UNITED STATES AIR FORCE ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

MQ-1B, T/N 07-3195

432D WING
CREECH AIR FORCE BASE, NEVADA

62D EXPEDITIONARY RECONNAISSANCE SQUADRON
451ST AIR EXPEDITIONARY WING
JALALABAD AIR BASE, AFGHANISTAN

LOCATION: JALALABAD, AFGHANISTAN

DATE OF ACCIDENT: 27 JUNE 2013

BOARD PRESIDENT: LIEUTENANT COLONEL JAMES A. ANDERSON

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

EXECUTIVE SUMMARY
ABBREVIATED AIRCRAFT ACCIDENT INVESTIGATION

MQ-1B, T/N 07-3195
JALALABAD, AFGHANISTAN
27 JUNE 2013

On 27 June 2013, at approximately 0905 Zulu (Z), 1335 local time (L), an MQ-1B, tail number (T/N) 07-3195, assigned to the 432d Wing (432 WG), Creech Air Force Base (AFB), Nevada (NV), impacted the ground at approximately 800 feet (ft.) past the departure end of the runway, Jalalabad Air Base (AB), Afghanistan. The mishap occurred after the mishap remotely piloted aircraft (MRPA) aborted its initial landing attempt (also known as a go-around). The MRPA was forward deployed from the 432 WG. At the time of the mishap, the MRPA was operated by a Launch and Recovery Element (LRE) from the 62d Expeditionary Reconnaissance Squadron, Jalalabad, Afghanistan, hereinafter referred to as the Mishap Crew (MC). The MRPA and one air-to-ground Hellfire missile (AGM-114) were destroyed upon impact with the loss valued at $4,511,499.00. There were no injuries or damage to other government or civilian property.

On 27 June 2013, at 0118Z, after normal preflight checks, the MRPA taxied and departed Jalalabad AB, Afghanistan. One LRE and one Mission Control Element (MCE) crew cycled through without incident prior to handing over the MRPA to the second MCE Crew (MCEC). The MCEC flew the MRPA uneventfully until 0824Z, when the MRPA experienced a turbocharger failure. The MCEC diagnosed the failure, ran the appropriate checklists and initiated a return to base (RTB). The MCEC notified the MC of the RTB. The MC briefed for the RTB and prepared to take control of the MRPA. Between 0845Z and 0901Z, the MCEC relinquished control of the MRPA to the MC. The MC returned the MRPA to the landing airfield, running all appropriate recovery checklists. At 0901Z, the MRPA was on a three-mile final approach for landing, correctly configured for approach. Between 0901Z and 0905Z, the Air Traffic Control Tower (Tower) repeatedly reported winds within technical order (TO) limits with variable headings and gusts. However, as the MRPA passed the location of the runway threshold, there was a very strong wind gust, which resulted in an unsafe landing condition. The MC immediately executed a go-around due to the unsafe landing condition. The MC attempted to maneuver the MRPA safely but was unable to sustain flight. At 0905Z, the MRPA impacted the ground approximately 800 ft. past the departure end of the runway, Jalalabad AB.

The Abbreviated Accident Investigation Board (AAIB) President developed his opinion by analyzing factual data from historical records, Air Force directives and guidance, engineering analysis, witness testimony, flight data and information provided by technical experts. By clear and convincing evidence, he found a combination of a turbocharger failure and a strong wind gust caused the mishap to occur. The turbocharger failed due to internal oil coking (burnt and hardened oil residue). Further, he found by the preponderance of evidence that insufficient technical guidance, an acceptance of operational weight waiver, and the MC's decision to go-around were substantially contributing factors to the mishap.

SUMMARY OF FACTS AND STATEMENT OF OPINION
MQ-1B, T/N 07-3195
27 JUNE 2013

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

-1	MQ-1B Predator Flight Manual
-1-1	MQ-1B Predator Flight Manual Appendix A Performance Data
1st Lt	First Lieutenant
3 SOS	3d Special Operations Squadron
11 RS	11th Reconnaissance Squadron
12 AF	Twelfth Air Force
20 RS	20th Reconnaissance Squadron
62 RS	62d Reconnaissance Squadron
432 AMXS	432d Aircraft Maintenance Squadron
432 WG	432d Wing
451 AEW	451st Air Expeditionary Wing
AAIB	Abbreviated Accident Investigation Board
AB	Air Base
ACC	Air Combat Command
AF	Air Force
AFB	Air Force Base
AFCENT	Air Forces Central
AFE	Aircrew Flight Equipment
AFI	Air Force Instruction
AFL	Above Field Level
AFSOC	Air Force Special Operations Command
AFTO	Air Force Technical Order
AGM	Air-to-Ground Missile
AOR	Area of Responsibility
ATC	Air Traffic Control
BFS	Battlespace Flight Services
C	Degrees Celsius
Capt	Captain
CMR	Crew Mission Ready
Det	Detachment
EP	Emergency Procedure
ERS	Expeditionary Reconnaissance Squadron
F	Degrees Fahrenheit
FCIF	Flight Crew Information File
FOB	Forward Operating Base
FOD	Foreign Object Debris
fpm	Feet Per Minute
ft.	Feet
FTU	Formal Training Unit
GA-ASI	General Atomics-Aeronautical Systems, Incorporated
GCS	Ground Control System
Hp	Horsepower
HUD	Heads-Up Display
IAW	In Accordance With
in. Hg.	Inches Mercury
ISR	Intelligence, Surveillance and Reconnaissance
JG	Job Guide
KIAS	Knots Indicated Airspeed
kts	Knots
L	Local Time
lb	Pound
LLC	Limited Liability Company
Lt Col	Lieutenant Colonel
LOS	Line of Sight
LR	Launch and Recovery
LRE	Launch and Recovery Element
Maj	Major
MAJCOM	Major Command
MC	Mishap Crew
MCE	Mission Control Element
MCEC	Mission Control Element Crew
MCT	Manifold Charge Temperature
METAR	Meteorological Aerodrome Report
MIC	Mission Intelligence Coordinator
mIRC	Microsoft Internet Relay Chat
MMP	Mishap Mission Pilot
MMSO	Mishap Mission Sensor Operator
MP	Mishap Pilot
MQT	Mission Qualification Training
MRPA	Mishap Remotely Piloted Aircraft
MSgt	Master Sergeant
MSL	Mean Sea Level
MSO	Mishap Sensor Operator
MXG	Maintenance Group
MXP	Maintenance Personnel
NV	Nevada
NOTAMs	Notices to Airmen
OJT	On-the-Job Training
Ops Sup	Operations Supervisor
Ops Tempo	Operations Tempo
ORM	Operational Risk Management
PPSL	Predator Primary Satellite Link
QA	Quality Assurance
RAPCON	Radar Approach Control
RPA	Remotely Piloted Aircraft
rpm	Revolutions Per Minute
RTB	Return to Base
SFO	Simulated Flame Out
SIB	Safety Investigation Board
Sims	Simulators
SME	Subject Matter Expert
SO	Sensor Operator
SSgt	Staff Sergeant
T/N	Tail Number
TCTO	Time Compliance Technical Order
TO	Technical Order
TOLD	Take Off and Landing Data
Tower	Air Traffic Control Tower
TSgt	Technical Sergeant
U.S.	United States
U.S.C.	United States Code
VIT	Variable Information Table

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 22 August 2013, Lieutenant General Lori J. Robinson, Vice Commander, Air Combat Command (ACC), appointed Lieutenant Colonel James A. Anderson to conduct an abbreviated aircraft accident investigation of the 27 June 2013 mishap of an MQ-1B aircraft, tail number (T/N) 07-3195, 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 Nellis Air Force Base (AFB), Nevada (NV), from 17 September through 28 October 2013. A legal advisor and recorder were also appointed as members of the board (Tab Y-3).

b. Purpose

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

2. ACCIDENT SUMMARY

On 27 June 2013, at approximately 0905 Zulu (Z), 1335 local time (L), an MQ-1B, T/N 07-3195, assigned to the 432d Wing (WG), Creech AFB, NV, impacted the ground at approximately 800 feet (ft.) past the departure end of the runway Jalalabad Air Base (AB), Afghanistan (Tabs Q-5). The mishap occurred after the mishap remotely piloted aircraft (MRPA) aborted its initial landing attempt (also known as a go-around) (Tab V-9.3, V-9.4). The MRPA was forward deployed from the 432 WG (Tab Q-5). At the time of the mishap, the MRPA was operated by a Launch and Recovery Element (LRE) crew, the mishap crew (MC), from the 62d Expeditionary Reconnaissance Squadron (62 ERS), Jalalabad, Afghanistan (Tab K-2, Q-5). The MRPA and one air-to-ground Hellfire missile (AGM-114) were destroyed upon impact with the loss valued at $4,511,499.00 (Tab P-4). There were no injuries or damage to other government or civilian property (Tab P-2, P-3).

3. BACKGROUND

The MRPA was an asset of the 432 WG (Tab Q-5, Q-6). The 432 WG falls under the major command (MAJCOM), Air Combat Command (ACC), and the numbered Air Force, Twelfth Air Force (12 AF) (Tab Q-5). At the time of the mishap, the MRPA was forward deployed to Afghanistan where it was operated by the 62 ERS, Detachment 1 (Det 1) and maintained by Battlespace Flight Services (BFS), Limited Liability Company (LLC) (Tabs K-2, Q-5). The 62 ERS, Det 1, is a unit within the 451st Air Expeditionary Wing (451 AEW) (Tabs K-2, Q-5). The 451 AEW is operationally assigned to United States (U.S.) Air Forces Central (AFCENT)

Command (Tab CC-10.3). At the time of the mishap, the MC was operating at a Forward Operating Base (FOB) in Afghanistan that controlled the MRPA (Tabs K-2, Q-5). The Mishap Pilot's (MP) home unit is the 20th Reconnaissance Squadron (20 RS), 432 WG (Tab V-9.1). The Mishap Sensor Operator's (MSO) home unit is the 3d Special Operations Squadron, 27th Special Operations Wing, Cannon AFB, New Mexico, which falls under the MAJCOM Air Force Special Operations Command (AFSOC) (Tabs V-8.1, CC-6.1).

a. Mishap Crew Pilot's Chain of Command

(1) Air Combat Command (ACC)

ACC is the primary force provider of airpower to America's warfighting commands (Tab CC-1.3). To support global implementation of national security strategy, ACC operates fighter, bomber, reconnaissance, battle-management and electronic-combat aircraft (Tab CC-1.3). It also provides command, control, communications and intelligence systems and conducts global information operations (Tab CC-1.3).

(2) Twelfth Air Force (12 AF)

12 AF is responsible for the combat readiness of 10 active-duty wings and one direct reporting unit (Tab CC-2.1). The subordinate commands operate more than 818 aircraft with more than 65,000 uniformed and civilian Airmen (Tab CC-2.1). The command is also responsible for the operational readiness of 12 AF-gained wings and other units of the Air Force Reserve and Air National Guard (Tab CC-2.1).

(3) 432d Wing (432 WG)

The 432 WG "Hunters" consists of combat-ready Airmen who fly RPAs in direct support of the joint warfighter (Tab CC-3.1). The Hunters conduct RPA training for aircrew, intelligence, weather and maintenance personnel (Tab CC-3.1).

(4) 20th Reconnaissance Squadron (20 RS)

The 20 RS provides combatant commanders with persistent intelligence, surveillance and reconnaissance (ISR) and full motion video for real-time actionable intelligence and precision weapons employment in combat operations (Tab CC-4.2).

b. Mishap Crew Sensor Operator's Chain of Command

(1) Air Force Special Operations Command (AFSOC)

AFSOC provides Air Force special operations forces with worldwide deployment and assignment to regional unified commands (CC-5.1). The command's core missions include battlefield air operations; agile combat support; aviation foreign internal defense;

information operations; precision aerospace fires; psychological operations; specialized air mobility; specialized refueling; and ISR (Tab CC-5.1).

(2) 27th Special Operations Wing (27 SOW)

The 27 SOW deploys personnel and aircraft globally in operations associated with the War on Terror (Tab CC-6.2). It maintains rapid deployment capabilities and supports unified commanders worldwide (Tab CC-6.2).

(3) 3d Special Operations Squadron (3 SOS)

The 3 SOS provides remotely piloted aircraft support to special operations forces (Tab CC-7.3).

c. Mishap Crew Unit Chain of Command

(1) United States Air Forces Central (USAFCENT)

USAFCENT is the air component of United States Central Command, a regional unified command (Tab CC-8.1). USAFCENT is responsible for air operations either unilaterally or in concert with coalition partners and developing contingency plans in support of national objectives for United States Central Command's 20-nation area of responsibility (AOR) in Southwest Asia (Tab CC-8.1). Additionally, USAFCENT manages an extensive supply and equipment prepositioning program at several AOR sites (Tab CC-8.1).

(2) 451st Air Expeditionary Wing (451 AEW)

The 451 AEW provides a persistent and powerful airpower presence in the Afghanistan AOR (Tab CC-8.3). 451 AEW Airmen provide world-class Tactical Airlift, Close Air Support, ISR, Command and Control, Airborne Datalink, Casualty Evacuation and Aeromedical Evacuation capabilities whenever and wherever needed (Tab CC-8.3). The wing also operates the MQ-1B Predator, EC-130H Compass Call, EC-130J Commando Solo, MC-12 and MQ-9 Reaper (Tab CC-8.3).

(3) 62d Expeditionary Reconnaissance Squadron (62 ERS)

The 62 ERS is a provisional U.S. Air Force unit (Tab CC-9.1). The primary mission of the 62 ERS is to launch and recover Air Force RPAs in the AFCENT AOR (Tab CC-9.2).

d. Battlespace Flight Services (BFS)

BFS provides organizational maintenance support for MQ-1B aircraft and systems to sustain the combat and training capability at tasked locations worldwide (Tab CC-10.1). The primary objective of BFS is to provide qualified management and supervisory personnel at continental U.S. and outside continental U.S. locations and a level of support for their personnel that allow them to accomplish their objective (Tab CC-10.1). Support includes aircraft maintenance, supply support, command, control, communications, computer, ISR systems, quality assurance, as well as an environmental, safety and health program (Tab CC-10.1).

e. MQ-1B – Predator

The MQ-1B Predator aircraft is a medium-altitude, long endurance RPA (Tab CC-11.1). Its primary mission is interdiction and conducting armed reconnaissance against critical perishable targets (Tab CC-11.1). The MQ-1B Predator is a fully operational system, consisting of an aircraft (with sensors), a Ground Control Station (GCS), a Predator Primary Satellite Link (PPSL) and operations and maintenance personnel for deployed 24-hour operations (Tab CC-11.1). The basic crew for the MQ-1B Predator is one pilot and one sensor operator (SO) (Tab CC-11.1). 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 (Tab CC-11.1). The MQ-1B has an ARC-210 radio, APX-100 Identify Friend or Foe/Selective Identification Feature with Mode 4 and an upgraded turbocharged engine (Tab CC-11.2). The MQ-1B Predator also carries the Multispectral Targeting System, which integrates electro-optical, infrared, a laser designator and a laser illuminator into a single sensor package (Tab CC-11.1). Due to the long duration of RPA missions, it is common for multiple crews to fly the RPAs in shifts (Tab V-4.1, V-5.1). There are two different types of crews flying the RPAs (Tab V-3.2). An LRE crew is responsible for all takeoffs and landings of the RPA, while the Mission Control Element (MCE) crew is responsible for all mid-mission operations (Tab V-3.2).

4. SEQUENCE OF EVENTS

a. Mission

On 27 June 2013, the MRPA was performing a classified ISR tasking out of Jalalabad, Afghanistan (Tabs V-4.1). The mission was authorized by USAFCENT through the daily Air Tasking Order (Tab V-9.1). The MRPA launched at a ramp weight of 2,538.1 pounds (lbs) in accordance with a USAFCENT operational waiver (Tabs D-5, BB-1.3). One LRE and one MCE crew cycled through without incident prior to handing over the MRPA to the second Mission Control Element Crew (MCEC) and subsequently the second LRE, the MC (Tabs DD-1.4, K-4).

b. Planning

The MCEC consisted of a Mission Mishap Pilot (MMP) and a Mission Mishap Sensor Operator (MMSO) (Tab V-4.1, V-5.1). MMP and MMSO mission planning included a mass briefing for all crews flying that day, followed by a briefing from the mission intelligence coordinator (MIC), and finally, a crew briefing from the previous MCE crew (Tab V-4.1, V-5.1). These briefings included factual data of the current mission, intelligence reports and weather (Tab V-4.1).

The LRE crew consisted of the MP and the MSO (Tab V-8.1, V-9.2). Both crewmembers signed in, completed their operational risk management (ORM) matrix and attended a mass shift briefing (Tab V-8.1, V-9.2). This briefing covered the launch and recoveries for the day, aircraft, maintenance and weather (Tab V-9.2). The briefing was conducted according to standard squadron briefings and was adequate for the mission (Tab V-9.2). The MP was the Operations Supervisor (Ops Sup) during this time (Tab V-9.1).

While the MRPA was conducting its mission, an update to the weather forecast, specifically stating gusty winds, compelled the MP, as the Ops Sup, to recall all but four of the RPAs flying at that time (Tab V-9.1). The MRPA was one of the four RPAs designated to continue flying its mission due to their scheduled landing times, which would have been after the winds subsided (Tab V-9.1).

c. Preflight

Notices to Airmen (NOTAMs) did not show anything that directly or indirectly affected the accident (Tab K-3). After learning of the MRPA's turbocharger failure, the MC conducted a pre-brief, discussed expectations, and performed wind calculations due to the impending out-of-limit wind situation (Tab V-8.1, V-8.2). There is no evidence to suggest preflight procedures were factors in this mishap (Tab V-8.1, V-9.2).

d. Summary of Accident

On 27 June 2013, the MRPA took off at approximately 0118Z (Tab DD-1.4). The mission proceeded as planned until approximately 0824Z (7.1 hours into the mission) (Tab DD-1.4).

At approximately 0830Z, during an operations check the MMP looked at his instruments, to include the heads-up display (HUD), and noticed indications of a possible turbocharger failure, including a decrease in altitude and low manifold air pressure (airflow into the engine) compared to the engine's revolutions per minute (Tab V-4.1, V-5.1). The MCEC completed the appropriate checklist (Tab V-4.1, V-4.2). The MMP notified the Air Traffic Control Tower (Tower) that the MRPA was unable to maintain programmed altitude, and the MCEC initiated RTB (Tab V-4.1, V-5.1).

Between 0845Z and 0901Z, the MMP relinquished control of the MRPA to the MC (Tab V-4.2, V-5.1, V-5.2, V-8.2, V-9.2). The MC initiated the MRPA's return to the landing airfield and ran the appropriate recovery checklists (Tab V-9.2). The maintenance Ops Sup (MXP1) was in the GCS and assisted the MC (Tab V-8.2, V-9.2). The MXP1 and the MC agreed the turbocharger was unresponsive and suspected of failure (Tab V-8.2, V-9.2). The MC continued to RTB (Tab V-8.2, V-9.2, V-9.3).

During the final approach for landing, the MRPA's landing gear was extended (Tab DD-1.5). The MRPA flew a planned simulated flameout (SFO) approach (Tab V-8.2, V-9.3). An SFO is a steeper flight path that would allow an aircraft to glide to a landing in the case of a total engine failure (Tab V-9.3).

At 0901Z, the Tower reported winds blowing from 70 degrees with gusts varying from 9 to 20 knots (Tabs W-3, V-8.2). The MSO asked the ATC to have the winds repeated for crosswind calculations (Tab V-8.2). The Tower repeated the winds, and the MSO determined the winds were within technical guideline limits and the gust factor required a three-knot (kt) correction to the approach speed (Tab V-8.2).

Between 0901Z and 0905Z, the MP applied crosswind control to the MRPA for course alignment purposes (Tab V-9.3). The MP and the MSO were satisfied with the progress of the approach to landing (Tab V-9.3). However, upon crossing the runway threshold, the MRPA experienced a strong gust of wind resulting in a violent aircraft maneuver to include nose dipping and excessive left wing-low orientation (Tab V-8.2, V-9.3). At 0904Z, the Tower reported winds from 100 degrees gusting from 4 to 20 kts (Tab W-3). The MP decided the approach was no longer safe and executed procedures for a go-around by applying full power to the MRPA (Tab V-8.2, V-9.3). With approximately one-half of the runway remaining in front of them, the MC realized the MRPA was no longer gaining altitude and verbally questioned whether the MRPA was capable of continued flight (Tab V-8.3, V-9.3, V-9.4). The MP continued the attempt of the go-around, but the MRPA was unable to sustain flight (Tab V-8.3, V-9.4).

e. Impact

On 27 June 2013, at approximately 0905Z, the MRPA impacted the ground at approximately 800 ft. past the departure end of the runway, Jalalabad AB, Afghanistan (Tabs Q-5, Q-6, DD-1.4). The MRPA was configured landing gear previously extended with the flaps retracted (TabDD-1.5). The MRPA roll command varied from 20 degrees to the right to 20 degrees to the left (Tab DD-1.6). The pitch angle was six degrees nose-high (Tab DD-1.6). The MRPA and one AGM-114 Hellfire missile were destroyed on impact (Tab P-4). There were no injuries or damage to other government or civilian property (Tab P-2). The total damage to U.S. Government property was assessed to be $4,511,499.00 (Tab P-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 Air Force Technical Order (AFTO) 781 series forms for the MRPA were documented IAW applicable maintenance guidance (Tab D-3 to D-4). The forms indicated no outstanding issues that would have prevented the MRPA from flying on 27 June 2013 (Tab D-3 to D-4). There were no recurring maintenance problems documented in the AFTO 781 Forms (TabV-1.3).

b. Inspections

All maintenance inspections were completed and documented IAW applicable regulations and technical orders (TOs) (Tabs D-3, D-4, V-1.5). On 24 June 2013, the maintenance crew satisfactorily completed a pre-flight inspection on the MRPA (Tabs D-3, D-4, V-6.1). On 27 June 2013, the maintenance crew performed a 60-hour inspection on the MRPA, which resulted in zero discrepancies (Tabs D-3, D-4, V-1.5).

A pre-flight inspection includes a visual walk around the plane (Tab V-6.1). The inspection was signed-off by a civilian contractor, the MXP2 (Tab U-2.1). There were no open discrepancies which would render the MRPA unsafe to fly (Tabs V-1.5, V-6.1, V-7.1, U-2.1).

The 60-hour inspection had just been completed, and the next scheduled inspection would have been the 720 flight-hour engine inspection (Tab V-1.5). The 60-hour inspection was completed by MXP2 (Tabs D-3, V-7.1). No discrepancies were discovered during the 60-hour inspection (Tabs D-3, U-3.20, V-1.3, V-6.1, V-7.1).

A turbocharger is a pneumatic/mechanical device designed to boost air pressure in an engine, thus increasing the horsepower output (Tabs V-1.3, EE-1.5). The turbocharger portion of the 60-hour engine inspection is a five-part check which includes: (1) verify the turbocharger spins correctly; (2) inspect the oil return line and feed fittings for defects; (3) inspect the mounting bracket and frame for cracks and other defects; (4) inspect the wastegate linkage and shaft for binding and other defects; and (5) inspect the wastegate linkage for cracks and ensure the springs are serviceable (Tabs V-1.3, V-1.4, V-2.1, V-2.2).

The standard turbocharger inspection would not detect signs of oil coking (burnt and hardened oil residue) on the heat shield, nor would it detect high crank case pressure (Tab V-1.4). It could detect signs of reduced oil flow through the turbocharger, as the checklist instructs the maintainer to check the oil lines and make sure the oil flows freely (Tab V-1.4). The standard turbocharger inspection would not detect obstruction in the banjo bolt (Tab V-1.4). It could detect a twisted or kinked oil return line (Tab V-1.4). There is no evidence to suggest the turbocharger inspection process was a factor in this mishap.

c. Maintenance Procedures

The engine, to include the turbocharger, is replaced between 720 and 792 hours of RPA flight time (Tab V-1.4). On the day of the mishap, the engine of T/N 07-3195 had 717 hours of flight time at the time of launching its mission (Tabs D-2, V-1.5). The MRPA was not due for any scheduled maintenance (Tab D-2). There is no evidence to suggest maintenance procedures were a factor in this mishap.

d. Maintenance Personnel and Supervision

Civilian contractors with BFS maintained the MRPA at Jalalabad AB, Afghanistan (Tab V-6.1, V-7.1). A review of the training records for the maintenance crew showed they were trained, experienced and certified to complete their tasks (Tab GG-1.3 through GG-1.88, GG-2.1 through GG-2.69). Additionally, the MXP1 and the MXP2 received adequate supervision while maintaining the MRPA (Tab U-2.1, U-3.2 through U-3.5). There is no evidence to suggest maintenance or supervision of maintainers was a factor in this mishap.

e. Fuel, Hydraulic and Oil Inspection Analyses

The MRPA was refueled prior to the mishap (Tab D-5). Fluid analysis is not part of the pre-flight or 60-hour turbocharger inspection (Tab V-1.5). The MRPA oil was serviced and inspected by a maintenance crew prior to the mishap and no discrepancies were reported (Tab U-2.2). There is no post-crash fluid analysis report. The MRPA did not contain a hydraulic system.

f. Unscheduled Maintenance

Not applicable.

6. AIRFRAME, MISSILE OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

The MRPA engine was sent to the General Atomics Aeronautical Systems, Incorporated, (GA-ASI) El Mirage facility for further analysis (Tab DD-1.7). The engine had 717 flying hours at the start of the mishap sortie (Tab D-2). The recovered engine was in poor condition due to crash, impact, fire and water damage sustained during the mishap (Tab DD-1.7). The cylinders were removed and all rings were found intact (Tab DD-1.7). Corrosion was found inside the engine and the turbocharger (Tab DD-1.8). This corrosion was likely caused by residual water from post-crash firefighting efforts (Tab DD-1.8). The turbocharger was disassembled (Tab DD-1.7). The heat shield, located between the turbine impeller and turbocharger core, had evidence of oil coking on both sides (Tab DD-1.7). The impeller shaft (the spinning rod in the center of the turbocharger) also had evidence of coking (Tabs DD-1.7, EE-1.5).

b. Engineering Evaluation and Analysis

GA-ASI analyzed the data logger files (the historical record of flight and engine parameters) (Tabs V-1.3, DD-1.6). The crosswind component calculated the wind information in the data logs at between 5 and 8 kts (Tab DD-1.7). GA-ASI indicated the maximum crosswind component for landing was 17 kts (Tab DD-1.7).

During the abrupt roll to 20 degrees as the MRPA crossed the runway threshold, roll command led the roll feedback; therefore, GA-ASI determined the roll was initiated by the pilot rather than a wind gust (Tab DD-1.7). However, GA-ASI provided a caveat stating the rudder input of 15 degrees to the right a second later may have been in response to a wind gust not seen in the wind values in the data logs or other abrupt air (Tab DD-1.7, DD-1.8). GA-ASI further noted that wind direction and speed in the data logs are filtered values based on a true airspeed calculation, from indicated airspeed and atmospheric conditions (Tab DD-1.7). The true airspeed value is then compared to groundspeed, to calculate a wind vector (Tab DD-1.7, DD-1.8). GA-ASI also stated that a wind gust not included in the data logs might have contributed to the MP's decision to attempt a go-around (Tab DD-1.8).

During the go-around, the MRPA was flown near an airspeed that provides the best climbing capability (Tab DD-1.8). The low propeller pitch angle during the go-around attempt was consistent with an underpowered engine (Tab DD-1.8).

GA-ASI indicated evidence of oil coking was found on the turbocharger, which likely seized the turbocharger (Tab DD-1.4). Oil coking is the result of high oil temperatures, which can be caused by reduced flow through the turbocharger from high crankcase pressure (Tab DD-1.4).

The MRPA had a ramp weight of 2,538.1 lbs (Tab D-5). Ordinarily, an MQ-1B operates at a maximum weight limit of 2,250 lbs (Tab BB-1.3). This limitation was exceeded by a waiver up to 2,550 lbs that is given by USAFCENT to MQ-1B aircraft while deployed, allowing the MRPA to carry more fuel to increase flight time (Tab BB-1.3). GA-ASI reported that the weight of the AGM-114 Hellfire Missile would have been included in the ramp weight, and overall aircraft configuration did not change during the mishap flight (Tab DD-1.6).

The climb performance charts in the flight manuals and performance data are based on an operating turbocharger (Tab DD-1.6). The applicable performance charts indicate a climb rate for all fully functioning aircraft at the MRPA's weight, configuration and density altitude (Tabs DD-1.6).

The GA-ASI performance calculations for the MRPA were based on: a seized turbocharger, extended landing gear, zero flap deflection, impact weight, no external stores, airfield density altitude, actual airspeed and a rate of climb of zero (Tab DD-1.6, DD-1.7). GA-ASI noted the aircraft was flown at its best climb capability airspeed at the time of the go-around (Tab DD-1.8). GA-ASI found the mishap engine was incapable of producing sufficient power for a sustained climb at the MRPA's weight and configuration (Tab DD-1.4).

GA-ASI conducted additional analysis to determine the rate of climb for an aircraft had it launched not using the operational waiver (e.g., a launch weight of 2,250 lbs versus the actual ramp weight of 2,538.1 lbs), keeping all other conditions of the crash constant (Tab DD-2.2). GA-ASI estimated the MRPA would have most likely been at a weight that would have permitted a climb rate sufficient for a successful go-around, assuming the same aircraft configuration and atmospheric conditions (Tab DD-2.2).

7. WEATHER

a. Forecast Weather

The initial weather forecast was not provided. However, forecast weather changes had weather degrading to the point of forcing an operational weather recall of aircraft that could not remain aloft until weather improved (Tab V-9.1).

b. Observed Weather

The Tower reported eight different wind readings for the 10 minutes prior to the incident (Tab W-3). These reports varied in heading from 60 degrees to 100 degrees (Tab W-3). Additionally, the winds varied in magnitude from 4 kts gusting to 20 kts minimum, to 15 kts gusting to 20 kts maximum (Tab W-3).

c. Space Environment

Not applicable.

d. Operations

Operations were conducted within their prescribed operational weather limitations (Tab V-8.2).

8. CREW QUALIFICATIONS

a. Mishap Pilot (MP)

The MP was current and qualified in the MQ-1B and had a total flight time of 691.2 hours at the time of the mishap (Tab G-3). Additionally, he was a qualified Launch and Recovery Pilot (Tabs G-14, V-9.1).

Recent flight time is as follows (Tab G-4 through G-10):

	Hours	Sorties
Last 30 Days	21.3	78
Last 60 Days	51.9	152
Last 90 Days	62.3	172

b. Mishap Sensor Operator (MSO)

The MSO was a current, qualified and experienced SO in the MQ-1B and had a total flight time of 1,445.2 hours at the time of the mishap (Tabs G-19, V-8.1). Additionally, he was a qualified Launch and Recovery SO (Tab V-8.1).

Recent flight time is as follows (Tabs G-21):

	Hours	Days*
Last 30 Days	17.6	21
Last 60 Days	48.1	49
Last 90 Days	64.6	64

*NOTE: In Tab G-21, the 30-60-90 history reflects days flown vice sorties.

There is no evidence to suggest crew qualifications were a factor in this mishap.

9. MEDICAL

a. Qualifications

At the time of the mishap, all crewmembers had current flight physicals, no known illnesses or injuries, and were medically qualified to perform flying duties (Tab FF-3).

b. Health

The MC's Preventive Health Assessments and flight physicals were current (Tab FF-3). No crewmembers had been issued a certificate restricting duties or "Duties Not Including Flying" (Tab FF-3). There were no pending or expired medical waivers (Tab FF-3). The members had no conditions that were factors in the mishap (Tab FF-3). No crewmembers were taking any medication other than those previously recommended, ground tested, approved and prescribed by licensed medical providers (Tab FF-3). There is no evidence medication was a factor in the mishap (Tab FF-3).

c. Pathology

Not applicable.

d. Toxicology

All crewmembers provided blood and urine samples at their respective locations (Tabs V-8.4, FF-3). The samples were tested for the presence of ethanol and drugs of abuse (amphetamine, barbiturates, benzodiazepines, cannabinoids, cocaine, opiates and phencyclidine) (Tab FF-3). All toxicology testing resulted in negative findings for ethanol and drugs of abuse (Tab FF-3).

e. Lifestyle

No lifestyle factors were found to be relevant to the mishap (Tab V-8.1, V-9.1).

f. Crew Rest and Crew Duty Time

AFI 11-202, Volume 3, *Flying Operations-General Flight Rules*, Chapter 9, 22 October 2010, requires pilots to have proper "crew rest" prior to performing in flight duties and adhere to proper duty time requirements (AFI 11-202, pages 62 and 63). No crew rest or crew duty-time requirements were violated nor were they found to be a factor in the mishap (Tab V-8.1, V-9.1).

10. OPERATIONS AND SUPERVISION

a. Operations

At the time of the mishap, operations tempo (ops tempo) for the MP was above average but sustainable for LRE operations in the AOR (Tab V-9.1). At the time of the mishap, ops tempo was normal for the MSO and sustainable for LRE operations in the AOR (Tab V-8.1). There is no evidence to suggest ops tempo contributed to the mishap.

b. Experience Level

The MSO was an experienced RPA SO as defined by AFI 11-2MQ-1 Volume 1 (Tab V-8.1). As defined by AFI 11-2MQ-1 Volume 1, the MP was inexperienced but current and qualified (Tab V-9.1). There is no evidence to suggest experience level of any crewmember contributed to the mishap.

c. Supervision

On the day of the mishap, the MC received their daily briefing from the Ops Sup (Tab V-8.1). The MXP1 was also present with the MC when the mishap occurred (Tab V-8.2, V-9.2). There is no evidence to suggest supervision contributed to the mishap.

11. HUMAN FACTORS

AFI 91-204, *Safety Investigations and Reports,* 24 September 2008, Attachment 5, contains the Department of Defense Human Factors Analysis and Classification System, which lists potential human factors that can play a role in aircraft mishaps. The following human factors were relevant to this mishap: Procedural Guidance/Publications and Perceptions of Equipment.

a. Procedural Guidance/Publications

Procedural Guidance/Publications is a factor when written direction, checklists, graphic depictions, tables, charts or other published guidance is inadequate, misleading or inappropriate and thus creates an unsafe situation (Tab BB-2.1, BB-2.2).

The narrative section of the TO 1Q-1(M)B-1 Turbocharger Failure checklist addresses crew actions required to attempt to maximize possible engine performance (Tab EE-2.1, EE-2.2). The checklists and TOs state engine power should improve as the aircraft descends (Tab V-8.2). However, the checklist and TOs themselves have no Notes, Warnings or Cautions warning the crew that sustained flight or a go-around may be out of the operational capability of the aircraft in any reduced-thrust situation, such as a turbocharger failure (Tab EE-2.1, EE-2.2).

b. Perceptions of Equipment

Perceptions of Equipment is a factor when over or under confidence in an aircraft, vehicle, device, system or any other equipment creates an unsafe situation (Tab BB-2.1).

The MQ-1B Predator has experienced an abnormally high rate of turbocharger failures in recent months (Tab BB-3.1). There is a cultural belief that a go-around is always a viable option (Tab V-8.4, V-9.4). Testimony from an MQ-1B Pilot subject matter expert (SME), the MP and the MSO all indicated they had personally performed, witnessed first-hand or had knowledge of a successful go-around despite a turbocharger failure (Tab V-3.2, V-8.4, V-9.4). The MP stated he had never experienced an aircraft unable to maintain flight below 6,000 ft. (Tab V-9.4). None of the witnesses stated any knowledge of a failed attempt at a go-around with an inoperative turbocharger. Finally, TO 1Q-1(M)B-1 does not contain any Notes, Warnings or Cautions warning the crew that sustained flight or a go-around may be out of the operational capability of the aircraft in any reduced-thrust situation, such as a turbocharger failure (Tab EE-2.1, EE-2.2).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publically Available Directives and Publications Relevant to the Mishap

(1) AFI 51-503, *Aerospace Accident Investigations*, 26 May 2010
(2) AFI 51-503, *Aerospace Accident Investigations Air Combat Command Supplement*, 5 September 2013
(3) AFI 91-204, *Safety Investigations and Reports*, 24 September 2008
(4) AFI 11-202, Volume 3, *Flying Operations-General Flight Rules*, 22 October 2010

NOTICE: All AFIs are available digitally on the Air Force Departmental Publishing Office website at: http://www.e-publishing.af.mil.

b. Other Directives and Publications Relevant to the Mishap

(1) TO 1Q-1(M)B-1, *Flight Manual, USAF Series, MQ-1B System*, 13 December 2010
(2) TO 1Q-1(M)B-1-1, *Flight Manual -- Appendix A, Performance Data, USAF Series, MQ-1B Remotely Piloted Aircraft*, 10 December 2012
(3) TO 1Q-1(M)B-1CL-1, *Flight Crew Checklist, USAF Series MQ-1B System*, 7 May 2013
(4) TO 1Q-1(M)B-2-72GS-00-1, *General System Maintenance, General System Engine Reciprocating MQ-1B Remotely Piloted Aircraft*, 8 June 2010
(5) TO 1Q-1(M)B-2-72JG-40-1, *Job Guide, Engine, Reciprocating, Exhaust and Turbocharger, USAF Series, MQ-1B Remotely Piloted Aircraft*, 8 June 2010
(6) Flight Crew Information File (FCIF) 13-30P, *MQ-1 Turbocharger Failure Special Interest Item (SII)*, 10 July 2013
(7) AFI 112MQ-1v1, *MQ-1 Aircrew Training*, 21 January 2013
(8) ACC Syllabus MQ1LR, *MQ-1 Launch/Recovery Training Course*, September 2008
(9) *USAFCENT Operational Guidance*, 8 July 2013

c. Known or Suspected Deviations from Directives or Publications

There are no known or suspected deviations from directives or publications by crew members or others involved in the mishap mission.

13. ADDITIONAL AREAS OF CONCERN

Not applicable.

28 October 2013

JAMES A. ANDERSON, Lt Col, USAF
President, Abbreviated Accident Investigation Board

STATEMENT OF OPINION

MQ-1B, T/N 07-3195
Jalalabad, Afghanistan
27 June 2013

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 27 June 2013, at approximately 0905 Zulu (Z), 1335 local time (L), an MQ-1B, tail number (T/N) 07-3195, assigned to the 432d Wing (432 WG), Creech Air Force Base (AFB), Nevada (NV), impacted the ground at approximately 800 feet (ft.) past the departure end of the runway, Jalalabad Air Base (AB), Afghanistan. The mishap occurred after the mishap remotely piloted aircraft (MRPA) aborted its initial landing attempt (also known as a go-around). The MRPA was forward deployed from the 432 WG. At the time of the mishap, the MRPA was operated by a Launch and Recovery Element (LRE) from the 62d Expeditionary Reconnaissance Squadron, Jalalabad, Afghanistan, hereinafter referred to as the Mishap Crew (MC). The MRPA and one air-to-ground Hellfire missile (AGM-114) were destroyed upon impact with the loss valued at $4,511,499.00. There were no injuries or damage to other government or civilian property.

I find by clear and convincing evidence the cause of the mishap was a combination of a mechanical failure of the engine's turbocharger (a pneumatic/mechanical device designed to boost air pressure in an engine, thus increasing the horsepower output) and gusty wind conditions during the attempted landing. The turbocharger failed, which significantly reduced the power output by the MRPA engine, placing it in an excessively thrust deficient condition. The wind gust placed the MRPA in an unsafe condition to land at an extremely critical moment in the landing procedure. The MP made a prudent decision to abort the landing as there was no empirical data available that would have made the MP aware of the thrust deficient condition, due to the failed turbocharger. However, the resultant loss of engine output made a successful go-around impossible.

I find by a preponderance of evidence that insufficient technical guidance, an operational weight-waiver for takeoff, and the MP's decision to go-around substantially contributed to the mishap.

2. CAUSE

a. Failure of the Turbocharger

I find by clear and convincing evidence that the failure of the turbocharger was a cause of the mishap. The turbocharger experienced a complete failure with no recovery capability. Thorough testing by General Atomics Aeronautical Systems, Inc., (GA-ASI) of the failed turbocharger revealed evidence of oil coking (burnt and hardened oil residue) on both sides of the heat shield and the impeller shaft, which likely seized the turbocharger. The standard turbocharger inspection could not have detected the oil coking. The turbocharger failure produced a thrust-deficient condition, which precluded the MRPA from producing enough lift to accomplish a successful go-around.

b. Gusty Winds

I find by clear and convincing evidence that gusting winds were also a cause of the mishap. The MRPA experienced a gust of wind at a critical moment during the landing phase of flight. This wind gust placed the MRPA in a severely compromised position to continue the landing successfully. The Air Traffic Control Tower (Tower) reported nine different wind readings for the 10 minutes prior to the incident. These reports varied in heading from 60 degrees to 100 degrees. Additionally, the winds varied in magnitude from 4 knots (kts) gusting to 20 kts minimum, to 15 kts gusting to 20 kts maximum. While the wind conditions reported by the Tower, to include gusts, were within operational limitations, the effect upon the MRPA from a particularly strong wind gust was excessive enough to result in the MP's belief that a successful landing was questionable. Based on the strong wind gust experienced during the landing attempt, the MP made the prudent decision to attempt a go-around.

3. Substantially Contributing Factors

a. Insufficient Technical Guidance

I find by a preponderance of the evidence that insufficient technical guidance was a substantially contributing factor to the mishap. The narrative section of the Technical Order (TO) 1Q-1(M)B-1 Turbocharger Failure checklist addresses crew actions required to attempt to maximize possible engine performance. The MP stated he had never experienced an aircraft unable to maintain flight below 6,000 ft. Additionally, the checklists and TOs state engine power should improve as the aircraft descends. However, the checklist and TOs themselves have no Notes, Warnings or Cautions warning the crew that sustained flight or a go-around may be out of the operational capability of the aircraft in any reduced-thrust situation, such as a turbocharger failure. The lack of technical guidance perpetuated the cultural view in general, and the MP's belief specifically, that a go-around is always possible. Lacking specific guidance to the contrary, the MP attempted the go-around.

b. Operational Weight Waiver

I find by a preponderance of the evidence that the operational weight waiver was a substantially contributing factor to the mishap. RPAs in theatre are granted a waiver for a launch weight of up to 2,550 pounds (lbs). In this case, the MRPA had a ramp weight of 2,538.1 lbs. This weight contributed significantly to the MRPA's inability to sustain a positive climb rate. The GA-ASI report stated: Performance calculations and engine testing indicated that the mishap engine was likely developing insufficient power for a go-around. GA-ASI testing indicated that had the MRPA taken off at maximum pre-waiver weight (2,250 lbs vice 2,550 lbs) and all other conditions remained the same, the MRPA would have most likely been at a weight that would have permitted a climb rate sufficient for a successful go-around.

c. The Decision to Go-Around

I find by a preponderance of the evidence that the decision to go-around was a substantially contributing factor to the mishap. If the MP had not made the decision to attempt a go-around the MRPA may have completed a successful landing. On the other hand, due to the gusting winds, he may have also crashed the MRPA. Based on the factors described and the information available to the MP, I find the decision to go-around was prudent, but was also a substantially contributing factor.

4. CONCLUSION

I developed my opinion by analyzing factual data from historical records, Air Force directives and guidance, engineering analysis, witness testimony, flight data and information provided by technical experts. By clear and convincing evidence, I find that a combination of turbocharger failure and wind gusts caused the mishap to occur. Further, I find by the preponderance of evidence that insufficient technical guidance, acceptance of an operational weight waiver, and the MP's decision to go-around were substantially contributing to the mishap.

28 October 2013

JAMES A. ANDERSON, Lt Col, USAF
President, Abbreviated Accident Investigation Board

INDEX OF TABS