

UNITED STATES AIR FORCE
ABBREVIATED AIRCRAFT ACCIDENT
INVESTIGATION BOARD REPORT



MQ-1B, T/N 07-3213
432D WING
CREECH AIR FORCE BASE, NEVADA

214TH RECONNAISSANCE SQUADRON
162D FIGHTER WING
DAVIS-MONTHAN AIR FORCE BASE, ARIZONA



LOCATION: NEAR JALALABAD AIRFIELD, AFGHANISTAN

DATE OF ACCIDENT: 26 APRIL 2014

BOARD PRESIDENT: MAJOR KENNETH S. DEGON

Conducted IAW Air Force Instruction 51-503
Abbreviated Accident Investigation Pursuant to Chapter 11



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

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29 SEP 2014

ACTION OF THE CONVENING AUTHORITY

The Report of the Abbreviated Accident Investigation Board, conducted under the provisions of AFI 51-503, that investigated the 26 April 2014, mishap near Jalalabad Airfield, Afghanistan involving an MQ-1B, T/N 07-3213, assigned to the 432d Wing, Creech Air Force Base, Nevada, complies with applicable regulatory and statutory guidance; on that basis it is approved.

JAMES N. POST III
Major General, USAF
Vice Commander

EXECUTIVE SUMMARY

ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION MQ-1B, T/N 07-3213 JALALABAD AIRFIELD, AFGHANISTAN 26 APRIL 2014

On 26 April 2014 at approximately 0014 Zulu (Z), the mishap aircraft (MA), an MQ-1B tail number 07-3213, owned by the 432d Wing at Creech Air Force Base (AFB), Nevada, crashed near Jalalabad Airfield, Afghanistan. At the time of the mishap, the MA was being operated by a mission control element (MCE) crew, from the 214th Reconnaissance Squadron at Davis-Monthan AFB, Arizona. There were neither injuries to civilians or military personnel nor damage to civilian property during the crash. The MA was destroyed upon impact with an estimated loss of government property valued at \$4.61 million. No portion of the MA wreckage was recovered.

On 25 April 2014 at 1829Z, the MA took off from Jalalabad Airfield without incident. The mishap crew (MC), which was the fourth MCE crew for the mishap flight, consisted of a Mishap Pilot (MP) and a Mishap Sensor Operator (MSO). The MC gained control of the MA from the previous MCE crew without incident. Approximately 5.3 hours after takeoff and 45 minutes after the MC assumed control of the MA, the aural warning tone alarm sounded in the ground control station. Simultaneously, the warnings for "low oil level" and "low oil pressure" appeared on the heads-down display. The engine oil level had rapidly decreased from 76 percent to 35 percent within a span of one minute and 54 seconds. MP directed MSO to turn the camera to the rear of the MA to look for oil leaks. The MC observed pieces of material and fluid emanating from the MA at a rapid pace. MP turned the MA in the direction of Jalalabad Airfield, while executing the Low Oil Pressure Checklist with the MSO. Seven minutes after the initial warning, the engine seized completely. Shortly thereafter, the MC lost satellite datalink connectivity with the MA. At the time it lost connectivity, the MA was at 14,500 feet mean sea level and descending in a glide. The satellite datalink was restored and remained intact for approximately 14 more minutes. When it was apparent that the MA would crash, the MC began to search for a non-populated area to land. Using the camera, they looked down and identified a valley. Twenty to twenty-five seconds prior to impacting the ground, the MC lost satellite connectivity with the MA and never regained it back. The MA was destroyed upon impact.

The Abbreviated Accident Investigation Board President found, by clear and convincing evidence, that the cause of the mishap was an engine oil leak. The MA sustained a complete loss of oil. The rapid rate at which the oil leaked out of the engine indicated catastrophic oil system failure, which eventually resulted in complete engine seizure. After the engine seized, the MA was unable to maintain altitude and was too far away from Jalalabad Airfield to return to base.

Under 10 U.S.C. § 2254(d) the opinion of the accident investigator as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report, if any, may not be considered as evidence in any civil or criminal proceeding arising from the accident, nor may such information be considered an admission of liability of the United States or by any person referred to in those conclusions or statements.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-1B, T/N 07-3213
JALALABAD AIRFIELD, AFGHANISTAN
26 APRIL 2014

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COMMONLY USED ACRONYMS AND ABBREVIATIONS

162 FW	162d Fighter Wing	L	Local
214 RS	214th Reconnaissance Squadron	LRE	Launch and Recovery Element
432 WG	432d Wing	Lt Col	Lieutenant Colonel
AAIB	Abbreviated Accident Investigation Board	MA	Mishap Aircraft
ACC	Air Combat Command	Maj	Major
AF	Air Force	MAJCOM	Major Command
AFB	Air Force Base	MC	Mishap Crew
AFI	Air Force Instruction	MCE	Mission Control Element
AFLCMC	Air Force Life Cycle Management Center	MM1	Mishap Maintainer 1
		MM2	Mishap Maintainer 2
AFMES	Armed Forces Medical Examiner System	MM3	Mishap Maintainer 3
		MM4	Mishap Maintainer 4
AFTO	Air Force Technical Order	MM5	Mishap Maintainer 5
AIB	Aircraft Investigation Board	MIRC	Multi-user Internet Relay Chat
ANG	Air National Guard	MP	Mishap Pilot
AOR	Area of Responsibility	MSgt	Master Sergeant
ATC	Air Traffic Control	MSL	Mean Sea Level
ATO	Air Tasking Order	MSO	Mishap Sensor Operator
AZ	Arizona	MX FAE	Maintenance Functional Area Expert
BFS	Battlespace Flight Services	NM	New Mexico
BP	Board President	nm	nautical miles
CAOC	Combined Air Operations Center	NOTAMS	Notices to Airmen
Capt	Captain	NV	Nevada
Dash One	T.O. 1Q-1(M)B-1	Ops	Operations
DoD	Department of Defense	Ops Sup	Operations Supervisor
fpm	feet per minute	Ops Tempo	Operations Tempo
GA-ASI	General Atomics Aeronautical Systems Incorporated	PHA	Preventive Health Assessment
		RPA	Remotely Piloted Aircraft
GCS	Ground Control Station	RTB	Return to Base
GDT	Ground Data Terminal	SrA	Senior Airman
HDD	Heads-Down Display	SSgt	Staff Sergeant
HUD	Heads-Up Display	TCTO	Time Compliance Technical Order
IAW	In Accordance With	T/N	Tail Number
IMDS	Integrated Maintenance Data System	T.O.	Technical Order
IPI	In-Process Inspection	US	United States
IQT	Initial Qualification Training	USAF	United States Air Force
ISR	Intelligence, Surveillance, Reconnaissance	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 23 June 2014, Lieutenant General Lori J. Robinson, Vice Commander, Air Combat Command (ACC) appointed Major Kenneth S. DeGon to conduct an abbreviated aircraft accident investigation of the 26 April 2014 mishap of an MQ-1B Predator aircraft, tail number (T/N) 07-3213, near Jalalabad, Afghanistan (Tab Y-3). The abbreviated aircraft accident investigation was conducted in accordance with (IAW) Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*, Chapter 11, at Davis-Monthan Air Force Base (AFB), Arizona (AZ), from 5 August 2014 through 27 August 2014. The following board members were also appointed: Legal Advisor (Captain) and Recorder (Senior Airman) (Tab Y-3). Maintenance Functional Area Expert (Master Sergeant) was also appointed to assist the Board (Tab Y-5).

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

On 26 April 2014 at approximately 0014 Zulu (Z), the mishap aircraft (MA), an MQ-1B remotely piloted aircraft (RPA), T/N 07-3213, assigned to the 432d Wing (432 WG) at Creech AFB, Nevada (NV), crashed during an intelligence, surveillance, and reconnaissance (ISR) mission enroute to Jalalabad Airfield, Afghanistan (Tabs Q-4 through Q-5, V-1.1, V-1.4). At the time of the mishap, the MA was being operated by a mission control element (MCE), mishap crew (MC), from the 214th Reconnaissance Squadron (214 RS) at Davis-Monthan AFB, AZ (Tab V-1.1, 2.1). The MC consisted of mishap pilot (MP) and mishap sensor operator (MSO) (Tab V-1.1, V-2.1). The MA was destroyed upon impact with a loss of government property valued at \$4.61 million (Tabs P-2, EE-3). There were neither injuries to civilians or military personnel nor damage to civilian property during the crash (Tabs V-1.4, EE-3). No portion of the MA wreckage was recovered (Tab DD-4).

3. BACKGROUND

The MQ-1B was by operated by personnel from the 214 RS, Air National Guard (ANG) located at Davis-Monthan AFB, AZ (Tab V-1.1, V-2.1). The MQ-1B belonged to the 432 WG, ACC, located at Creech AFB, NV (Tab Q-5).

a. Air Combat Command (ACC)

ACC is the primary force provider of combat airpower to America's warfighting commands (Tab CC-3). To support global implementation of national security strategy, ACC operates fighter, bomber, reconnaissance, battle-management and electronic-combat aircraft (Tab CC-3). It also provides command, control, communications and intelligence systems, and conducts global information operations (Tab CC-3). As a force provider, ACC organizes, trains, equips and maintains combat-ready forces for rapid deployment and employment while ensuring strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense (Tab CC-3). ACC numbered air forces provide the air component to United States (US) Central, Southern and Northern Commands, with Headquarters ACC serving as the air component to Joint Forces Commands (Tab CC-3). ACC also augments forces to US European, Pacific, and Strategic Command (Tab CC-3).



b. Air National Guard (ANG)

The ANG's federal mission is to maintain well-trained, well-equipped units available for prompt mobilization during war and provide assistance during national emergencies (Tab CC-7). The ANG provides almost half of the Air Force's tactical airlift support, combat communications functions, aeromedical evacuations and aerial refueling (Tab CC-7). When ANG units are not mobilized or under federal control, they report to the governor of their respective state, territory, or the commanding general of the District of Columbia National Guard (Tab CC-7). Under state law, the ANG provides protection of life, property and preserves peace, order and public safety (Tab CC-7).



c. 162d Fighter Wing (162 FW)

Since its activation in 1956, 162 FW has fulfilled a federal and state mission (Tab CC-10). The wing's federal mission is to maintain well-trained, well-equipped units available for prompt mobilization during war and provide assistance during national emergencies such as natural disasters or civil disturbances (Tab CC-10). Under state law, the wing provides protection of life, property and preserves peace, order and public safety (Tab CC-10).



d. 432d Wing (432 WG)

The 432d Wing, 432d Air Expeditionary Wing "Hunters," consists of combat-ready Airmen who fly RPAs in direct support to the joint forces warfighter (Tab CC-13). The RPA systems provide real-time reconnaissance, surveillance, and precision attack against fixed and time-critical targets (Tab CC-13). The Hunters conduct RPA initial qualification



training (IQT) for aircrew, intelligence, weather, and maintenance personnel (Tab CC-13).

e. 214th Reconnaissance Squadron (214 RS)

The 214th Reconnaissance Squadron employs the MQ-1B Predator through remote split operations from Davis-Monthan AFB, AZ (Tab CC-14). The 214th Reconnaissance Squadron is also known as “The Black Sheep” (Tab CC-14). The unit employs 188 full-time and part-time military personnel and 20 civilian personnel (Tab CC-14). The unit currently operates one 24/7/365 Predator orbit, with the capability to surge one additional orbit if tasked (Tab CC-14).



f. Battlespace Flight Services (BFS)

Battlespace Flight Services (BFS) provides a high level of organizational maintenance support for MQ-1B aircraft and systems to sustain the combat and training capability at tasked locations worldwide (Tab CC-15). Their objective is to provide qualified management and supervisory personnel at the contractor’s and customer’s facilities, and qualified organizational maintenance personnel at continental US and outside continental US locations (Tab CC-15). They also provide a level of support for their personnel to allow them to accomplish the primary objective (Tab CC-15).

g. MQ-1B Predator

The MQ-1B Predator is an armed, multi-mission, medium-altitude, long endurance RPA that is employed primarily in a killer/scout role as an intelligence collection asset and secondarily against dynamic execution targets (Tab CC-17).



Given its significant loiter time, wide-range sensors, multi-mode communications suite, and precision weapons, it provides a unique capability to autonomously execute the kill chain against high value, fleeting, and time sensitive targets (Tab CC-17). Predators can also perform the following missions and tasks: intelligence, surveillance, reconnaissance (ISR), close air support, combat search and rescue, precision strike, buddy-lase, convoy/raid overwatch, route

clearance, target development, and terminal air guidance (Tab CC-17). The MQ-1B’s capabilities make it uniquely qualified to conduct irregular warfare operations in support of combatant commander objectives (Tab CC-17).

The launch and recovery element (LRE) comprises the personnel and equipment required to prepare, inspect, service, and arm the individual aircraft for the mission as well as launch, perform system check-out, recover, and land the aircraft (Tab BB-23). An LRE is typically

forward-deployed relative to the MCE (Tab BB-23). The MCE comprises the personnel and equipment required to assume control of aircraft launched by LREs through the handover process (Tab BB-24). The MCE executes the assigned missions and returns the aircraft to LRE control for recovery (Tab BB-24). The MCE includes RPA control stations as well as the communications links to the squadron operations center (Tab BB-24).

4. SEQUENCE OF EVENTS

a. Mission

The MC was conducting an ISR mission at the time of the mishap (Tab V-1.1). The mission was authorized via the daily Air Tasking Order published by the Combined Air Operations Center under the authority of the Combined Forces Air Component Commander (Tab EE-3).

b. Planning

Mission planning was adequate and consisted of standard mission briefing procedures (Tab V-1.2). MP briefed the mission utilizing a standard mission briefing guide (Tab V-1.2, V-2.1). The brief was attended by the MC, MP and the previous shift Operations Supervisor were the supervisory personnel in attendance (Tab V-1.2). The crew briefing included a changeover brief with the previous crewmembers, a review of applicable weather forecasts, aircraft status, Operations Supervisor mission brief, and a Mission Intelligence Coordinator update (Tab V-1.1).

c. Preflight

MP's preflight consisted of reviewing the engine parameters, minimum descent altitudes, and performing an operations check of the MA (Tab V-1.2). MP also reviewed all applicable Notices to Airmen (Tab V-1.2).

d. Summary of Accident

On 25 April 2014 at 1829Z, the MA took off without incident from Jalalabad Airfield (Tab EE-3). The MC, which was the fourth MCE crew for the mishap flight, gained control of the MA from the previous MCE crew (Tab V-1.1). There were no reported issues with the MA at the time of handover (Tab V-1.3). MP was also acting as the flying Operations Supervisor for the mishap flight (Tab V-1.2). After assuming control of the flight, MP conducted an operations check of the MA (Tab V-1.2). Everything appeared normal (Tab V-1.2). The MA was at an altitude of 20,000 feet mean sea level (MSL) (Tab EE-3). Engine parameters, oil level, and oil temperature were normal (Tab EE-3).

Approximately 5.3 hours after takeoff and 45 minutes after the MC assumed control of the MA, the aural warning tone alarm sounded in the ground control station (GCS) (Tabs V-1.2, DD-4). Simultaneously, the warnings for "low oil level" and "low oil pressure" appeared on the heads-down display (Tab V-1.2). The engine oil level had rapidly decreased from 76 percent to 35 percent within a span of one minute and 54 seconds (Tab EE-3).

After hearing the alarm, MP directed MSO to turn the camera to the rear of the MA to look for oil leaks (Tab V-1.2). The MC observed pieces of material and fluid emanating from the MA at a rapid pace (Tab V-1.2). MP directed MSO to execute the Low Oil Pressure Checklist (Tab V-1.2). Then MP turned the MA in the direction of Jalalabad Airfield, while executing the Low Oil Pressure Checklist with MSO (Tab V-1.2).

Approximately five minutes after the initial warning, the MC was approved by air traffic control to return to base via direct routing (Tab EE-3). MP turned off altitude hold mode (Tab DD-6). Approximately seven minutes after the initial oil leak warning, the engine seized (Tab EE-4). The alternators stopped producing electrical power, and the MA began operating on the batteries (Tab DD-6).

Shortly thereafter, the MC lost satellite datalink (i.e.,connectivity) with the MA for approximately two minutes (Tab EE-4). At the time it lost connectivity, the MA was at 14,500 feet MSL and descending in a glide (Tabs V-2.2, DD-6). The satellite datalink was restored and remained intact for approximately 14 more minutes (Tab EE-4). Based on the MA's glide, winds, and distance from base, the MC determined it would not make it back to Jalalabad Airfield (Tab V-1.4). When it was apparent that the MA would crash, the MC began to search for a non-populated area to land; they identified a valley (Tab V-1.3, V-2.2). Twenty to twenty-five seconds prior to impact, the MC lost satellite connectivity with the MA (Tab V-1.3).

e. Impact

The MA impacted the ground at approximately 0014Z returning to Jalalabad Airfield. (Tabs Q-4, V-1.4). The aircraft configuration at the time of impact was gear retracted (Tab V-1.4). The MA was traveling at 69 knots in a 700 feet per minute descent with all autopilot hold modes off (Tab V-1.4).

f. Egress and Aircrew Flight Equipment

Not Applicable.

g. Search and Rescue

Not Applicable.

h. Recovery of Remains

Not Applicable.

5. MAINTENANCE

a. Forms Documentation

The Abbreviated Accident Investigation Board (AAIB) reviewed the MA's maintenance documentation, including the active Air Force Technical Order (AFTO) 781 series forms, AFTO

Forms 95, the Integrated Maintenance Data System (IMDS), and the mishap engine's hours and maintenance logs (Tab U-3). Mishap Maintainer (MM) 3 signed the Exceptional Release to certify the active forms were reviewed, confirming the MA was safe for flight on the day of the mishap (Tab D-117).

The AAIB reviewed the AFTO 781K forms and IMDS records for delayed discrepancies, time compliance technical orders (TCTOs), time change items, and the completion history of special inspections (Tab U-3). There were no overdue TCTOs, time change items, or special inspections that would have prevented the MA from flying on the day of the mishap (Tab U-3). Furthermore, the MA had no recurring maintenance issues (Tab U-3). The aircraft forms and records reflected various delayed discrepancies (Tab U-3). There is no evidence to suggest these discrepancies were a factor in the mishap (Tab U-3). In summary, the maintenance documentation was found to be complete and annotated IAW technical order (T.O.) 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures*, 1 April 2013 (Tab U-3).

b. Inspections

All required aircraft inspections were accomplished satisfactorily IAW T.O. 1Q-1(M)B-6WC-1 and T.O. 1Q-1(M)B-6WC-2, *Aircraft Periodic Inspections and Maintenance Requirements*, Change 3, 25 March 2013 (Tab U-3). The AFTO 781H confirmed the correct flight preparedness inspection was performed on the MA by MM4 on 24 April 2014 IAW (T.O.) 1Q-1(M)B-6WC-1, *Preflight, Thruflight, Basic Postflight, Combined Basic Postflight/Preflight Inspection Requirements*, Change 2, 25 March 2013 (Tabs D-117, U-3). The inspection included a visual examination of the MA's servicing components and systems to ensure there were no defects or malfunctions hazardous to flight (Tab U-3). No relevant discrepancies were discovered during the preflight inspection (Tab U-3). The inspection was completed IAW T.O. 1Q-1(M) B-6WC-1 and T.O. 1Q-1(M) B-6WC-2 (Tab U-3).

The MA engine had accrued 8361 hours prior to takeoff (Tab D-2).

c. Maintenance Procedures

On 24 April 2014, MM1 and MM2, BFS Department of Defense (DoD) contractors, accomplished a 60-hour engine inspection on the MA (Tabs D-37, V-3.1, V-4.1). A 60-hour engine inspection involves a visual inspection of the engine for oil or coolant leakage (Tab BB-14). The engine's fuel lines, oil lines, and coolant hoses are also inspected for damage, security, chafing, proper routing, and leaks (Tab BB-14). All engine oil lines were inspected and found to be normal (Tab V-3.1). MM2 observed MM1 while he accomplished the inspection tasks (Tab V-4.1). MM1 did not notice anything that would have led him to believe further maintenance was required on the engine (Tab V-4.1). The inspection was completed without incident (Tab V-3.1).

When the oil filter is installed, a maintenance-supervised "In-Process Inspection" (IPI) must be accomplished (Tab V-4.1). This inspection entails a maintenance supervisor visually observing the oil filter being lubricated correctly, then signing the aircraft maintenance forms to indicate that the maintenance had been performed properly (Tab V-4.1). T.O. 1Q-1(M)B-2-72JG-50-1,

Engine, Reciprocating, Cooling and Lubrication, MQ-1B Remotely Piloted Aircraft, 8 June 2010 states:

“Failure to lubricate oil filter seal prior to installation may result in insufficient tightening of oil filter. Insufficient tightening may result in a loss of oil pressure” (Tab BB-12).

MM1 lubricated and torqued the oil filter in compliance with the IPI inspection requirements (Tab V-3.1). MM2 observed MM1 accomplish these actions (Tab V-4.1). Furthermore, the engine ground run prior to the mishap flight indicated the engine was functioning normally prior to the mishap flight (Tab V-4.1).

d. Maintenance Personnel and Supervision

All maintenance was performed by BFS DoD contractors (Tab U-3). A review of the training records of the personnel who performed maintenance on the MA prior to flight indicated they were all trained, experienced, and qualified to accomplish the maintenance or inspections they performed (Tab U-4). MM3, the Maintenance Superintendent for BFS, accomplished the Exceptional Release for the mishap flight (Tab V-5.1). MM3 verified the completeness of the work performed by maintenance personnel by visually inspecting the MA and reviewing all the aircraft forms prior to flight (Tab V-5.1). Everything appeared to be in order (Tab V-5.1).

e. Fuel, Hydraulic and Oil Inspection Analyses

Fluid analysis was not conducted for the MA post-mishap (Tab U-4).

f. Unscheduled Maintenance

No relevant unscheduled maintenance was performed on the MA prior to the mishap (Tab U-4).

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS.

a. Structures and Systems

No portion of the wreckage was recovered (Tab DD-4).

b. Evaluation and Analysis

(1) Engine

The MA's engine was manufactured by Rotax (Tab D-130). The MQ-1B engine oil system uses a dry sump, forced lubrication system to provide oil to all internal engine components (Tab BB-4). The oil system houses a 9-quart oil reservoir for the engine (Tab BB-4). The main oil pump draws engine oil from the oil reservoir, pressurizes the oil, and sends it through a line to the oil cooler (Tab BB-4). The oil is forced through the cooler and sent back down to the oil filter mounted to the side of the oil pump assembly (Tab BB-4). Pressurized oil is forced through the oil filter, through the oil pump assembly and distributed to the engine (Tab BB-4). In addition,

oil from the filter is fed through a separate line from the main pump assembly to the shaft bearings of the turbocharger (Tab BB-4 through BB-5). (See Figures 1 and 2).

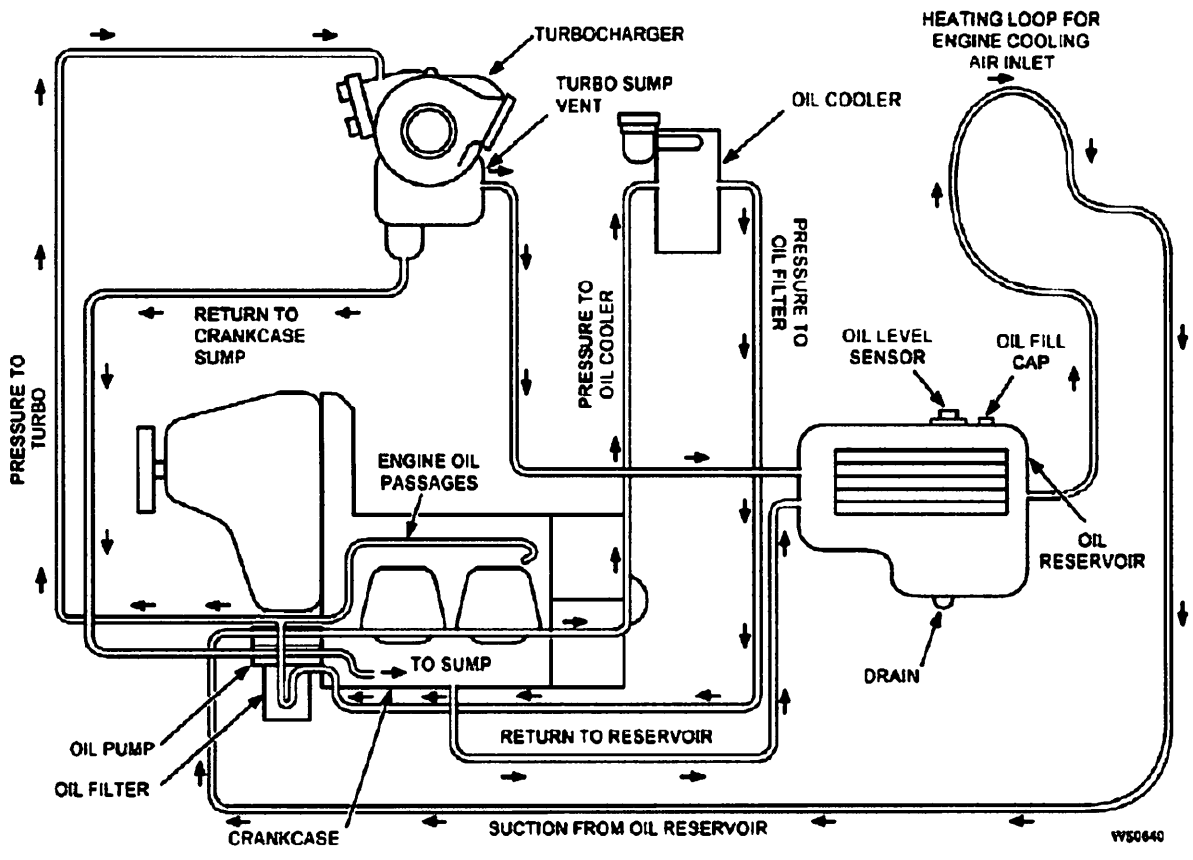


Figure 1. (Tab BB-6)

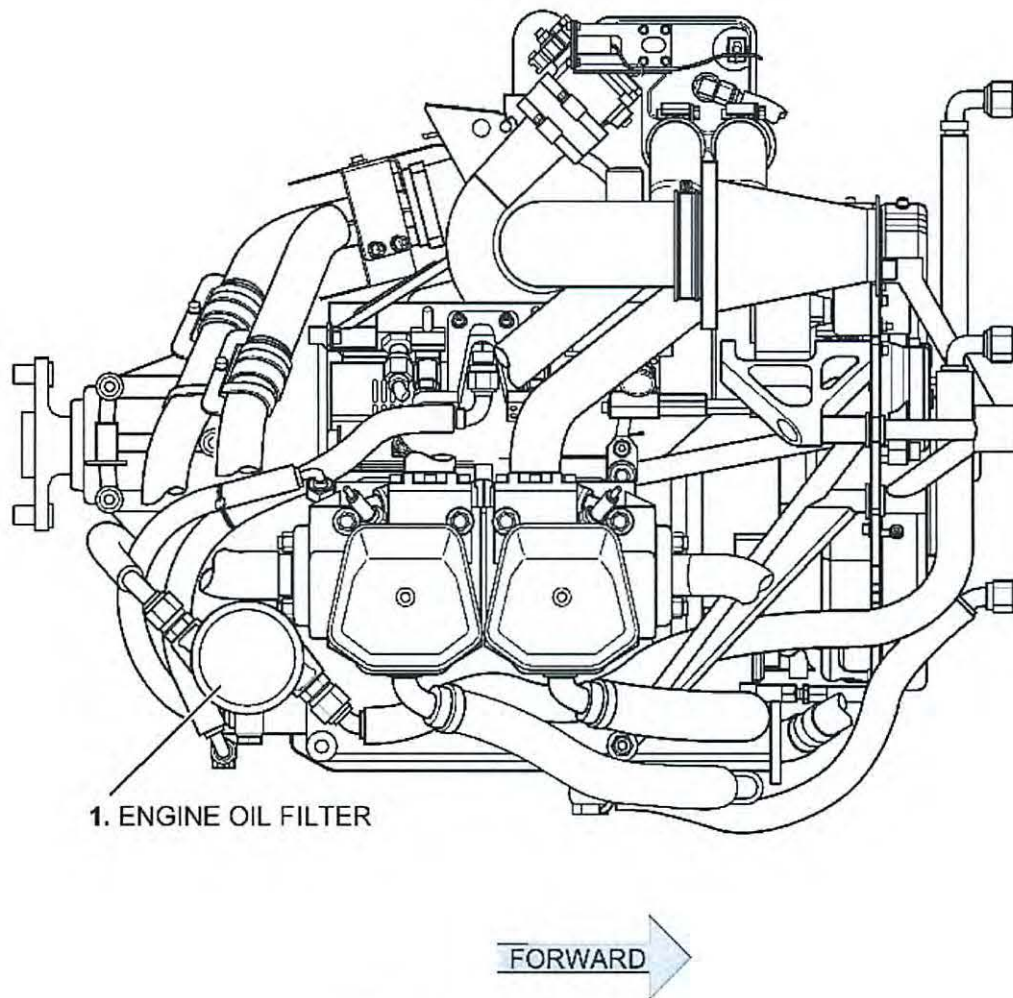


Figure 2. (Tab BB-10)

Engineers from General Atomics Aeronautical System Incorporated (GA-ASI) analyzed the data loggers for the mishap flight (Tab DD-12 through DD-15). They concluded it was unlikely that a mechanical failure such as a broken piston rod or a ruptured cylinder wall caused the engine failure (Tab DD-13). Additionally, GA-ASI analysts indicated the leak could have been the result of an incorrectly installed oil filter that loosened from vibration during flight (Tab DD-15). As discussed earlier, all maintenance actions were completed IAW the technical guidance (Tab V-3.1, V-4.1).

GA-ASI analysts indicated a partial failure of an oil hose or hose connection was unlikely because the leak rate was not consistent with a ruptured hose (Tab DD-15). Furthermore, they determined that oil hose chafing could have been the potential cause of the oil leak (Tab DD-15). The oil hoses were inspected during the 60-hour inspection for chafing and none was found (Tab V-3.1). The hoses were also wrapped in tape to prevent hose chafing (Tab V-3.1).

(2) Ground Control Station

Technicians at the Air Force Life Cycle Management Center, Detachment 3, tested the GCS utilized by the MC on the mishap date (Tab J-3 through J-4). Analysis determined the GCS was operating normally at the time of the mishap (Tab J-4).

7. WEATHER

a. Forecast Weather

The forecasted weather for the area in which the MA was operating at the time of the mishap was clear skies, no precipitation, and clear visibility (Tab V-1.4).

b. Observed Weather

The observed weather was clear skies (Tab V-1.4). During the descent, the crew noticed scattered clouds (Tab V-1.4). There were no in-flight weather reports passed from or received by the MC (Tab V-1.4). The post-mishap weather was clear skies with clear visibility (Tab V-1.4).

c. Space Environment

Not Applicable.

d. Operations

Not Applicable.

8. CREW QUALIFICATIONS

a. Mishap Pilot

MP is a former US Army rotary and fixed-wing pilot (Tab V-1.1). MP had been previously qualified on various aircraft types including Apache helicopters and other fixed-wing aircraft (Tab V-1.1). He accumulated 3,039.9 hours of non-MQ-1B military flight time (Tab G-3). MP completed MQ-1B IQT at the 163rd Reconnaissance Wing on 28 June 2012 (Tab G-16). MP was certified as an "Experienced" MQ-1B pilot and had 599.9 total MQ-1B hours at the time of the mishap (Tab G-2 through G-3).

MP's recent flight time is as follows (Tab G-4):

	Hours	Sorties
Last 30 Days	6.8	3
Last 60 Days	18.8	7
Last 90 Days	34.8	11

b. Mishap Sensor Operator

MSO completed MQ-1B IQT at the 11th Reconnaissance Squadron Formal Training Unit on 27 October 2010 (Tab G-21). MSO was certified as an “Experienced” MQ-1B sensor operator and had 794.8 total MQ-1B hours at the time of the mishap (Tab G-8 through G-9).

MSO’s recent flight time is as follows (Tab G-10):

	Hours	Sorties
Last 30 Days	0.8	1
Last 60 Days	0.8	1
Last 90 Days	24.0	8

9. MEDICAL

a. Qualifications

At the time of the mishap, the MC was medically qualified for flying duties (Tab X-4).

b. Health

The MC’s medical records and toxicology results were reviewed (Tab X-3). Both members had current preventive health assessments (Tab X-3). No current medical issues were noted in either members’ medical records (Tab X-3).

c. Toxicology

The blood and urine samples for MC, MM1, MM2, and MM3 were sent to the Armed Forces Medical Examiner System at Dover AFB, Delaware for testing (Tab X-3). Specifically, their blood was tested to determine the blood ethanol level; their urine was tested for amphetamine, barbiturates, benzodiazepines, cannabinoids, cocaine, opiates, and phencyclidine using gas chromatography or immunoassay (Tab X-3). All tests returned negative (Tab X-3).

d. Lifestyle

No lifestyle factors were found to be relevant to the mishap.

e. Crew Rest and Crew Duty Time

IAW AFI 11-202 Volume 3, *General Flight Rules*, 22 October 2010, ACC Supplement, 28 November 2012, prior to performing in-flight duties, Air Force crewmembers must have proper crew rest (AFI 11-202, paragraph 9.8). Normal crew rest is defined as a minimum 12-hour non-duty day period before the designated flight duty period begins, during which time an aircrew member may participate in meals, transportation, and rest, as long as he or she has the opportunity for at least eight hours of uninterrupted sleep (AFI 11-202, paragraphs 9.4.5 and 9.8). The purpose of crew rest is to ensure crewmembers are adequately rested before

performing flight or flight-related duties (AFI 11-202, paragraph 9.4.5). Both MP and MSO had adequate crew rest prior to the mishap (Tab V-1.1, V-2.1).

10. OPERATIONS AND SUPERVISION

a. Operations

The operations tempo was moderate on the day of the mishap (Tab V-1.1, V-2.1). The MC and maintainers that operated the MA were experienced (Tabs G-2, G-8, U-4).

b. Supervision

On 25 April 2014, MP arrived prior to his scheduled flight start time to go through normal pre-mission briefings (Tab V-1.1). MP was acting as both the Operations Supervisor and the pilot for the mishap flight (Tab V-1.1). MP received a shift changeover brief about the status of the mission from the previous Operations Supervisor (Tab V-1.1).

11. HUMAN FACTORS

Not Applicable.

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

- (1) AFI 11-202 Volume 3, *General Flight Rules*, 22 October 2010, ACC Supplement, 28 November 2012
- (2) Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*, 26 May 2010

NOTICE: All directives and publications listed above are available digitally on the AF Departmental Publishing Office internet site at: <http://www.e-publishing.af.mil>.

b. Other Directives and Publications Relevant to the Mishap

- (1) *Air Force Tactics, Techniques, and Procedures* 3-3.MQ-9, 14 December 2012
- (2) T.O. 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures*, 1 April 2013
- (3) T.O. 1Q-1(M)B-2-72JG-50-1, *Engine, Reciprocating, Cooling and Lubrication, MQ-1B Remotely Piloted Aircraft*, 8 June 2010
- (4) T.O. 1Q-1(M)B-6WC-1, *Preflight, Thruflight, Basic Postflight, Combined Basic Postflight/Preflight Inspection Requirements*, Change 2, 25 March 2013
- (5) T.O. 1Q-1(M)B-6WC-2, *Aircraft Periodic Inspections and Maintenance Requirements*, Change 3, 25 March 2013


c. Known or Suspected Deviations from Directives or Publications

Not Applicable.

13. ADDITIONAL AREAS OF CONCERN

Not Applicable.

25 AUGUST 2014


KENNETH S. DEGON, Maj, USAF
President, Abbreviated Accident Investigation Board

STATEMENT OF OPINION

MQ-1B, T/N 07-3213 JALALABAD AIRFIELD, AFGHANISTAN 26 APRIL 2014

Under 10 U.S.C. § 2254(d) the opinion of the accident investigator as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report, if any, may not be considered as evidence in any civil or criminal proceeding arising from the accident, nor may such information be considered an admission of liability of the United States or by any person referred to in those conclusions or statements.

1. OPINION SUMMARY

On 26 April 2014 at approximately 0014 Zulu (Z), the mishap aircraft (MA), an MQ-1B remotely piloted aircraft, tail number 07-3213, assigned to the 432d Wing at Creech Air Force Base (AFB), Nevada (NV), crashed during an intelligence, surveillance, and reconnaissance mission returning to Jalalabad Airfield, Afghanistan. At the time of the mishap, the MA was being operated by a mission control element (MCE) crew from the 214th Reconnaissance Squadron at Davis-Monthan AFB, Arizona. The MA was destroyed upon impact with the ground with a loss of government property valued at \$4.61 million. There were neither injuries to civilians or military personnel nor damage to civilian property during the crash. No portion of the MA wreckage was recovered.

I found by clear and convincing evidence, that the cause of the mishap was an engine oil leak. The MA sustained a complete loss of oil. The rapid rate at which the oil leaked out of the engine indicated catastrophic oil system failure, which eventually resulted in complete engine seizure. After the engine seized, the MA was unable to maintain altitude and was too far away from Jalalabad Airfield to return to base. I developed my opinion by analyzing factual data from Air Force directives and guidance, engineering analyses, witness testimony, flight data, and information provided by technical experts.

2. BACKGROUND

On 25 April 2014 at 1829Z, the MA took off from Jalalabad Airfield without incident. The mishap crew (MC), which was the fourth MCE crew for the mishap flight, consisted of a Mishap Pilot (MP) and a Mishap Sensor Operator (MSO). The MC gained control of the MA from the previous MCE crew without incident. Approximately 5.3 hours after takeoff and 45 minutes after the MC assumed control of the MA, the aural warning tone alarm sounded in the ground control station. Simultaneously, the warnings for "low oil level" and "low oil pressure" appeared on the heads-down display. The engine oil level had rapidly decreased from 76 percent to 35 percent within a span of one minute and 54 seconds. MP directed MSO to turn the camera to the rear of the MA to look for oil leaks. The MC observed pieces of material and fluid emanating from the MA at a rapid pace. MP turned the MA in the direction of Jalalabad Airfield, while executing the Low Oil Pressure Checklist with the MSO. Seven minutes after the initial warning, the engine seized completely. Shortly thereafter, the MC lost satellite datalink

connectivity with the MA. At the time it lost connectivity, the MA was at 14,500 feet mean sea level and descending in a glide. The satellite datalink was restored and remained intact for approximately 14 more minutes. When it was imminent that the MA would crash, the MC began to search for a non-populated area to land: using the camera, they looked down and identified a valley. Twenty to twenty-five seconds prior to impacting the ground, the MC lost satellite connectivity with the MA and never regained it back. The MA was destroyed upon impact.

3. CAUSE

Analysts from General Atomics – Aeronautical Systems Incorporated (GA-ASI) - analyzed the data loggers for the mishap flight. They concluded that it was unlikely that a mechanical failure such as a broken piston rod or a ruptured cylinder wall caused the engine failure. GA-ASI analysts indicated the leak could have been the result of an incorrectly installed oil filter that loosened from vibration during flight. In accordance with technical guidance, a maintenance supervised “In-Process Inspection” (IPI) is required when the oil filter is installed. This inspection entails a maintenance supervisor visually observing the oil filter being lubricated correctly, then signing the aircraft maintenance forms to indicate that the maintenance had been performed properly. Maintenance technical orders caution:

“Failure to lubricate oil filter seal prior to installation may result in insufficient tightening of oil filter. Insufficient tightening may result in a loss of oil pressure.”

The maintenance records for the MA showed all prescribed maintenance actions were performed correctly for the 60-hour engine inspection. Maintenance personnel training records indicated the maintenance personnel who performed the 60-hour engine inspection were trained, experienced, and qualified to perform the inspection. The maintainers who performed the oil filter installation and IPI performed their tasks in compliance with the technical guidance. Specifically, the oil filter was lubricated and installed correctly. The engine ground run confirmed the engine was functioning properly prior to the mishap flight. Although the GA report stated the oil leak could have been from an incorrectly installed oil filter, based on witness testimony it is unlikely given that maintainers appeared to properly perform and oversee the oil filter installation.


Analysts indicated that a partial failure of an oil hose or hose connection was unlikely because the leak rate was not consistent with a ruptured hose. They concluded oil hose chafing could have been the potential cause of the oil leak. During the 60-hour engine inspection, maintenance personnel inspected the oil hoses for chafing and none was found. The hoses were wrapped in tape prior to the inspection to prevent hose chafing. An oil hose or oil hose connection failure remains a possibility, though it could not be confirmed given the absence of physical evidence.

In sum, an incorrectly installed oil filter or hose chafing are the most probable causes of the oil leak. As regards to the possibility of an incorrectly installed oil filter, this appeared unlikely given that maintainers appeared to properly perform and oversee the oil filter installation. As regards to the possibility of hose chafing, this remains a possibility, though it could not be confirmed given the absence of physical evidence. For these reasons, I was unable to determine a substantially contributing factor.

4. CONCLUSION

I found by clear and convincing evidence, that the cause of the mishap was an engine oil leak. The MA sustained a complete loss of oil. The rapid rate at which the oil leaked out of the engine indicated catastrophic oil system failure, which eventually resulted in complete engine seizure. After the engine seized, the MA was unable to maintain altitude and was too far away from Jalalabad Airfield to return to base.

25 AUGUST 2014



KENNETH S. DEGON, Maj, USAF
President, Abbreviated Accident Investigation Board

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