DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

24 MAR 2010

OFFICE OF THE COMMANDER
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MEMORANDUM FOR ACC/JA

SUBJECT: Accident Investigation Board Report: MQ-1B, T/N 06-3175, 196 RS, 163 RW, March ARB, CA, 3 October 2009

I have reviewed the Accident Investigation Board Report regarding the MQ-1B, T/N 06-3175, which crashed into the side of a mountain while flying an operational mission in Afghanistan on 3 October 2009. The report prepared by Lt Col Todd G. Chase complies with the requirements of AFI 51-503 and is approved.

WILLIAM J. REW
Lieutenant General, USAF
Vice Commander

Attachment:
Accident Investigation Board Report

EXECUTIVE SUMMARY

AIRCRAFT ACCIDENT INVESTIGATION

MQ-1B, T/N 06-3175, MARCH JOINT AIR RESERVE BASE
3 October 2009

At 0353 Zulu (Z) / 0723 Local, Afghanistan on 3 October 2009 (2053 Pacific Daylight Saving Time on 2 October 2009), after normal maintenance and pre-flight checks, the Mishap Remotely Piloted Aircraft (MRPA) taxied and departed from Kandahar Air Field for a reconnaissance mission. There were two mishap crews involved in this mishap, as the mishap occurred shortly after crew swap. Mishap Crew 1 (MC1) consisted of Mishap Pilot 1 (MP1) and Mishap Sensor Operator 1 (MSO1). Mishap Crew 2 (MC2) consisted of Mishap Pilot 2 (MP2) and Mishap Sensor Operator 2.

During the flight, MC1 received a direct tasking from the Combined Forces Air Component Commander to provide close air support to United States and Afghan ground forces under attack by Anti-Afghan Forces (AAF). At the time of the tasking, AAF carried out a large, coordinated attack against U.S. and Afghan ground forces at two remote outposts. Several U.S. troops were killed during the attacks. Given the circumstances of the AAF attack and the immediate and urgent need for CAS, both Mishap Crews (MCs) were consumed with a high-degree of urgency.

While en route to the tasking, MC2 assumed control of the MRPA at approximately 0905Z. At approximately 0918Z, despite efforts by MC2 to avoid the terrain at the last minute, MC2 failed to prevent a Controlled Flight Into Terrain of the MRPA. The impact completely destroyed the MRPA.

The Accident Investigation Board President determined, by clear and convincing evidence, that the mishap was the result of pilot error caused primarily by MP2's channelized attention away from flying the MRPA and an inattention to the high terrain in the MRPA's immediate vicinity. Furthermore, inattention by both MP1 and MP2 resulted from a perceived absence of threat from the environment. Specifically, they both failed to appreciate the need for a significant increase in altitude required to safely overfly the mountainous terrain located between the MRPA and the target.

SUMMARY OF FACTS AND STATEMENT OF OPINION

MQ-1B, T/N 06-3175
3 October 2009

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COMMONLY USED ACRONYMS AND ABBREVIATIONS

ACC	Air Combat Command
AB	Air Base
AEW	Air Expeditionary Wing
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFTO	Air Force Technical Order
AIB	Accident Investigation Board
ANG	Air National Guard
ARB	Air Reserve Base
ATC	Air Traffic Control
BP	Board President
CAS	Close Air Support
CFIT	Controlled Flight Into Terrain
CONUS	Continental United States
CRM	Crew Resource Management
DoDI	Department of Defense Instruction
DSN	Defense Switched Network
"Dash 1"	TO 1Q-1(M)B-1 Flight Manual
EEI	Essential Elements of Interests
EM	Emergency Mission
EO	Electro-Optical
FCIF	Flight Crew Information File
FOIA	Freedom of Information Act
FTU	Field Training Unit
GA-ASI	General Atomics Aeronautical Systems, Incorporated
GCS	Ground Control Station
IAW	In Accordance With
IMDS	Integrated Maintenance Data System
IR	Infrared
KIAS	Knots Indicated Airspeed
L	Local (Afghanistan)
LOS	Line of Sight
LRE	Launch and Recovery Element
MAJCOM	Major Command
MC	Mishap Crew
mIRC	Mardem-Beys Internet Relay Chat
MMC	Mishap Mission Coordinator
MP	Mishap Pilot
MRPA	Mishap Remotely Piloted Aircraft
MSA	Minimum Safe Altitude
MSL	Mean Sea Level
MSO	Mishap Sensor Operator
MX	Maintenance
OEF	Operation ENDURING FREEDOM
OIF	Operation IRAQI FREEDOM
ORM	Operational Risk Management
PA	Public Affairs
PCL	Point-Click Loiter
PHA	Periodic Health Assessment
POC	Point of Contact
PPSL	Predator Primary Satellite Link
RS	Reconnaissance Squadron
RPA	Remotely Piloted Aircraft
RTB	Return to Base
SA	Situational Awareness
SAT	Satellite
SMIC	Senior Mission Intelligence Coordinator
SSO	Special Security Officer
TCTO	Time Compliance Technical Order
T/N	Tail Number
TO	Technical Order
TRB	Tactical Range and Bearing
UAS	Unmanned Aerial System

UCMJ	Uniform Code of Military Justice	WOC	Wing Operations Center
U.S.	United States	WG	Wing
U.S.C.	United States Code	Z	Zulu
USAF	United States Air Force		

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, PURPOSE, AND CIRCUMSTANCES

a. Authority

On 7 January 2010, Lieutenant General William J. Rew, Vice Commander, United States Air Combat Command (ACC), appointed Lieutenant Colonel Todd G. Chase as the Accident Investigation Board (AIB) President to investigate the 3 October 2009 crash of a MQ-1B Predator, tail number (T/N) 06-3175, in Afghanistan. An AIB convened at March Joint Air Reserve Base (ARB), Riverside, California (CA), from 20 January 2010 through 4 February 2010, pursuant to Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*, 16 July 2004, Incorporating through Change 2, 11 February 2008. Members appointed to the AIB were Colonel Gary M. Townsend (Medical Advisor), Major Lance A. Aiumopas (Legal Advisor/Recorder), Major Beverly G. Schneider (Legal Advisor/Recorder), and Chief Master Sergeant Joseph A. Yzaguirre (Maintenance Member). (Tab Y-3).

b. Purpose

The purpose of this investigation is to provide a publicly releasable report of the facts and circumstances surrounding the mishap, to include a statement of opinion on the cause or causes of the mishap; to gather and preserve evidence for claims, litigation, disciplinary, and administrative actions; and for other purposes. This report is available for public dissemination under the Freedom of Information Act, Title 5, United States Code, Section 552.

c. Circumstances

The AIB was convened to investigate the Class A mishap involving an MQ-1B Predator, T/N 06-3175, assigned to ACC, which occurred on 3 October 2009. (Tab Y-3)

2. ACCIDENT SUMMARY

At 0353 Zulu (Z) / 0723 Local, Afghanistan (L) on 3 October 2009 (2053 Pacific Daylight Saving Time (PDST) on 2 October 2009), after normal maintenance and pre-flight checks, the Mishap Remotely Piloted Aircraft (MRPA) taxied and departed from Kandahar Air Base (AB) for a reconnaissance mission. (Tab B-3) There were two mishap crews involved in this mishap, as the mishap occurred shortly after crew swap. Mishap Crew 1 (MC1) consisted of Mishap Pilot 1 (MP1) and Mishap Sensor Operator 1 (MSO1). Mishap Crew 2 (MC2) consisted of Mishap Pilot 2 (MP2) and Mishap Sensor Operator 2 (MSO2). During the flight, while MC1 was in control, the MRPA was redirected to support a battle in progress. (Tabs V-19, V-44, V-45, V-56, CC-3, CC-5 through CC-9) At approximately 0905Z, MC1 turned over control of the MRPA to the follow-on crew, MC2. At approximately 0918Z, the MRPA flew into the side of a mountain during an attempted 180-degree turn away from terrain. (Tabs J-5, V-59, CC-4) Despite efforts by MC2 to avoid the terrain at the last minute, MC2 failed to prevent a Controlled

Flight Into Terrain (CFIT) of the MRPA. The impact completely destroyed the MRPA. The estimated cost of destroyed items is $3.8M, which includes the airframe, mission critical/essential systems (engine, electronics, communications, computer systems), an AGM-114 missile, two rail launchers, and two weapons pylons. (Tab P-3) This mishap caused no deaths, injuries or damage to personal property. (Tab P-4)

3. BACKGROUND

The MRPA was an ACC aircraft from the 432 Air Expeditionary Wing (AEW) at Creech AFB, Nevada, operated by members of the 196th Reconnaissance Squadron (196 RS) at March Joint Air Reserve Base, CA. (Tabs B-3, C-3, D-5) 196 RS is a unit of the 163rd Reconnaissance Wing (163 RW), March ARB, CA. (Tab CC-43)

Although the MRPA launched from Kandahar Air Field, Afghanistan, the MCs operated the MRPA from March ARB, California, at the time of the mishap. (Tabs B-3, K-4, V-3, V-4, V-15, V-42, V-52, V-69, V-70) All members of both MCs were stationed at March ARB; the MPs and MSO2 are assigned to the 196 RS, MSO1 is assigned to 163 Operations Group (163 OG), and the Mishap Mission Coordinator (MMC) is assigned to the 163 RW. (Tabs K-4, T-3, T-9, T-13, T-17, T-21, T-25, V-3, V-4, V-15, V-42, V-52, V-69, V-70) Similar to the 196 RS, the 163 OG is a unit of the 163 RW, March ARB. (Tab CC-41)

a. United States Air Combat Command (ACC)

ACC is the primary force provider of combat airpower to America's warfighting commands. To support global implementation of national security strategy, ACC operates fighter, bomber, reconnaissance, battle-management, and electronic-combat aircraft. It also provides command, control, communications and intelligence systems, and conducts global information operations. (Tab CC-11 through C-14)

b. Air National Guard (ANG)

As provided under the United States Constitution, the Air National Guard has a federal and state mission. Its federal mission is to provide a well-trained, well-equipped force available for prompt mobilization during national emergencies as well as supporting contingency operations such as Operation ENDURING FREEDOM (OEF) and Operation IRAQI FREEDOM (OIF). The Air National Guard provides almost half of the Air Force's tactical airlift support, combat communications functions, aeromedical evacuations, and aerial refueling, as well as being responsible for providing the total air defense of the entire United States. (Tab CC-15 through CC-17)

c. California Air National Guard

The California Air National Guard (CA ANG) has four flying wings, which includes the 163 RW at March Joint Air Reserve Base. (CC-19, CC-20)

d. Unit Information

(1) March Joint Air Reserve Base, CA.

March Joint Air Reserve Base is home to the Air Force Reserve Command's largest air mobility wing of the Fourth Air Force, including units that support Air Mobility Command, ACC, and Pacific Air Forces. March is also the home of units from the Army Reserve, Navy Reserve, Marine Corps Reserve, and the CA ANG, which includes the 163 RW. (Tab CC-21 through CC-35)

(2) Creech Air Force Base (AFB), Nevada

Creech AFB is home to the 432nd Air Expeditionary Wing (AEW). It is located about 35 miles northwest of Las Vegas, Nevada. (Tab CC-37, CC-38)

(3) 432nd Wing, 432nd Air Expeditionary Wing, ACC

The 432 WG, also known as the "Hunters", consists of combat-ready Airmen who fly the MQ-1B Predator and MQ-9 Reaper to support United States and Coalition warfighters. The 432 WG conducts Unmanned Aircraft System (UAS) initial qualification training for aircrew, intelligence, weather, and maintenance personnel. It is the first United States Air Force wing dedicated to unmanned aircraft systems. (Tab CC-39)

(4) 163rd Reconnaissance Wing

In November 2006, the 163 RW stood up and became the first Air National Guard unit to receive the MQ-1 Predator, and the first to become a fully functional ANG Flying Training Unit and Field Training Detachment for the Predator. The 163 RW is a tenant unit at March Joint Air Reserve Base. (Tab CC-41)

(5) 196 Reconnaissance Squadron

The 196 RS is a unit of the 163 RW of the CA ANG. (Tab CC-43, CC-44)

e. MQ-1B – Predator System

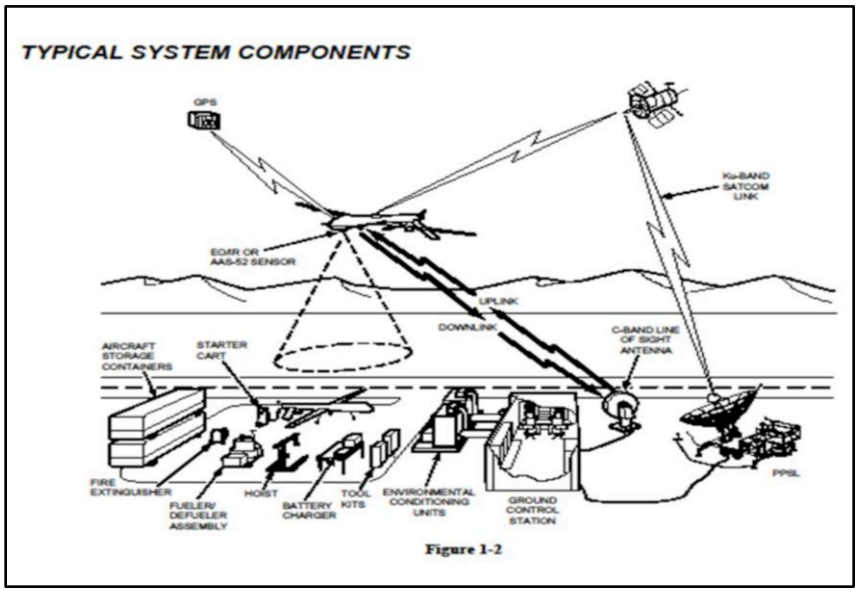

Figure 1-2

The MQ-1B Predator is a medium-altitude, long endurance, remotely piloted aircraft. Its primary mission is interdiction and conducting armed reconnaissance against critical perishable targets. (Tab CC-45, CC-46)

The MQ-1B Predator is a fully operational system, not just an aircraft. This system consists of four aircraft (with sensors), a Ground Control Station (GCS), a Predator Primary Satellite Link (PPSL), and operations and maintenance personnel for deployed 24-hour operations. (See Figure 1-2, Tab Z-3) The basic crew for the MQ-1B Predator is one pilot and one 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. The GCS consists of two seats, one for the pilot and one for the sensor operator, with their respective controls. 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. The LOS and the beyond line of sight portions of the flight are not necessarily flown from the same location. (Tab CC-45)

The MQ-1B Predator 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. (Tab CC-45)

The MQ-1B Predator is manufactured by General Atomics Aeronautical Systems Inc. (GA-ASI) headquartered in San Diego, CA, and it is the technical expert for the weapon system. (Tab CC-46)

Typically MQ-1B missions last for several hours. Multiple aircrews operate the aircraft throughout these extended missions. (Tab AA-3 through AA-7)

4. SEQUENCE OF EVENTS

a. Mission

The mission was a combat mission support sortie of an MQ-1B Remotely Piloted Aircraft (RPA) flown by the 196 RS. The MRPA launched from Kandahar AB, Afghanistan. (Tab B-3) Both MPs and MSOs were MQ-1B qualified. (Tab G-14, G-38, G-40, G-86, G-99, G-101, G-103, G-123, G-125, G-126, G-128) MC2 was the third crew to assume control of the MRPA during the mission. (Tab AA-3) MC2 assumed control of the MRPA from MC1.

b. Planning

Prior to entering the GCS, MCs receive a mission brief. (Tab V-6, V-43, V-54) After entering the GCS, the outgoing MC conducts changeover briefs with the incoming MC, typically providing information listed in 196 RS guidance. (Tabs O-24, V-6, V-18, V-43, V-54 throughV-56) The guidance is not directive and deviations are acceptable. (Tab O-5) The duration of changeover briefs varies depending on the current situation or mission. (Tab V-6, V-23, V-24, V-44, V-55, V-56)

Both MCs performed mission planning, briefing and changeover (also referred to as "crew swap") duties in accordance with (IAW) 196th Squadron Standards. (Tabs O-3, V-6, V-18, V-23, V-24, V-43, V-44, V-54 through V-56). The mission planning appeared normal. (Tab V-21, V-24, V-44, V-45, V-56, V-58) MC1 and MC2 attended their respective mission briefings prior to assuming control of the MRPA. (Tab V-6, V-43, V-54)

c. Preflight

The Launch and Recovery Element (LRE) had no issues with the taxi, takeoff, or handoff to the Mission Crew Element (MCE). (Tab AA-3) MP2 and MSO2 completed their changeover briefings and assumed control of the MRPA at approximately 0905Z on 3 October 2009. (Tab V-9, V-24, V-43, V-44, V-54 through 56) The MCs executed a changeover briefing as they began their shift in the GCS IAW 196 Squadron Standards. (Tabs V-6, V-18, V-43, V-54 through V-56) MC2 assumed control of the MRPA approximately five hours and 12 minutes into the mission. (Tabs V-9, V-24, V-43, V-44, V-54 through V-56, AA-3)

d. Summary of Accident

The LRE launched the MRPA at 0353Z from the deployed location, and then handed over the MRPA to the MCE at 0408Z. MC1 assumed control approximately an hour later. (Tabs B-3, AA-3) During the mission, MC1 received a tasking of the highest priority, directing them to

support a battle in progress approximately 90 minutes northeast from their current location. (Tab CC-3, CC-5 through CC-9) The terrain elevation rose from the MRPA's location to the tasking, located in high, mountainous terrain. (Tabs B-3, AA-13 through AA-15) Initially, MC1 requested and received clearance to transit at 15,000 feet mean sea level (MSL).

There were numerous thunderstorms and severe turbulence between the MRPA's location at the time of tasking and the battle in progress. (Tabs CC-3, CC-4, V-7, V-8, V-11, V-13) These adverse weather conditions forced MC1 to deviate westerly from a direct flight path to the tasking. Despite the deviations, the MRPA experienced moderate to severe turbulence and brief periods of icing during transit. (Tabs F-7, F-8, F-10, F-13, J-3, V-7, V-8, CC-3, CC-4,)

MP1 made initial requests to climb to 16,000 feet for aircraft deconfliction over the tasking. No response was received from Air Traffic Control. (Tab V-8, V-46) At the time of changeover, there were multiple peaks within 10 miles of the MRPA, the highest of which was approximately 18,000 feet. Therefore, the minimum safe altitude (MSA), the altitude at which an aircraft can be flown with at least 2,000 feet of clearance from the highest obstacle, was approximately 20,000 feet. (Tabs O-25, AA-13 through AA-15)

During the changeover brief, MPs and MSOs briefed each other, respectively, as to the current mission status and the high-priority tasking. (Tab V-6, V-8, V-9, V-18, V-19, V-22, V-23, V-24, V-30, V-38, V-39, V-43, V-44, V-45, V54, V-61, V-71) While briefing, MP1 conducted one orbit at 15,000 feet, then proceeded to the northwest for the remainder of the brief. Upon assuming control of the MRPA, MP2 initiated a turn to the northeast toward the tasking. (Tab L-8, L-9)

Although MP1 had concerns about the rising terrain, this information was either not clearly communicated or received by MP2. (Tab V-8, V-45, V-10, V-11) MSO1 recalled expressing concern several times to MSO2 about the MRPA's current altitude, which was lower than the rising terrain along the intended flight path. MSO2 affirmatively shook his head and raised his hand, which indicated to MSO1 that MSO2 understood the concern. (Tab V-33) Conversely, MSO2 recalled immediately advising MP2 to turn south immediately after he first heard MSO1's warning. (Tab V-22 through V-24, V-56, V-59)

At the time of changeover with MC2, MP1 had no concerns with weather or turbulence. (Tab V-11) Once seated at approximately 0905Z, MC2 began to review Mardem-Beys Internet Relay Chat (mIRC) messages and other mission data to become familiar with the current tasking. They also focused on developing a course of action to avoid the adverse weather and accomplish their mission. (Tabs V-44, V-45, V-56 through V-58, CC-3, CC-4) Due to the high-priority tasking, MC1 remained in the GCS to observe. (Tab V-9, V-25)

MP1 maintained the MRPA at an altitude of approximately 15,000 feet MSL and at an indicated airspeed of approximately 80 Knots (KIAS). (Tab L-14) MP1 flew with altitude, airspeed, and heading hold modes engaged and the preprogram mode disengaged. (Tab J-3) The MRPA transited into mountainous terrain with numerous peaks over 15,000 feet in the

immediate vicinity. (Tab AA-13 through AA-15) At 0914Z the MRPA experienced moderate to severe turbulence, which lasted the remainder of the flight. (Tab J-5)

At 0918Z, approximately 13 minutes after MC2 assumed control of the MRPA, MC2 realized the elevation of the surrounding mountainous terrain exceeded the MRPA's altitude. (Tab V-46) Approximately 30 seconds prior to the mishap, MP2 initiated a right-hand turn for 180 degrees, believing that the opposite direction was the safest flight path to exit the terrain. All autopilot hold modes were engaged at the time, and the GCS commands were all normal. (Tab J-3) At 0918 and 41 seconds Z, after only achieving 58 degrees of heading change, the MRPA crashed into a nearly 17,000-foot mountain. (Tabs J-3, J-5, CC-4, AA-13 through AA-15)

e. Impact

At 0918Z, 3 October 2009, the MRPA impacted mountainous terrain in Afghanistan. (Tab B-3) The MRPA impacted the ground in rugged, vertical terrain with the aircraft, missile, and payloads completely destroyed in the ensuing fire. (Tab P-3)

f. Life Support Equipment, Egress and Survival

Not applicable.

g. Search and Rescue (SAR)

Not applicable.

h. Recovery of Remains

The MRPA impacted in high, rugged terrain and was deemed non-recoverable. (Tab P-4).

5. MAINTENANCE

a. Forms Documentation.

Every USAF aircraft has a dedicated set of both written and electronic maintenance records used to record all flight and maintenance activity. Air Force Technical Order (AFTO) 781 forms provide maintenance, inspection, servicing, configuration, status, and flight records for all USAF aircraft. The Integrated Maintenance Data System (IMDS) is a computer system used for maintenance management and trend analysis. Technical Order (TO) 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures* and Air Force Instruction (AFI) 21-101, *Aircraft and Equipment Maintenance Procedures*, provide specific guidelines and mandatory directions for aircraft maintenance actions and aircraft form and IMDS entries.

A review of aircraft forms and the IMDS indicated that some documentation was not in accordance with TO 00-20-1. However, there is no evidence to suggest that forms documentation contributed to the mishap.

Delayed discrepancies are those discrepancies identified as requiring correction at a future date. There was one delayed discrepancy in the aircraft maintenance forms (AFTO 781K), awaiting maintenance, for a "backshell on vertical tail cannon plug broken, cannon plug still usable." (Tab D-56) However, there is no evidence to suggest that this delayed discrepancy contributed to the mishap.

b. Inspections.

Phase inspections are regularly scheduled maintenance performed on USAF aircraft at specific flying hours (e.g., every 150 hours). Phase inspections are similar to scheduled maintenance on automobiles at specific mileage points. Similarly, Time Compliance Technical Orders (TCTO) are directions to perform specific maintenance actions, usually upgrades or modifications, within a specific time period.

All inspections were accomplished per the inspection schedule and there were no overdue TCTOs. The MRPA had a 150 hour inspection completed on 29 September 2009 and was 20.8 hours into its last completed 150 hour airframe inspection. (Tab D-3) The MPRA engine had a 60-hour engine inspection which was also accomplished on 29 September 2009. (Tab D-3)

There is no evidence to suggest that these inspections contributed to the mishap.

c. Maintenance Procedures.

There is no evidence that any lapses in maintenance procedures contributed to the mishap.

d. Maintenance Personnel and Supervision.

There is no evidence that maintenance personnel or supervision contributed to the mishap.

e. Fuel, Hydraulic, and Oil Inspection Analyses.

Maintenance personnel properly performed MRPA servicing in accordance with technical data. The MRPA impacted high up in rugged terrain and was completely destroyed. The wreckage was non-recoverable, and post mishap samples could not be obtained. However, there is no evidence to suggest petroleum, oils, or lubricants contributed to this mishap.

f. Unscheduled maintenance.

All necessary repairs or replacements were made when deemed necessary, independent of maintenance schedules, and were not relevant to the mishap.

6. AIRCRAFT AND AIRFRAME

a. Condition of systems

All systems were operating normal prior to the mishap. The MQ-1B's design is such that it captures and retains system information throughout every flight by means of a data logger system. While the MQ-1B is airborne, it continually transmits the status of onboard electrical systems and other electronic sensors to the GCS, where the data is recorded. Data is recorded against a time stamp (in seconds) that begins during aircraft preflight when the aircrew powers on the recorders. General Atomics Aeronautical Systems, Inc. (GA-ASI), the subject matter expert on this weapon system, reviewed data logs of the MRPA's systems. The data loggers provided no indication of anomalous behavior prior to impact. (Tab J-1 thru J-7)

b. Testing

There was no recovered hardware to test in this incident. The MRPA was completely destroyed upon impact. The MRPA impacted in high, rugged terrain and was deemed non-recoverable. (Tabs H-5, H-7, P-4)

The repair depot for the MQ-1B system analyzed the Ground Control Station (GCS) involved in the aircraft. The system was working properly and returned to service. (Tab L-3, L-4)

c. Weapons

The aircraft was loaded with one AGM-114 Hellfire missile which was also destroyed upon impact. (Tab P-3)

7. WEATHER

At the time and location of the mishap, weather was within operational limits, with thunderstorms to the east and unrestricted visibility in the immediate area of the mishap. Although the MCs dealt with adverse weather and turbulence throughout the flight, there was no evidence to suggest weather caused this mishap.

a. Forecast Weather

The forecast for 3 October 2009, published at 0600Z, was valid from 0600Z to 0000Z (4 October 2009). (Tab F-5) The forecast predicted scattered clouds at 12,000 feet with thunderstorms in the mountains. The term "scattered" means clouds cover less than 50% of the sky, and "broken" refers to cloud layers that cover more than 50% of the sky. The forecast also called for visibility to be seven statute miles and winds coming from 080 degrees (out of the East) at nine knots. (Tab F-5) The weather forecast called for scattered and broken cloud layers from 16,000 feet up to 22,000 feet MSL. (F-7) Flight level winds at 14,000 feet were forecasted to be variable at five knots. (Tab F-6)

b. Observed Weather

Weather observed by the MC2 at the time of the mishap consisted of clear skies with a line of thunderstorms to the east of the MRPA's position. Both MCs experienced turbulence throughout the flight; the winds were 15 to 20 knots out of the west at the MRPA's altitude. (Tabs J-3, L-15)

8. CREW QUALIFICATIONS

Crew qualifications were reviewed and found to be in order. There is no evidence to suggest crew qualifications were relevant to the mishap. (Tab G-14, G-38, G-40, G-86, G-99, G-101, G-103, G-123, G-125, G-126, G-128)

a. Mishap Pilot 1

(1) Training

MP1 was qualified as a MQ-1B pilot on 2 July 2008. (Tab G-14)

(2) Experience

MP1's total flight time is 2,331 hours, which includes 996 hours in the MQ-1B. (Tab G-20) Prior to flying the MQ-1B, MP1 was a C-135 pilot. (Tab G-17) He had completed 300 MQ-1B sorties since initial qualification with his last one being on 2 October 2009. (Tabs G-20, AA-6)

The MP1's flight time during the 90 days before the mishap is as follows (Tab G-20):

MP1	Hours	Sorties
Last 30 Days	48.7	12
Last 60 Days	101.8	25
Last 90 Days	101.8	25

b. Mishap Pilot 2

(1) Training

MP2 was qualified as a MQ-1B pilot on 15 July 2009. (Tab G-86)

(2) Experience

MP2 is rated a Senior Pilot with total flight time of 3,693.7 hours, which includes 147 hours in the MQ-1B. (Tab G-90, G-91, G-92) Prior to flying the MQ-1B, MP2 was a C-17

pilot/instructor/evaluator. (Tab G-90) As of 29 September 2009, he completed 61 MQ-1B sorties since initial qualification. (Tab G-92) His last sortie prior to the mishap was on 2 October 2009. (Tab AA-4)

MP2's flight time during the 90 days before the mishap is as follows (Tab G-91):

MP2	Hours	Sorties
Last 30 Days	45.7	17
Last 60 Days	106.4	41
Last 90 Days	131	53

c. Mishap Sensor Operator 1

(1) Training

MSO1 qualified as a MQ-1B sensor operator on 24 August 2007. (Tab G-40)

(2) Experience

MSO1's total flight time in the MQ-1B is 1,575.2 hours. (Tab G-43)

MSO1's flight time during the 90 days before the mishap is as follows (Tab G-43):

MSO1	Hours	Sorties
Last 30 Days	40.9	19
Last 60 Days	110.1	44
Last 90 Days	172.9	70

d. Mishap Sensor Operator 2

(1) Training

The MSO2 qualified as a MQ-1B sensor operator on 25 January 2007. (Tab G-99)

(2) Experience

The MSO2's total flight time is 1,866.2 hours in the MQ-1B. (Tab G-107)

The MSO2's flight time during the 90 days before the mishap is as follows (Tab G-107):

MSO2	Hours	Sorties
Last 30 Days	47.5	14
Last 60 Days	111.5	40
Last 90 Days	181.6	69

9. MEDICAL

There is no evidence that medical histories were relevant to the mishap.

a. Qualifications

At the time of the mishap, both MCs were fully medically qualified for flight duty. As such, physical and medical qualifications were not factors in the mishap. No maintenance or support personnel were medically evaluated.

b. Health

Medical records and individual histories revealed all individuals were in good health and had no recent performance-limiting illnesses prior to the mishap. Review of the Preventative Health Assessment (PHA), Individual Medical Readiness, Composite Healthcare System and Automated Information Management Tracking System databases showed that the MCs had current PHAs. After thoroughly reviewing the material described above, there was no evidence that any medical condition contributed to this mishap.

c. Toxicology

Within several hours after the mishap, commanders directed toxicology testing for all MPs and MSOs. Blood and urine samples were submitted to the Armed Forces Institute of Pathology for toxicological analysis. This testing included ethanol levels in the blood and drug testing of the urine. Ethanol results were negative for the MCs and there were no abnormalities, alcohol, illicit drugs or toxins found in the urine samples of all crew members.

d. Lifestyle

There is no evidence that unusual habits, behavior or stress on the part of the MCs contributed to this accident. Witness testimonies, as well as review of 72-hour and 14-day histories of the MCs, revealed no lifestyle factors, including unusual habits, behavior or stress that would have caused or substantially contributed to the mishap.

e. Crew Rest and Crew Duty Time

Air Force Instructions require pilots have proper "crew rest," as defined in AFI 11-202, Volume 3, General Flight Rules, 5 June 2006, prior to performing in-flight duties. AFI 11-202 defines normal crew rest as a minimum 12-hour non-duty period before the designated flight duty period (FDP) begins. During this time, an aircrew member may participate in meals, transportation or rest as long as he or she has the opportunity for at least eight hours of uninterrupted sleep.

A review of the duty cycles of the MCs leading up to the mishap indicated that they had adequate crew rest. The MCs complied with the crew rest and duty day requirements on the day of the mishap. None of the crew indicated they suffered from excessive stress, pressure, fatigue or lack of rest prior to or during the mishap sortie. The MCs also stated that they were adequately rested and not suffering from any illnesses at the time of the mishap. There is no evidence to suggest that fatigue was a factor in this mishap.

10. OPERATIONS AND SUPERVISION

a. Operations

The MCs were working the standard rotation in the second day of their work week. The operations tempo was normal for combat support operations. (Tab AA-9, AA-10)

b. Supervision

There is no evidence to suggest that operations tempo or supervision were factors in the mishap.

11. HUMAN FACTORS

A human factor is any environmental or individual physical or psychological factor a human being experiences that contributes to or influences his performance during a task. Human factors were of primary concern in this investigation. The following factors were causal or contributory. They are listed in descending order of significance with regard to the mishap:

a. Human Factors, Causal

(1) PC102 Channelized Attention

"Channelized Attention is a factor when the individual is focusing all conscious attention on a limited number of environmental cues to the exclusion of others of a subjectively equal or higher or more immediate priority, leading to an unsafe situation. May be described as a tight focus of attention that leads to the exclusion of comprehensive situational information." (Tab BB-9)

Due to the high-priority nature of the current mission, MC2 focused on issues other than the MRPA's altitude. (Tabs V-44, CC-3, CC-5 through CC-9) MC2 focused on the adverse weather conditions to the east of the MRPA and did not appreciate the rising terrain. In addition, MP2 focused on becoming familiar with the MRPA's mission status, reading mIRC messages, and reviewing aircraft systems. MP2 was relatively new to the MQ-1B and typically spent the first 15-30 minutes of each shift on this familiarization process. Depending on mission requirements, this process could take longer. (Tab V-44, V-45) Similarly, MSO2 concentrated on the combat conditions at the recently assigned location, in addition to his familiarization process. (Tab V-56 through V-58)

(2) PC101 Inattention

"Inattention is a factor when the individual has a state of reduced conscious attention due to a sense of security, self-confidence, boredom or a perceived absence of threat from the environment which degrades crew performance. (This may often be a result of highly repetitive tasks. Lack of a state of alertness or readiness to process immediately available information.)" (Tab BB-9)

Both MPs exhibited a state of reduced conscious attention due to a perceived absence of threat from the environment. They failed to appreciate the need for a significant increase in altitude required to safely overfly the mountainous terrain located between the MRPA and the target. The MRPA transited at 15,000 feet MSL, which is 5,200 feet below the MSA. Also, both MPs' requests to increase altitude to 16,000 feet MSL were insufficient to safely traverse the intervening terrain. (Tabs V-22, V-46 through V-48, O-25, AA-13 through AA-15, CC-4)

b. Human Factors, Contributory

(1) AE105 Breakdown in Visual Scan

"Breakdown in Visual Scan is a factor when the individual fails to effectively execute learned practiced internal or external visual scan patterns leading to unsafe situation." (Tab BB-4)

MC2 did not display an awareness of the MRPA's close proximity to the terrain until 30-40 seconds prior to the mishap. For the majority of the time MP2 controlled the MRPA, he focused his external scans on the adverse weather conditions to the east of the MRPA and did not scan the rising mountainous terrain in front of the MRPA. (Tabs V-44, V-45, AA-13 through AA-15, CC-3, CC-4) In addition, there was an apparent breakdown in internal scanning, as there are two separate displays of the MRPA's geographic position and maximum elevation figures (MEFs) on sectional maps. Once MP2 gained awareness of MRPA's proximity to the terrain, MP2 initiated a right-hand turn, attempting to avoid terrain. (Tabs V-46, CC-4)

(2) AE201 Risk Assessment – During Operation

"Risk Assessment – During Operation is a factor when the individual fails to adequately evaluate the risks associated with a particular course of action and this faulty evaluation leads to inappropriate decision and subsequent unsafe situation. This failure occurs in real-time when formal risk-assessment procedures are not possible." (Tab BB-5)

MP1 piloted the MRPA at 15,000 feet MSL, well-below the MSA. However, the adverse weather was a factor in this decision. When MP2 assumed control of the MRPA, weather was no longer a factor, and he turned toward the northeast and higher terrain, maintaining altitude at 15,000 feet MSL.

(3) PC208 Complacency

"Complacency is a factor when the individual's state of reduced conscious attention due to an attitude of overconfidence, undermotivation or the sense that others "have the situation under control" leads to an unsafe situation." (Tab BB-11)

Complacency on the part of MC2 is apparent in two situations. First, as evidenced by his comments, MP2 felt MP1 had piloted the MRPA through the adverse weather and MRPA was in a safe position at changeover. (Tab CC-4) Second, MSO2 did not warn MP2 of the imposing terrain until 30 to 40 seconds prior to impact. Although there is a dispute as to how many warnings MSO1 gave to MSO2, no concerns were expressed to MP2 during the first 13 minutes that MC2 had control of the MRPA. (Tab V-22, V-23, V-56)

Additionally, another indicator of complacency was the emergency mission altitudes. An emergency mission is a preprogrammed mission the MQ-1B flies when it loses its satellite link. Pilots periodically update the emergency mission flight plan, to include altitude settings, depending on the MQ-1B's current location. The MRPA's emergency mission altitudes remained set at 9,000 feet throughout the flight. Each time the MPs updated or reviewed the MRPA's emergency mission, the altitude setting remained at 9,000 feet, which was insufficient for the terrain. Neither MP seemed to recognize that this emergency mission altitude would have resulted in the probable loss of the MRPA had it lost its satellite link. (Tabs J-3, L-13, V-7, V-44)

(4) AE202 Task Misprioritization

"Task Misprioritization is a factor when the individual does not organize, based on accepted prioritization techniques, the tasks needed to manage the immediate situation." (Tab BB-5)

The immediate situation demanded that MC2 operate and navigate the MRPA safely to the assigned location. Instead, MC2 was apparently focused on the weather and mission at the recently assigned location. (Tabs V-44, V-45, V-58, CC-3, CC-4)

(5) AE301 Error due to Misperception

"Error due to Misperception is a factor when an individual acts or fails to act based on an illusion; misperception or disorientation state and this act or failure to act creates an unsafe situation." (Tab BB-5)

Both MCs were under the misperception that they were flying at a safe altitude and failed to take corrective action. (Tabs V-7, V-45, V-22, V-23, CC-4)

(6) PC504 Misperception of Operational Conditions

"Misperception of Operational Conditions is a factor when an individual misperceives or misjudges altitude, separation, speed, closure rate, road/sea conditions, aircraft/vehicle location within the performance envelope or other operational conditions and this leads to an unsafe situation." (Tab BB-15)

Both MCs failed to appreciate the urgency for an increase in altitude while approaching the new location. (Tabs V-7, V-45, V-46, V-58, CC-4)

(7) PP102 Cross-Monitoring Performance

"Cross-monitoring performance is a factor when crew or team members failed to monitor, assist or back-up each other's actions and decisions." (Tab BB-17)

All crew members in the GCS failed to back-up MP2's situational awareness, either through complacency or a lack of assertiveness. First, MSO2 failed to monitor MP2's lack of response to the increasing terrain. Second, MP1 failed to recognize the inadequate response of MP2 to the MRPA's location with respect to the terrain. Third, although MSO1 recognized the situation, he did not directly advise MP2 of his concerns regarding the terrain, particularly when there was a lack of action by MSO2. (Tabs V-7, V-22, V-23, V-58, CC-4)

(8) PP109 Mission Planning

"Mission planning is a factor when an individual, crew or team failed to complete all preparatory tasks associated with planning the mission, resulting in an unsafe situation. Planning tasks include information collection and analysis, coordinating activities within the crew or team and with appropriate external agencies, contingency planning, and risk assessment." (Tab BB-17)

Both MCs failed to complete all preparatory tasks associated with their recently assigned high-priority mission. Primarily, they failed to correct the MRPA's altitude needed for the intervening terrain to the assigned location. Both MPs failed to appreciate the need for a significant increase in altitude required to safely overfly the mountainous terrain. (Tabs O-25, V-7, V-22, V-23, V-45, V-58, AA-13 through AA-15, CC-3)

(9) PP111 Task/Mission-In-Progress Re-Planning

"Task/mission-in-progress re-planning is a factor when crew or team members fail to adequately reassess changes in their dynamic environment during mission execution and change their mission plan accordingly to ensure adequate management of risk." (Tab BB-18)

MC1 failed to adequately reassess changes in the terrain as a result of the new mission tasking in an unfamiliar area with a higher elevation than the MRPA's initial operating area. Primarily, they failed to correct the MRPA's altitude needed for the intervening terrain to the target. Both MPs failed to appreciate the need for a significant increase in altitude required to safely overfly the mountainous terrain. (Tabs O-25, V-7, V-8, V-10, V-46, Z-5, AA-13 through AA-15, CC-4)

(10) AE103 Procedural Error, AE206 Decision-making During Operation, AE104 Overcontrol/Undercontrol

"Procedural Error is a factor when a procedure is accomplished in the wrong sequence or using the wrong technique or when the wrong control or switch is used. This also captures errors in navigation, calculation or operation of automated systems." (Tab BB-4)

"Decision-making During Operation is a factor when the individual through faulty logic selects the wrong course of action in a time-constrained environment." (Tab BB-5)

"Overcontrol/Undercontrol is a factor when an individual responds inappropriately to conditions by either overcontroling or undercontroling the aircraft/vehicle/system. The error may be a result of preconditions or a temporary failure of coordination." (Tab BB-4)

MP2 utilized both the wrong technique and undercontrolled the MRPA by not disengaging its autopilot. MP2 exhibited faulty logic by believing that he could not command an immediate climb without executing multiple key strokes on his computer console. (Tab V-46) However, the MQ-1B allows the pilot to disengage the autopilot by pressing a button and pulling the trigger, both of which are on the control stick. Using this technique coupled with the addition of power allows for an immediate response, to include a steeper bank turn or a full-power climb. (Tab CC-4)

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Primary Operations Directives and Publications

(1) AFI 11-2MQ-1, Volume 1, MQ-1 Crew Training, 4 May 2007

(2) AFI 11-2MQ-1, Volume 2, MQ-1 Crew Evaluation Criteria, 2 August 2005

(3) AFI 11-2MQ-1, Volume 3, MQ-1 Operations Procedures, 29 November 2007

(4) AFI 11-202, Volume 3, General Flight Rules, 29 November 2007

(5) AFI 11-401, Flight Operations Aviation Management, 7 March 2007, as supplemented 25 April 2008

(6) AFI 11-418, Operations Supervision, 20 March 2007

(7) AFI 51-503, *Aerospace Accident Investigations*, 16 July 2004, incorporating through Change 2, 11 February 2008.

(8) TO 1Q-1(M)B-1, 1 November 2003, USAF Series MQ-1B and RQ-1B Systems, with Change 11, 14 January 2008, and incorporating all interim operational supplements through IOS-33, 31 March 2008

(9) TO 1Q-1(M)B-1CL-1, 1 November 2004, USAF Series MQ-1B and RQ-1B Systems Flight Checklist, with Change 14, 14 January 2008

(10) Department of Defense Human Factors Analysis and Classification System, 11 January 2005

b. Maintenance Directives and Publications

(1) AFI 21-101, Aircraft and Equipment Maintenance Management, 29 June 2006

(2) TO 00-20-1, Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures, 30 April 2003, incorporating Change 4, 1 September 2006

(3) TO 1Q-1(M)B-6, MQ-1B Technical Manual, Aircraft Scheduled Inspection and Maintenance Requirements, 21 August 2008

(4) TO 1Q-1(M)B-6WC-1, MQ-1B Inspection Workcard, Preflight, Thruflight, Basic Postflight, Combined Basic Postflight/Preflight Inspection Requirements, 15 January 2007, incorporating Change 1, 5 March 2007

(5) TO 1Q-1(M)B-6WC-2, MQ-1B Inspection Workcard, Aircraft Periodic Inspections and Maintenance Requirements, 21 August 2008

(6) TO 1Q-1(M)B-2-2, MD-1A Ground Control Station Maintenance Procedures, 15 September 2006

c. Known or Suspected Deviations from Directives or Publications

None.

13. NEWS MEDIA INVOLVEMENT

There was no news media coverage of this mishap. (Tab CC-5 through CC-8)

14. ADDITIONAL AREAS OF CONCERN

No additional areas of concern contributed to this MRPA accident.

4 February 2010

TODD G. CHASE, Lt Col, USAF
President, Accident Investigation Board

STATEMENT OF OPINION
MQ-1B, T/N 06-3175, ACCIDENT
3 October 2009

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 an aircraft 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. SUMMARY OF OPINION

I find, by clear and convincing evidence, that the mishap was the result of pilot error caused primarily by Mishap Pilot 2's (MP2's) channelized attention away from flying the Mishap Remotely Piloted Aircraft (MRPA) and an inattention to the high terrain in the MRPA's immediate vicinity. Furthermore, inattention by both Mishap Pilot 1 (MP1) and MP2 resulted from a perceived absence of threat from the environment. Specifically, they both failed to appreciate the need for a significant increase in altitude required to safely overfly the mountainous terrain located between the MRPA and the target. Numerous human factors further contributed to this mishap.

2. DISCUSSION OF OPINION:

a. The mishap occurred due to MP2 flying the aircraft into the high terrain. In my opinion, channelized attention on the high-priority mission and inattention to the high terrain in the MRPA's immediate vicinity were causal factors in this mishap. MP1 also exhibited inattention to the high terrain prior to changeover. Although MP2 was ultimately responsible to fly the MRPA, channelized attention and inattention also affected mishap sensor operator 2 (MSO2). Due to the critical circumstances on the ground and the need for immediate close air support (CAS), MP2 and MSO2 focused on scanning the adverse weather conditions to the east of the MRPA, becoming familiar with the MRPA's mission status, reading Mardem-Beys Internet Relay Chat (mIRC) messages concerning the tasking, and reviewing the status of MRPA's systems.

b. Numerous additional factors contributed to this mishap, including: a breakdown in visual scan; a failure by both MP1 and MP2 to adequately evaluate the risks of the MRPA's altitude relative to the mountainous terrain; complacency by both MCs; MC2's misprioritization on the weather and mission rather than the MRPA's current flight path; misperception by both MCs that the MRPA was at a safe altitude; failure of both MCs to cross-monitor MP2's situational awareness; inadequate mission planning with respect to the minimum safe altitude for the immediate vicinity; a failure to adequately reassess changes in the terrain as a result of the new tasking; and procedural and decision-making errors resulting in MP2 undercontrolling the MRPA.

c. Although most of these factors resulted in the MRPA traveling at an altitude much too low for the immediate area, the decision to remain on the autopilot and attempt to turn away from the terrain was the final contributing error. Another technique would have been to disable the autopilot using Landing Configuration Mode and apply immediate maximum power for a straight ahead climb. Taking the MRPA off of autopilot would have allowed for an increased turn rate through rudder application and a steeper turning angle. However, I am unable to positively determine whether any terrain avoidance technique would have avoided the mishap because MP2 realized his precarious situation only 40 seconds prior to impact.

d. All systems were operating normal prior to the mishap. The MQ-1B's design is such that it captures and retains system information throughout every flight by means of a data logger system. While the MQ-1B is airborne, it continually transmits the status of onboard electrical systems and other electronic sensors to the ground control station (GCS), where the data is recorded. Data is recorded against a time stamp (in seconds) that begins during aircraft preflight when the aircrew powers on the recorders. General Atomics Aeronautical Systems, Inc. (GA-ASI), the subject matter expert on this weapon system, reviewed data logs of the MRPA's systems. The data loggers provided no indication of anomalous mechanical or electrical behavior prior to impact. There is no indication that any maintenance items were a factor in the mishap.

e. At the time and location of the mishap, weather was within operational limits, with thunderstorms to the east and unrestricted visibility in the immediate area of the mishap. Although the MP1 dealt with adverse weather and turbulence throughout the flight, there was no evidence to suggest weather caused this mishap.

f. All evidence led to my conclusion that the mishap was the result of pilot error caused primarily by MP2's channelized attention to the high-priority mission and inattention to the high terrain in the MRPA's immediate vicinity. The failure by both MCs to appreciate mountainous terrain with numerous peaks over 15,000 feet in the MRPA's immediate vicinity also contributed to this mishap.

4 February 2010

TODD G. CHASE, Lt Col, USAF
President, Accident Investigation Board

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 an aircraft 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.

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