UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION BOARD REPORT

C-145A, T/N 12-0331

720TH OPERATIONS SUPPORT SQUADRON
24TH SPECIAL OPERATIONS WING
HURLBURT FIELD, FLORIDA

LOCATION: EGLIN AIR FORCE BASE, FLORIDA
DATE OF ACCIDENT: 3 AUGUST 2015
BOARD PRESIDENT:
BRIGADIER GENERAL VINCENT K. BECKLUND

Conducted IAW Air Force Instruction 51-503

United States Air Force Accident Investigation Board Report

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

C-145A, T/N 12-0331
Eglin Air Force Base, Florida 3 August 2015

On 3 August 2015, at approximately 1136 hours local time (L), two Special Tactics airmen sustained non-survivable injuries, and were later pronounced dead, following an accidental head-to-head collision during a military parachute training jump from a C-145A, tail number 12-0331, using MC-4 parachutes at Auxiliary Field 6, Eglin Air Force Base (AFB), Florida. The mishap jumpers were both members of the 720th Operational Support Squadron (720 OSS) assigned to Hurlburt Field, Florida.

During the third and final group jump of the day, with nine jumpers on board, Mishap Jumper 2 (MJ2) exited the aircraft from 10,000 feet above ground level (AGL) as the seventh jumper, and struck the fifth jumper, Mishap Jumper 1 (MJ1), in a head-to-head collision at approximately 8,000 feet AGL, immediately rendering both jumpers unconscious. Both jumpers fell uncontrolled until each of their automatic activation devices initiated their reserve parachute canopies at approximately 1,600 feet AGL. At 1140L, both MJ1 and MJ2 drifted under fully inflated reserve parachute canopies into a nearby wooded area.

No other jumpers or drop zone personnel were injured or killed in the mishap. Total damage to government property was valued at $20,494.

The Accident Investigation Board (AIB) president found, by a preponderance of the evidence, the mishap was caused by MJ2 failing to see and avoid MJ1, who as the lower jumper had the right of way during free fall.

Additionally, the AIB President found, by a preponderance of the evidence, four factors that substantially contributed to the mishap. The first factor consists of MJ2 choosing an overaggressive track body position in the air that produced excessive speed in order to descend rapidly to a lower jumper. The second factor consists of MJ2 overestimating his personal capability to avoid other jumpers while descending rapidly to reach a lower jumper. The third factor consists of MJ2, after almost colliding with another jumper, redirecting his attention, which forced him to adjust his track body position, and ultimately his flight vector, placing him on a collision course wherein he failed to see and avoid MJ1. The fourth factor consists of the Mishap Jumpmaster (MJM), not providing complete information regarding action procedures under military free fall (group procedures), or confirming that the Mishap Assistant Jumpmaster (MAJM) provided this information separately during group three's jump profile rehearsal. The briefing inadequacy did not violate military instructions or guidance, but substantially contributed to the mishap.

United States Air Force Accident Investigation Board Report

SUMMARY OF FACTS AND STATEMENT OF OPINION
C-145A, T/N 12-0331
3 AUGUST 2015

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ACRONYMS AND ABBREVIATIONS

24 SOW	24th Special Operations Wing
720 OSS	720th Operational Support Squadron
720 STG	720th Special Tactics Group
919 SOW	919th Special Operations Wing
AAR	After Action Report
ABU	Airmen Battle Uniform
AF	Air Force
AFB	Air Force Base
AFE	Aircrew Flight Equipment
AFI	Air Force Instruction
AFIP	Air Force Institute of Pathology
AFMAN	Air Force Manual
AFPAM	Air Force Pamphlet
AFRICOM	Africa Command
AFSOC	Air Force Special Operations Command
AFTO	Air Force Technical Order
AGL	Above Ground Level
AGOS	Air Ground Operations School
AIB	Accident Investigation Board
AJM	Assistant Jumpmaster
AOR	Area of Responsibility
ARMS	Automated Record Management System
ASOS	Air Support Operations Squadron
ATP	Army Techniques Publications
BMNT	Before Morning Nautical Twilight
CAC	Common Access Card
Capt	Captain
CASEVAC	Casualty Evacuation
CCT	Combat Control Team
CENTCOM	Central Command
CG	Center of Gravity
Col	Colonel
CPR	Cardiopulmonary Resuscitation
CYPRES	Cybernetic Parachute Release System
DO	Director of Operations
DoD	Department of Defense
DZCO	Drop Zone Control Officer
DZSO	Drop Zone Safety Officer
DZ	Drop Zone
EENT	End Evening Nautical Twilight
EMS	Emergency Medical Services
EP	Emergency Procedure
ETA	Estimated Time of Arrival
FAM	Familiarization
FCIII	Flying Class III
FLS	Field Landing Strip
fps	Feet per Second
ft	Feet
FTN	Force Tracking Number
GCC	Geographic Combatant Command
GOV	Government Owned Vehicle
GTC	Government Travel Card
HAHO	High Altitude High Open
HALO	High Altitude Low Open
HLZ	Helicopter Landing Zone
IAW	In Accordance With
IDMT	Independent Duty Medical Technician
ISB	Interim Safety Board
J-coded	Alternate Aircraft Commander
JCET	Joint Combined Exchange Training
JFK	John F. Kennedy
JMPI	Jumpmaster Personnel Inspection
JTAC	Joint Tactics
K	Thousand
KCAS	Knots Calibrated Airspeed
KTAS	Knots True Airspeed
kts	Knots
L	Local Time
LAR	Launch Acceptability Region
Lt Col	Lieutenant Colonel
LZ	Landing Zone
MA	Mishap Aircraft
Maj	Major
MAJCOM	Major Command
MASCAL	Mass Casualty
MFF	Military Free Fall
MAJM	Mishap Assistant Jumpmaster
MAST	Military Anti-Shock Trousers
MJ	Mishap Jumper
MJM	Mishap Jumpmaster
MLM	Mishap Loadmaster
MO	Malfunctions Officer
MOA	Military Operating Area
MP	Mishap Pilot
MSL	Mean Sea Level
NAS	Naval Air Station
NCO	Noncommissioned Officer
NCOIC	Noncommissioned Officer in Charge
NM	Nautical Miles
NOTAMs	Notices to Airmen
NVGs	Night Vision Goggles
OCONUS	Outside the Contiguous United States
ODA	Operation Detachment Alpha
OG	Operations Group
OI	Operating Instructions
OL	Operations Locations
OPR	Officer Performance Report
Ops Tempo	Operations Tempo
OR	Operating Room
ORM	Operational Risk Management
OSS	Operation Support Squadron
PA	Physician Assistant
PCS	Permanent Change in Station
PHA	Physical Health Assessment

PI	Point of Impact
PJ	Pararescue Jumper
PPE	Personal Protective Equipment
PTSD	Post-Traumatic Stress Disorder
QA	Quality Assurance
RP	Reference Point
RSL	Reserve Static Line
RTB	Return-To-Base
SA	Situational Awareness
SAR	Search and Rescue
SAV	Staff Assistance Visit
SD Card	Secure Digital Card
SERE	Survival, Evasion, Resistance, and Escape
SII	Special Interest Item
SNCO	Senior Noncommissioned Officer
SOAMXS	Special Operations Aircraft Maintenance Squadron
SOF	Supervisor of Flying
SOP	Standard Operating Procedure
SOST	Special Operations Surgical Team
SOU	Statement of Understanding
SOW	Special Operations Wing
ST	Special Tactics
Stan/Eval	Standards and Evaluation
STG	Special Tactics Group
STIF	Special Tactics Information File
STGOI	Special Tactics Group Operational Instruction
STTS	Special Tactics Training Squadron
TACP	Tactical Air Control Party
TCTO	Time Compliance Technical Order
TDY	Temporary Duty
T/N	Tail Number
TOD	Tech Order Data
TOT	Time on Target
TTP	Tactics, Techniques and Procedures
UC	Unit Compliance
USAF	United States Air Force
USSOCOM	United States Special Operations Command
UTC	Unit Tasking Code
VTC	Video Teleconference
WARNO	Warning Order
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 25 August 2015, Major General Morris E. Haase, Vice Commander, Air Force Special Operations Command (AFSOC), appointed Brigadier General Vincent K. Becklund to conduct an aircraft accident investigation of a mishap that occurred on 3 August 2015 involving a Military Free Fall (MFF) Parachuting accident on Eglin Air Force Base (AFB), Florida (Tab Y-3). The aircraft accident investigation was conducted in accordance with Air Force Instruction (AFI) 51-503, *Aerospace and Ground Accident Investigations*, at Hurlburt Field, Florida, from 5 September 2015 through 1 October 2015 (Tab Y-3). Board members assigned were a medical member (Colonel), a legal advisor (Captain), a jumpmaster (Senior Master Sergeant), and a recorder (Technical Sergeant) (Tab Y-3 to Y-6).

b. Purpose

In accordance with AFI 51-503, *Aerospace and Ground Accident Investigations*, this accident investigation board conducted a legal investigation to inquire into all the facts and circumstances surrounding this Air Force aerospace accident, prepare a publicly releasable report, and obtain and preserve all available evidence for use in litigation, claims, disciplinary action, and adverse administrative action.

2. ACCIDENT SUMMARY

On 3 August 2015, at approximately 1136 hours local time (L), two Special Tactics airmen sustained non-survivable injuries, and were later pronounced dead, following an accidental head-to-head collision during a military parachute training jump from a C-145A, tail number 12-0331, using MC-4 parachutes at Auxiliary Field 6, Eglin AFB, Florida (Tabs R-141, R-167, U-10, U-12, V-1.1, V-6.6, V-13.3, X-3 to X-4, AA-3, AA-7 to AA-8, and DD-71). The mishap jumpers were both members of the 720th Operational Support Squadron (720 OSS) assigned to Hurlburt Field, Florida (Tabs G-56, and G-62).

3. BACKGROUND

Mishap Jumper 1 (MJ1) was an Air Force Technical Sergeant, Combat Controller, assigned to 720 OSS, with over 15 years of active-duty service (Tabs G-57 to G-61, and T-5). MJ1 was a certified Master Parachutist with 224 total jumps, multiple combat deployments and a distinguished service record (Tabs G-56, and T-5).

Mishap Jumper 2 (MJ2) was an Air Force Technical Sergeant, Tactical Air Control Party (TACP) operator, assigned to 720 OSS with over 14 years of active-duty service (Tabs G-62 to G-63, and T-7 to T-8). MJ2 was a certified Parachutist with over 50 military jumps, multiple combat deployments and a distinguished service record (Tabs G-62, and T-5).

a. Air Force Special Operations Command (AFSOC)

AFSOC is one of ten Air Force Major Commands (MAJCOM) and is the Air Force component of United States Special Operations Command (USSOCOM) (Tab CC-3). The primary mission of AFSOC is to organize, train and equip Airmen to execute global special operations (Tab CC-3). AFSOC brings unique capabilities to form versatile special operations teams (Tab CC-3). AFSOC accomplishes this mission through its subordinate units, including three Air Force Wings, among which is the 24th Special Operations Wing at Hurlburt Field, Florida (Tab CC-4).

b. 24th Special Operations Wing (24 SOW)

The primary mission of the 24 SOW is to provide Special Tactics forces for rapid global employment to enable airpower success (Tab CC-7). The 24 SOW is USSOCOM's tactical air and ground integration force (Tab CC-7). The unique skills of the 24 SOW provide full-spectrum, air-focused special operations capability to combatant commanders to ensure airpower success (Tab CC-7). The 24 SOW is the most decorated unit in the Air Force (Tab CC-7). The 24 SOW has multiple subordinate units, including the 720th Special Tactics Group at Hurlburt Field, Florida (Tab CC-8).

c. 720th Special Tactics Group (720 STG)

The 720 STG is an integral part of AFSOC, comprised of Combat Control, TACP operators, Pararescue, Combat Weather and support personnel (Tab CC-10). The 720 STG organizes, trains, and equips Special Tactics forces worldwide to provide airmanship expertise and establish air to ground interface in an objective area (Tab CC-10). To accomplish this mission, the 720 STG uses a wide range of combat insertion methods to include military parachuting (Tab CC-10).

d. 720th Operational Support Squadron (720 OSS)

The 720 OSS supports all phases of the 720 STG mission (Tab CC-13). The unit is responsible for Special Tactics taskings, operations, training, weapons and tactics, exercise planning, medical and logistical management and support (Tab CC-13).

e. 919th Special Operations Wing (919 SOW)

The 919 SOW is located at Eglin Air Force Base Field 3, known as Duke Field, Florida (Tab CC-15). The 919 SOW is a subordinate unit of the Air Force Reserve Command and 10th Air Force, but falls under AFSOC for wartime or contingency operations (Tab CC-15). The 919 SOW provides operational

support to the aviation mission of AFSOC through the employment of, among other things, the C-145A aircraft (Tab CC-15).

f. C-145A

The C-145A is a twin engine, high wing aircraft with twin vertical fins and non-tractable landing gear, capable of short take-off and landing on unprepared runways (Tab CC-19). The C-145A is configured to support airdrop of cargo and personnel (Tab CC-19). The C-145A can carry a maximum of 16 passengers, or 10 combat rigged paratroopers (Tab CC-19). The Air Force uses C-145As to support non-standard aviation missions (Tab CC- 19).

g. Military Free Fall Parachute Operations

The Air Force conducts MFF parachute operations as a means of aerial delivery of personnel into a designated area of operations (Tab BB-11). Parachutists must receive formal military training and be authorized to participate in such operations (Tabs BB-4, and DD-62). Once qualified, MFF parachutists are required to jump once each quarter to maintain proficiency and current parachutist status (Tabs V-12.3, V-13.8 and V-14.5). As part of a MFF operation, jumpers must conduct sustained airborne training within the 24 hour period before the operation (Tabs BB-4, and BB-46). At a minimum, the MFF sustained airborne training must consist of a jumpmaster troop briefing, a mock aircraft rehearsal, action procedures in free fall and canopy flight, emergency procedures, canopy entanglement procedures and landing procedures (Tab BB-46 to BB-49). Commonly, these requirements are met in the jumpmaster briefing or jump profile rehearsal briefing prior to jumping (Tab BB-46 to BB-49). Guidance for these requirements can be found in Air Force Manual (AFMAN) 11-411(I), *Special Forces Military Free Fall Operations* (Tab BB-10).

h. Military Free Fall Techniques from AFMAN 11-411(I)

Through extensive training and recurring MFF jumps, jumpers develop and maintain the skills for controlling their body position for stability and movement (Tab BB-26 to BB-31). Different body positions are used by jumpers to control direction and speed (Tab BB-26 to BB-31).

(1) Body Stabilization

Body stabilization skills allow the parachutist to group in free fall, cover small lateral distances with a rucksack, move off a lower parachutist's back in free fall, and turn to keep the drop zone (DZ) or group leader in sight (Tab BB-26).

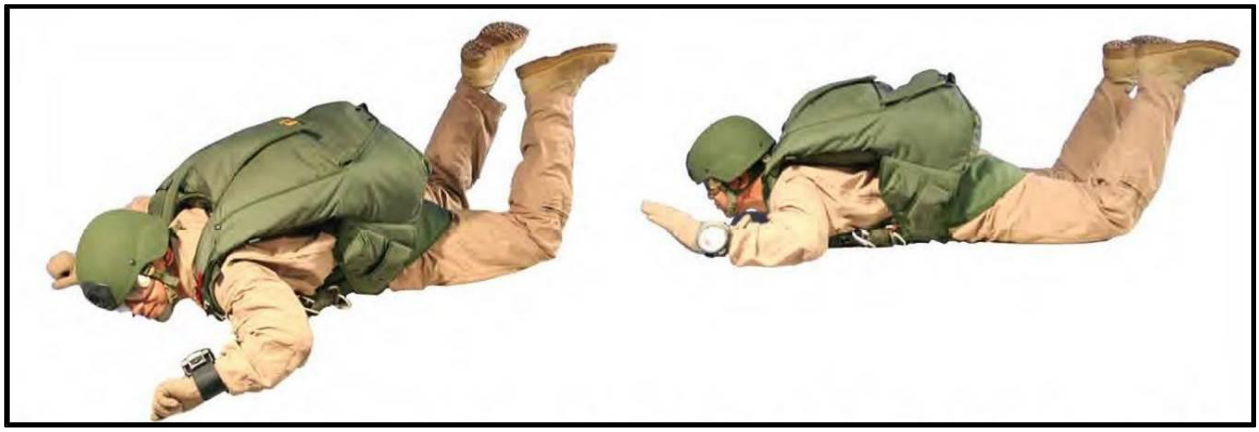

Figure 1: Stable free fall position (Tab BB-29).

In the stable free fall position, parachutist arches his back and holds his head up and back (Tab BB-29).

Figure 2: Gliding (Tab BB-29).

The glide is a controlled lateral movement (Tab BB-29). It allows the parachutist to maintain relative position with a designated group leader or bundle (Tab BB-29). The straighter he holds his legs, the faster the glide will be (Tab BB-29). To stop the glide, he returns to the stable free fall position (Tab BB-29).

(2) **Tracking**

Tracking is the technique of assuming a body position that allows the jumper to move horizontally while free falling (Tab BB-31). Although there are many variations of the basic body position, it essentially involves the jumper moving out of the traditional face-to-earth arched position, straightening the legs, bringing the arms to the sides at a 45-degree angle, rolling the shoulders forward, and cupping the air to provide maximum lift (Tab BB-31). Tracking is regarded as an essential lifesaving skill for all MFF jumpers engaging in grouping exercises (Tab BB-31). It allows the jumpers to gain horizontal separation before opening their parachutes or when the jumpers must cover great distance because of an incorrect spot determined by the jumpmaster (Tab BB-31). Because a good track body position can lead to significant horizontal speed and because the body's curved and slightly head-down position can cause less-experienced jumpers to be aware of a reduced area around them, novice jumpers should train themselves to be aware of what is going on around them in all directions for a greater distance while tracking (Tab BB-31). See warning from AFMAN 11-411(I) below in Figure 3:

Figure 3: Danger Warning (Tab BB-32).

Figure 4: Track body position (Tab BB-31).

(3) **Collision Avoidance**

The lower jumper has the right of way (Tab BB-53). Jumpers must never get over the top of another jumper (Tab BB-53). The jumper should use forward movement or side slide to get off another jumper's back (Tab BB-53). Additionally, while performing grouping procedures, AFMAN 11-411(I) states jumpers are to "maintain 25-meter separation" (Tab BB-58).

4. SEQUENCE OF EVENTS

a. Mission

720 OSS conducted an MFF High Altitude Low Opening (HALO) parachute jump from a C-145A at Auxiliary Field 6 of Eglin Air Force Base, Florida (Tabs AA-3, and DD-16). Auxiliary Field 6 is approximately 14 miles northwest of Eglin AFB's main airfield (Tabs V-1.12 to V-1.13, Z-6, and Z-24).

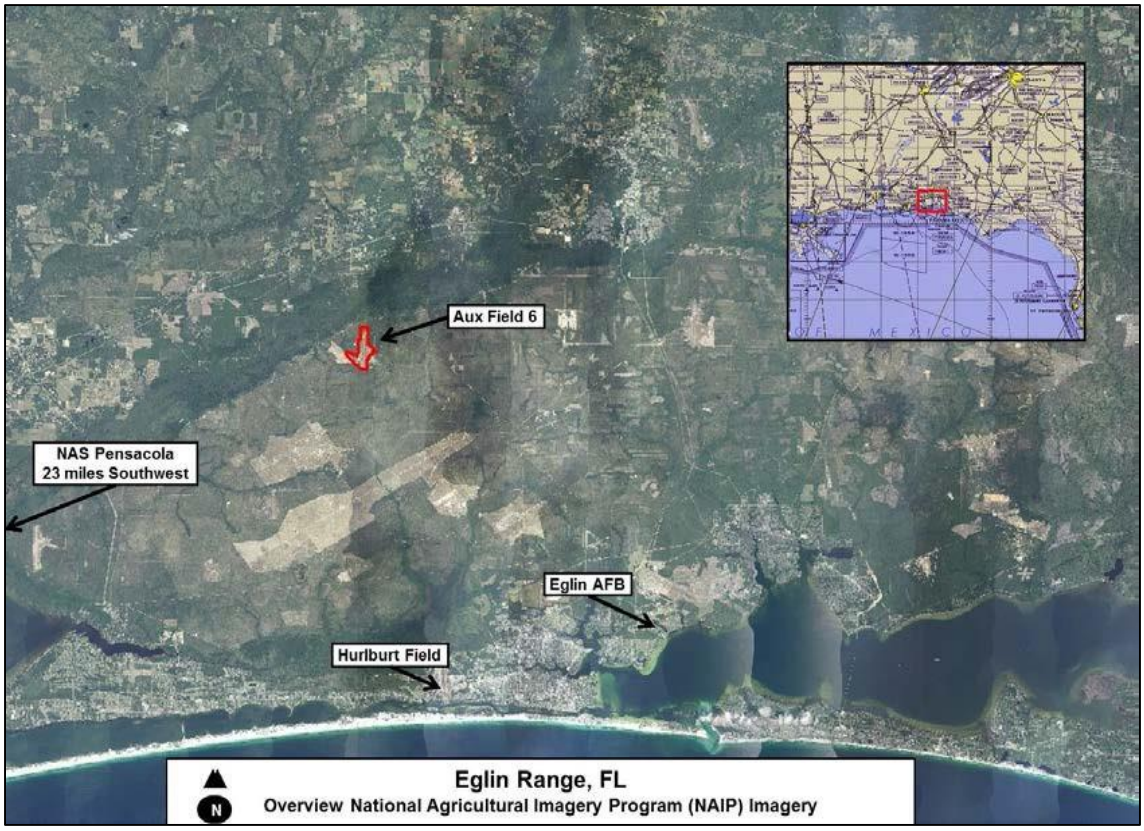

Figure 6: Map of Eglin Range (Tab Z-24).

The purpose of this jump was to conduct MFF parachute jump training to maintain proficiency and current parachutist status (Tab V-13.3). Such jumps by 720 OSS recur monthly and participants individually volunteer for each jump (Tab V-12.3 to V-12.4).

b. Planning

On Friday, 31 July 2015, prior to the mishap, the Mishap Jumpmaster (MJM) and the Mishap Assistance Jumpmaster (MAJM) conducted mission planning with the C-145A aircrew at Duke Field, FL (Tabs R-11, R-56, R-227, V-1.5, V-15.2, and V-25.1). The MJM and MAJM conducted an in-depth brief, including a walk-through of the non-standard aircraft, and an exchange of briefs between the loadmaster and MJM regarding emergency procedures and any non-standard or unique requirements from both the aircrew and jumpers; including the use of a non-standard Drop Zone (DZ) marking system consisting of two large red and green circular disks (Tabs R-11, R-56, and V-15.2). The MJM and C-145A aircrew reviewed the DZ survey and discussed moving the Point of Impact (PI), or planned jumper landing location, from the surveyed location to a new location to improve training efficiency (Tab R-11). At the conclusion of this meeting, the jumpmasters and aircrew felt confident in their plan for Monday's MFF operation (Tabs R-11, and V-15.2).

c. Jumpmaster Briefing

On Monday, 3 August 2015, at 0730L MJM and MAJM conducted the MFF jumpmaster brief from an approved 720 STG PowerPoint briefing (Tabs R-95, R-180, and DD-12 to DD-64). According to multiple witnesses, the briefing was very thorough and covered all required

emergency procedures for a MFF parachute jump (Tabs R-27, R-128 to R-129, R-180, V-7.20 and V-14.2). Additionally, MJM identified three jumper groups, or lifts, in anticipation of each jumper receiving at least one MFF jump that day (Tab R-12, R-75, and DD-16). The jumpmaster brief did not include a jump profile rehearsal, wherein each lift would rehearse the exit, group procedures under free fall and canopy, and landing expectation after exiting the aircraft (Tabs R-12, V-1.6, V-4.2, and DD-12 to DD-65). MJM's intent was for each lift to conduct a separate jump profile rehearsal with the members of their respective lifts (Tab V-1.4 to V-1.6). According to witness testimony, this is common practice when conducting multiple lifts (Tab V-1.6 to V-1.7). MJM had verified all scheduled jumpers were current, certified, and able to jump using the Automated Records Management System (ARMS) (Tabs R-14 to R-15, R-27, R-275, and V-12.4). This system ensures all necessary prerequisite training and qualifications are accomplished in accordance with governing operating instructions to include currency of the Special Tactics Information File (STIF) (Tabs R-14 to R- 15, R-27, and R-275). Most participants had previously scheduled themselves for a jump and had been pre-screened by MJM (Tabs R-12, and V-12.3 to V-12.4). However, Mishap Jumper 5 (MJ5) and MJ1 arrived ready to jump, but late for the jumpmaster brief, and consistent with standard practice at 720 OSS, these jumpers were verified by MJM as current, certified, and able to jump via ARMS (Tabs R-146, V-1.22 to V-1.23 and V-6.4). MAJM briefed the entire jumpmaster brief to MJ5 and MJ1, using pre-printed PowerPoint slides, once they arrived at the DZ (Tabs R-146, and V-6.4). Shortly after 0800L, the jumpmaster briefing concluded and all personnel then loaded a bus, or one of several Government Owned Vehicles (GOV), to depart for the designated DZ at Auxiliary Field 6 (Tabs R-10, and R-146).

d. Summary of Accident

(1) **Arrival**

At approximately 0905L, all jumpers and support personnel arrived at Auxiliary Field 6 (Tabs R-46 to R-47, and DD-71). Key medical and support personnel included a Physician's Assistant (720 STG PA), Nurse Case Manager (720 STG Nurse), Standards and Evaluation representative (720 STAN/EVAL), a designated Drop Zone Control Officer (DZCO), and a Malfunction Officer (MO) from 720 OSS (Tabs R-95, R-147, R-190, V-9.3 to V-9.4, V-11.3 and V-23.1). Upon arrival, all personnel began to prepare for jump operations by unloading parachute and personal equipment (Tab R-27). Simultaneously, each jumper was issued a parachute and altimeter (Tabs R-10, R-27, R-95, and R-126). At approximately the same time, MJ2 and Mishap Jumper 3 (MJ3) were briefed by 720 STAN/EVAL and were tasked to conduct a medical exercise upon lift one jumpers landing (Tabs V-4.3, and V-9.3). MJ3 was the intended exercise patient and MJ2 was the intended exercise first responder (Tabs V-4.3, V-9.3, and V-4.14 to V-4.15). After receiving the medical exercise instructions from 720 STAN/EVAL, both jumpers returned to the staging area to don parachutes and receive their Jump Master Personnel Inspection (JMPI), along with all other jumpers (Tabs R-185, V-4.15, and V-22.1). The JMPI is a required formal process, wherein the jumpmaster inspects each jumper's equipment to ensure proper fit and function (Tab V-22.1).

At approximately 1000L, the C-145A arrived at Auxiliary Field 6 and shut down both engines (Tabs V-4.14, V-15.2, AA-3, and DD-71). At this time, the jumpmasters proceeded to the aircraft to conduct a pilot and jumpmaster brief (Tabs R-27, R-129, V-10.2, and V-15.2 to V-15.3). After the brief was complete, MJM had all jumpers proceed to the rear of the aircraft for an aircraft orientation brief conducted by both the MJM and the mishap loadmaster (MLM)

(Tabs R-27, R-129, V-10.2, and V-15.2 to V-15.3). MJM determined an aircraft orientation was necessary because the C-145A is a non-standard aircraft (Tab R-27). Specifically, the C-145A differs from more commonly used MFF aircraft in several ways, most importantly it has a narrow fuselage (Tabs R-29, R-204, R-206, and Z-19). Following this orientation, all jumpers were given an opportunity to walk through the aircraft, although according to witness testimony, not all jumpers took advantage of this opportunity (Tabs V-3.12, V-4.13, V-17.2, and V-20.4). Of note, an aircraft walk through is not standard practice when conducting MFF jump operations (Tabs V-8.12).

(2) **Group One Jump Profile Rehearsal**

After the aircraft orientation, MAJM conducted a jump profile rehearsal for lift one and determined that, due to the size of the C-145A, the jumpers would exit in single file (Tabs R-17, and R-116). In his witness testimony, MAJM stated his jump profile rehearsal consisted of instructing all lift one jumpers to jump out in a "cigar formation," face in, "basic school house standard," 6,000 feet track away, 5,000 thousand feet wave off, and 4,000 feet pull standard (Tabs R-17, R-57, R-61, R-148, and V-3.3). Of note, the term "cigar formation" is not defined in any Department of Defense military free fall instruction or guidance (Tab V-8.4). According to MAJM, the term "cigar formation" refers to the oval shape the jumpers form after exiting the aircraft (Tab V- 3.3). In essence, each jumper faces into the center of the oval or cigar, while maintaining both horizontal and vertical spacing between jumpers (Tab V-3.3, V-6.4, V-7.3, and V-12.6). Upon reaching 6,000 feet above ground level (AGL), each jumper "tracks away," or travels away from the other jumpers, at 5,000 feet AGL each jumper then clears his airspace, and at 4,000 feet AGL each jumper pulls his ripcord to initiate parachute canopy deployment (Tabs V-1.17, V-3.3, V- 5.3 to V-5.4, V-14.4, and V-20.2).

Witness testimony from other lift one jumpers indicates the jump profile rehearsal was very basic and no other jumper on lift one could recall MAJM using the term "cigar formation" (Tabs V-14.3, V-17.3, and V-20.2 to V-20.3). Witness testimony states no jumper within lift one identified a desire to perform any grouping exercises or skill training (Tabs V-4.3, and V-17.3). As such, the plan was to exit the aircraft in single file, with no specific planned freefall actions until 6,000 feet AGL was reached (Tabs V-14.3, V-17.3, and V-20.2 to V-20.3). Of note, MJ3 testified he assumed the lack of a detailed free fall plan indicated he could use a track body position to travel to the lowest jumper before initiating his parachute canopy deployment (Tab V- 4.7 to V-4.8).

(3) **Group Two Jump Profile Rehearsal**

The jumpmaster for lift two conducted his jump profile rehearsal at approximately the same time as the MAJM conducted lift one's jump profile rehearsal (Tabs R-10 to R-11, R-15 and R-116). Witness testimony confirms lift two's instructions were similar to those received in lift one, and that again, no jumper within lift two identified any desire to conduct any skill training or grouping exercises (Tab V-16.3).

(4) **Mishap Jump Profile Rehearsal**

MAJM did not conduct lift three's jump profile rehearsal following the aircraft orientation, but waited until returning from lift one's jump where he was the acting jumpmaster (Tabs V-3.4, V-3.15, and V-5.3). Upon completing lift one's jump and debrief, MAJM discovered extra

parachutes were available, and informed several jumpers that there was room on lift three to add additional jumpers (Tabs R-57, V-3.15, and V-10.11). Upon completion of the medical exercise with 720 STAN/EVAL, MJ2 and MJ3 arrived at the staging area, where MAJM was offering extra parachutes (Tabs R-75, and V-3.15). MJ2 and MJ3 then volunteered to jump again and began to don their parachutes (Tabs R-57, R-75, R-79, and V-3.15).

At this time, 720 STAN/EVAL overheard a conversation between jumpers, discussing their plans for free fall during lift three (Tab V-10.7). According to 720 STAN/EVAL, the discussion was about "linking up," wherein two or more jumpers touch during the jump (Tab V-10.7 to V-10.8). He was not clear whether this "linking up" was planned to occur while exiting the ramp or in free fall (Tab V-10.7 to V-10.8). 720 STAN/EVAL acknowledged that AFMAN 11-411 states jumpers will maintain 25-meters separation, but testified there was nothing unusual about this conversation as "linking up" was an organizational norm during 720 OSS MFF jumps (Tab V-10.8).

According to MAJM's testimony, he gathered all lift three jumpers before loading the aircraft to conduct a jump profile rehearsal, though other witnesses could not recall a formal rehearsal (Tabs R-96, V-3.3 to V-3.4, and V-4.7). MAJM recalled stating once again, "cigar formation," "school basic free fall course," "jump out," "face in," "standard," 6,000 track away, "5,000 wave off, 4,000 pull" (Tabs R-57, R-116, V-3.3, and V-4.3).

Witness testimony from other lift three jumpers indicate they recalled MAJM addressing the lift before or while loading the aircraft (Tabs R-96, V-4.2 to V-4.3, V-5.3, V-5.15, V-7.4, and V-8.3). All lift three jumpers' testimonies recalled the single file exit and pull sequence altitudes, but testimony varies regarding exit order and the use of the term "cigar formation" (Tabs R-96, V-4.2 to V-4.3, V-5.3, V-5.15, V-7.4, and V-8.3). Witnesses could not agree whether the term "cigar formation" was used before loading the aircraft (Tabs R-116, V-5.3 to V-5.4, and V-7.4). Similar to lift one and two, testimony confirms no jumper identified a desire to practice grouping exercises or skill training. (Tabs V-4.7, and V-5.3 to V-5.4). Lift three loaded the aircraft, sat down facing the rear of the aircraft in two alternating lines as shown below (Tabs R-148, and Z-3 to Z-4).

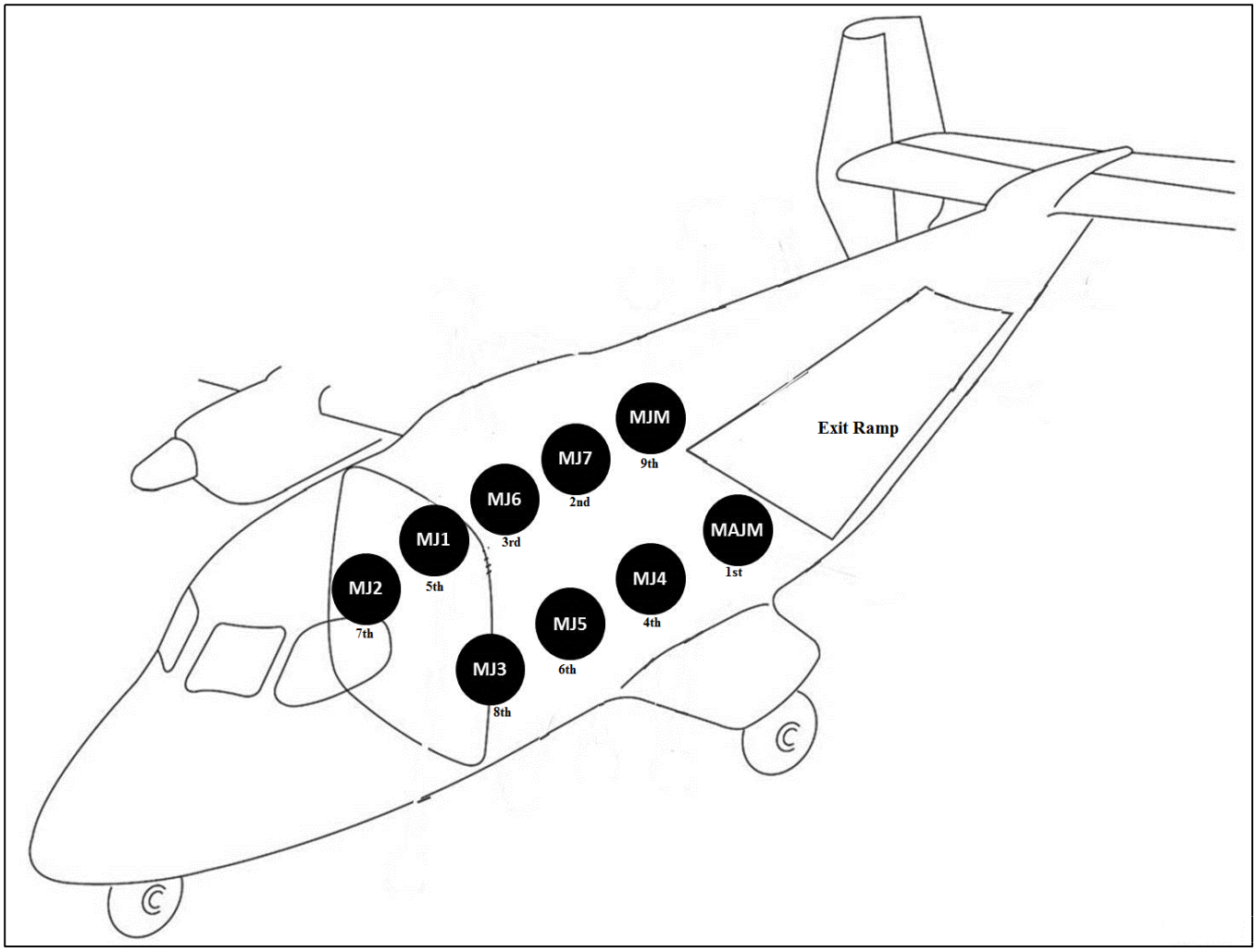

Figure 6: Lift three jumper positions inside the aircraft. (Tab Z-17).

MJM stayed on the C-145A during lift one and lift two, and assumed the last position in the rear, right-side of the aircraft, facing backwards for lift three (Tabs R-206, V-1.4, and V-1.6). After all jumpers loaded the aircraft, MJM then asked MAJM if he had conducted a jump profile rehearsal to which MAJM responded "affirmative" (Tab V-1.3 to V-1.4).

(5) **In Flight Discussion and Understanding**

The aircraft departed Auxiliary Field 6 at 1126L (Tab DD-71). On the aircraft, during taxi or soon after take-off someone near the front of the aircraft shouted to Mishap Jumper 7 (MJ7), asking if MJ7 would be the first or second jumper to exit (Tabs V-4.7, V-5.5, V-7.4, and V-8.4 to V-8.5). MJ7 did not turn around, but responded by holding up two fingers, indicating he would be second to exit (Tabs V-4.7, and V-8.4 to V-8.5). The same voice from the front of the aircraft then shouted "we're coming to you" (Tabs V-4.7, V-4.16 and V-8.5).

According to witness testimony, all jumpers on the aircraft heard some version of the phrase "we're coming to you," except MAJM and MJ5 (Tabs R-17 to R-18, V-3.20, V-4.7, V-5.5, V-6.10, V-7.4, and V-8.5). MJ3 identified himself as the source of the phrase, though Mishap

Jumper 6 (MJ6) believed it was MJ2 (Tab V-4.7, and V-7.4). MJM, MJ7 and Mishap Jumper 4 (MJ4) identified both MJ2 and MJ3 as the source of the shouting, and in MJ3's testimony he explains it in terms of unified action with MJ2 (Tabs V-4.7, R-17 to R-18, R-42, V-7.4, V-5.5, and V-8.5). MJ3 testified in his interview that MJ7 was wearing the Airman Battle Uniform (ABU), which was different from the rest of the jumpers who were wearing the "multi-cam" pattern uniform (Tab V-4.7). According to MJ3, this distinction was the reason he and MJ2 decided to form on MJ7 even though MJ7 would not be the first out of the aircraft (Tabs R-75, and V-4.7).

MJM testified that he was concerned by the shouting, which he described as "grumblings" and that he responded by nudging MAJM and asking "is that what you briefed?" (Tabs R-17, R-47, V-1.5, and V-2.1). According to MJM, MAJM said "absolutely not" and then turned around to face the jumpers, got their attention and "reiterated" his intentions by saying they would all exit in single file and face each other like a military cigar (Tabs R-18, and V-1.19). MAJM did not recall MJM nudging or prompting him, but verifies he performed his normal jumpmaster duties by turning to face the jumpers and stating, "hey guys, jump up, stay in cigar formation, turn in, at six, face out, track out at six, 5,000 wave off, 4,000 pull, good?" (Tabs R- 61, and V-22.1). MAJM further stated that after this statement he received acknowledgement from each jumper on the lift (Tabs R-61, and V-3.3).

All jumpers testified that MAJM did reiterate his plan on the aircraft and that no jumper asked any questions for clarification (Tabs V-1.4, V-2.1, V-4.8, V-4.12, V-5.4 to V-5.5, V-6.11, V-7.4, and V-8.3 to V-8.4). As outlined below, each jumper's testimony reflected varying understanding of MAJM's briefed free fall plan.

(a) Individual Recollections

MAJM, the first jumper to exit, testified the intent of his free fall plan was to have lift three exit the aircraft single file, assume a stable free fall body position, with each jumper facing into the center of the oval shape (Tab V-3.3). This oval would initially have vertical and horizontal spacing, though through normal free fall procedures, the vertical spacing would slowly diminish, ideally with all jumpers on a level plane (Tab V-3.3). Additionally, MAJM did not tell any jumper to track down to other jumpers (Tabs V-3.14, and V-3.20).

MJ7, the second jumper to exit, testified to hearing the term "cigar formation" on the aircraft and understood that after exiting the aircraft single file, all jumpers would face into the center of the oval, but attempt to decrease their vertical separation through track body position while maintaining their horizontal spacing (Tabs R-200, and V-8.3). MJ7 admitted it would be difficult for all jumpers to reach the same altitude given their single file exit, especially for the last jumpers who would need to work harder to decrease their vertical spacing (Tab R-200). MJ7 assumed all jumpers on lift three were going to decrease spacing and come near him to create the "cigar formation" (Tab V-8.16).

MJ6, the third jumper to exit, testified he does not recall the use of the term "cigar formation" at any time before the mishap, but states he was focused on reviewing his emergency procedures during the climb out, implying he could have missed it (Tab V-7.4 and V-7-12 to V-7.13). MJ6 stated MAJM's instructions were unremarkable but that he recalls MAJM explaining single file exits (Tab V-7.4 to V-7.5). MJ6 testified he exited the aircraft, turn inwards to face exiting jumpers, and assume a stable free fall body position (Tab V-7.4 to V-7.6).

MJ4, the fourth jumper to exit, testified that MAJM's instructions were intended to correct the jumpers in the rear of the aircraft who stated they were coming to MJ7 (Tab V-5.5). MJ4 testified, his understanding of a "cigar formation" is "where everybody just kind of falls, fat, dumb and happy and then at 6,000 feet turn, clear airspace, get separation, 5,000 feet wave off, 4,000 feet pull" (Tab R-116). MJ4 did not think the plan was to use a track body position to travel to the "low guy," nor did he intend to do it (Tab R-117 to R-118). It is also worth noting, MJ4 executed his free fall wearing a helmet mounted GoPro camera (Tab R-98, R-132, V-5.8, and V-5.12). MJ4 did not meet 720 STG requirements to free fall with a camera, nor did he notify the jumpmaster of his intentions either verbally or by presenting the camera during the JMPI (Tabs V-1.13 to V-1.15, and BB-89). MJ4 stated he recorded the mishap jump, but deleted the recording later that evening (Tabs R-134, and V-5.10). The AIB was unable to recover the deleted file (Tab DD-81).

MJ1, who was fatally injured, was the fifth jumper to exit the aircraft (Tab R-148 to R-149, and R-180).

MJ5 was the sixth jumper to exit the aircraft (Tab R-148 to R-149, and R-180). Although MJ5 stated he did not hear shouting from the front of the aircraft, he recalled the term "cigar formation" and believed the guidance was "more than clear" dictating that the jumpers would form an elongated oval, with each jumper facing the center of that oval (Tabs R-158, V-6.4 and V-6.14). The jumpers would initially have vertical and horizontal separation, but according to MJ5, the vertical separation would gradually decrease under a stable free fall body position, but the horizontal separation would not (Tab V-6.4).

MJ2, who was fatally injured, was the seventh jumper to exit the aircraft (Tab V-4.8).

MJ3 was the eighth jumper to exit the aircraft (Tab V-4.8). MJ3 recalled MAJM's use of the term "cigar formation" and understood this to mean that every jumper would attempt to get on the same level plane, thus forcing the later jumpers to get down to the same altitude as the first jumpers using a track body position (Tabs V-4.7 to V-4.8). Though MJ3 testified to shouting to MJ7 "we are coming to you," he did not understand MAJM's reiteration of the jump plan to be a correction of his intentions (Tabs V-4.7 to V-4.8, and V-4.12). In fact, MJ3 assumed since he clearly shouted his intentions to MJ7, each jumper on the aircraft had the same intention of using MJ7 as the base of the "cigar formation" (Tab V-4.12).

(b) Summary of Individual Recollections

Although the individual jumpers did not express confusion regarding MAJM's use of the term "cigar formation," jumpers interpreted its meaning differently. Additionally, when asked in subsequent testimony if MAJM's instructions meant for the higher jumpers to use a track body position to travel down to the lower jumpers, MJM, MAJM, MJ4, MJ5 and MJ6 all said no (Tabs R-181, V-2.3, V-3.13, V-5.6, and V-6.14). MJ5 described this as "reckless," MJ6 referred to it as "wazoo stuff" and MAJM described it as "sky boogie," and being inconsistent with the very purpose of MFF jumps (Tabs R-187, V-3.13, and V-6.14). MAJM also testified that if he had heard a jumper in the back saying he planned to use a track body position to travel to lower jumpers, he "absolutely" would have told them not to do it (Tab V-3.20 to V-3.21).

Alternatively, MJ7 stated "if you were planning on getting into a formation where everyone is at the same altitude, then invariably, the guys at the end of the stick are going to have to somehow

get down to the people that are at the front of the stick. It's unavoidable. They've got to make up that altitude difference somehow" (Tab V-8.16). MJ3 assumed all jumpers intended to track down to MJ7, who would form the base of the "cigar formation," (Tab V-4.7 to V-4.8). According to MJ3, this did not mean they would "link-up," rather they would group while maintaining adequate horizontal separation (Tab V-4.2). According to MJ3, at no time did he interpret the instructions from the MAJM to mean that all jumpers would just simply jump out and assume a stable free fall body position for the duration of the free fall (Tab V-4.12). He testified, if MAJM intended to have jumpers go out and just fall, then "that is not going to be a formation, it's just going to be guys lined up across the sky" (Tabs R-103 and V-4.12).

(6) **Free Fall**

Four minutes before drop time, the aircraft ramp doors opened and the MAJM began to perform outside safety checks of the aircraft and DZ (Tabs R-17, R-62, and R-166). This included giving heading corrections to the flight crew and issuing proper jump commands (Tabs R-23, V-5.6, V-7.5, and V-19.4). The MAJM issued the standard jumpmaster calls at two minutes and again one minute before drop time (Tabs V-3.3, and V-7.5). MJM verified the release point and the jumpers exited at approximately 1136L when MAJM gave the "go" hand signal and exited the aircraft (Tabs V-3.5, V-8.5, and DD-71). All jumpers exited in a single file with approximately one second separation between jumpers (Tabs R-16, R-80, R-91, R-206, V-2.6, V-3.18, V-4.4, V-5.4, and V-6.11).

Figure 7: Jumper exiting C-145A. (Tab Z-19)

With the aircraft traveling at roughly 120 knots, at 10,000 feet AGL, each jumper initially transitioned from moving at the same forward speed as the aircraft, into a straight vertical drop toward the ground (Tabs R-16 to R-18, R-149, V-1.3, V-2.2, V-2.6, and V-5.4). At one second intervals, in single file, the jumpers had roughly 55 meters horizontal separation between each jumper as they exited the aircraft (Tabs R-16 to R-18 and Z-8). Additionally, the jumpers fell at an average speed of approximately 120 miles per hour, or approximately 54 meters per second (Tabs J-44, and Z-8). Consequently, for MJ2 to have bridged the gap between himself and MJ7, he would have needed to cover approximately 275 horizontal meters and 265 vertical meters, and would have needed to do it before reaching the prescribed wave off altitude of 6,000 feet (Tab Z-8). AFI 11-231, *Computed Air Release Point Procedures* states an experienced jumper can maneuver 152 meters horizontally for each 1,000 feet of free fall (Tab BB-76).

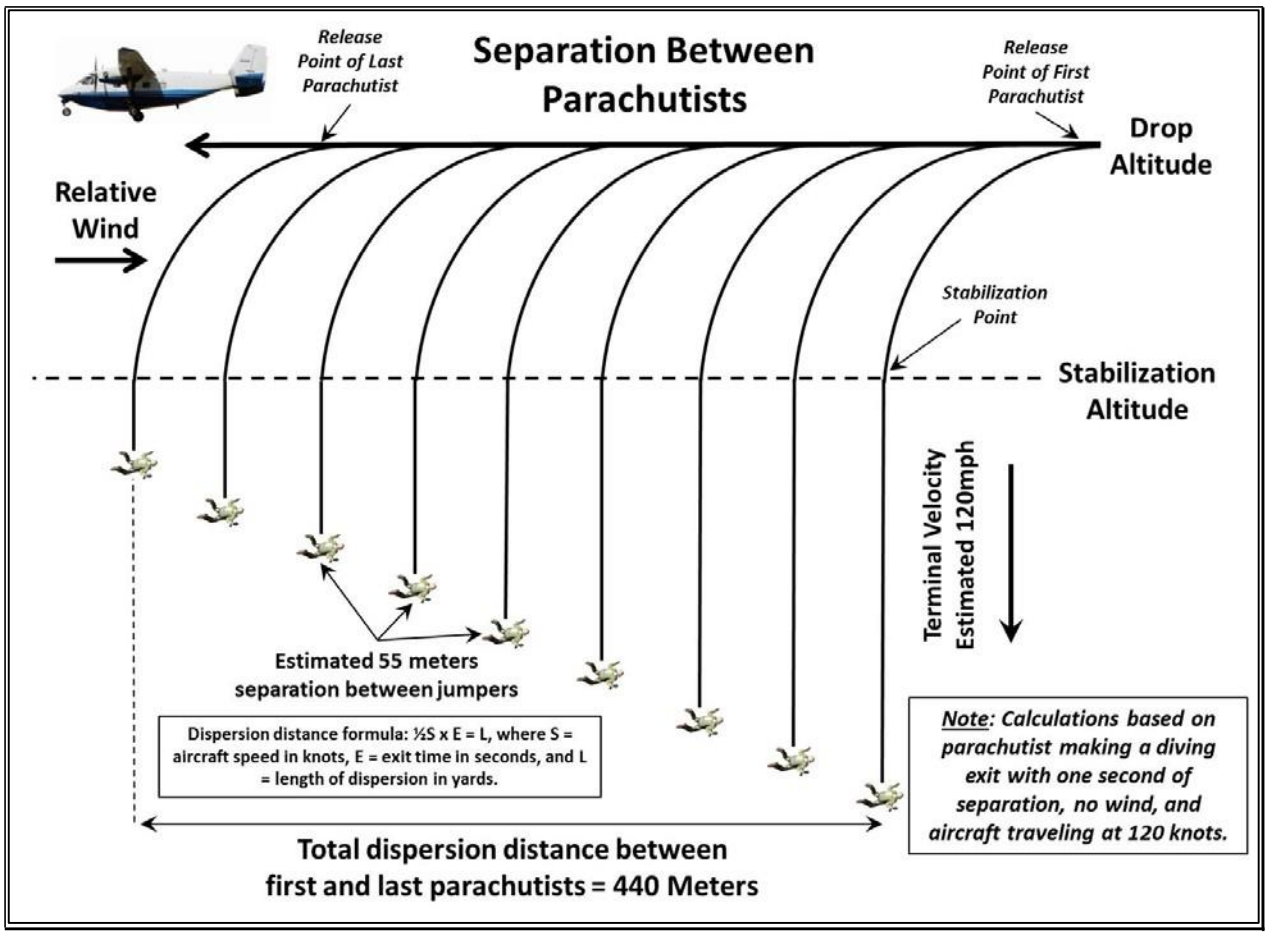

Figure 8: Estimated dispersion distance between jumpers (Tab Z-8).

With the release point identified, MAJM exited the aircraft first; after exiting, MAJM turned around so he was facing the aircraft (Tabs R-57, and V-3.5). While in a stable free fall position, MAJM did not see anything remarkable prior to deploying his parachute canopy and stated the jump seemed uneventful (Tabs R-50, R-57, and V-3.5).

MJ7 exited the aircraft as the second jumper and performed a diving exit (Tab V-8.5). Once in a stable free fall body position, he observed MAJM slightly below his altitude and to his right (Tab V-8.5). He attempted to lose some altitude to get down to MAJM, but decided

MAJM was falling too fast and instead oriented himself on the drop zone and began to go through his pull sequence (Tab V-8.5).

Initially, MJ6 was to exit as the fourth jumper, but stated in his testimony that he switched with MJ4 once on the aircraft and became the third jumper (Tab R-180, V-5.5, and V-7.5). MJ6 testified he believes MJ4 requested the switch because MJ4 was wearing a GoPro camera and wanted more jumpers in front of him to film (Tabs R-180, and V-7.5). After exiting the aircraft, MJ6 turned momentarily to count the jumpers behind him (Tab V-7.6). He then assumed a stable free fall body position (Tab V-7.6). Sometime shortly before deploying his parachute canopy, MJ6 saw another jumper falling with his back to the ground and his arm over his body (Tabs R-176, R-181, and V-7.7). MJ6 did not think this was unusual and assumed the jumper had merely lost stability and was using his arm in an attempt to turn around (Tabs R-176, R-181, and V-7.7). The jump was otherwise uneventful for MJ6 (Tabs R-181, and V-7.7).

MJ4 exited in the fourth position, assumed a stable free fall body position, and testified to seeing a jumper he assumed was MJ6 some distance below his position (Tabs R-119, and V-5.6). Due to a perceived altimeter malfunction, MJ4 testified he tracked east and away from the other jumpers and deployed his parachute canopy at an unspecified altitude (Tabs R-119, and V-5.6). MJ4's altimeter was not collected or set aside following the mishap (Tabs V-1.22, and V-21.3). Consequently, the AIB was unable to corroborate MJ4's testimony concerning his perceived altimeter malfunction.

MJ1 exited in the fifth position (Tab R-148 to R-149, and R-180).

MJ5 exited in the sixth position (Tabs V-4.8, V-6.6, and V-7.5). MJ5 testified at the two minute warning, he asked the jumper to his left if he was going in front of or behind him (Tabs R-148, and V-6.6). This jumper responded that he was "going to catch someone," so MJ5 told this jumper to exit in front of him (Tabs R-148, R-165, and V-6.6). MJ5 stated he did not want to "get in the way" of this jumper, who MJ5 was unable to identify (Tab V-6.6). After exiting, MJ5 assumed a stable free fall body position and noticed two jumpers below and in front of him (See Figure 9) (Tabs R-141, R-149, and V-6.6). The two jumpers appeared to be in close proximity and looking at one another approximately 30 meters from MJ5 (Tabs R-149, R-166, and V-6.6).

Figure 9: Simulated view from behind MJ5 (Tabs V-6.6, and Z-11).

MJ2 exited in the seventh position (Tab V-4.8).

MJ3 exited in the eighth position (Tab V-4.8). MJ3 testified upon exiting he quickly passed MJ2 on the right-side using a track body position (Tabs R-75, R-89, R-96, R-158, and V-4.8 to V-4.9). MJ3 flew a track body position all the way down to MJ7, the second jumper, ending up slightly past and a couple hundred feet above MJ7 (Tabs R-83, R-96, and V-4.8). MJ3 testifies he then attempted to lose some additional altitude to reach MJ7's altitude, but at this point he had reached his designated altitude to initiate the pull sequence (Tabs R-83, and V-4.8).

MJM exited as the final jumper (Tabs R-23, and V-1.15). Before exiting the aircraft, MJM told the C-145A loadmaster "last man" and then dove out of the aircraft (Tabs R-23, V-1.9 and V-1.15). Upon exit, MJM assumed a stable free fall body position (Tab V-1.9). Once orientated, MJM realized he was higher and considerably farther south than any other jumper (Tab V-1.9). During free fall, MJM testified to seeing three to four jumpers in close proximity, but not close enough to identify them (Tabs V-1.10, and V-1.15 to V-1.16). When MJM was at approximately 6,000 feet, he noticed two parachutes deploying (Tabs R-30, and V-1.16 to V-1.17). This caused MJM to check his altimeter, and recheck his spare altimeter on his right wrist to verify the altitude (Tab V-1.16). According to MJM's testimony, his altimeter had not reached 5,000 feet AGL (Tab V-1.16 to V-1.17).

(7) **Collision**

MJ5 is the only jumper to offer eyewitness testimony of the collision (Tabs R-149, R-166, V-6.6 to V-6.7). After exiting sixth, MJ5 assumed a stable free fall body position and noticed two jumpers approximately 30 meters below and in front of him (See Figure 9 below) (Tabs R-141, R-149, R-166, and V-6.6 to V-6.7). The two jumpers appeared to be in close proximity and looking at one another (Tabs R-149, R-166, and V-6.6). MJ5 attempted to close the gap with these two jumpers below him by pulling his arms and legs into his body to increase his vertical speed (Tab R-141, R-149, and V-6.6). MJ5 stated he "picked up some speed pretty quickly" so

he resumed his stable free fall body position (Tabs R-149, and V-6.6). At this time, he recognized one of the jumpers below him to be MJ1 (Tabs R-149, and V-6.6). Almost simultaneously, he noticed a shadow, and then MJ2 pass over his left shoulder moving quickly in a track body position (Tabs R-149, R-166 to R-167, and V-6.6).

Figure 10: Simulated view from behind MJ5 after MJ2 passed over his left shoulder (Tab Z-12).

MJ5 testified that MJ2 momentarily suspended his track body position, quickly looked back at MJ5, and then immediately resumed this track body position before colliding head-to-head with MJ1 (See Figures 11 and 12 below) (Tab R-158, and V-6.6).

Figure 11: Simulated view from behind MJ5 as MJ2 briefly gets out of his track body position and looks back at MJ5 (Tab Z-13).

Figure 12: Simulated view from behind MJ5 as MJ2 returns to his track body position (Tabs V-6.6, and Z-15).

MJ5 estimates this collision occurred at approximately 8,000 feet AGL (Tab R-150). Following the collision, MJ5 watched MJ2 flip over MJ1's back, and begin spinning to the right, unresponsive (Tabs R-150, and V-6.7). Additionally, MJ5 watched as MJ1 maintained a stable free fall body position for a split second more, before spinning off to the left, unresponsive (Tab V-6.7). After witnessing the collision, MJ5 testifies the other unidentified jumper below his altitude deployed his parachute canopy (Tab R-150, and V-6.7). Finally, MJ5 then pulled his parachute canopy to avoid any further conflict (Tab R-150, and V-6.7).

e. Impact

The collision occurred at approximately 8,000 feet AGL (Tab R-150). At the time of the impact, MJ2's head was facing down, while MJ1's head was facing up toward the horizon (Tab J-47). The impact occurred 10 degrees right of MJ1's helmet centerline (Tab J-47). The speed of the two mishap jumpers at the time of collision is not definitively known, but subsequent analysis of the two helmets by the US Army Aeromedical Research Laboratory revealed the closure rate between the two mishap jumpers could have exceeded 100 mph (Tab J-47).

f. Egress and Aircrew Flight Equipment (AFE)

MJ1 and MJ2 fell unresponsive until approximately 1,615 and 1,630 feet AGL, respectively, before their automatic activation devices deployed their reserve parachute canopies (Tabs DD-66, and DD-68). MJ1 then drifted under his fully inflated reserve parachute canopy until landing approximately 50 meters into a wooded area adjacent to Auxiliary Field 6 (Tabs R-32, V-8.9, V-20.1, and Z-6). MJ2 likewise drifted under his fully inflated reserve parachute canopy until it became entangled, suspending him 20 to 30 feet up in the trees, approximately 300 meters northeast of Auxiliary Field 6 in a dense wooded area (Tabs R-76, V-3.5 and Z-6). Both reserve parachute canopies operated as designed (Tab H-2 to H-3).

g. Search and Rescue (SAR)

At approximately 1140L, MJ1 and MJ2 landed under fully inflated reserve parachutes, northeast of the runway at Auxiliary Field 6 in a wooded area (Tabs R-6, R-50, R-57 to R-58, R-71, R-75 to R-76, R-120, R-233, and DD-71). While under his parachute canopy, MJ5 made an unsuccessful attempt to call ground personnel with his personal cell phone to alert them of the mid-air collision (Tabs R-150 and V-6.7).

(1) **MJ1**

Aside from MJ5, none of the mishap jumpers testified to witnessing the mid-air collision; however, several jumpers noticed MJ1's reserve parachute open at an unusually low altitude, and that MJ1 did not attempt any parachute canopy control maneuvers (Tabs R-23 to R-24, R-30, R-120, and V-7.8). Similarly, drop zone control personnel, including medical support and earlier jumpers, also noticed MJ1's low opening and uncontrolled flight into the tree line (Tabs V-9.5, V-16.5, and V-20.1). Immediately, 720 STG PA, 720 STG Nurse and others climbed into the designated STG medical truck and drove to the tree line where MJ1's parachute canopy was last seen (Tabs R-151, R-203, R-233, V-8.10, and V-23.1). 24 SOW Non-Commissioned Officer (NCO), 720 STG PA, 720 STG Nurse, Stick two Jumper 3, 720 OSS Readiness Non-Commissioned Officer in Charge (NCOIC), and MJ7 were the first responders to arrive on scene, approximately 50 meters in the wooded tree line (Tabs R-6, R-31 to R-32, R-151, R-233, V-17.7, Z-6, and Z-23). MJ1 was found unconscious, on the ground, leaning against a branch from a fallen tree (Tabs R-233, and R-237).

720 STG PA, and other personnel, immediately began assessing and treating MJ1 (Tab R-233, R-237, R-298, and V-9.5). 720 STG PA informed ground personnel that MJ1 required urgent medical care and immediate evacuation, while he and others attempted cardiopulmonary resuscitation (CPR) (Tabs R-151, R-203 to R-237, R-238, V-6.8, V-9.5, and V-24.1). At this time, DZCO attempted to contact Eglin Crash Fire Rescue located at Camp Rudder via radio communication, but received no response (Tabs R-33, R-257, and Tab V-11.6). At 1200L, 24 SOW NCO made contact with the Okaloosa County Emergency Operations Center by calling 911 using his personal cell phone (Tabs R-151, V-17.7, and DD-7). After approximately two minutes of CPR, MJ1 had a pulse and 720 STG PA decided to move him (Tabs R-153, R-237, R-239, and V-15.5). At 1208L, the 720 STG PA and others lifted MJ1 and carried him the 50 yards out of the wooded area and loaded him into the medical truck (Tabs R-238, and Tab DD-7). During this time, 24 SOW NCO made multiple requests for an estimated time of arrival (ETA) while on 911, but was told an ETA was unavailable (Tab DD-7). Given the severity of MJ1's injuries, and the fact that the C-145A was on site and able to transport MJ1 to Naval Air Station (NAS) Pensacola, 720 STG PA made the decision to utilize the C-145A for casualty evacuation (CASEVAC) (Tabs R-238, and V-9.5 to V-9.6). At 1210L, with medical personnel providing on-going care, MJ1 was transferred from the designated STG medical truck to the waiting C- 145A at 1210L (Tabs R-153 to R-154, V-9.5 to V-9.6, V-23.1, and DD-71).

At 1215L, the aircraft took off from Auxiliary Field 6 with MJ1 and five other ground personnel, including 720 STG PA, 720 STG Nurse, MJ5, MJ7, and Stick two Jumper 3, all of whom provided medical care or assistance during transport (Tabs R-153 to R-154, and DD-71). At 1227L, the C-145A arrived at NAS Pensacola, where MJ1 was transferred immediately to a waiting ambulance (Tabs R-154 to R-155, and DD-71). Four civilian Emergency Medical

Technicians provided patient care for MJ1 during the 17 minute transport to Baptist Hospital (Tabs R-155, and X-3). Upon arrival, MJ1 was evaluated and treated by a general surgeon and a pulmonary critical care specialist (Tab X-3). Later these physicians consulted a neurosurgeon who reviewed MJ1's neuroimaging studies and determined MJ1 would not benefit from surgery (Tab X-3).

MJ1 was admitted to, and further treated in the intensive care unit where hours later, MJ1 went into cardiopulmonary arrest and CPR was initiated (Tab X-3). After consultation with the physicians, and given the severity of his injuries and his prognosis, the decision was made to stop further life saving measures (Tab X-3). With his wife at his bedside, MJ1 was provided with comfort measures and later pronounced dead at 1727L (Tab X-3).

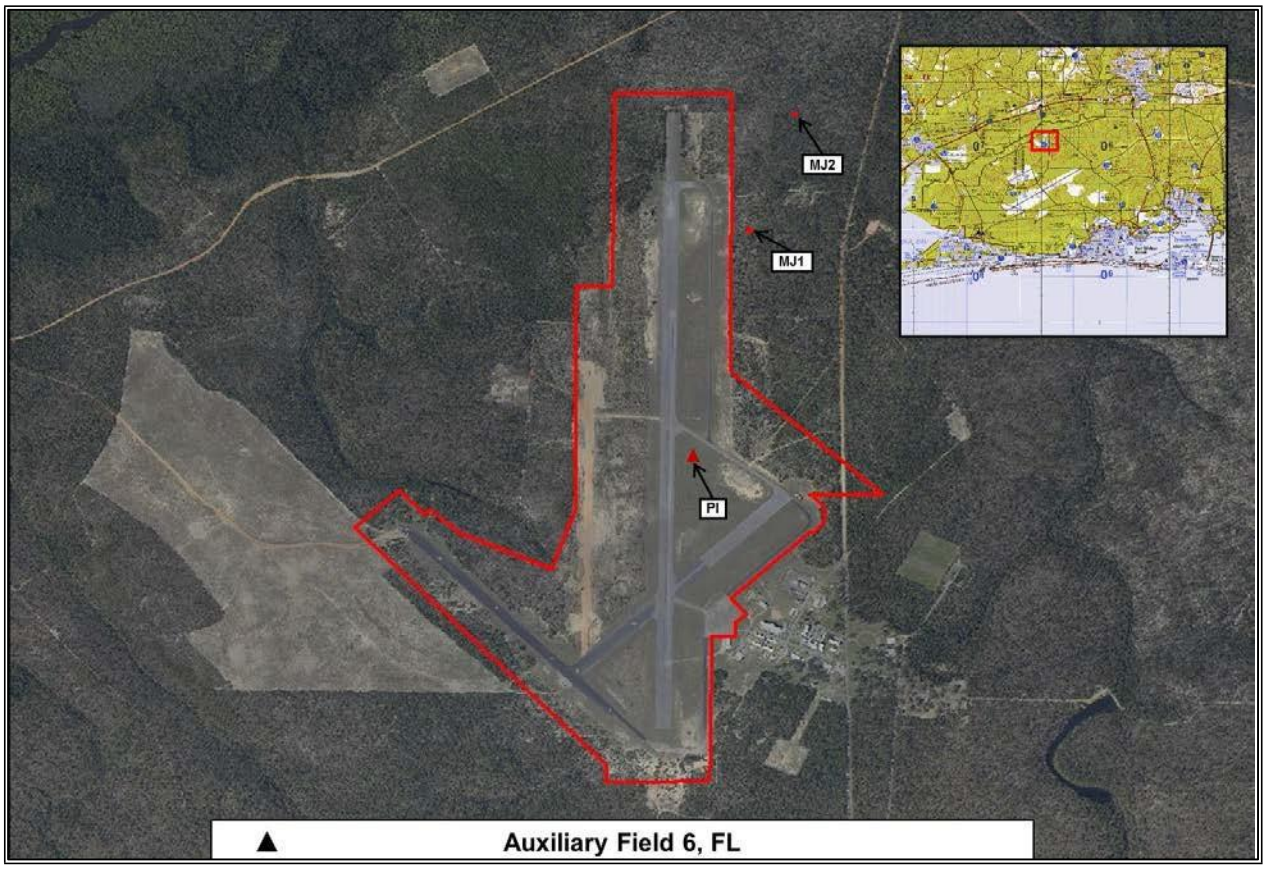

Figure 13: Map of Auxiliary Field 6 and landing site of MJ1 and MJ2 (Tab Z-23).

(2) **MJ2**

While under their parachute canopies, both MAJM and MJ3 noticed MJ2 tumbling low and uncontrolled (Tab R-57 to R-58, and R-75 to R-76). Additionally, they watched as his reserve parachute canopy opened unusually low, and noticed that MJ2 did not attempt any parachute canopy control maneuvers (Tab R-57 to R-58, and R-75 to R-76). Both MAJM and MJ3 steered their parachute canopies close to the tree line where MJ2's parachute canopy was last seen (Tab R-57, and R-76). Upon landing, MAJM and MJ3 quickly discarded their jump equipment and ran into the wooded area to find MJ2 (Tabs R-57, and R-76). At that time, neither MAJM nor MJ3 knew the identity of the jumper, nor did they know the exact location within the densely wooded area where MJ2 landed (Tab R-76). In an attempt to locate MJ2 quickly, MAJM and

MJ3 spread out and walked through the trees while shouting "Hey Jumper!" (Tabs R-58, and R-76). After searching for a short period of time, MAJM and MJ3 located MJ2, unconscious, approximately 300 meters into the wooded area, with his reserve parachute canopy entangled in the trees and his body suspended approximately 20 to 30 feet above the ground (Tabs R-34, R-58, R-76, R-183, V-3.5, and V-24.1).

In an attempt to reach MJ2 without a ladder, MAJM and MJ3 tried climbing the tree, and forming a human pyramid with four other ground personnel (Tabs R-34, R-58, R-71, R-76, R-279, and V-4.20 to V-4.21). All attempts to reach MJ2 were unsuccessful (Tab R-58, R-279, V-4.20 to V-4.21, and V-24.1). Additionally, MAJM and MJ3 called 911 to request assistance, and stated their location (Tab R-58, and R-76). At 1214L, MJ2's situation was reported to the 911 operator by 24 SOW NCO (Tab DD-8). In the interim, Camp Rudder and Eglin Crash Fire Rescue personnel, both located adjacent to Auxiliary Field 6, were notified and proceeded to MJ2's site (Tabs R-33, and V-11.6). Upon arrival, Eglin Crash Fire Rescue provided a large ladder, which MJM and a fire fighter used to extricate MJ2 out of his suspended parachute harness and then carefully carried him to the ground (Tabs R-6, R-34, R-123, R-183, R-279, and V-1.23). At 1245L, MJ2's extrication from the tree was complete and medical personnel began attempts to resuscitate him within the wooded area (Tabs R-86, R-123, R-183, and DD-10). Army Ranger personnel provided chain saws and began clearing a path through the wooded area in anticipation of moving MJ2 to awaiting medical transportation (Tabs R-124, R-183, and V- 24.1).

At 1255L, MJ2 was carried on a backboard to a designated medical truck and then transferred to a waiting ambulance (Tabs R-124, R-183, V-24.1, and DD-10). MJ2 was transported to Fort Walton Medical Center via ground ambulance with Okaloosa County and MedFlight medical personnel and with MJ4 and 720 OSS Readiness NCOIC in the back (Tabs R-86, R-184, V-5.10, and V-11.9). The head medic from Okaloosa County EMS made the decision to transport MJ2 in an ambulance rather than MedFlight helicopter (Tab V-24.2). Multiple unsuccessful medical resuscitation attempts were performed enroute to the hospital (Tabs R-124, V-24.1, and DD-10). At 1341L, MJ2 arrived at Fort Walton Beach Medical Center and was evaluated by the medical trauma team and pronounced dead at 1344L (Tab X-4).

Figure 14: MJ2's landing site (Tab S-14).

h. Recovery of Remains

Not applicable.

5. MAINTENANCE

a. Forms Documentation

All relevant aircraft maintenance documents were reviewed, including Air Force Technical Order (AFTO) Form 781 Series and the aircraft's 60 day history (Tabs U-3 to U-7, and V-27.1). Prior to 3 August 2015, the aircraft had two minor discrepancies, but they were noted as having no effect on the airworthiness of the aircraft (Tab V-27.1).

b. Inspections

(1) Aircraft

On 3 August 2015, the aircraft had an updated preflight inspection, indicating the aircraft was ready for flight (Tab V-27.1). The aircraft was not overdue for any inspections or maintenance actions on the day of the mishap (Tabs V-27.1, and U-3).

(2) Parachutes

The MC-4 parachute systems are required to be inspected and re-packed every 120 days, in accordance with Technical Order 14D1-2-468-2 (Tabs U-9 to U-10, U-12 to U-13, and V-26.1). The main parachute canopy is usually packed more often, depending on operations tempo, but is not required to be packed more frequently than every 120 days (Tab V-26.1). The inspections were tracked in an electronic filing system and recorded on Air Force Technical Order (AFTO) Form 391 (Tab V-26.1). Some specific items in the parachute system had established expiration dates, including the Cybernetic Parachute Release System (CYPRES) (Tab V-26.1). All expiration dates were likewise recorded on the AFTO Form 392 (Tabs U-9 to U-10, U-12 to U-13, and V-26.1). Additionally, the parachute canopies undergo an annual porosity test wherein the material strength of the parachute canopy is tested to ensure inflation reliability and airworthiness (Tab V-26.1).

The two parachute systems involved in the mishap received all of the required inspections and were properly documented (Tabs H-2 to H-3, U-9 to U-10, U-12 to U-13, and V-26.1). The main parachute used by MJ1 was last inspected on 22 July 2015, and MJ1's reserve parachute was last inspected on 23 July 2015 (Tab V-26.1). MJ2's main parachute was last inspected on 27 July 2015, and his reserve parachute was last inspected on 28 May 2015 (Tab V-26.1). All inspection and packing records were up to date on the day of the mishap (Tabs U-9 to U-10, U-12 to U-13, and V-26.1).

c. Maintenance Procedures

(1) Aircraft

On 3 August 2015, the aircraft was not overdue for any maintenance procedures or actions (Tab V-27.1).

(2) MC-4 Parachute System

The CYPRES unit on MJ1's parachute system was manufactured in May 2007, had maintenance actions performed by the manufacturer in May 2012, and again in April 2015 (Tab DD-66). The CYPRES unit on MJ2's parachute system was manufactured in December 2011, and the next manufacturer maintenance was scheduled to occur in December 2015 (Tab DD-68). There is no evidence to suggest parachute systems were a factor in this mishap.

d. Maintenance Personnel and Supervision

919th Special Operations Aircraft Maintenance Squadron (SOAMXS) personnel performed all required inspections, documentation and servicing for the mishap aircraft prior to flight (Tab V-27.1). Personnel involved with the mishap aircraft's preparation for flight had adequate training, experience, expertise and supervision to perform their assigned tasks (Tab V-27.1).

e. Fuel, Hydraulic, and Oil Inspection Analyses

Not applicable.

f. Unscheduled Maintenance

No relevant unscheduled maintenance actions were performed on the aircraft since completion of its last inspection (Tabs U-6 to U-7, and V-27.1). The aircraft performed as intended on the day of the mishap and the aircrew did not notice any issues or concerns on the day of the mishap (Tabs V- 19.9, and V-25.1). There were no recurring maintenance issues with the aircraft (Tab U-3 to U-7). There is no evidence to suggest maintenance was a factor in the mishap.

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

(1) Aircraft

The mishap aircraft was examined following the mishap and was not damaged or affected in any way (Tab V-19.9, and V-15.5, and V-25.1).

(2) MC-4 Parachute Systems

Although some of MJ1's harness straps were cut during the medical response, his parachute system was otherwise not damaged (Tab H-2). MJ2's harness straps also were cut and minor damage was noted in his parachute canopy after it was caught in the trees near Auxiliary Field 6 (Tab H-3). Total damage to the parachute systems was valued at $20,494 (Tab P-2).

(3) **Personal Equipment**

Both MJ1 and MJ2's helmets were damaged during the mishap (Tab J-43 to J-44).

b. Evaluation and Analysis

A thorough inspection and layout of MJ1 and MJ2's parachutes and helmets were conducted following the mishap (Tab H-2 to H-3, and J-40 to J-48).

(1) **MJ1 Parachute System**

MJ1's MC-4 parachute system harness assembly, comprised of a Reserve Static Line (RSL), Reserve Ripcord Handle, Main Ripcord Handle and Main cut-away pillow was analyzed post-mishap (Tab H-2). Additionally, the back-mounted container assembly was inspected, which houses the main and reserve canopies (Tab H-2).

Figure 15: MC-4 Main and Reserve Parachutes in Container (Tab BB-18).

Figure 16: Harness Straps (Tab BB-19).

MJ1's main parachute canopy was not deployed, and remained within the container pack throughout the mishap jump (Tab H-2). The chest strap, waist band, right main lift web and left main lift web were cut by ground personnel to extract MJ1 from his harness (Tab H-2). Regardless, the inspection verified all items comprising the harness functioned properly, including both leg straps (Tab H-2). Both the main and reserve ripcord handles were not pulled, and were properly stowed (Tab H-2). Similarly, the main canopy release ripcord, an item commonly referred to as the cut away pillow, and designed to release the main parachute canopy in case of emergency, was likewise not pulled and found properly stored (Tab H-2). MJ1's reserve parachute canopy deployed at approximately 1,615 feet AGL functioned properly and was not damaged (Tabs H-2 and DD-66).

(2) **MJ2 Parachute System**

MJ2's MC-4 parachute system was analyzed post-mishap (Tab H-3). The main parachute canopy was not deployed, and remained within the container pack throughout the mishap jump (Tab H-3). The chest strap, waist band, right and left main lift webs and both leg straps were also cut by ground personnel, and similarly the inspection verified all harness items functioned properly (Tab H-3). The reserve ripcord handle was properly stowed, and was not pulled (Tab H-3). The main ripcord handle was dislodged when inspected, but had not been pulled (Tab H- 3). The cut away pillow was stowed properly and was not pulled (Tab H-3). MJ2's reserve parachute canopy deployed at approximately 1,630 feet AGL and functioned properly (Tabs H-3, and DD-68). Upon inspection, several reserve canopy panels were damaged, but this damage was attributed to the trees where MJ2 became entangled in the wooded area (Tab H-3).

(3) **Cybernetic Parachute Release System (CYPRES) Analysis**

The MC-4 parachute system is equipped with a CYPRES, or automatic activation device, which is designed to cut the material holding the reserve parachute in place (Tabs H-3, and BB-23). The CYPRES triggers at or above an activation speed of approximately 35 meters per second (or 78 mph), and is then designed to release the reserve parachute canopy at approximately 1,500 feet AGL if the jumper has not deployed his main canopy (Tabs BB-25, DD-66, and DD-68).

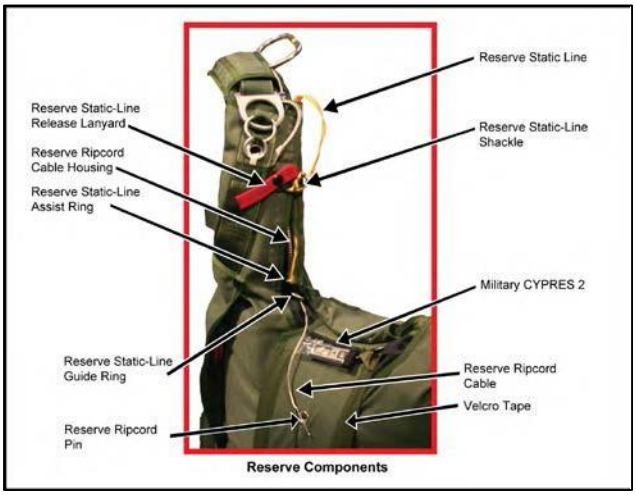

Figure 17: Reserve Components (Tab BB-20).

(a) MJ1

MJ1's CYPRES attained the activation speed, and began recording at approximately 7,340 feet AGL (Tab DD-66 to DD-67). The CYPRES unit recorded an average falling speed of 134 mph before deployment of the reserve parachute (Tab DD-67). The CYPRES functioned properly, releasing MJ1's reserve parachute canopy at 1,615 feet AGL, which then slowed MJ1's vertical descent to an average of 9 mph before he landed near Auxiliary Field 6 (Tabs H-2, and DD-66 to DD-67).

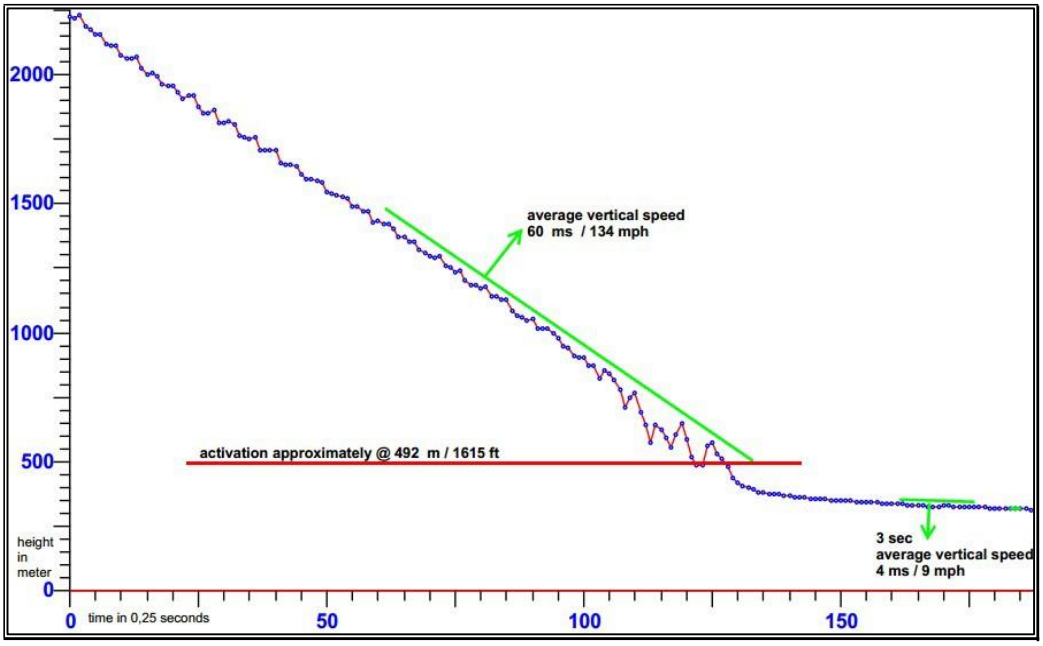

Figure 17: MJ1 CYPRES Data (Tab DD-67).

(b) MJ2

MJ2's CYPRES attained the activation speed, and began recording at approximately 8,235 feet AGL (Tab DD-68). MJ2's CYPRES unit recorded an average speed of 134 MPH (Tab DD-69). The CYPRES functioned properly, releasing MJ2s reserve parachute canopy at 1,630 feet AGL, which then slowed MJ2's vertical descent to an average of 9 miles per hour before he landed near Auxiliary Field 6 (Tabs H-3, and DD-68 to DD-69).

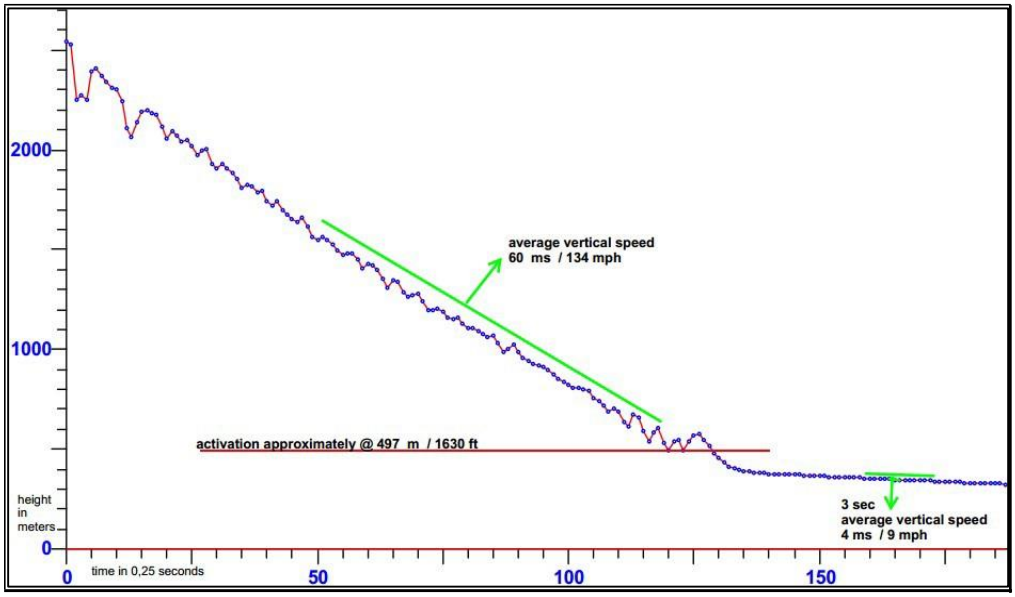

Figure 18: MJ2 CYPRES Data (Tab DD-69).

(2) Mishap Helmet Analysis

During the mishap, MJ1 and MJ2 were wearing Ops-Core, "Carbon Skeleton" helmets, a type of non-ballistic bump helmet, size "L/XL," consisting of composite carbon fibers and epoxy structure with a plastic headband, fitting pads and a nape and chin retention strap (Tab J-42 to J-45). The padding consisted of four 0.5 inch thick pads (Tab J-43). These helmets are standard issue equipment for all 720 OSS personnel (Tab J-42).

Figure 19: Ops-Core "Carbon Skeleton" helmet (Tab Z-21).

An Ops-Core non-ballistic bump helmet was tested for performance specifications of 17.6 feet per second (fps) impact velocity in varying environmental conditions, including those environmental conditions experienced by MJ1 and MJ2 (Tabs F-2, and J-45 to J-46). In earlier

evaluations, the Ops-Core non-ballistic bump helmet, of the type used by MJ1 and MJ2, performed as well or better than comparable non-ballistic bump helmets (Tab J-45 to J-46). In subsequent analysis of the mishap helmets, each revealed multiple exterior shell fractures (Tabs J-43 to J-44). Additionally, no material or manufacturing defects were noted (Tab J-47 to J-48). Given a closure rate that "could have been in excess of 100 mph or 146 fps," which greatly exceeds the designed blunt impact protection capabilities of the Ops-Core helmet, it is unlikely any marketed helmet would have altered the outcome of the collision (Tab J-47).

7. WEATHER

a. Forecast Weather

At 0600L, the forecasted weather for Duke Field, the closest weather station to Auxiliary Field 6, included sky conditions of scattered clouds at 25,000 feet AGL, and wind out of the northwest at eight knots (Tab F-2). The temperature was forecasted to be 88 degrees Fahrenheit (Tab F-2).

b. Observed Weather

At 1135L, DZCO reported winds out of the northwest at five knots from Auxiliary Field 6 (Tab DD-79).

c. Space Environment

Not applicable.

d. Operations

Observed weather, cloud, ceilings, wind limitations and visibility met the requirements to conduct MFF operations in accordance with AFI 13-217 (Tab BB-79 to BB-80). There is no evidence to suggest weather was a factor in this mishap.

8. CREW QUALIFICATIONS

a. Mishap Jumpers

MJ1 was a qualified and current MFF parachutist (Tab G-56). He graduated from the U.S. Army Airborne Course on 13 September 2002, the U.S. Army Military Free Fall Course on 14 December 2006, and the Static Line Jumpmaster Course on 22 April 2005 (Tab G-58). His last training jump occurred on 7 May 2015 (Tab G-56).

MJ2 was a qualified and current MFF parachutist (Tab G-62). He became a parachutist on 10 October 2003, and the Navy Parachute Free Fall Course on 12 February 2012 (Tabs G-64, and T-3). Prior to his earlier jump on the day of the mishap, his last training jump was 3 April 2015 (Tab G-62). Additionally, MJ2 had logged approximately 184 civilian jumps between 16 May 2009 and 19 August 2013 (Tabs G-71 to G-89).

Jump History

Member	Static Line	Static Line Jumpmaster	Military Free Fall	Military Free Fall Jumpmaster
MJ1	131	32	93	0
MJ2	24	0	29	0

(Tabs T-10 and T-12).

b. Other Mishap Jumpers and Aircrew

MJM is a qualified and current MFF and static line jumpmaster (Tab G-118). He graduated from the U.S. Army Airborne Course on 14 November 1997, the U.S. Army Military Free Fall Course on 16 November 2007, the Static Line Jumpmaster Course, and the U.S. Army Military Free Fall Jumpmaster Course on 22 March 2012 (Tab G-120). His last training jump was on 8 July 2015 (Tab G-118).

MAJM is a qualified and current MFF and static line jumpmaster (Tab G-123). He graduated from the U.S. Army Airborne Course on 3 February 2006, the U.S. Army Military Free Fall Course on 5 February 2009, the Static Line Jumpmaster Course on 04 November 2011, and had completed the U.S. Army Military Free Fall Jumpmaster Course (Tabs T-26, and V-22.1). His last training jump was on 17 June 2015 (Tab T-26).

MJ7 was a qualified and current MFF and static line jumpmaster (Tab G-113). MJ3, MJ4, MJ5 and MJ6 were all qualified and current MFF parachutists (Tabs G-91, G-98, G-103, and G-108).

Jump History

Member	Static Line	Static Line Jumpmaster	Military Free Fall	Military Free Fall Jumpmaster
MJM	100	29	102	50
MAJM	50	6	114	46
MJ3	43	0	220	0
MJ4	22	0	61	0
MJ5	35	0	77	0
MJ6	25	0	27	0
MJ7	48	21	218	88

(Tabs T-14, T-16, T-18, T-20, T-22, T-24, and T-26).

The mishap pilot was a current and qualified instructor pilot with nearly 500 flight hours in the C-145A, and over 2,000 total flight hours in other aircraft, primarily the MC-130 (Tab G-17). The mishap pilot's flight records indicate he had completed 38.6 flight hours in the C-145A in the last 90 days, 17.1 in the last 60 days and 9.6 in the last 30 days (Tab G-17).

The mishap co-pilot was a current and qualified instructor pilot with 272 flight hours in the C-145A with over 5,000 total flight hours in other aircraft (Tab G-5). The mishap co-pilot's flight records indicated he had completed 31.3 flight hours in the C-145A in the last 90 days, 29 flight hours in the last 60 days and 15.1 flight hours in the last 30 days (Tab G-5).

The mishap loadmaster was a current and qualified instructor loadmaster with 381 flight hours in the C-145A, and almost 4,000 total flight hours in other aircraft, primarily the MC-130 (Tab G-29, and G-32). The mishap loadmaster's flight records indicate he had logged 64.4 flight

hours in the C-145A in the last 90 days, 41.5 in the last 60 days and 18.4 in the last 30 days (Tab G- 29).

9. MEDICAL

a. Qualifications

At the time of the mishap, MJ1, MJ2, MJ3, MJ4, MJ5, MJ6, MJ7, MJM, and MAJM were medically qualified for flying duty with a current USAF Flying Class III (FCIII) physical (Tab X-3 to X-5). Additionally, MJM, MJ3 and MJ7 had valid and current FCIII medical waivers (Tab X-4 to X-5). There is no evidence to suggest physical and medical qualifications were factors in the mishap.

b. Health

MJ1 and MJ2 were in good health and had no performance limiting conditions or illnesses prior to the mishap (Tab X-3 to X-4). There is no evidence to suggest that any medical condition or illness contributed to the mishap.

c. Pathology

On 4 August 2015, an autopsy of MJ1 was conducted at Eglin AFB, FL (Tab X-3). Results from that autopsy revealed that MJ1 died from non-survivable brain injuries sustained during the mishap free fall (Tab X-3). On 4 August 2015, MJ2 underwent an autopsy at Eglin AFB, FL

(Tab X-4). Results from the autopsy revealed that MJ2 died from non-survivable brain injuries sustained during the mishap free fall (Tab X-4).

d. Lifestyle

The Armed Forces Medical Examiner performed toxicology screens on MJ1 and MJ2, which revealed no evidence of alcohol or drugs of abuse (Tab X 3 to X-4). Alcohol and toxicology screens performed on MJ3, MJ4, MJ5, MJ6, MJ7, MJM and MAJM revealed no evidence of alcohol or drugs of abuse (Tab X 3 to X-4). 72 hour and 7 day histories were collected from all mishap jumpers (Tabs R-5, R-8, R-53, R-73, R-109, R-143, R-177, and R-198). There is no evidence to suggest lifestyle factors were a factor in the mishap.

e. Crew Rest and Crew Duty Time

All 72 hour histories were reviewed, and revealed crew rest and crew duty time requirements, as specified in AFI 11-410, *Personnel Parachute Operations,* were satisfied (Tabs X-3, and BB-5). There is no evidence to suggest crew rest or crew duty time contributed to the mishap.

10. OPERATIONS AND SUPERVISION

a. Operations

The MFF administrative jump was a recurring monthly event and was scheduled in advance of the mishap jump (Tabs R-14, R-261, V-13.2 to V-13.3). MJM, MAJM, DZCO, MO, and medical support personnel, to include all jumpers, had enough notice to complete required coordination, briefings, and administrative paperwork without undue haste or confusion (Tabs R-262, R-269, and V-18.2). MJM's jumpmaster brief was professional and well developed (Tabs R-27, R-95, R-128 to R-129, R-180, V-7.20 and V-14.2). 720 OSS leadership described their operations tempo as busy, but normal (Tabs V-12.2, and V-13.2). There is no evidence to suggest that operations tempo was a factor in this mishap.

b. Supervision

The 720 OSS coordinated and scheduled the MFF operation at Auxiliary Field 6 in accordance with guidance and procedures (Tabs R-14, R-261 to R-262, V-13.2 to V-13.3, and BB-6 to BB-8).

A qualified jumpmaster, DZCO, MO and medical personnel were present during MFF operations in accordance with guidance and regulations (Tabs R-233, R-262, R-269, R-276, V-14.2, and BB-6 to BB-8).

Formal Operational Risk Management (ORM) for the MFF operation was assessed as "Medium," and was reviewed and signed off by the 720 OSS Assistant Director of Operations in accordance with guidance and regulations (Tabs V-12.3 to V-12.4, and DD-74).

MJM and MAJM completed the Non-Standard Aircraft orientation during a separate event the week prior, and once again on the DZ with all jumpers in attendance prior to the first lift in accordance with guidance and regulations (Tabs R-11, R-56, R-227, V-1.4 to V-1.5, V-15.2 to V-15.3, and V-25.1, and BB-92 to BB-93).

All jumpers reviewed the 720 STG Special Tactics Information File (STIF), and reviewed their currency data in accordance with guidance and procedures (Tabs V-1.20, and V-11.11). Because the 720 OSS does not maintain documentation showing a list of all jumpers on a scheduled jump with their currency data, the AIB could only verify the accuracy of the currency data through witness testimony (Tab V-13.4).

11. HUMAN FACTORS

The AIB considered all human factors as prescribed in the Department of Defense Human Factors Analysis and Classification System 7.0 (DoD HFACS 7.0) (Tab BB-84 to BB-86).

a. Overconfidence (PC 206)

Overconfidence is a factor when the individual overvalues or overestimates personal capability, the capability of others or the capability of aircraft/vehicles or equipment (Tab BB-84).

Overconfidence was a factor in this mishap for the following reason. MJ2 overestimated his personal capability to avoid other jumpers while descending rapidly to reach a lower jumper (Tabs R-36, R-81, R-97 to R-98, R-103 to R-104, R-149, R-167, R-200, and V-6.6 to V-6.7). MJ2 intended to come to MJ7, who was the second jumper to exit the aircraft (Tabs R-71, R-75, R-81, R-103 to R-104, R-200, and V-4.7). This required MJ2 to cover a significant distance in a short period of time (Tabs R-200, and Z-8).

MJ2 had only seven recorded MFF jumps since graduating from the Navy Parachute Free Fall Course in February 2012 (Tab T-3, and T-12). In that same period of time, he had approximately 84 civilian jumps (Tab G-67 to G-90). Civilian skydiving tends to put greater emphasis on track body positioning with lighter and streamlined parachutes, for greater maneuverability while in free fall (Tabs V-3.13, V-6.5, and V-10.6). MFF jumps tend to use bulkier parachutes that weigh more and offer less maneuverability (Tab V-10.6). MJ2's civilian jump experience may have bolstered his confidence in his personal capability to use a track body position to safely maneuver at high speeds during the mishap jump (Tabs G-67 to G-90, and V-4.10 to V-4.11).

b. Distraction (PC 106)

Distraction is a factor when the individual has an interruption of attention and/or inappropriate redirection of attention by an environmental cue or mental process (Tab BB-86).

Distraction was a factor in this mishap for the following reason. After almost colliding with MJ5, MJ2 redirected his attention, forcing him to adjust his track body position, and ultimately his flight vector, placing him on a collision course wherein he failed to see and avoid MJ1 (Tabs R-149, R-167, and V-6.6 to V-6.7). After passing MJ5, who abruptly dropped altitude, MJ2 looked back at MJ5 momentarily, changing his track body position and flight vector before redirecting his attention to acquire MJ7 below (Tabs R-149, R-167, and V-6.6 to V-6.7).

c. Briefing Inadequate (PP 109)

Briefing Inadequate is a factor when individuals failed to complete all preparatory tasks associated with briefing the mission (Tab BB-85).

Briefing Inadequate was a factor in this mishap for the following reasons. MJM did not provide complete information regarding action procedures under free fall (group procedures), and did not confirm that MAJM provided this information separately during lift three's jump profile rehearsal (Tabs R-15, and V-1.3, V-3.3). MAJM stated he conducted a jump profile rehearsal for lift three, but some jumpers could not recall this happening, and all jumpers stated the information provided was cursory and did not involve a detailed explanation of actions in free fall (Tabs R-78 to R-79, R-96, R-116, R-129, R-147, R-164, R-205, V-3.3, V-4.3, V-5.3, V-6.5, V-7.4, and V-8.3). MAJM's jump profile rehearsal for the third group did not cover grouping exercises or individual skill training and his use of the undefined term "cigar formation" without explanation highlights the failure to complete all preparatory tasks in a sufficient manner. (Tabs R-79, R-96, R-116, R-129, R-147, R-164, R-205, V-4.3, V-5.3, V-6.5, V-7.4, and V-8.3).

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publically Available Directives and Publications Relevant to the Mishap

(1) AFI 51-503, *Aerospace and Ground Accident Investigations*, 14 April 2015
(2) AFI 11-2C-145AV3, *C-145A Operations Procedures*, 23 June 2015
(3) AFI 11-231, *Computer Air Release Point Procedures*, 31 August 2005
(4) AFI 11-410, *Personnel Parachute Operations*, 4 August 2008
(5) AFI 13-217, *Drop Zone and Landing Zone Operations*, 10 May 2007
(6) AFI 13-217 Air Force Special Operations Command Supplement, *Drop Zone and Landing Zone Operations*, 15 May 2014
(7) AFI 13-219, *Combat Control and Special Tactics Officer Standardization and Evaluation*, 23 February 2009
(8) AFI 90-802, *Risk Management*, 11 February 2013
(9) AFI 91-204, *Safety Investigations and Reports*, 12 February 2014, corrective actions applied 10 April 2014

NOTICE: All directives and publications listed above 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) ATP 3-18.11 (FM 3-05.211)/AFMAN 11-411(I)/NTTP 3-05.26M, *Special Forces Military Free fall Operations*, October, 2014
(2) 24 Special Operations Wing Instruction, 90-802, *Risk Management*, 27 March 2014
(3) Air Force T.O. 14D1-2-468-2, *MC-4 RAM Air Free fall Personnel Parachute System*, 30 July 2003
(4) 720 Special Tactics Group Operating Instruction (STG OI) 11-104, *Special Tactics Helmet Mounted Devices*, 17 August 2011
(5) 720 STG OI 11-411, *720 STG Military Freefall Operations*, 30 November 2014

c. Known or Suspected Deviations from Directives or Publications

Not applicable.

1 OCTOBER 2015

//SIGNED//
VINCENT K. BECKLUND,
Brigadier General, USAF
President, Accident Investigation Board

STATEMENT OF OPINION

C-145A, T/N 10-0331
EGLIN AIR FORCE BASE,
FLORIDA 3 AUGUST 2015

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 3 August 2015, at approximately 1136 hours local time (L), two Special Tactics airmen sustained non-survivable injuries, and were later pronounced dead, following an accidental head-to-head collision during a military parachute training jump from a C-145A, tail number 12-0331, using MC-4 parachutes at Auxiliary Field 6, Eglin Air Force Base (AFB), Florida. The mishap jumpers were both members of the 720th Operational Support Squadron (720 OSS) assigned to Hurlburt Field, Florida.

During the third and final lift of the day, with nine jumpers on board, Mishap Jumper 2 (MJ2) exited the aircraft as the seventh jumper, and struck the fifth jumper, Mishap Jumper 1 (MJ1), in a head-to-head collision at approximately 8,000 feet above ground level (AGL), immediately rendering both jumpers unconscious. Both jumpers fell uncontrolled until each of their automatic activation devices initiated their reserve parachute canopies at approximately 1,600 feet AGL. At 1140L, both MJ1 and MJ2 drifted under fully inflated parachute canopies to a wooded area.

Military personnel were immediately on scene at both locations. MJ1 was located on the ground, unconscious, and treated by on-scene medical and ground personnel. MJ1 was evacuated by C-145A to Naval Air Station (NAS) Pensacola, Florida, and then transported by ambulance to Baptist Hospital. MJ1 was declared dead by competent medical authorities at 1727L. MJ2 was located suspended in a tree, 20 to 30 feet above the ground and unconscious. At approximately 1245L, military and civilian responders lowered MJ2 to the ground, treated and transported him by ambulance to Fort Walton Beach Hospital. MJ2 was declared dead by competent medical authorities at 1344L. No other jumpers or drop zone personnel were injured or killed in the mishap. Total damage to government property was valued at $20,494.

I find, by a preponderance of the evidence, the mishap was caused by MJ2 failing to see and avoid MJ1, who as the lower jumper had the right of way during free fall.

I find, by a preponderance of the evidence, four factors that substantially contributed to the mishap. The first factor consists of MJ2 choosing an overaggressive track body position that produced excessive speed in order to descend rapidly to a lower jumper. The second factor consists of MJ2 overestimating his personal capability to avoid other jumpers while descending rapidly to reach a lower jumper. The third factor consists of MJ2, after almost colliding with another jumper, redirecting his attention, which forced him to adjust his track body position, and

ultimately his flight vector, placing him on a collision course wherein he failed to see and avoid MJ1. The fourth factor consists of the Mishap Jumpmaster (MJM), not providing complete information regarding action procedures under free fall (group procedures), or confirming that the Mishap Assistant Jumpmaster (MAJM) provided this information separately during lift three's jump profile rehearsal. The briefing inadequacy did not violate military instructions or guidance, but substantially contributed to the mishap.

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.

2. CAUSE

I find, by a preponderance of the evidence, the mishap was caused by MJ2 failing to see and avoid MJ1, who as the lower jumper had the right of way during free fall.

MJ1, who was the fifth of nine jumpers to exit the aircraft, fell in a stable free fall body position. Shortly thereafter, MJ2, who was the seventh jumper to exit the aircraft, assumed a track body position in order to reach a lower jumper. This caused MJ2 to travel at a rapid horizontal and vertical speed. MJ2 collided with MJ1, who was at a lower altitude than MJ2 at the time. MJ2 had a responsibility to avoid lower jumpers while traveling in free fall. While it remains impossible to conclude definitively why MJ2 failed to see and avoid MJ1 during free fall, ultimately, it was MJ2's responsibility to avoid lower jumpers, who had the right of way.

3. SUBSTANTIALLY CONTRIBUTING FACTORS

a. Overaggressive Track Body Position

MJ2 chose an overagressive track body position that produced excessive speed in order to descend rapidly to a lower jumper, and failed to see and avoid MJ1 along the way. MJ2 was the seventh jumper to exit the aircraft. MJ2 intended to come near MJ7, who was the second jumper to exit the aircraft. In order to accomplish this, MJ2 needed to travel a significant distance in a short period of time. For this reason, upon exiting the aircraft MJ2 immediately chose a track body position that increased his vertical and horizontal speed. While traveling at this excessive speed, MJ2 failed to see and avoid MJ1. This track body position, within the context of a parachute training jump, was overaggressive and substantially contributed to the mishap.

b. Overconfidence

Overconfidence is a factor when the individual overvalues or overestimates personal capability, the capability of others or the capability of aircraft/vehicles or equipment. Overconfidence was a factor in this mishap for the following reason. MJ2 overestimated his personal capability to avoid other jumpers while descending rapidly to reach a lower jumper and substantially contributed to the mishap.

c. Distraction

Distraction is a factor when the individual has an interruption of attention and/or inappropriate redirection of attention by an environmental cue or mental process. Distraction was a factor in

this mishap for the following reason. After almost colliding with another jumper, MJ2 redirected his attention, forcing him to adjust his track body position, and ultimately his flight vector, placing him on a collision course wherein he failed to see and avoid MJ1 and substantially contributed to the mishap.

d. Briefing Inadequate

Briefing inadequate is a factor when individuals failed to complete all preparatory tasks associated with briefing the mission. Briefing Inadequate was a factor in this mishap for the following reasons. MJM did not provide complete information regarding action procedures under free fall (group procedures), and did not confirm that the MAJM provided this information separately during lift three's jump profile rehearsal. MAJM did not cover grouping exercises or individual skill training and his use of the undefined term "cigar formation" without explanation highlights the failure to complete all preparatory tasks in a sufficient manner.

In essence, each jumper executed his MFF jump with an assumption that the other jumpers on lift three would do the same. Some jumpers believed the entire lift would assume a stable free fall body position until pull altitude. Based on the use of the term "cigar formation," other jumpers believed they needed to group, which would require using a track body position to get into formation. This misunderstanding created an unsafe environment wherein some jumpers traveled at a rapid horizontal and vertical speed, while other jumpers ahead and below fell stable and straight to the ground. The briefing inadequacy created these misunderstandings and substantially contributed to the mishap.

4. CONCLUSION

I find, by a preponderance of the evidence, the mishap was caused by MJ2 failing to see and avoid MJ1, who as the lower jumper had the right of way.

Additionally, I find, by a preponderance of the evidence, four factors that substantially contributed to the mishap. The first factor consists of MJ2 choosing an overaggressive track body position that produced excessive speed in order to descend rapidly to a lower jumper. The second factor consists of MJ2 overestimating his personal capability to avoid other jumpers while descending rapidly to reach a lower jumper. The third factor consists of MJ2, after almost colliding with another jumper, redirecting his attention, which forced him to adjust his track body position, and ultimately his flight vector, placing him on a collision course wherein he failed to see and avoid MJ1. The fourth factor consists of the MJM, not providing complete information regarding action procedures under free fall (group procedures), or confirming that the MAJM provided this information separately during lift three's jump profile rehearsal. The briefing inadequacy did not violate military instructions or guidance, but substantially contributed to the mishap.

//SIGNED//
1 OCTOBER 2015 VINCENT K. BECKLUND,
Brigadier General, USAF
President, Accident Investigation Board

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