UNITED STATES AIR FORCE AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

M-28, T/N 08-0319

318th Special Operations Squadron
27th Special Operations Wing
Cannon Air Force Base, New Mexico

LOCATION: VSP WALAN RABAT, AFGHANISTAN

DATE OF ACCIDENT: 18 DECEMBER 2011

BOARD PRESIDENT:

CONDUCTED IAW AIR FORCE INSTRUCTION 51-503

EXECUTIVE SUMMARY

AIRCRAFT ACCIDENT INVESTIGATION

M-28, T/N 08-0319
VSP WALAN RABAT, AFGHANISTAN
18 DECEMBER 2011

At 0939 hours Zulu time on 18 December 2011, an M-28, Tail Number 08-0319, departed Kandahar Air Base, Afghanistan on a mission to pick up four passengers at Qalat, Afghanistan, transport them to Walan Rabat short takeoff and landing zone, transport two additional personnel from Walan Rabat back to Qalat, then return to Kandahar Air Base. The mishap aircraft and crew were assigned or attached to the 318th Special Operations Squadron, 27th Special Operations Wing at Cannon Air Force Base, New Mexico, and were deployed to the 318th Expeditionary Special Operations Squadron at Kandahar Air Base, Afghanistan.

After an uneventful stop at Qalat to onload four passengers and their bags, the mishap crew flew a 20-minute leg to Walan Rabat. Surface winds at Walan Rabat were 190 degrees at 14 knots gusting to 17 knots, 30 degrees off a direct tailwind for runway 34. Because the landing zone has a three percent upslope for runway 34, and a 1,500-foot mountain exists 1½ miles to the north, the pilot elected to land with a tailwind on runway 34, the preferred landing direction. Walan Rabat Landing Zone is a 1,756-foot long, 31-foot wide, semi-prepared dirt strip with poorly defined boundaries. The landing zone was marked with AMP-3 markings, commonly called a "box-and-one" with colored panels. The mishap pilot consulted a wind component chart and incorrectly calculated the tailwind component, mistakenly believing it was within the allowable limit for landing the M-28. The pilot flew a shallow 2½-3 degree approach due to the upsloping landing zone. At approximately 1,000 feet short of the landing zone, the mishap pilot visually acquired the AMP-3 markings and landed the mishap aircraft at 1032 zulu. After a firmer than normal landing, the aircraft veered to the right and departed the prepared surface. The nose gear encountered uneven terrain and collapsed, causing the mishap aircraft to flip tail-over-nose. The mishap crew and passengers then egressed the aircraft through the copilot's window. There were no serious injuries to crew or passengers. The mishap aircraft, which was valued at approximately $12,300,000 was destroyed. There were no civilian casualties.

The AIB president found no clear and convincing evidence of the primary cause of the accident. He determined by a preponderance of evidence that the Landing Zone Condition, Cross-Monitoring Performance, Task/Mission-in-Progress Re-planning, Landing with an Excessive Tailwind, and Aircraft Engine Anomalies substantially contributed to the mishap, ultimately causing the mishap aircraft to veer off the prepared surface into rough terrain, resulting in the collapse of the nose landing gear and destruction of the aircraft.

SUMMARY OF FACTS AND STATEMENT OF OPINION
M-28, T/N 08-0319
18 DECEMBER 2011

TABLE OF CONTENTS

TABLE OF CONTENTS i
SUMMARY OF FACTS 1
1. AUTHORITY and PURPOSE 1
a. Authority 1
b. Purpose 1
2. ACCIDENT SUMMARY 1
3. BACKGROUND 2
a. Air Force Special Operations Command 2
b. Unit Information 2
(1) 23d Air Force, Hurlburt Field, Florida 2
(2) 27th Special Operations Wing, Cannon AFB, New Mexico 2
(3) 318th Special Operations Squadron 3
c. M-28, Skytruck 3
4. SEQUENCE OF EVENTS 3
a. Mission 3
b. Planning/Briefing. 4
c. Preflight 4
d. Flight 5
e. Landing/Impact 6
f. Egress and Aircrew Flight Equipment (AFE) 6
g. Search and Rescue (SAR) 6
5. MAINTENANCE 6
a. Forms Documentation 6
b. Inspections 7
(1) Mishap Aircraft 7
c. Maintenance Procedures 8
d. Maintenance Personnel and Supervision 8
e. Fuel, Hydraulic and Oil Inspection Analyses 8
f. Unscheduled Maintenance 8
6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS. 9
a. Structures and Systems 9
(1) Fuselage 9
(2) Wing 10
(3) Empennage 12
(4) Landing Gear 13
(5) Power Plant 14
(6) Flight Control System 16
(7) Hydraulic System 16
(8) Oil System 17

(9) Fuel System 17
(10) Fire-Protection System 17
(11) Electrical System 17
(12) Flight/Navigation Instruments Supply 18
(13) Flight Instrumentation, Cockpit Instrument and Control Panels 18
b. Evaluations and Analyses 19
(1) Engines 19
(2) Propellers 19
7. WEATHER 20
a. Forecast Weather 20
b. Observed Weather 20
c. Space Environment 20
d. Operations 20
8. CREW QUALIFICATIONS 20
a. Mishap Pilot (MP) 20
b. Mishap Co-pilot (MCP) 21
c. Mishap Loadmaster (MLM) 21
9. MEDICAL 22
a. Qualifications - Health 22
b. Pathology 22
c. Lifestyle 22
d. Crew Rest and Crew Duty Time 22
10. OPERATIONS AND SUPERVISION 22
a. Operations 22
b. Supervision 23
11. HUMAN FACTORS 23
a. Introduction 23
b. Contributory 24
1. SP006 Risk Assessment - Formal 24
2. PC 212 Excessive Motivation to Succeed 24
3. PP102 Cross-Monitoring Performance 24
4. PP109 Mission Planning 24
5. PP111 Task/Mission-in-Progress Re-Planning 24
12. GOVERNING DIRECTIVES AND PUBLICATIONS 25
a. Directives and Publications Relevant to the Mishap 25
13. ADDITIONAL AREAS OF CONCERN 26
a. M-28 Operations/Maintenance Interface 26
b. Aircraft Flight Manual Guidance 26
STATEMENT OF OPINION 27
1. OPINION SUMMARY 27
2. DISCUSSION OF OPINION 28
a. Substantially Contributing Factors: 28
(1) Landing Zone Condition 28
(2) Task/Mission-in-Progress Re-planning 28
(3) Cross-Monitoring Performance 29

(4) Excessive Tailwind Component 29
(5) Aircraft Engine Anomalies 29
b. Additional Factors 31
(1) Mission Planning/Inattention to Detail 31
(2) Operational Risk Management 31
(3) Excessive Motivation to Succeed 31
(4) Non-Standard Approach Parameters 32
(5) Violating Safe Landing Criteria 32
3. Conclusion 32
INDEX OF TABS 34

COMMONLY USED ACRONYMS AND ABBREVIATIONS

AF	Air Force	Lt Col	Lieutenant Colonel
AFB	Air Force Base	M	Mach
AFE	Air Flight Equipment	MA	Mishap Aircraft
AFI	Air Force Instruction	Maj	Major
AFIP	Air Force Institute of Pathology	MAJCOM	Major Command
AFPAM	Air Force Pamphlet	MP	Mishap Pilot
AC	Alternating Current	MS	Mishap Sortie
AGL	Above Ground Level	M3	Modular Maintenance Management
Ah	Ampere Hour	NM	Nautical Miles
AIB	Aircraft Investigation Board	NOTAMS	Notices to Airmen
Capt	Captain	Np	Propeller Speed
CAUT	Caution	Ops Tempo	Operations Tempo
Col	Colonel	ORM	Operational Risk Management
DC	Direct Current	P&W	Pratt and Whitney
DoD	Department of Defense	P&WC	Pratt and Whitney Canada
DR	Discrepancy Report	PHA	Physical Health Assessment
ECS	Environmental Control System	PM	Periodic Maintenance
FAR	Federal Aviation Regulation	PR	Pre Flight
FLCS	Flight Control System	PSI	Pounds Per Square Inch
FPM	Feet Per Minute	PZL	Polskie Zaklady Lotnicze
FPS	Fire Protection System	QA	Quality Assurance
FRC	Fault Reporting Codes	RH	Right Hand
ft	Feet	SAR	Search and Rescue
g	Gravitational Force	SIB	Safety Investigation Board
GPS	Global Positioning System	SNC	Sierra Nevada Corporation
IAW	In Accordance With	SII	Special Interest Item
IFDL	Intra-Flight Data Link	STOL	Short Takeoff and Landing
K	Thousand	T/N	Tail Number
KCAS	Knots Calibrated Airspeed	TOD	Tech Order Data
KTAS	Knots True Airspeed	USAF	United States Air Force
kts	Knots	V	Volts
L	Local	VA	Volts Ampere
LH	Left Hand	VSP	Village Stability Platform

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 3 January 2012, Major General O.G. Mannon, Vice Commander, AFSOC, appointed Colonel Lewis E. Jordan, Jr. to conduct an aircraft accident investigation of the 18 December 2011 crash of an M-28 aircraft, tail number (T/N) 08-0319, at VSP Walan Rabat, Afghanistan. The investigation was conducted in Afghanistan and at Cannon AFB, New Mexico, and Hurlburt Field, Florida, from 10 January 2012 through 21 February 2012. The following board members were also appointed: MEDICAL MEMBER (Medical), PILOT MEMBER (Pilot), LEGAL ADVISOR (Legal), MAINTENANCE MEMBER (Maintenance), and BOARD RECORDER (Recorder) (Tab Y-3–4).

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

At 0939 hours Zulu time (Z), 18 December 2011, the mishap aircraft (MA), an M-28, T/N 08-0319, departed Kandahar AB, Afghanistan on a mission to pick up four passengers at Qalat, Afghanistan, transport them to Walan Rabat short takeoff and landing zone (STOL LZ), transport additional personnel from Walan Rabat back to Qalat, then return to Kandahar AB. The crew consisted of a mishap pilot (MP), mishap copilot (MCP), and mishap loadmaster (MLM). After an uneventful stop at Qalat to onload the four passengers and their bags, the MC flew a short 20-minute leg to Walan Rabat LZ. The combat controller (CCT) controlling the LZ transmitted surface winds of 190 degrees at 14 knots gusting to 17 knots, which are 30 degrees off a direct tailwind for runway 34. Because the landing zone at Walan Rabat has a three percent upslope for runway 34, and a 1,500 foot mountain exists within 1½ miles to the north of the LZ, the MP elected to land on runway 34 with a tailwind.

Prior to commencing the approach, the MP consulted a wind component chart and incorrectly calculated the tailwind and crosswind components, mistakenly believing the tailwind component was within the allowable limit for landing the M-28. The MP elected to fly a shallow 2½-3 degree approach because of the upsloping LZ. This likely caused a late visual acquisition of the landing zone. At approximately 1,000 feet short of the LZ, the MP visually acquired the LZ and landed the MA. At 1032Z, after a firmer than normal landing on the semi-prepared dirt LZ, the aircraft veered to the right and departed the prepared surface. When the nose gear encountered uneven terrain, it collapsed, causing the nose to strike the surface and the MA to flip tail-over-nose. The MC and passengers then egressed the MA through the copilot's window. There were no serious injuries to the MC or passengers. The MA was valued at approximately $12,300,000. There were no civilian casualties.

3. BACKGROUND

The MA belonged to the 27 SOW at Cannon AFB, NM. At the time of the mishap, the aircraft was operated by the 318 ESOS, the expeditionary unit of the 318 SOS at Cannon AFB, NM. The 318 SOS is a component of the 27 SOW. The wing and its subordinate units are all components of the Air Force Special Operations Command (Tabs CC-3–12).

a. Air Force Special Operations Command

The primary mission of the Air Force Special Operations Comand (AFSOC) is to present combat ready Air Force Special Operations Forces to conduct and support global special operations missions. AFSOC's vision is to be America's specialized airpower by being a step ahead in a changing world, delivering Special Operations power anytime, anywhere. AFSOC provides Air Force special operations forces (SOF) for worldwide deployment and assignment to regional unified commands. The command's SOF are composed of highly trained, rapidly deployable Airmen, conducting global special operations missions ranging from precision application of firepower, to infiltration, exfiltration, resupply and refueling of SOF operational elements (Tab CC-3).

b. Unit Information

(1) 23d Air Force, Hurlburt Field, Florida

The 23d Air Force (23 AF) is the only numbered air force in AFSOC and is designated as AFSOC's unit of execution to U.S. Special Operations Command. The mission of the 23 AF is to provide highly trained special operations command and control, intelligence, weather and reachback support forces to deployed air commanders for execution of assigned missions (Tab CC-7).

(2) 27th Special Operations Wing, Cannon AFB, New Mexico

The 27th Special Operations Wing (27 SOW) is one of two AF active duty Special Operations wings within AFSOC. The primary mission of the 27 SOW is to plan and execute specialized and contingency operations using advance aircraft, tactics, and air refueling techniques to infiltrate, exfiltrate, and resupply SOF and provide intelligence, suveillance and reconnaissance operations, and specialized aerospace mobility (Tab CC-9).

(3) 318th Special Operations Squadron

The 318th Special Operations Squadron (318 SOS) flies light and medium transport aircraft such as the Pilatus PC-12 and the M-28 Skytruck. The unit utilizes these aircraft to accomplish global special operations taskings as an AF component member of the United States Special Operations Command. Crews plan, prepare, and execute theater mobility missions in support of joint SOF while directly supporting theater special operations commanders by conducting night vision infiltration, exfiltration, resupply and other combat taskings on unimproved runways (Tab CC-11).

c. M-28, Skytruck

The M-28 Skytruck is a multipurpose airplane, short takeoff and landing (STOL) class commuter category, adapted for operation from short, unpaved runways, at high-elevation airfields. It is powered by two Pratt & Whitney Canada PT6A-65B turboprop engines, combined with five-blade synchrophased, automatic-feathering, fully reversible Hartzell HC-B5MP-3D propellers. Depending on the equipment installed, the M-28 can be operated in the following mission versions: passenger transport (up to 19 passengers), cargo transport (2300 kg payload), paradrop (17 seats), and mixed version (i.e. passengers and cargo) (Tab CC-13–14).

4. SEQUENCE OF EVENTS

a. Mission

The mishap crew was assigned or attached to the 318th Special Operations Squadron (SOS), which is designated the 318th Expeditionary Special Operations Squadron (ESOS) in theater; the mishap pilot is assigned to the Wing Plans office at 27th Special Operations Wing (SOW) (Tab V-1.2. V-2.2, V-3.2). The 318 ESOS falls under operational control (OPCON) of the Combined Joint Special Operations Air Detachment (CJSOAD) in country, and the Combined Joint Special Operations Air Component (CJSOAC) in theater, which falls under the operational control of Special Operations Command Central (SOCCENT) (Tab CC-11). The unit operates the M-28 Skytruck supporting small teams of special operations forces (SOF). The specific mission involves the tactical airdrop of supplies and airland infiltration/exfiltration of personnel and equipment to small, semi-prepared landing zones (Tab CC-11).

The M-28 Skytruck is a new aircraft in the AFSOC inventory (Tab CC-65). It is a light mobility aircraft of Polish design, is capable of short takeoff and landings (STOL), and has been modified for combat operations (Tab CC-34). It entered combat service in Afghanistan in March 2011 with three aircraft (Tab EE-22). For the first six months, the M-28 crews primarily flew airdrop missions because there were very few STOL landing zones (LZ) (Tab EE-22, V-1.23, V-13.4, and V-14.4). As the availability of LZs increased in late 2011, the unit focused primarily on air-land operations, so that by December 2011, the mission had become almost exclusively STOL (Tab EE-22, V-1.23, V-13.4, and V-14.4). The mishap LZ (Walan Rabat STOL LZ) had been surveyed and approved for use on 11 December 2011, and had been used twice by M-28 crews prior to the mishap on 18 December 2011 (Tab EE-17, V-1.5, V-4.2, V-4.4). Walan Rabat

STOL LZ is a 1,756-foot long, 31-foot wide, semi-prepared dirt strip (Tab EE-17). It has an approximate 3 percent upslope on runway 34 and 100-foot overruns on both ends (Tab EE-17). Runway 34 is the recommended primary runway due to the 3 percent grade and a 1,500 foot mountain within 1 1/2 miles north of the LZ (Tab EE-17 – 20). The LZ survey notes that up to two inches of “moondust” may accumulate on the LZ (Tab EE-18).

The 318 ESOS does not fly “hard crews”, but builds individual mission crews based on experience levels and operations tempo (Tab V-1.3). The mishap crew (MC) consisted of an AF major, the mishap pilot (MP), an AF captain, the mishap copilot (MCP), and an AF staff sergeant, the mishap loadmaster (MLM) (Tab K-3). All three aircrew members were current and qualified in the M-28 mission, and all were assigned or attached to the 318 SOS (Tab EE-21). The MP and MCP had not flown together prior to the mishap flight (Tab V-1.3). The MP was also the 318 ESOS deployed squadron commander, had been in country for 22 days, and had flown twice on his current rotation (Tab V-1.3). He was on his second OEF deployment with the 318 ESOS (Tab V-1.3, V-1.23). The MCP and MLM had been deployed for 85 days (Tab V-2.3, V-3.2).

The planned mission for aircraft 08-0319 was to depart Kandahar Air Base, land at Qalat, a 4,925-foot gravel runway, onload four passengers and their bags, fly to Walan Rabat STOL LZ to offload the passengers, onload two additional passengers, return to Qalat to drop off the additional passengers, then return to Kandahar AB (Tab V-1.4, V-3.3).

b. Planning/Briefing.

As is typical of 318 ESOS operations, the MP conducted mission planning on the day prior to the mishap (Tab V-1.4). He also had a discussion with another pilot who had already flown into Walan Rabat STOL LZ (Tab V-1.5). On the day of the mishap, The MP awoke at 0430Z, went to the joint operations center, made a few phone calls, and ensured the day’s mission was still on track. The MP then went to the gym and returned to the M-28 planning room at 0730Z (Tab V-1.4). The rest of the MC showed to brief the mission at 0730Z, 2 hours prior to scheduled departure (Tab V-1.4). The MP led the MC through the aircrew brief which includes weather and intel briefs from the CJSOAD staff, and a discussion of Operational Risk Management (ORM) among the crew (Tab V-1.4–1.5). The weather slide shows that enroute weather was favorable for the mission (Tab F-4–10). Forecast winds at Kandahar were variable at 6 knots; however, forecast winds at Walan Rabat were 190 at 9 knots, which is a 7.8 knot tailwind component for the preferred landing direction, runway 34 (Tab F-8–9, AA-5). The ORM worksheet shows an overall “low” assessment, with the top risks for the mission identified as “mountainous terrain” and “STOL operations” (Tab AA-3–4). The pre-mission brief also included an in-depth route study of the objective areas (Tab V-1.5, V-2.3). Emphasis on this mission was placed on Walan Rabat STOL LZ, since this was the most challenging landing zone and was unfamiliar to the MC (Tab V-1.5).

c. Preflight

The MC complied with all preflight checklists and taxied out of parking approximately 10 minutes ahead of schedule (Tab V-1.6). The Engine/Propeller checks, comprised of max power, auto feather, over-speed governor, and reverse check passed with no discrepancies (Tab V-

15.1–15.2). The only thing noted was the engine speed (Ng) while in flight idle; one engine registered 69-70%, the other was 75% (Tab V-15.1). Per Airplane Flight Manual PZL M28 the Ng should be between 70% and 73% during the flight idle check (Tab BB-38–39). The MP verified the Ng was within limits prior to takeoff (Tab EE-23).

d. Flight

Due to congestion at the field, the MC took off at 0939Z, 9 minutes late enroute to Qalat, their first destination (Tab V-1.6, V-2.3, EE-22). The sortie enroute to Qalat was uneventful (Tab V-1.6, V-2.3, V-3.3). The MCP flew the leg to Qalat including the approach, landing, and takeoff from Qalat (Tab V-1.6). All were uneventful (Tab V-1.6, V-2.3, V-3.3). The MC did not note any aircraft systems discrepancies during the enroute portion or ground operations at Qalat (Tab V-1.6, V-2.3, V-3.3). The MC onloaded 4 passengers and bags at Qalat (Tab V-3.3). The bags were floor loaded and the personnel were secured with tethers (Tab V-3.3). The MP flew the climbout from Qalat and maintained the controls until the mishap (Tab V-1.6, Tab N). Upon departure the MC leveled off at 9,500 MSL and deviated approximately 10 miles left of course due to A-10 traffic overhead (Tab V-1.7, V-2.4). Since the leg from Qalat to Walan Rabat was only 20 minutes, the MC condensed the 20-minute crew advisory and completed the "Crew Brief" from the 10-minute checklist at that time (Tab V-1.7, EE-22). During the crew brief, the MP did not mention missed approach procedures or parameters for Walan Rabat LZ (EE-22). The 10-minute checklist was accomplished on time (EE-22). The MC initiated an enroute descent prior to the approach and was at a proper altitude to commence the approach. Due to the off-course maneuvering, the MC intercepted the final approach course on an approximate 5-mile final (Tab V-1.16, N-5).

At 7 minutes, 25 seconds before touchdown, the MC contacted the LZ controller, and AF combat controller (CCT) (Tab N-2, EE-22). The CCT called surface winds at 190 degrees at 14 knots, gusting to 17; there was no ceiling and visibility was unrestricted (Tab V-1.13, N-2, R-22, V-2.7). At this point, the MP expressed surprise at the direction of the wind, noting that it was only 30 degrees from a direct tailwind for the final approach (Tab N-2–3). The MP directed the MCP to check the chart to determine the tailwind component (N-2). The MCP explained that his wind chart was in his pubs bag in the back of the aircraft, but commented "tailwind component, that's 30 degrees off…it's going to be about half…8 to 9…is that right? (Tab R-9, N-3). The MP then referenced his own chart to determine the crosswind and tailwind components (Tab V-1.14).

Per Airplane Flight Manual (AFM) PZL M28, the "maximum demonstrated tailwind velocity" for landing is 8 knots (Tab BB-37). This is generally recognized by the M-28 community as the maximum allowable tailwind component for landing (Tab BB-37, V-1.14, 2.7). The MP misread the wind chart believing he would have an 8 knot tailwind and a 12 knot crosswind (Tab V-1.14–1.16). He should have computed an 8 knot crosswind and a 12 knot steady state tailwind (Tab V-1.16). This tailwind component would have been well past the maximum allowable 8 knots (Tab BB-37). The MP elected to continue the approach and landing at Walan Rabat STOL LZ, runway 34 (Tab N). The MP briefly discussed and rejected landing on runway 16 due to the high terrain north of the LZ and 3 percent down-sloping runway (Tab N-3–4).

The MCP initially identified the landing zone environment at greater than 6 miles out as the MA approached course centerline from left to right (Tab N-5). The MA intercepted course centerline at 5 miles out, but the pilot had not yet positively identified the landing zone (Tab V-1.16, N-5). The MP initially identified the LZ environment inside of 3.5 miles out and set up to fly a 2-3 degree glide slope on final (Tab N-5–6). Inside 1.5 miles, the MCP noted that the approach was "…still drug in looking." The MP acknowledged the shallow approach with "Yep, this one will be drug in" (Tab N-7). At 13 seconds prior to landing, both MP and MCP stated "negative box" meaning they did not see the AMP-3 landing zone markings. At 6 seconds prior to landing, both MP and MCP stated "got the zone" (Tab N-7). At 5 seconds prior to landing, the MP stated "Coming back to centerline" (Tab N-7). Shortly after, the cockpit voice recorder records the sounds of the aircraft landing for 5 seconds followed by a loud yell from an unidentified crewmember as the recording ends (Tab N-7).

e. Landing/Impact

After an initial firm landing, the MA veered to the right (Tab V-1.9, 2.4, 4.3). Approximately 3 seconds after landing, the nose dipped and the right wing dropped as the landing gear collapsed (Tab Z-3). The impact of the nose caused the MA to summersault forward, tail-over-nose, coming to rest upside down, just off the right edge of the LZ at approximately midfield (Tab R-23, V-4.3, Z-3).

f. Egress and Aircrew Flight Equipment (AFE)

After the MA came to rest upside down, the MC checked the condition of all passengers (there were no serious injuries to crew or passengers), and determined the copilot's window was the safest exit (Tab V-1.10, V-2.4, V-3.5). The MCP exited first, followed by the 4 passengers, the MLM and finally, the MP (Tab V-2.4). The MP then contacted CCT who coordinated emergency response (Tab V-4.3). Although the AFTO 46CG, *Prepositioned Aircrew Flight Equipment Assets*, documentation appears to have been lost during wreckage recovery, available evidence, including MC testimony, shows no discrepancies or failures; there is no evidence the life support equipment was relevant to this mishap (Tab R-12). The passengers and MLM were restrained by lanyards to the floor of the cargo compartment, and were not seriously injured despite the MA flipping over (Tab V-3.3–3.5).

g. Search and Rescue (SAR)

A United States Air Force (USAF) HH-60 rescue helicopter was dispatched to recover the MC from the site of the accident (Tab V-4.3). The helicopter landed near the Walan Rabat STOL LZ and onloaded the MC (Tab V-4.4). Upon departure, the HH-60 crashed as well (Tab EE-23). The MCP was thrown from the aircraft during the crash and was partially pinned underneath some of the wreckage (Tab EE-23). He experienced minor injuries (Tab EE-23). The other mishap crewmembers experienced no significant injuries from the helicopter crash (Tab EE-23).

5. MAINTENANCE

a. Forms Documentation

Sierra Nevada Corp (SNC) maintained the aircraft forms for the MA. All maintenance was documented on SNC Daily Flight Logs, SNC Discrepancy Reports (DR), and in M3 (Modular

Maintenance Management). The purpose of the daily flight logs and DRs is to document various maintenance actions. They are maintained in a binder specifically assigned to each aircraft. M3 is an automated database of aircraft discrepancies, maintenance repair actions and flying history.

The current daily flight logs and DRs were aboard the MA and subsequently recovered by the mishap crew. A review of the current aircraft forms for the day of the mishap revealed the left engine was serviced with one quart of oil during preflight and there were four delayed discrepancies that did not affect airworthiness (Tabs U-11, U-30–33, V-10.4).

The historical daily flight logs and DRs revealed minor documentation errors, commonly found in maintenance forms. These minor errors were previously reconciled. A detailed 90-day review of records and forms revealed a recurring discrepancy with the power plant propeller system which could have contributed to the mishap (Tabs D-5, D-8–9, U-49, U-241–243, V-1.9–1.10, V1.19, V-1.23, V-2.4, V-2.10, V-3.4, V-3.9–3.13, V-4.3, V-4.6, V-4.9, V-5.3–5.12, V-6.3–6.9, V-7.6–7.8, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8, EE-7–16).

A comprehensive review of all daily flight logs, DRs, and M3 was accomplished to determine airworthiness of the MA (Tabs D-4–14, U-11, U-30–33, U-43–58, U-207–210, U-217–224, U-226–243).

Airworthiness Directives are inspections or maintenance procedures required before specific dates or flights. The M3 automated system tracks compliance times and dates. No Airworthiness Directives restricted the MA from flying. Historical records showed all Airworthiness Directives were accomplished IAW applicable guidance. Airworthiness Directive non-compliance did not contribute to the accident (Tab U-3–7).

Prior to the mishap sortie, the MA's total aircraft time was 1163.8 hours with 1273 operational cycles, 1175 improved runway landings, and 98 unimproved runway landings during 979 calendar days of operation. Both engines were Pratt and Whitney (P&W) PT6A-65B turboprop engines. The #1 engine, serial number PCE-PP0118, had 1145.6 hours total engine operating time with 1255 total operating cycles. The #2 engine, serial number PCE-PP0138, had 283.8 hours total engine operating time with 289 total operating cycles (Tabs U-9, U-11, U-213–216).

There were no major maintenance discrepancies that would have prevented the MA from accomplishing the air-land mission on 18 December 2011.

b. Inspections

(1) Mishap Aircraft

The PZL M-28 Periodic Maintenance Inspections (PM) is a periodic cycle of in-depth inspections based on flight hours and operational cycles. These inspections are performed IAW the PZL M28 Maintenance Manual. The most recent PM inspection for the MA was performed on 29 October 2011. Prior to the mishap sortie, the next PM inspection for the MA was due in 23.5 flight hours or 249 operational cycles. The PM inspections were current and not contributory to the mishap (Tabs U-11, U-211).

The Pre-Flight (PR) is a flight preparedness inspection performed prior to flight. The PR inspections are performed IAW the PZL M28 Maintenance Manual. The purpose of this inspection is to visually inspect and operationally checkout various areas and systems of the aircraft in preparation for a flying period. The most recent PR was performed on 18 December 2011 prior to the mishap sortie and was not contributory to the mishap (Tabs U-11, V-10.3–10.6, V-13.3).

c. Maintenance Procedures

The most-recent significant maintenance procedures performed on the MA were adjustments to the powerplant propeller system on 4, 8, and 9 December 2011 (Tabs D-5, D-8–9, U-49, U-241–243, V-1.9–1.10, V1.19, V-1.23, V-2.4, V-2.10, V-3.4, V-3.9–3.13, V-4.3, V-4.6, V-4.9, V-5.3–5.12, V-6.3–6.9, V-7.6–7.8, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8, EE-7–16).

On 4 December 2011 the #2 engine exceeded 1700 Np on max reverse. For the corrective action SNC personnel adjusted the max reverse stop and flight idle IAW PZL M28 MM (Tabs D-5, U-49, U-241, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8).

On 8 December 2011 the #2 engine went to 1800 Np at max reverse. For the corrective action SNC personnel adjusted the max reverse stop out two full turns IAW PZL M28 MM (Tabs D-8, U-242, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8).

On 9 December 2011, the crew reported asymmetrical operation of engines and power levers. For the corrective action SNC personnel re-rigged #1 engine IAW PZL M28 MM (Tabs D-9, U-243, V-9.3–9.4, V-12.3–12.8).

These three discrepancies are indicative of a recurring problem with the power plant propeller system which could have contributed to the mishap (Tabs D-5, D-8–9, U-49, U-241–243, V-1.9–1.10, V1.19, V-1.23, V-2.4, V-2.10, V-3.4, V-3.9–3.13, V-4.3, V-4.6, V-4.9, V-5.3–5.12, V-6.3–6.9, V-7.6–7.8, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8, EE-7–16).

d. Maintenance Personnel and Supervision

All pre-mission activities were normal and all personnel involved in the PR and launch of the MA were highly experienced and competent. A thorough review of maintenance training records revealed all involved personnel were properly trained and qualified (Tab U-59–206).

e. Fuel, Hydraulic and Oil Inspection Analyses

The documented forms illustrated correct levels of fluids in the aircraft at takeoff. Maintenance personnel properly serviced fuel tanks and oil reservoirs IAW applicable technical data. There is no evidence that petroleum, oils and lubricants were a factor in the mishap (Tabs U-11, V-10.3–10.6, V-13.3).

f. Unscheduled Maintenance

There was no unscheduled maintenance from 10 December 2011 to mishap sortie.

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS.

a. Structures and Systems

(1) Fuselage

The airplane fuselage is a semi-monocoque all-metal structure. The fuselage forward section contains a cockpit and entry door, center section houses a passenger/cargo cabin, while the aft section features a cargo (paradrop) door, electrical/air-conditioning equipment compartments, pressure (central) refueling door, and hydraulic system ground service systems (Tab CC-14).

The MA fuselage received significant structural damage to the bottom forward section during the mishap. It also sustained damage to the top and sides of the fuselage during the mishap. It received additional damage during the process of being prepped for shipment which included moving the MA to a safer distance from the mishap landing zone, flipping it over to the upright position, and cutting away the wings, nacelles, and empennage.


(2) Wing

The wing of semi-monocoque, two-spar, all-metal split structure consists of the center wing and two outboard wings. The space between spars is used for integral fuel tanks. The wing is fitted with slats, ailerons, flaps, flaperons and spoilers (Tab CC-16).


The right outboard wing and center wing sustained significant structural damage during the mishap. The left outboard wing sustained damage to its outer surface and flight control surfaces during the mishap. Additional damage was sustained during the process of prepping the aircraft for shipment. This included moving the MA to a safer distance from the mishap landing zone, flipping it over to the upright position, and cutting the wings away from the fuselage. It also included cutting the wings into smaller sections for shipment.







(3) Empennage

The empennage is a cantilever, all-metal, semi-monocoque construction, with twin vertical fins and rudders, a horizontal stabilizer and split elevator. Both rudders and elevator halves incorporate trim tabs. The stabilizer leading edge (nose section) is fitted with a fixed-type slat (vane rake) (Tab CC-16).

The empennage sustained damage to the vertical fins during the mishap. Additional damage was sustained during the process of prepping the aircraft for shipment. This included moving the MA to a safer distance from the mishap landing zone, flipping it over to the upright position, and cutting the empennage away from the fuselage. It also included cutting the empennage into smaller sections for shipment.


(4) Landing Gear

The landing gear is a tricycle, non-retractable type with a nose wheel steerable for taxi and takeoff. Main wheels are provided with hydraulic brakes fitted with anti-skid (ABS) system (Tab CC-16).


The nose wheel landing gear structural support collapsed during the mishap allowing the nose wheel landing gear to collapse into the bottom forward fuselage. The main landing gear fairings sustained damage when the outboard wing supports were cut away in preparation for shipment.


(5) Power Plant

The airplane is powered by two PT6A-65B turboprop engines, driving all-metal, five-blade constant-speed propellers with thrust reverse and feathering capability. Propeller electrical anti-ice system is a part of airplane standard equipment (Tab CC-17).

A detailed 90-day review of records and forms revealed a recurring discrepancy with the power plant propeller system which contributed to the mishap (Tabs D-5, D-8–9, U-49, U-241–243, V-1.9–1.10, V1.19, V-1.23, V-2.4, V-2.10, V-3.4, V-3.9–3.13, V-4.3, V-4.6, V-4.9, V-5.3–5.12, V-6.3–6.9, V-7.6–7.8, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8, EE-7–16).

An analysis of the FDR data during landing indicates the presence of asymmetric thrust pushing the aircraft to the right. At touchdown, the aircraft was producing forward thrust from the left-hand engine and within one second of touchdown was producing reverse thrust from the right-hand engine, which caused the aircraft to veer to the right (Tabs BB-39, DD-405—419, FF-32-33, V-1.9).

The Flight Data Recorder (FDR) data for Left Hand Engine Torque (TQLH) and Right Hand Engine Torque (TQRH) indicates that both subject engines, PCE-PP0118 and PCE-PP0138, experienced over torque conditions during the mishap sortie per the PZL M28 AFM, Paragraph 2.7.2. (Tabs BB-33–35, DD-3–58, EE-7–15, V-16.1).

Another anomaly identified from the FDR data is “torque droop” during power reductions. When power was reduced on both engines simultaneously, the torque on the right-hand engine would droop 10-20% lower than the left-hand engine (Tab DD-59).

The right engine nacelle and both left and right propeller systems sustained damage during the mishap. Both the left and right engine nacelles and propeller systems sustained additional damage during the process of prepping the aircraft for shipment. This included moving the MA to a safer distance from the mishap landing zone, flipping it over to the upright position, and cutting the nacelles away from the wings. It also included cutting the individual propellers away from the propeller hubs.




(6) Flight Control System

The flight control system of cable/pushrod type ensures control for the rudders and elevator, ailerons, flaps, spoilers and trim tabs from both pilots' workstations. Elevator, rudder, and aileron trim tabs are electrically controlled, with the elevator trim tab provided with an auxiliary mechanical control system. Wing flaps and spoilers are hydraulically operated (Tab CC-16).

The flight control system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the flight control system contributed to the mishap.

(7) Hydraulic System

The hydraulic system is used to operate nose wheel steering, wing flap extension and retraction, spoiler deployment, main wheel braking and cargo door opening. The system is powered from two engine-driven pumps. The emergency hydraulic power source is a hydro-accumulator, which ensures operation of wing flaps, spoilers, wheel braking, cargo door opening and parking brake application. Variable-output hydraulic pumps are supplied with working fluid from a tank pressurized by propeller slipstream air (Tab CC-16).

The hydraulic system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the hydraulic system contributed to the mishap.

(8) Oil System

The oil system is an integral part of each engine. The airframe portion of the system consists of two oil coolers fitted with thermostats and power supply systems for the automatic prop feathering pressure and propeller shaft maximum torque warning (Tab CC-17).

The oil system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the oil system contributed to the mishap.

(9) Fuel System

The main fuel tanks, together with two electric fuel feed pumps and fuel gauge senders are located in the outboard wings each. Auxiliary fuel tanks are those located in outboard wing tips and in centerwing. Total capacity of the fuel system amounts to 2278 liters (600 US gal.; 1765 kg). System provides for cross feeding (each engine can be fed from each main tank) (Tab CC-17).

The fuel system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the fuel system contributed the mishap.

(10) Fire-Protection System

The fire protection system for each engine consists of an automatic fire detection unit built up of nine (9) sensors located inside the engine nacelle, and of a combined visual (light)/aural (horn) annunciation in the cockpit. Each nacelle is equipped with a halon type fire extinguisher, manually activated in two stages. Both fire extinguishers can be applied for fighting fire inside one of the engine nacelles. Each fire extinguisher is fitted with a pressure gauge and a thermal-type safety provision. Each engine nacelle features fireproof steel fire walls for fire containment. (Tab CC-17).

The fire-protection system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the fire-protection system contributed to the mishap.

(11) Electrical System

The basic source of electrical power are two starter-generators of 28V D.C. and 12 kW power output each (operating in the generator mode), supplying power in parallel to a single bus, from which all electric loads are powered and the batteries charged. The emergency power supply sources are two Nickel-Cadmium batteries of 26Ah capacity each, which can be also used for engine starting. The secondary electric power supply sources are two transistor converters of 200/115V, 400Hz output and 1500 VA capacity each, supplying power to the cockpit windshield icing protection systems, two 250 VA converters, and a transformer unit to ensure power supply of 115V AC, 36V AC, 26V AC voltage (avionics, hydraulic system pressure gauging system). A standard ground power unit (GPU) connection has been installed in the forward fuselage section to ensure external power supply for ground maintenance and air-conditioner operation with engines off (Tab CC-18).

The electrical system sustained damage during the mishap and additional damage during the process of prepping the MA for shipment. There is no evidence that the electrical system contributed to the mishap.

(12) Flight/Navigation Instruments Supply

Flight instruments are supplied with total and static pressure from Pitot tubes (PWD-5 probes) installed on both fuselage sides. The Pitot tube on the port side supplies total pressure data to the flight/navigation instruments at the pilot-in-command station, while that on the starboard side supplies total pressure data to the corresponding instruments at the co-pilot station. Static pressure data for the flight/navigation instruments are provided from static pressure receivers installed inside the fuselage. The starboard Pitot tube also supplies the airspeed information to the flight data recorder. Pitot heads are fitted with an electric anti-icing system (Tab CC-18).

There is no evidence that the flight/navigation instruments supply system contributed to the mishap.

(13) Flight Instrumentation, Cockpit Instrument and Control Panels

The set of instruments arranged on the cockpit panels provides for IFR/VFR (instrument and visual) flying capability, day and night. The center forward cockpit features a classic-style, T-configuration instrument panel. The Left Hand (LH) and Right Hand (RH) instrument panels, located directly in front of each pilot's station, incorporate flight and navigation instruments. The center panel features navigation and communication unit clusters, including a weather radar and a GPS receiver, as well as all engine operation monitoring instruments and fuel gauge indicators. The anti-glare screen mounted over the instrument panel incorporates a built-in center control panel including automatic pilot controls and annunciator lights of the primary failure-, fire-, and limit torque exceedance warning system. The center support of the instrument panel is provided by the center control panel unit featuring engine control levers, and trim tab/flap position indicators. The upper (overhead) control panel contains an array of annunciator lamps, combined with verbal warning, and sets of switches for engine starting, fuel system control, and master switches for power supply and avionics. The LH side control panels contain controls for cockpit and instruments lighting, flight data recorder, entry door operation and hydraulic system monitoring, pressure setting and flight/navigation instruments power supply switches. The RH side control panels include circuit breakers for primary and emergency electric power supply, air-conditioning and anti-ice system ON/OFF switches, etc. All controls and test system elements have been designed in compliance with Federal Aviation Regulation (FAR) 23, while ensuring minimum pilot workload (Tab CC-19).

There is no evidence that the flight instrumentation, cockpit instruments and control panels contributed to the mishap.

b. Evaluations and Analyses

(1) Engines

The subject engines, PCE-PP0118 and PCE-PP0138, arrived at Pratt & Whitney Canada's (P&WC) Service Investigation facility in Bridgeport, West Virginia, on 26 January 2012. The engine investigation was performed by a P&WC investigator with members of the United States Air Force (USAF) Safety Investigation Board (SIB). The powerplant investigation was performed on 1 February 2012. The Factual Notes were published on 9 February 2012 (Tabs J-2—29 & EE-7–16). The Accident/Incident Report, published by Pratt & Whitney dated 3 May 2012 is at Tab FF).

A detailed 90-day review of records and forms revealed a recurring discrepancy with the power plant propeller system similar to the asymmetric thrust anomaly that was found to be a substantially contributing factor during the mishap (Tabs D-5, D-8–9, U-49, U-241–243, V-1.9–1.10, V1.19, V-1.23, V-2.4, V-2.10, V-3.4, V-3.9–3.13, V-4.3, V-4.6, V-4.9, V-5.3–5.12, V-6.3–6.9, V-7.6–7.8, V-8.3–8.14, V-9.3–9.4, V-12.3–12.8, EE-7–16).

An analysis of the FDR data during landing indicates the presence of asymmetric thrust pushing the aircraft to the right. At touchdown, the aircraft was producing forward thrust from the left-hand engine and within one second of touchdown was producing reverse thrust from the right-hand engine, which would cause the aircraft to veer to the right (Tabs BB-39, DD-405—419, V-1.9).

Additionally, the FDR data for TQLH and TQRH indicates that both subject engines, PCE-PP0118 and PCE-PP0138, experienced over torque conditions during the mishap sortie per the PZL M28 AFM, Paragraph 2.7.2. (Tabs BB-33–35, DD-3–58, EE-7–16, V-16.1).

Another anomaly identified from the FDR data is "torque droop" during power reductions. When power was reduced on both engines simultaneously, the torque on the right-hand engine would droop 10-20% lower than the left-hand engine (Tab DD-59).

(2) Propellers

The subject propellers were investigated at the Hartzell Propeller Inc. factory in Piqua, OH on 3 February 2012. The report was published on 28 Feb 2012. The investigation concluded that both propellers had blade damage consistent with rotation while at low or moderate power at the time of impact. Blade angle indications (witness marks) on the right propeller suggested impact while operating at a reverse pitch position. There were no useful blade angle indications from the left propeller. There were no discrepancies noted that would preclude normal operation. All damage was consistent with impact damage. (Tabs J-30—44 & EE-7–16).

7. WEATHER

a. Forecast Weather

The weather requirement for a 318 ESOS-AG mission is a ceiling of 1,500 feet and visibility of three miles (Tab EE-22). The weather forecast for 18 December 2011 predicted clear skies and 5-mile visibility with haze, and landing zone winds of 190 degrees at 9 knots (Tab F-9). Forecasted weather prior to the mishap sortie was within limits.

b. Observed Weather

On initial contact with the landing zone the weather was as follows: no ceiling; unlimited visibility; surface winds 190 degrees at 14 knots gusting to 17 knots (Tab F-11, N-2). Prior to landing at the landing zone, the winds changed slightly to 190 degrees at 14knots with no gust. All other parameters remained the same (Tab F-11, N-6).

c. Space Environment

Not applicable.

d. Operations

Based on the observed weather at the LZ, the weather was not within limits for the landing (Tab F-11, N-6, BB-37).

8. CREW QUALIFICATIONS

a. Mishap Pilot (MP)

The MP was a current and qualified Evaluator Pilot with 3,546.7 total hours, including 123.7 instructor hours of which 434 hours, including 21.1 instructor hours were in the M-28 (Tab EE-21). The MP was current on both Semi-Prepared and Short Field landings (Tab EE-21).

The member's Flight Evaluation Folder (FEF) is a permanent record of aircrew qualifications. The MP's FEF showed a solid performance throughout his aviation career (Tab EE-25). The MP successfully completed M-28 Pilot training IAW with AFSOC approved Syllabus of Instruction (SOI) (Tab EE-21).

Additionally, the MP completed a civilian Mountain Flying Course in Oct 2010 (Tab EE-21). The course places an emphasis on airstrip analysis, wind direction and intensity, and effects of runway gradients (Tab EE-3).

The MP's flight time during the 90 days before the mishap is as follows (Tab EE-21):

	Hours Flown
Last 30 Days	10.1
Last 60 Days	37.1

Last 90 Days	42.9

b. Mishap Co-pilot (MCP)

The MCP was a current and qualified Mission Co-pilot with 982.2 total hours. These hours include 677.4 M-28 hours (Tab EE-21).

The member's Flight Evaluation Folder (FEF) is a permanent record of aircrew qualifications. The MP's FEF showed a solid performance throughout his aviation career (Tab EE-25). The MP successfully completed M-28 Pilot training IAW with AFSOC approved Syllabus of Instruction (SOI) (Tab EE-21).

Additionally the MP completed a civilian Mountain Flying Course in July 2011 (Tab EE-21). The course places an emphasis on airstrip analysis, wind direction and intensity, and effects of runway gradients (Tab EE-3).

The MCP's flight time during the 90 days before the mishap is as follows (Tab EE-21):

	Hours Flown
Last 30 Days	77.1
Last 60 Days	139.7
Last 90 Days	188.1

c. Mishap Loadmaster (MLM)

The MLM was a current and qualified mission loadmaster with 2,127.2 total hours (Tab EE-21). These hours consisted of 225.5 M-28 hours and 1,873.3 hours in multiple C-130 variants (Tab EE-21).

The member's Flight Evaluation Folder (FEF) is a permanent record of aircrew qualifications. The MLM's FEF showed a solid performance throughout his AFSOC flying career (Tab EE-25). The MLM successfully completed M-28 Loadmaster training IAW with AFSOC approved Syllabus of Instruction (SOI) (Tab EE-21).

The MLM's flight time during the 90 days before the mishap is as follows (Tab EE-21):

	Hours Flown
Last 30 Days	71.1
Last 60 Days	132.4
Last 90 Days	193.5

Crew qualifications were not a factor in this mishap.

9. MEDICAL

a. Qualifications - Health

The Mishap Aircrew was medically qualified to perform flying duties at the time of the mishap. Medical records and individual histories revealed all individuals were in good health and had no recent performance-limiting illnesses prior to the mishap. After thoroughly reviewing the material described above, there was no evidence that any medical condition contributed to this mishap (Tab EE-5).

b. Pathology

Timely and accurate toxicology testing was conducted for the mishap crew. The blood and urine samples were submitted to the Department of Defense Armed Forces Medical Examiner System at Dover AFB, for toxicology analysis. All results were negative (Tab EE-5).

c. Lifestyle

No lifestyle factors were found to be relevant to the mishap (Tab EE-6).

d. Crew Rest and Crew Duty Time

Air Force Instructions require all air crew to have proper "crew rest" as defined in AFI 11-202, Volume 3, *General Flight Rules*, 22 October 2010, prior to performing in-flight duties. AFI 11-202 defines normal crew rest as a minimum of a 12-hour non-duty period before the designated flight duty period begins (Tab BB-42–43). During this time, an aircrew member may participate in meals, transportation, or rest as long as he or she has had at least twelve hours of continuous restful activity with the opportunity for at least eight hours of uninterrupted sleep. Available records show neither fatigue nor sleep deprivation were factors in the mishap and the crew was afforded a 12-hour non-duty period and the opportunity for eight hours of uninterrupted sleep on the night prior to the mishap (Tab EE-6). There is no evidence to suggest that inadequate crew rest was a factor in this mishap.

10. OPERATIONS AND SUPERVISION

a. Operations

The operations tempo of the 318 ESOS is high, but was not a significant factor in this mishap (Tab V-7.3). The M-28 Skytruck is a new aircraft in the AFSOC inventory, and began its initial combat deployment to Afghanistan in March 2011 (Tab EE-22, CC-65). Initially, the M-28 mission was primarily airdrop, but in the two months prior to the mishap, the mission became primarily air/land as new STOL LZs were cleared, surveyed, and approved for use (Tab EE-22, V-1.23, V-13.4, V-14.4). The MP was also the deployed squadron commander, having recently deployed to Afghanistan on his second rotation with the unit (Tab V-1.3 – 1.4). The MCP and MLM were nearing completion of their 90-day rotations (Tab V-2.3, V-3.2). There was no evidence to indicate that stress due to the operations tempo was a significant factor in the mishap (Tab V-7.3).

b. Supervision

Operations supervision was adequate for the mishap flight. The MP was also the deployed squadron (318 ESOS) commander. The MP conducted an initial Operational Risk Management (ORM) analysis of the mission using an AFSOC ORM Worksheet, and identified several risk factors assessed as "Medium Risk" (Tab AA-3–4). The possibility of enemy engagement was assessed as "Medium", as were mountainous terrain around the objective area and aircraft performance (Tab AA-3–4). All other risk factors were assessed as "Low" (Tab AA-3–4). The overall assessment of risk for the mission was "Low" with "Mountainous Terrain" and "STOL Operations" listed as the top mission risks (Tab AA-3–4). There was no mention of an unfamiliar landing zone as a risk factor. As aircraft commander and deployed squadron commander, the MP reviewed his own risk assessment and mitigation plan (Tab V-1.4). The ORM worksheet was also reviewed by the CJSOAD Deputy Commander and then reviewed and approved by the CJSOAD Commander, an Air Force O-6 (Tab V-1.4, V-1.12).

It is the responsibility of an aircraft commander to verbalize areas of risk and discuss with the crew the risk mitigation plan. While the MP testified that he did discuss the new LZ during the pre-mission aircrew brief, there likely was no discussion about landing with a tailwind, since the MP thought the weather forecast was for variable winds at 6 knots (despite the weather sheet stating forecast winds for Walan Rabat were 190 degrees at 9 knots) (Tab V-1.4–1.5, V-1.12, F-8 –9). Additionally, there was no discussion of the effects of landing with a tailwind, or missed approach criteria and procedures during the in-flight approach brief (Tab N).

11. HUMAN FACTORS

a. Introduction

The board evaluated human factors relevant to the mishap using the analysis and classification system model established by the Department of Defense (DoD) Human Factors Analysis and Classification System (HFACS) guide, implemented by Air Force Instruction 91-204, *Safety Investigations and Reports,* dated 24 September 2008. A human factor is any environmental, technological, physiological, psychological, psychosocial, or psycho-behavioral factor a human being experiences that contributes to or influences his performance during a task. The DoD has created a framework to analyze and classify human factors and human error in mishap investigations (Tab BB-1).

The framework is divided into four main categories: *Acts*, *Preconditions*, *Supervision*, and *Organizational Influences*. Each category is further subdivided into related human factor subcategories (BB-8–31). The main categories allow for a complete analysis of all levels of human error and how they may interact together to contribute to a mishap. This framework allows for evaluation from the unsafe acts that directly are related to the mishap through the indirect preconditions, supervision, or organizational influences that may have led to the mishap (Tab BB-1).

There were five relevant factors that may have *contributed* to the mishap.

b. Contributory

1. SP006 Risk Assessment - Formal

Risk Assessment – Formal is a factor when supervision does not adequately evaluate the risks associated with a mission or when pre-mission risk assessment tools or risk assessment programs are inadequate (Tab BB-26-27).

The MP and unit supervision failed to accurately assess the risks involved with an unfamiliar landing zone as the ORM worksheet was marked as low risk for LZs. Additionally, the MP failed to assess the impact of a forecasted tailwind at Walan Rabat LZ during pre-mission ORM (Tab AA-3,V-1.12).

2. PC 212 Excessive Motivation to Succeed

Excessive Motivation to Succeed is a factor when the individual is preoccupied with success to the exclusion of other mission factors leading to an unsafe situation (Tab BB-16).

The MP and MCP focused on the landing at Walan Rabat to the exclusion of eliminating the uncertainty regarding the cross and tail-wind components of the prevailing winds at the LZ (Tab V-1.14–V1.15, V-2.8).

3. PP102 Cross-Monitoring Performance

Cross-Monitoring Performance is a factor when crew or team members failed to monitor, assist or back-up each other's actions and decisions (Tab BB-22).

When it appeared that the winds at Walan Rabat were not what the Mishap Crew expected, and from the testimony, there was some confusion regarding the cross and tail wind components, the MCP was unable to verify the Mission Pilot's computations due to his not having his wind chart on his knee board. He had left it in his helmet bag (Tab R-9).

4. PP109 Mission Planning

Mission planning is a factor when an individual, crew or team failed to complete all preparatory tasks associated with planning the mission, resulting in an unsafe situation (Tab BB-23).

In the preflight mission brief, the MP was under the impression that the winds at Walan Rabat were variable at 5 knots, when in fact, that was the wind factor at Qalat. Recognizing the winds at Walan Rabat being 190/14G17 would have alerted the Mishap Crew to the possibility of out of limit winds at the destination, and allowed them to develop appropriate alternative procedures to deal with them (Tab V-1.11).

5. PP111 Task/Mission-in-Progress Re-Planning

Task/mission-in-progress re-planning is a factor when crew or team members fail to adequately reassess changes in their dynamic environment during mission execution and change their mission plan accordingly to ensure adequate management of risk (Tab BB-23).

When the wind conditions at Walan Rabat were realized, the Mishap Crew failed to accurately assess the cross and tail wind components of the winds, and based on this miscalculation, prosecuted a landing with an out of limits tail wind component (Tab V-1.16).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Directives and Publications Relevant to the Mishap

(1) Electronic Code of Federal Regulations (e-CFR), 26 January 2012
- a. TITLE 14 - Aeronautics and Space
  - i. Chapter 1 Federal Aviation Administration (FAA), Department of Transportation
    - 1. Subchapter D - Airmen
      - a. Part 65 Certification: Airman Other Than Flight Crewmembers
    - 2. Subchapter F - Air Traffic and General Operating Rules
      - a. Part 91 General Operating and Flight Rules

(2) AFI 21-101, *Aircraft and Equipment Maintenance Management*, 26 July 2010

(3) Quality Assurance Surveillance Plan (QASP) For Sierra Nevada Corporation Non-Standard Aviation (NSAv) Light Contractor Logistics Support (CLS), FA8620-11-G-4020 Order Number 0006, 1 December 2011

(4) AFI 13-217, *Drop Zone and Landing Zone Operations*, 10 May 2007

(5) AFI 13-217, *Drop Zone and Landing Zone Operations*, Air Force Special Operations Command Supplement 1, 15 May 2003

(6) AFI 90-901, *Operational Risk Management*, 1 April 2000

(7) AFPD 90-9, *Operational Risk Management*, 1 April 2000

(8) AFI 11-202 Volume 3, *Flying Operations*, 22 October 2010

(9) AFI 11-202 Volume 3, *Flying Operations*, Air Force Special Operations Command Supplement, 15 October 2006

(10) Airplane Flight Manual PZL M28 with PT6A-65B engines, Revision 22, April 2002 AFSOCI 11-2NSAv Volume 1, *NSAv Aircrew Training*, 3 May 2011

(11) AFSOC Guidance Memorandum (GM) 11-16, *Nonstandard Aviation (NSAv) Operations Procedures*, 18 August 2011

(12) AFSOC Guidance Memorandum (GM) 11-13, *Nonstandard Aviation (NSAv) Operations Procedures, Addendum B*, 14 April 2011

(11) AFSOC Guidance Memorandum (GM) 11-16, *Nonstandard Aviation (NSAv) Operations Procedures*, 18 August 2011

(12) AFSOC Guidance Memorandum (GM) 11-13, *Nonstandard Aviation (NSAv) Operations Procedures, Addendum B*, 14 April 2011

(13) Airplane Flight Manual PZL M28 with PT6A-65B engines, Revision 22, April 2002

(14) PZL M28 Maintenance Manual, Revision 23A, 13 October 2011

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

13. ADDITIONAL AREAS OF CONCERN

a. M-28 Operations/Maintenance Interface

M-28, tail number 08-0319, had a recent history of a recurring discrepancy with the power plant propeller system as documented in the aircraft forms. Write ups occurred on 4, 8, and 9 December (Tab D-5, D-8–D-9). During witness interviews, both aircrew members and operations supervision stated that maintenance was increasing visual inspections of cable linkages as well as cleaning and lubricating cables to counteract the effects of the high-dust environment (Tab V-5.7, V-7.6–7.7). When maintenance members and their supervision were asked about the details of the increased inspection, cleaning, and lubrication, they had no idea why operations supervision believed the increased maintenance was taking place (Tab V-8.10, V-14.4). In fact, there were no documented additional inspections or maintenance of the cables.

b. Aircraft Flight Manual Guidance

The PZL M28 Aircraft Flight Manual paragraph 2.37.1 identifies wind limitations for takeoff and landing. Table 2.4 identifies the "maximum demonstrated wind velocity" at various aspects (Tab BB-37). For a direct tailwind ('Flight-to-Wind' {degrees}; 180), that component is 8 knots per Table 2.4 (Tab BB-37). There is no explanation of why 8 knots is the published limit. Although the 318th Special Operations Squadron considers 8 knots as an operational limitation and regulatory guidance, the AFM terminology, "maximum demonstrated wind velocity" does not imply an operational limitation for which aircrews could be held accountable (Tab V-1.14, V-2.7, BB-37).

4 JUNE 2012

, Colonel, USAF
President, Accident Investigation Board

STATEMENT OF OPINION

M-28, T/N 08-0319
VSP WALAN RABAT, AFGHANISTAN
18 December 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

After a careful and complete investigation of this mishap, I find by a preponderance of evidence that the Landing Zone Condition, Task/Mission-in-Progress Re-planning, Cross-Monitoring Performance, Landing with an Excessive Tailwind, and Aircraft Engine Anomalies substantially contributed to the mishap. The landing zone's narrow width, poor visual cues, and uneven surface created an unforgiving terrain with little margin for error. Additionally, the mishap crew failed to effectively re-plan the mission when observed winds were stronger than forecast. They also failed to cross-monitor each other on several occasions, most importantly when the mishap pilot made critical chart errors while computing the tailwind component for landing. Furthermore, the mishap aircraft's excessive tailwind resulted in a higher than normal groundspeed which compressed the landing sequence and increased the likelihood of a harder than normal landing. Finally, the flight data recorder and an inspection of the engines confirms the presence of asymmetric thrust by the left and right engines which pushed the aircraft right after landing.

On 18 December 2011, at approximately 1032Z, an M-28, T/N 08-0319, departed the prepared surface after landing at Walan Rabat STOL LZ, Afghanistan (Tab K-3, V-4.3, V-4.18, EE-22). Upon contact with rough terrain, the nose gear collapsed and the aircraft flipped tail-over-nose and came to rest upside-down east of the landing zone (Tab V-4.3, V-4.18). All three crewmembers and all four passengers safely egressed the aircraft through the copilot's window (Tab V-1.10, V-2.4, V-3.5). There were no significant injuries to crewmembers or passengers and no civilian casualties (Tab V-1.10, V-2.4, V-3.5). The aircraft was destroyed (Tab V-4.18). There was no damage to other government or civilian property.

I also investigated the following factors, which could have played an important role, directly or indirectly, in the sequence of events; however, there was insufficient evidence to determine which particular factor, or combination thereof, substantially contributed to this mishap. These additional factors include Mission Planning/Inattention to Detail, Operational Risk Management, Excessive Motivation to Succeed, Non-Standard Approach Parameters, and Violating Safe Landing Criteria.

I developed my opinion by analyzing factual data from historical records, flight data recorder, cockpit voice recorder, guidance and directives, engineering analysis, witness testimony, photographic evidence, and information provided by technical experts.

2. DISCUSSION OF OPINION

a. Substantially Contributing Factors:

(1) Landing Zone Condition

Walan Rabat STOL LZ is a challenging landing zone. It is a 1,756' by 31' dirt strip with a 3 percent grade that points directly at a 1,500 foot mountain within 1.5 miles of the extended centerline for runway 34 (Tab EE-17–20). Additionally, a note on the LZ survey states that up to 2 inches of moondust might cover the LZ (Tab EE-18). All these factors make it a challenge for an aircrew to visually acquire the unfamiliar LZ. The poor visual cues also make it difficult to identify LZ centerline and the boundaries of the prepared surface (Tab EE-20, R-11). On a 31-foot wide LZ, an M-28 landing on centerline has only 9 feet from either main gear to the edge of the LZ (EE-23). Without clearly defined boundaries, a crew landing just a few feet off centerline or a few degrees off heading could quickly have the main gear off the prepared surface into rougher terrain (EE-23).

(2) Task/Mission-in-Progress Re-planning

When the MC made initial radio contact with the CCT at 7 minutes and 25 seconds out from Walan Rabat LZ, CCT reported the surface wind observation as 190/14G17 knots (14 knots steady-state with gusts to 17 knots) (Tab N-2, EE-23). This surprised the MC, who was not prepared for, and had not expected a tailwind landing (Tab N-2). The cockpit voice recorder captures confusion in the cockpit as the MP directed the MCP to "pull out the crosswind chart" to determine the tailwind component (Tab N-2). The MCP didn't have his flight manual available, so the MP used the chart on his knee board to figure the tailwind component without transferring control of the aircraft to the MCP (Tabs N-2, R-9). In the rushed condition, the MP entered the chart at 30 degrees off the tail and 14 knots. He should have read 8 knots of crosswind and 12 knots of tailwind components, but transposed the two numbers, believing his crosswind component was 12 knots and his tailwind component was 8 knots (Tab V-1.14–1.16). The MP stated "8 and 12", but didn't identify which was which (Tab N-3). The MCP thought the MP meant an 8-knot steady state tailwind component and the 12-knot gust factor (Tab V-2.8). In the rushed condition, the figures were not cross-checked by the MP or the other crewmembers.

(3) Cross-Monitoring Performance

There were several cases of the MC not questioning the decisions or actions of the MP, or the MP not responding to inputs from the other crewmembers. The MCP could not access his flight publications, so was unable to assist the MP computing the tailwind component (Tab R-9). Despite apparent confusion over the tailwind component, the MCP did not press the MP for a clear explanation of 8 versus 12 knots (Tab V-2.8). Another example occurred during the final approach as the MCP made the observation that the approach was shallower than normal ("drug-in"), and the pilot acknowledged as such, but the MCP accepted the answer and did not continue to voice concern (Tab N-7). A third example is that the MCP witnessed the entire approach, and visually acquired the landing zone markings at the same time as the MP, but never voiced the idea of flying a missed approach to get a good visual of the LZ, and get an accurate reading of the winds on final (Tab N-7).

(4) Excessive Tailwind Component

The primary effect of flying an approach and landing with a significant tailwind is that everything looks different. A higher groundspeed on the approach condenses the approach sequence and can cause the crew pacing to be rushed. It can also contribute to late acquisition of the LZ markings. The visual picture as the pilot attempts to land in the 200-foot zone is also different. At 15 knots faster than normal, the zone passes quickly and a tendency is to chop power to land in the zone. The faster groundspeed might also account for an early flare, especially on an upsloping LZ. Finally, the faster groundspeed might contribute to a harder landing and cause the MA to bounce as was observed by CCT (Tab V-4.3).

(5) Aircraft Engine Anomalies

The flight data recorder (FDR) indicates an approximate 12-second over-torque of 107.06% on the right-hand engine during initial takeoff on from Kandahar (Tabs DD-5, DD-9. DD-13, DD-17, DD-21, DD-25, DD-29, DD-33, DD-37). The M-28 has an audible warning tone for an engine over-torque (Tab EE-23). The tone starts when either engine's torque exceeds 100% and extinguishes when both engines' torques are below 100% (Tab EE-23). However, there was no audible tone on the CVR (Tab EE-22). The FDR indicates another over-torque on the takeoff from Qalat (Tabs DD-45, DD-49, DD-53, DD-57, EE-22). The right-hand engine shows 107.06% torque for 1-2 seconds and the left-hand engine shows 106.86% torque for 1-2 seconds (Tabs DD-45, DD-49, DD-53, DD-57). The second set of over-torques did have an associated audible warning tone on the CVR (Tab EE-22).

Another anomaly identified from the FDR is "torque droop" during power reductions (Tab DD-59). When power was reduced on both engines simultaneously, the torque on the right-hand engine would droop 10-20% lower than the left-hand engine (Tab DD-59). The droop would last 5-10 seconds at which point the torques of both engines would re-synchronize (Tab DD-59).

During the portions of flight where the Power Control Levels (PCLs) are typically matched-up and moved simultaneously (takeoff roll and approach to landing) the right-hand engine torque readings are approximately 5% lower than the left-hand engine (Tab DD-60). This condition will give the aircraft more thrust on the left side, pushing the aircraft to the right. It is common to have the PCLs matched up and the engine torques differ by a few percentages (Tab EE-22). During climbout and cruise flight a pilot will adjust one PCL forward or aft of the other PCL to get matching torques (Tab EE-22). When the split between the two PCLs, with torques matched, is great enough (usually ½-1 inch) the pilot will write up the discrepancy and maintenance personnel will make the appropriate adjustments (Tab EE-22).

Additionally, there were two write-ups, in the two weeks prior to the mishap, related to the reverse power check performed during the "Before Takeoff Checklist" (Tabs D-5, D-8). On both write-ups the right-hand engine failed the reverse power check by having the propeller RPM (Np) exceeding 1600 RPMs (Tabs D-5, D-8). The aircraft was returned to maintenance, the corrective actions were completed, and the aircraft returned to flying status (Tab D-5, 8-9).

Finally, an analysis of the FDR during landing indicates the presence of asymmetric thrust pushing the aircraft to the right (Tab FF-5, FF-32, FF-33). Touchdown was determined by analyzing the Vertical Overload information on the FDR. At 10:24:17.1875 on the FDR, the aircraft load increased from 1.23g to 2.05g indicating aircraft touchdown (Tab DD-409, DD-411). Approximately 0.1875 seconds prior to landing the engines show an increase in torque (Tab DD-405, DD-407, DD-409, DD-411). The left-hand engine shows an increase of torque to 33.98%, while the right-hand engine only shows an increase to 11.16% (Tab DD-405, DD-407, DD-409, DD-411). At touchdown, the MP went immediately into reverse without first waiting for the engines to stabilize (TAB V-1.9). Upon the PCLs being placed into reverse, the right-hand engine was already stabilized and went into reverse thrust, indicated by the rise in torque to 33.33% (Torque at max reverse is 30% minimum) from 10:24:18.000 to 10:24:19.000 on the FDR (Tab DD-409, DD-411, DD-413, DD-415, Tab BB-39). At touchdown, the left-hand engine was still stabilizing and producing forward thrust, indicated by the drop in torque from 33.98% at 10:24:17.000, to flight idle torque at approximately 10:24:19.000 (Tab DD-405, DD-407, DD-409, DD-411). At approximately 10:24:19.000 the left hand-engine went into reverse thrust indicated by rise in torque from 10:24:19.000 to 10:24:20.000 (the end of FDR recording) (Tab DD-413, DD-415, DD-417, DD-419). The torque on the left-hand engine only increased to 20.11% before the data ended on the FDR (Tab DD-417, DD-419).

The FDR indicates that at touchdown, the aircraft was producing forward thrust from the left-hand engine and within one second of touchdown was producing reverse thrust from the right-hand engine, which caused the aircraft to veer to the right. Below is a chart of the torque readings from the FDR. Green indicates forward thrust and red indicates reverse thrust as determined by the analysis of the FDR. In the block is not colored, it could not be determined whether the engines were in reverse. In any case, neither engine was producing much power during that time.

	LH Torque	RH Torque
10:24:16	7.82 %	5.26 %
10:24:17	33.98 %	11.16%
10:24:17.187	TOUCHDOWN	
10:24:18	19.44 %	7.37 %
10:24:19	9.27 %	33.33 %
10:24:20	20.11 %	33.33 %

The board indicated that asymmetric thrust was present at and shortly after landing, which would facilitate the aircraft veering to the right.

b. Additional Factors

Evidence suggests a number of other factors also contributed to the mishap. However, the available evidence does not permit an accurate determination of the relative significance of the factors in the sequence of events.

(1) Mission Planning/Inattention to Detail

During the mission planning phase, the crew received a weather briefing that forecasted surface winds at Walan Rabat STOL LZ as 190/09 knots (Tab F-9). Neither the MP nor MCP recalled seeing forecast winds from 190 degrees. The MP testified that winds were forecast for light and variable and the MCP testified the winds were forecasted from 240 degrees (Tab V-1.11, 2.5). The forecast winds for Kandahar were variable/6 knots and for Qalat were 240/10G15 knots, but the weather sheet clearly shows 190/09 for Walan Rabat (Tab F-8–9). Had the MC expected a tailwind, they would likely have discussed how the tailwind and higher groundspeed would impact the approach and landing, and what steps could be taken to mitigate the increased risk. Because the tailwind was not expected, the MP was forced to consult his chart while still flying the aircraft because the MCP had left his publications in his bag in the back of the aircraft (Tab R-9, V-1.15). Furthermore, the MP elected to fly a shallow 2 ½ -3 degree approach instead of a standard 4-5 degree approach because of the 3 percent upslope on runway 34 (Tab V-1.17). While there is sound logic to the shallower approach, a steeper angle would have made visual acquisition of the runway environment and the marked landing zone easier for the MC.

(2) Operational Risk Management

While the 318 ESOS has an effective Operational Risk Management program, it did not account for the complexity of the Walan Rabat STOL LZ. The 1,756’ by 31’ runway has a 3 percent grade, has a 1,500-foot mountain within 1½ mile of runway centerline to the north, has poorly defined boundaries, and is covered with fine “moondust” (Tab EE-17-20). Despite the runway conditions and the fact that neither pilot had ever landed at Walan Rabat LZ, the ORM worksheet was marked “low” for the mission and did not mention that Walan Rabat was an unfamiliar LZ (Tab AA-3). Both the MC and unit leadership failed to identify the complexity of this unfamiliar LZ as a significant risk factor.

(3) Excessive Motivation to Succeed

During the approach briefing in the 10-minute checklist, there was no discussion of missed approach parameters or procedures despite the fact that neither pilot had ever been to Walan Rabat LZ (Tab EE-23). Upon receiving the observed surface winds from CCT, there was no discussion about aborting the mission or flying a low approach to visually identify the LZ and get a wind update (Tab N-2). During the approach, the MC did not visually identify the LZ environment until inside of 3½ miles (Tab N-5). After finally confirming the runway environment, the MC continued the approach until a point at 100 feet AGL and approximately 1,000 feet short of the "box", leaving only 6 seconds between seeing the marked LZ and touchdown (Tabs N-7, EE-23). Never during the approach did any member of the MC mention a go-around (Tab N-7, EE-23). Pressure to land the aircraft inside the 200-foot zone might have caused the MP to aggressively cut power to land in the box. An audible stall warning lasted for 4-5 seconds as the MP flared for landing (Tab N-7, EE-23). While a short stall warning is not unusual during landings, a stall warning of this duration suggests a high flare, which is consistent with the CCT member's testimony that the MA appeared to drop eight feet onto the runway and bounce (Tab V-4.3).

(4) Non-Standard Approach Parameters

The MP elected to fly a 2½-3 degree approach to Walan Rabat LZ because of the 3 percent upslope for runway 34 (Tab V-1.7). The MCP commented on final approach that the approach was "still drug-in looking" (Tab N-7). The MP confirmed the picture with "Yep, this one will be drug in" (Tab N-7). While a shallow approach is a valid technique for an upsloping LZ, it makes it more difficult to visually identify an unfamiliar runway environment and the landing zone markings. This is especially true for a landing zone marked with cerise panels laid flat on the ground (Tab V-1.9). The MP only acquired the LZ markings 6 seconds prior to landing and landed in the box (Tabs N-7, EE-23).

(5) Violating Safe Landing Criteria

AFSOC M-28 crews are conditioned to think of the "maximum demonstrated wind velocity" of 8 knots on the tail as an operational limit that is not to be exceeded (Tab BB-37, V-1.14, V-2.7). Because of confusion in the cockpit, the MP erroneously read an 8-knot tailwind component from the allowable wind component chart (Tab V-1.15). The correct reading was 12 knots (Tabs AA-5, V-1.16). In effect, the MC violated regulatory guidance by landing with 50 percent more tailwind component than allowed by the Aircraft Flight Manual.

3. CONCLUSION

I found no clear and convincing evidence of the primary cause of the accident. I determined by a preponderance of evidence that the Landing Zone Condition, Task/Mission-in-Progress Re-planning, Cross-Monitoring Performance, Landing with an Excessive Tailwind, and Aircraft Engine Anomalies substantially contributed to the mishap, ultimately causing the mishap aircraft to veer off the prepared surface into rough terrain, resulting in the collapse of the nose landing gear and destruction of the aircraft.

4 JUNE 2012

, Colonel, 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.

INDEX OF TABS

DISTRIBUTION LETTER AND SAFETY INVESTIGATOR INFORMATION………… A

THIS TAB NOT USED………………………………………………………………… B

THIS TAB NOT USED………………………………………………………………… C

MAINTENANCE REPORT, RECORDS, AND DATA……………………………………… D

THIS TAB NOT USED………………………………………………………………… E

WEATHER AND ENVIRONMENTAL RECORDS AND DATA…………………………… F

PERSONNEL RECORDS……………………………………………………………… G

EGRESS, IMPACT, AND CRASHWORTHINESS ANALYSIS…………………………… H

DEFICIENCY REPORTS……………………………………………………………… I

RELEASABLE TECHNICAL REPORTS AND ENGINEERING EVALUATIONS……… J

MISSION RECORDS AND DATA……………………………………………………… K

DATA FROM ON-BOARD RECORDERS……………………………………………… L

DATA FROM GROUND RADAR AND OTHER SOURCES……………………………… M

TRANSCRIPTS OF VOICE COMMUNICATIONS……………………………………… N

ANY ADDITIONAL SUBSTANTIATING DATA AND REPORTS………………………… O

DAMAGE AND INJURY SUMMARIES………………………………………………… P

AIB TRANSFER DOCUMENTS……………………………………………………… Q

RELEASABLE WITNESS TESTIMONY………………………………………………… R

RELEASABLE PHOTOGRAPHS, VIDEOS, AND DIAGRAMS…………………………… S

THIS TAB NOT USED………………………………………………………………… T

AIRCRAFT MAINTENANCE RECORDS (not included in Tabs H or O) ……………… U

WITNESS TESTIMONY AND STATEMENTS…………………………………………… V

THIS TAB NOT USED………..…………….……………………………………………...….. W

STATEMENTS OF INJURY OR DEATH……………………………….………………......….. X

DOCUMENTS APPOINTING THE AIB MEMBERS…………………….…………...…… Y

PHOTOGRAPHS (not included in Tab S) ……………………………….………...…… Z

FLIGHT DOCUMENTS………………………………………………….………...……. AA

GOVERNMENT DOCUMENTS AND REGULATIONS…………………..…….…..…….. BB

UNIT AND AIRCRAFT FACT SHEETS……….…………………….……………..….. CC

MECHANICAL DATA & ANALYSIS..…………………….…….…………………….. DD

MEMORANDA FOR RECORD & MISCELLANEOUS DATA………………….....….…. EE

ENGINE ANALYSIS REPORT……………………………………………………………. FF