d. Mishap Sensor Operator 2 (MSO2)**

**(1) Training**

MSO2 successfully completed qualification training as a sensor operator on 9 March 2011. (Tab G-37)

**(2) Experience**

He has a total of 92.0 hours in RPAs all in the MQ-1B (Tab G-39)

MSO	Hours	Sorties
Last 30 Days	52.3	14
Last 60 Days	58.9	16
Last 90 Days	60.9	17
(Tab G-40)		

**9. MEDICAL**

**a. Qualifications**

At the time of the mishap, the mishap crew was fully medically qualified for flight duty without medical restrictions or waivers. All mishap crew had undergone complete physical examination within the previous 18 months and were fit for military aviation in accordance with AFI 48-123, Section 6H. (Tab CC-11 through CC-24)

**b. Health**

There is no evidence the health of any member of the mishap crew contributed to the mishap.

### **c. Pathology**

Immediately following the mishap, blood and urine samples from the personnel directly involved were collected for toxicological analysis. All toxicology results were within normal limits. (Tab CC-25 through CC-30)

### **d. Lifestyle**

No lifestyle factors were found to be causal or substantially contributory to the mishap.

### **e. Crew Rest and Crew Duty Time**

Crew rest or crew duty time were not factors that contributed to the mishap.

## **10. OPERATIONS AND SUPERVISION**

### **a. Operations**

Operations tempo was investigated and there is no evidence to suggest that operations tempo or supervision were a factor in the mishap.

### **b. Supervision**

Operations supervision was investigated and found not a factor in this mishap flight.

## **11. HUMAN FACTORS**

There is no evidence to suggest that any human factors contributed to this mishap.

## **12. GOVERNING DIRECTIVES AND PUBLICATIONS**

### **a. Primary Operation Directives and Publications**

1. Air Force Instruction (AFI) 11-2MQ-1, Volume 1, M Q-1 Aircrew Training, 21 January 2010
2. AFI 11-2MQ-1, Volume 2, MQ-1 Crew Evaluation Criteria, 28 November 2008
3. AFI 11-2MQ-1, Volume 3, MQ-1 Operations Procedures, 29 November 2007
4. AFH 11-203, Volume 1, 1 March 1997, *Weather for Aircrews*

### **b. Maintenance Directives and Publications**

AFI 21-101, 26 July 2010, *Aircraft and Equipment Maintenance Management*.

**NOTICE:** The AFIs listed above are available digitally on the Air Force Departmental Publishing Office internet site at: <http://www.e-publishing.af.mil>.

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

No unapproved deviations were identified.

**13. ADDITIONAL AREAS OF CONCERN**

There are no additional areas of concern.

5 August 2011

JAMES J. O'CONNELL, Lt Col, USAF  
President, Accident Investigation Board



**STATEMENT OF OPINION**  
**MQ-1B, T/N 07-3204 ACCIDENT**  
**5 JUNE 2011**

*Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report 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.*

**OPINION SUMMARY**

I find by clear and convincing evidence that hazardous weather and, specifically, a lightning strike during the mishap remotely-piloted aircraft's (MRPA) sortie, caused the loss of communications and subsequent crash. Historical weather data showing the high potential for the rapid development of hazardous convective activity in the MRPA's operating area, weather forecasts on the day of the mishap, satellite imagery showing the rapid development of thunderstorms, witness statements, and the analysis of the MRPA's datalogs conducted by General Atomics Aeronautical Systems Inc. (GA-ASI) all support this conclusion. In addition, the absence of any evidence that any crewmember error or maintenance issue contributed to this mishap bolsters the conclusion that a lightning strike caused the loss of the MRPA's satellite link and its subsequent presumed crash.

**DISCUSSION OF OPINION**

The mission commander and first and second mishap crews (MC1 and MC2) received a Mission Execution Forecast which showed that the MRPA would be operating in a "see and avoid" area with the potential for thunderstorms and icing, but with sufficient clear areas for the crews to work around. Witness statements from MC1 and MC2 confirm that the forecasts were accurate. Finally, the pilot of an aircraft sent to the last known location of the MRPA observed a "thunderstorm [that] was large and building, with virga and moderate turbulence around it." Satellite imagery of the area also showed that the MRPA was in close proximity to thunderstorms. Lastly, the leadership at Jalalabad Air Base issued a weather recall and then a stop launch which also confirms that the weather was too hazardous to endanger any other aircraft or personnel.

In addition to confirming the presence of hazardous weather, the testimony of the mishap crewmembers, corroborated by both the transcript of the 20 minutes leading up to the MRPA lost satellite link and the GA-ASI report, enabled me to rule out crew error as a contributing factor in the mishap. The abbreviated accident investigation board found strong evidence that both mishap crews demonstrated impressive competence in maintaining support to the troops who were in contact with the enemy (TIC) while proactively taking measures to mitigate the weather related risks to the MRPA. The crews were well aware of the restrictions and risks associated with flying in a location with the potential for hazardous convective activity. These risks included the turbulence, icing and lightning strikes.

Both crews acknowledge that they were flying in and out of clouds and near thunderstorms, but they did so with vigilance, conducting frequent weather scans of the MRPA and the surrounding area. Both mishap crews looked for areas that were free of clouds and took steps to ensure the MRPA's pitot heat was operating properly to keep it clear of ice. MC1 requested a lower altitude to get below the clouds but the request was denied due to altitude conflicts with aircraft that were providing close air support for the TIC. Each time the heads-up display showed an icing warning, the mishap sensor operators would scan the MRPA to confirm there was no ice. The GA-ASI report confirms the witnesses' testimony that the MRPA was in controlled flight and that all systems, to include the engine and datalink, were operating normally right up until the time of the loss of the satellite link.

Exiting the weather would have been beneficial by allowing the MCs see the ground to help support the critical TIC situation and by decreasing the weather related risks to the MPRA. Even still, just operating near convective activity posed risks as well. A FH 11-203, Volume 3, *Weather for Aircrews*, Paragraph 13.6.4.1., states that

Electrostatic discharges are very similar to natural lighting but are triggered by the aircraft itself. Charges build up on aircraft when they fly through clouds or precipitation (liquid or frozen)... This discharge does not have to occur in a thunderstorm. Aircraft have reported damage from electrostatic discharges occurring in cirrus downwind of previous thunderstorm activity, in cumulus around a thunderstorm's periphery, and even in stratiform clouds and light rain showers. (Emphasis added).

The GA-ASI analysis of the MRPA's datalog provides convincing evidence that hazardous weather, and specifically a lightning strike, caused this mishap. The datalogs "indicated several factors that were characteristic of a lightning strike." One such factor was the sudden loss of power that MRPA sensors reported. The MRPA recorded other data also consistent with a lightning strike. The GA-ASI identified two previous known lightning strikes of MQ-1B aircraft in which the consequences were similar. Also the reported stated that the aircraft and Ground Control Systems were functioning properly prior the mishap. Subsequent intermittent data updates showed that the MRPA was out of control and descending rapidly.

The MRPA clearly encountered weather similar to that described in AFH 11-203. Despite taking active, preventative measures to exit the weather, the risk of a lightning strike remained. Both MP1 and MP2 observed the MRPA maintaining controlled flight all the way up to the loss of satellite link. The MRPA's datalogs show sudden, drastic changes to the MRPA's flight path following whatever event caused the loss of link. The GA-ASI report identifies sensory readings at the moment of lost link consistent with past known lightning strikes. Accordingly, I find that hazardous weather and, specifically, a lightning strike during the MRPA's sortie, caused the loss of communications and subsequent crash.

5 August 2011

JAMES J. O'CONNELL, Lt Col, USAF  
President, Accident Investigation Board