UNITED STATES AIR FORCE
ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

MQ-1B T/N 06-3174
432D WING
CREECH AIR FORCE BASE, NEVADA

LOCATION: JALALABAD, AFGHANISTAN

DATE OF ACCIDENT: 10 JULY 2011

BOARD PRESIDENT: LIEUTENANT COLONEL MARK E CHURCH

Conducted IAW Air Force Instruction 51-503

Abbreviated Accident Investigation pursuant to Chapter 11

EXECUTIVE SUMMARY

ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION
MQ-1B T/N 06-3174, JALABAD, AFGHANISTAN
10 JULY 2011

On 10 July 2011, at 0053 Local time (9 July 2011 at 1953 Zulu (Z)), the mishap aircraft (MA), a MQ-1B Predator, tail number (T/N) 06-3174, was lost and presumed crashed at a forward operating location. The MA was carrying one AGM-114 Hellfire missile. It was owned by the 432d Aircraft Maintenance Squadron, 432d Wing, Creech AFB, NV and flown by the 3d Special Operations Squadron, 27th Special Operations Wing, Cannon AFB, NM. At 1953Z, the MA lost its return link (RL) while flying an intelligence, surveillance and reconnaissance mission in support of OPERATION ENDURING FREEDOM. RL refers to the data transmission capability from the aircraft to the Ground Control Station (GCS) via the Predator communications systems. Attempts to re-establish the RL were unsuccessful. The MA did not return to its forward operating base and is presumed crashed with no known injuries, deaths or reported property damage. The aircraft loss is valued at approximately $4.4 million.

After normal maintenance and preflight checks, the MA taxied and departed from its forward deployed location at 0057Z for a planned 22 hour mission. At 1953Z, the RL between the MA and the GCS was lost. The Mishap Crew (MC) followed the required standard procedures in an attempt to regain the link, but was unable to do so. Subsequent Air Traffic Control and Launch and Recovery Element attempts to locate the MA were also unsuccessful. Contact with the MA was not re-established and the aircraft is presumed to have crashed. No wreckage has been found.

The post mishap investigation revealed no significant anomalies with regards to the MA at the time of the lost link. The only known anomaly was a LN100G navigation system failure, but the MA was operating normally on the backup navigation system at the time of the mishap. Preflight procedures and launch of the MA were all normal. There was no evidence of negative maintenance trends or issues and maintenance records showed no discrepancies. The MC had no problems with the operation of the MA immediately prior to the mishap.

The AIB President could not determine the cause of this mishap by clear and convincing evidence. Further, the AIB President also could not determine any factors which contributed substantially to the mishap by a preponderance of evidence.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-1B T/N 06-3174
10 JULY 2011

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COMMONLY USED ACRONYMS & ABBREVIATION

ACC	Air Combat Command	LOS	Line of Sight
AGM	Air to Ground Missle	LRE	Launch and Recovery Element
AIB	Accident Investigation Board	MA	Mishap Airplane
AAIB	Abbreviated Accident Investigation Board	MC	Mishap Crew
		MCE	Mission Crew Element
AF	Air Force	ME	Mishap Engine
AFB	Air Force Base	MIS	Maintenance Information System
AFI	Air Force Instruction	MP	Mishap Pilot
AFTO	Air Force Technical Order	MSO	Mishap Sensor Operator
AFSOC	Air Force Special Operations Command	MTS-A	Multispectral Targeting System
		NM	Nautical Miles
AOR	Area of Responsibility	OEF	OPERATION ENDURING FREEDOM
ATC	Air Traffic Control		
CND	Could Not Duplicate	OIF	OPERATION IRAQI FREEDOM
EM	Emergency Mission	PCM	Primary Control Module
FOB	Forward Operating Base	RPA	Remotely Piloted Aircraft
GA	General Atomics	RL	Return Link
GCS	Ground Control Station	SO	Sensor Operator
GPS	Global Positioning System	SOF	Special Operations Forces
HDD	Head-down Display	SOS	Special Operations Squadron
HUD	Head-up Display	T/N	Tail Number
IAW	In Accordance With	TV	Television
IFF	Identification of Friend or Foe	WG	Wing
IFOC	In Flight of Checkout	WOC	Wing Operations Center
ISR	Intelligence, Surveillance and Reconnaissance	Z	Zulu or Greenwich Meridian Time (GMT)
LL	Lost Link		

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 8 September 2011, Lieutenant General William J. Rew, Vice Commander Air Combat Command (ACC), appointed Lieutenant Colonel Mark E. Church as the Abbreviated Accident Investigation Board (AAIB) President to investigate the 10 July 2011 crash of an MQ-1B Predator aircraft, tail number (T/N) 06-3174. An AAIB was conducted at Cannon Air Force Base (AFB), New Mexico, from 10 September 2011 to 21 September 2011, pursuant to Chapter 11 of Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*. A Legal Advisor and Recorder were also appointed to the AAIB. A pilot and maintainer were detailed as Functional Area Experts. (Tab Y-2, Y-3)

b. Purpose.

This is a legal investigation convened to inquire into the facts surrounding the aircraft or aerospace 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

After preflight checks the Mishap Aircraft (MA), a remotely piloted MQ-1B Predator, taxied and departed from a Forward Operating Base (FOB) in the Area of Responsibility (AOR) at 0057Z. (Tab D-8) Approximately nineteen hours into the flight, the MA lost its return link (RL) with the Ground Control Station (GCS). (Tab DD-2) RL refers to the data transmission capability from the aircraft to the GCS via the aircraft communications system. At 1953Z the GCS received a Loss of RL warning, along with simultaneous freezing of the Head Up Display (HUD). The Mishap Crew (MC) ran the Lost Ku Command/Return Link checklist, but was unable to re-establish link with the MA. (Tab V-1.6, V-2.5) Since the MA was orbiting approximately 20 nautical miles (nm) from the Launch Recovery Element (LRE) when it lost link, a recovery by the LRE was attempted, but it was unable to locate the aircraft. (Tab DD-2) The MA did not fly its pre-programmed Emergency Mission (EM), which would have returned it to its launch base, and was never located. (Tab DD-2) It is presumed that the MA crashed and was destroyed. There are no known injuries or damage to private property. The loss of the MA is valued at approximately $4,400,000.00. (Tab P-2)

3. BACKGROUND

a. Units and Organization

(1) Air Combat Command

ACC is a major command of the United States Air Force and primary force provider of combat airpower to America's warfighting commands. Its mission is to organize, train, equip, and maintain combat-ready forces for rapid deployment and employment while ensuring strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense. ACC operates fighter, bomber, reconnaissance, battle-management, and electronic-control aircraft and provides command, control, communications, and intelligence systems and conducts global information operations. Over 67,000 active duty members, 13,500 civilians, and when mobilized, 50,000 Air National Guard and Reserve members compose ACC, and its units operate 1,800 aircraft. (Tab CC-5 to CC-7)

(2) Air Force Special Operations Command (AFSOC)

AFSOC is headquartered at Hurlburt Field, FL, and is one of ten major Air Force commands. AFSOC provides Air Force special operations forces for worldwide deployment and assignment to regional unified commands. The command's Special Operations Forces (SOF) are composed of highly trained, rapidly deployable Airmen conducting global special operations missions ranging from precision application of firepower, to infiltration, ex-filtration, resupply and refueling of SOF operational elements. (Tab CC-9 to CC-11)

(3) 12th Air Force (12 AF)

12th Air Force controls ACC's conventional forces in the western United States and has the warfighting responsibility for U.S. Southern Command as well as the U.S. Southern Air Forces. It manages all Air Force assets and personnel in the AFSOUTH AOR, which includes Central and South America. 12 AF has worked closely with nations in the Caribbean, Central and South America in the Global War on Terrorism by providing forces to OPERATION ENDURING FREEDOM (OEF), OPERATION IRAQI FREEDOM (OIF), and OPERATION NOBLE EAGLE, and it also has supported efforts to stem the flow of illegal drugs into the U.S. and neighboring countries.

12 AF directs 10 active duty wings and one direct reporting unit as well as 13 gained wings and other units of the Air National Guard and Reserve. (Tab CC-13 to CC-14)

(4) 432d Wing (432 WG)

The 432d Wing, stationed at Creech AFB, Nevada, flies the MQ-1B Predator and MQ-9 Reaper remotely piloted aircraft (RPA) systems to provide real-time reconnaissance, surveillance, and precision attack against fixed and time-critical targets to support American and coalition forces worldwide. The 432 WG also conducts initial qualification training for aircrew, intelligence, weather, and maintenance personnel who will fly and support RPA systems. The wing's organization includes two groups, six RPA flying squadrons, an operational support squadron, and a maintenance squadron. The wing and its subordinate units are components of the Air Force's ACC and 12 AF. (Tab CC-17)

(5) 27th Special Operations Wing (27 WG)

The 27th SOW at Cannon AFB, NM, is one of two Air Force active duty Special Operations wings and falls under AFSOC. The primary mission of the 27th SOW is to plan and execute specialized and contingency operations using advanced aircraft, tactics, and air refueling techniques to infiltrate, exfiltrate, and resupply SOF and provide ISR, and close air support for SOF operations. (Tab CC-19)

(6) 3rd Special Operations Squadron (3 SOS)

The 3rd SOS accomplishes global special operations tasking as a member of the Air Force component of United States Special Operations Command. It directly supports theater commanders by providing precision weapons employment and persistent intelligence, surveillance, and reconnaissance. It also plans, prepares, and executes MQ-1B Predator missions supporting special operations forces. (Tab CC-15 to CC-16)

b. Aircraft: MQ-1B Predator

The MQ-1B Predator is a medium- altitude, long-endurance, unmanned aircraft system with primary missions of close air support, air interdiction, and 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. The MQ-1B is actually a system, not just an aircraft, which 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. The entire system is deployable worldwide for operations and can be transported on almost any Air Force cargo aircraft. (Tab CC-3 to CC-4)

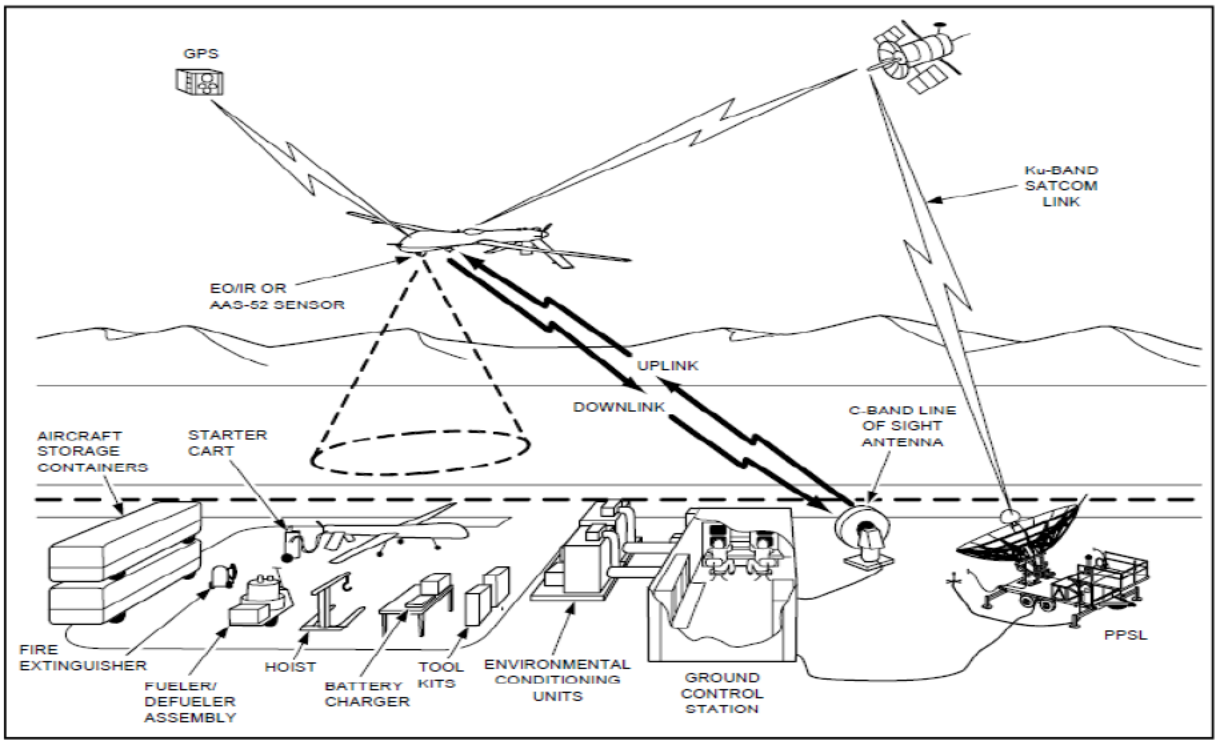

Figure 1. Typical Components of the MQ-1B System

Figure 2. Inside View of Ground Control Station

The basic crew for the Predator consists of a pilot to control the aircraft and command the mission and an enlisted aircrew member to operate sensors and weapons plus a mission coordinator, when required. The crew employs the aircraft from inside a GCS via a line-of-sight data link or a satellite data link for beyond line-of-sight (LOS) operations. The MQ-1B carries the Multi-spectral Targeting System (MTS-A) which integrates an infrared sensor, a color/monochrome daylight television (TV) camera, an image-intensified TV camera, a laser designator and a laser illuminator into a single package. The full motion video from each of the imaging sensors can be viewed as separate video streams or fused together. The aircraft can employ two laser-guided AGM-114 Hellfire missiles which possess a highly accurate, low collateral damage, and anti-armor and anti-personnel engagement capability. The aircraft has a wingspan of 55 feet, a maximum takeoff weight of 2,250 pounds, and cruises at 84 miles per hour. (Tab CC-3 to CC-4)

The aircraft is initially controlled by a LRE, which consists of a crew in a GCS at the same airfield as the aircraft, using LOS data link connections between the aircraft and ground data terminal, which is a radio antenna at the same airfield. The LRE is typically deployed in a theater of operations, where it will launch the aircraft, get it to a specified altitude, accomplish a systems check, and via either multi-user internet relay chat or a phone call, hand the aircraft off to a stateside GCS in what is called remote split operations. The stateside GCS crew will control the aircraft via Ku-band satellite data link and performs the designated mission until the aircraft is ready to land at which time control is returned to the LRE. Some missions, however, such as local base defense missions, are performed entirely by the LRE using the LOS data link with the aircraft. (Tab CC-3, CC-4)

4. SEQUENCE OF EVENTS

a. Mission.

The mishap sortie was an intelligence, surveillance and reconnaissance (ISR) mission flown in support of OEF and was authorized by an Air Tasking Order. (Tab C-2)

b. Planning.

The MC, functioning as the second Mission Crew Element (MCE), was assigned to the 3 SOS, Cannon AFB, and the MA was assigned to the 432 WG at Creech AFB. (Tab C-2, V-1.2, V-2.2, D-13)

The MA was launched from the AOR at 0057Z by the LRE using LOS C-Band transmitters then handed off at 0104Z to the first MCE crew via Ku Band satellite transmissions. (Tab D-8) The MA was planned to fly a 22 hour sortie, with a scheduled land time of 2200Z. (Tab D-13)

The MC accomplished all preflight mission requirements and briefed in accordance with standard operating procedures. (Tab V-1.2, V-2.2) This was their first sortie of the day and the fifth crew to pilot the MA, including the LRE and break crews. The Mishap Pilot (MP) assumed control of the MA while orbiting over its target, approximately 10 hours and 33 minutes into the flight. The Mishap Sensor Operator (MSO) assumed control of his station approximately 15 hours and 3 minutes into the flight. (Tab D-13)

c. Preflight.

The LRE conducted a normal preflight, launch, and handoff.

d. Summary of Accident.

The MA, scheduled for a 0001Z launch time, departed without incident at 0057Z. As scheduled, at 1130Z, the MP took control of the MA from the breakcrew pilot who had relieved the previous MCE pilot. (Tab D-13) The MP was briefed on one ongoing issue with the MA at the time of handover. (Tab V-1.3) Approximately six hours into the flight, the LN100G (AP1/NAV1) unit experienced an autopilot and navigation quality failure. The aircraft automatically switched from using the LN100G for navigation to using the Novatel GPS (note that AP2 was already selected as the primary autopilot sensor). The unit continued to provide data that was accurate and similar to that produced by the primary autopilot unit and secondary navigation sensors. At the time of lost link (LL), there was no indication that AP2 or NAV2 had malfunctioned. (Tab EE-3)

At 1600Z, the MSO came on duty and was briefed on mission and aircraft status by the off-going sensor operator (SO). (Tab D-13, V-2.3) The weather was clear with no restrictions at the time with winds out of the NW at 10 knots. (Tab DD-2) The MP was relieved by a break crew at

1630Z and came back on duty at 1730Z. (Tab D-13) There were no changes to the mission or aircraft status while he was away. (Tab V-4.3)

At 1953Z, the RL was lost. (Tab DD-2) The MC received warnings for Loss of Data and Loss of Clock on their Head Down Displays (HDDs) and picture freeze on their HUDs. (Tab V-1.6, V-2.4) The MA was in wings level flight at the time. The MC ran the Lost Ku Command/Return Link checklist, which directs the crew to disable the Ku Command Link Control and to mute the Command Link. (Tab V-1.6, V-1.7)

Attempts to regain RL were unsuccessful. The MA was not identified by Air Traffic Control (ATC) at the time. (Tab V-1.7, V-2.5) The crew contacted ATC at 1956Z in an attempt to locate the MA on radar, but were unsuccessful. At 2005Z, the MC contacted the LRE and coordinated with them to attempt pick up of the MA using LOS signal from their GCS. The LRE was unable to locate the MA. (Tab DD-2) All subsequent efforts to regain link and to locate the MA were unsuccessful. (Tab V-1.7, V-2.5) At 2304Z, based upon estimated fuel starvation point, the Wing Operations Center (WOC) Deployed reported that the MA had crashed. (Tab DD-2)

e. Impact

The MA was presumed to have crashed sometime after 1953Z. However, the wreckage was never located, thus specific crash location is not known.

f. Egress and Aircrew Flight Equipment.

This section is not applicable for mishaps involving RPA.

g. Search and Rescue.

The MC notified tactical control about the LL and coordinated for search efforts to be conducted. Attempts to acquire the MA via radar and Identification Friend or Foe (IFF), started only three minutes after the MA went lost link, failed, potentially suggesting the MA was no longer airborne. Despite these efforts, the MA was never found. (Tab DD-2)

h. Recovery of Remains.

This section is not applicable for mishaps involving RPA.

5. MAINTENANCE

a. Forms Documentation.

The active 781-series forms for the MA were documented in accordance with (IAW) applicable maintenance guidance for the MQ-1B, and the forms indicated that the MA had no outstanding maintenance issues that would prevent it from flying. The only open entry in the Air Force Technical Order (AFTO) Form 781A for the MA was an in-flight-operational-checkout (IFOC)

for Prop P amp spikes. One delayed discrepancy was noted on the AFTO Form 781K for W362P2 had excessive play at the alternator connection point. The production superintendent certified the aircraft for flight. (Tabs D-2 to D-14, U-2)

A pre-mishap history check in Maintenance Information System (MIS) and AFTO 781-series forms showed numerous maintenance actions in the period of 19 June 2011 through the mishap. With only one exception, all actions were documented correctly in the aircraft forms and MIS. The exception was for JCN 111700023. A pilot reported discrepancy for the prop servo reading above 75 degrees celsius was signed off in the forms as could not duplicate (CND), but the term CND was not utilized in the MIS entry. (Tabs D-2 to D-7, U-2)

b. Inspections.

All required inspections and time changes were accomplished on the MA, and there were no overdue Time Compliance Technical Orders directing modification or inspection of the aircraft. (Tab U-2)

c. Maintenance Procedures.

Review of the aircraft forms and MIS did not reveal any causes for concern with maintenance procedures. (Tab U-2)

d. Maintenance Personnel and Supervision.

Aircraft maintenance records indicated all maintenance and supervisory activities were normal. A thorough review of the training records provided and special certification rosters of those who performed maintenance on the MA was accomplished. All individual training records indicate they were trained and qualified. (Tab U-3)

e. Fuel, Hydraulic and Oil Inspection Analysis.

Maintenance personnel properly serviced fuel tanks and oil reservoirs IAW technical data. The servicing certification on the AFTO Form 781H reflected full oil levels and adequate fuel levels. The “Info Note” page correctly reflected the 3 to 2 ratio in the forward and aft fuel tanks per the applicable technical order. Fuel and oil samples were not performed due to the wreckage being unrecovered. (Tab D-2 to D-7)

f. Unscheduled Maintenance.

All necessary repairs or replacements were properly made when required independent of maintenance schedules and were not relevant to the mishap. (Tab U-2)

6. AIRCRAFT AND AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems.

Due to the unknown impact location of the MA, the AAIB could not investigate the post mishap physical condition of the MA's wreckage. The GCS was immediately sequestered for test and evaluation and un-impounded soon after for continued operations. (Tab D-15)

b. Engineering Evaluations and Analyses.

General Atomics (GA) analyzed the data logger files from the GCS since the MA was not recovered. The GA report concluded there were no indications in the data logs of anomalous performance or failure of any subsystem or component that would have resulted in a lost link condition and loss of the aircraft. In case of a LL, the MA had a loaded EM. This mission would have instructed the MA to fly to a designated location awaiting link recovery. The MA was within range of the LRE. Data shows the MA never began its EM and the LRE was unable to recover the aircraft. Because the aircraft could not be recovered and the EM was not executed, GA found that these were both indications the MA most likely experienced a catastrophic failure that simultaneously prevented a data link and resulted in loss of aircraft control. (Tab EE-3, EE-7, EE-9)

There were several single-point failure modes within the aircraft that could cause a LL. These include: failure on either the Power Board or Flight Computer Board in the Primary Control Module (PCM), or a failure of multiple wires within the W160 cable, which provided power to the PCM. However, due to the lack of recovery a root cause could not be determined. GA opined the failure of the LN100G earlier in the flight was most likely not a contributing factor to the mishap. (Tab EE-9)

7. WEATHER

a. Forecast Weather.

The forecast for the area in which the MA was operating at the time of the mishap was surface winds variable at six knots and clear skies. (Tab F-2)

b. Observed Weather.

The weather at the time of the incident was clear skies, no restrictions and flight level winds were out of the NW at 10 knots. It was night time. (Tab DD-2)

c. Operations.

There was no significant weather in the forecast that would affect the ability for the MQ-1B to effectively operate. No evidence suggests weather was a factor in the mishap. (Tab F)

8. CREW QUALIFICATIONS

a. Mishap Pilot

(1) **Training**

The MP was qualified in the MQ-1B as a pilot since 11 April 2011. (Tab T-2)

(2) **Experience**

The MP had a total flight time of 267.4 hours, all of it in the MQ-1B. The MP was designated as an "Inexperienced" crewmember in the MQ-1B (had less than 500 hours flying the aircraft). The MP's flight time during the 90 days before the mishap was as follows:

	Hours	Sorties
30 days	43.5	9
60 days	122.6	22
90 days	221.9	40

(Tab G-2)

b. Mishap Sensor Operator

(1) **Training**

The MSO has been a qualified MQ-1B sensor operator since 14 July 2010 (Tab T-3).

(2) **Experience**

The MSO had a total flight time of 7292.4 hours, with 407.9 in the MQ-1B. Prior to becoming a MQ-1 B sensor operator, the MSO was a Flight Engineer on various aircraft. The MSO was not designated as an "Experienced" crewmember in the MQ-1B. The MSO's flight time during the 90 days before the mishap was as follows:

	Hours	Sorties
30 days	16.5	2
60 days	51.3	9
90 days	72.8	14

(Tab G-3)

9. MEDICAL

a. Qualifications.

At the time of the mishap flight, crew members had current 1042s, flight physicals, no known illnesses or injuries, and were medically qualified to perform flying duties.

b. Health.

No reported health issues for the crew members relevant to the cause of the mishap.

c. Pathology.

Lab results indicate pathology was not applicable to this mishap.

d. Lifestyle.

Based on interviews and 72 hour/14 day histories, no lifestyle factors were found to be relevant to this mishap.

e. Crew Rest and Crew Duty Time.

Based on interviews and 72 hour/14 day histories, all crew members reported having the required amount of sleep prior to the mishap. MP stated he had changed shifts a week earlier, however he was adequately rested for the mishap sortie. (Tab V1.3)

10. OPERATIONS AND SUPERVISION

a. Operations.

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

b. Supervision.

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

11. HUMAN FACTORS ANALYSIS

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

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Primary Operations Directives and Publications.

(1) T.O. 1Q-1(M)B-1, USAF Series MQ-1B System, 13 December 2010
(2) T.O. 1Q-1(M)B-1CL-1, Flight Crew Checklist, USAF Series MQ-1B System, 13 December 2010
(3) AFI 11-2MQ-1, Volume 2, MQ-1 Crew Evaluation Criteria, 28 November 2008
(4) AFI 11-2MQ-1, Volume 3, MQ-1 Operations Procedures, 29 November 2007
(5) AFI 11-418, Operations Supervision, 21 October 2005, incorporating Change 1, 20 March 2007
(6) AFI 11-401, Aviation Management, 7 March 2007, incorporating through Change 2, 18 May 2009
(7) AFI 11-202, Volume 3, General Flight Rules, 22 October 2010

b. Maintenance Directives and Publications.

(1) T.O. 1Q-1(M)B-2-93GS-00-1, General System Surveillance, 8 February 2010
(2) T.O. 1Q-1(M)B-5-1, Basic Weight Checklists, USAF Series, MQ-1B Remotely Piloted Aircraft, 26 March 2010
(3) T.O. 00-20-1, Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures, 1 September 2010
(4) T.O. 1Q-1(M)B-2-48JG-00-1, Job Guide, Communication/Navigation/Identification, General, USAF Series, MQ-1B Remotely Piloted Aircraft, 09 October 2009
(5) T.O. 1Q-1(M)B-2-32JG-10-1, Job Guide, Landing Gear, Main Gear, Extension/Retraction, USAF Series, MQ-1B Remotely Piloted Aircraft, 2 January 2010
(6) T.O. 1Q-1(M)B-2-32JG-10-1, Job Guide, Landing Gear, Main Gear, Extension/Retraction, USAF Series, MQ-1B Remotely Piloted Aircraft, 2 January 2010
(7) T.O. 1Q-1(M)B-2-05JG-10-1, Ground Handling USAF Series, MQ-1B Remotely Piloted Aircraft, 9 Jun 2009, thru change 5 21 July 2010
(8) T.O. 1Q-1(M)B-6WC-1, Preflight, Thruflight, Basic Postflight, Combined Basic Postflight/Preflight inspection requirements, ASAF Series, MQ-1B Remotely Piloted Aircraft, 21 January 2010
(9) T.O. 1Q-1(M)B-6WC-2, Aircraft Periodic Inspections and Maintenance Requirements, USAF Series, MQ-1B Remotely Piloted Aircraft, 21 January 2010
(10) T.O. 1Q-1(M)B-2-72JG-00-2, Job Guide Engine Reciprocating General Volume II, USAF Series MQ-1B and RQ-1B Remotely Piloted Aircraft, 08 June 2010

(11) T.O. 1Q-1(M)B-6, Aircraft Scheduled Inspection and Maintenance Requirements, USAF Series MQ-1B Remotely Piloted Aircraft, 21 January 2010
(12) AFI 21-101, Aircraft and Equipment Maintenance Management, 26 July 2010
(13) 380 AEWI 21-101, Aircraft and Equipment Maintenance Management, 28 September 2009

c. Known or Suspected Deviations from Directives or Publications.

There were no known deviations relevant to this mishap.

13. ADDITIONAL AREA OF CONCERN

There were no additional areas of concern relevant to this mishap.

21 September 2011

MARK E. CHURCH, Lt Col, USAF
President, Accident Investigation Board

STATEMENT OF OPINION
MQ-1B T/N 06-3174 ACCIDENT
10 JULY 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, 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:

I find there is not sufficient evidence to determine the cause of this mishap. I find sufficient evidence to conclude that the MA was not lost due to weather, icing, the GCS or MC performance, maintenance discrepancies, or LN100G failure.

At 1953Z, the MA lost its RL. Loss of RL refers to the loss of data transmission capability from the MA to the GCS. The MC followed the appropriate procedures in a timely manner to attempt to regain the RL. For unknown reasons, the EM did not return the MA. The MA is presumed to have crashed. The wreckage has not been located.

2. DISCUSSION OF OPINION:

Because the MA's wreckage could not be located, the AAIB did not have access to post-mishap physical evidence. This lack of physical evidence limited the AAIB's ability to determine the exact cause of the mishap. However, even without wreckage, there is sufficient evidence to rule out some possible causes. These conclusions are based upon a combination of witness statements, review of maintenance records, consultation with expert advisors, results of technical analysis, weather data, and examination and review of other relevant documents. The AAIB reviewed the complete training and personnel records of all individuals directly involved in the mishap. A technical analysis of the computer data (data logger) received from the MA prior to the loss of the RL by the manufacturer GA was also reviewed.

This investigation revealed no anomalies with regards to the MA at the time of the lost RL at 1953Z. The satellite signal strength was normal and the MA was responsive. There was no evidence of negative maintenance trends or issues, and maintenance records showed no relevant discrepancies. The MC reported no anomalies with the operation of the MA immediately prior to the mishap. The MA had 138 gallons of fuel remaining at the time it went lost link

The failure of the LN100G was not responsible for the lost link and the subsequent failure of the MA to fly its emergency mission. Although the LN100G reported a failure, navigation and autopilot data from the LN100G appeared normal throughout the remainder of the data logs and the MA automatically switched from using the LN100G for navigation to using the Novatel GPS.

Atmospheric weather in the area and along the emergency mission route was clear. Therefore, thunderstorms, icing and turbulence were not causal to the loss of the RL or to the mishap. The GCS for this mission was impounded and closely examined and found to be in normal working condition. The GCS was not causal to the LL or the MA's failure to return to base.

Aircraft attitude was not responsible for lost link. An individual onboard component may have failed and been responsible for lost link, but should not have prevented the safe recovery of the aircraft.

The MC followed all established checklist procedures and executed them in a timely manner. The MC was not causal to the lost link or the MA's failure to return to its recovery base.

Even after failing to regain link, the MA should have been able to fly the LL profile and then the EM profile to get back within range of the LRE LOS link, and hence execute a safe recovery. Attempts to acquire the MA via radar and IFF, started only three minutes after the MA went LL, failed, potentially suggesting the MA was no longer airborne. The MQ-1B does have a history of catastrophic PCM failure which would have resulted in immediate loss of data link and loss of aircraft control. However, given the evidence available, the actual cause of the crash cannot be determined by clear and convincing evidence at this time.

21 September 2011

MARK E. CHURCH, 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, 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.