

UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION
BOARD REPORT



187th CIVIL ENGINEER SQUADRON
187th FIGHTER WING
DANNELLY FIELD, ALABAMA

TYPE OF ACCIDENT: Fitness Assessment Fatality

LOCATION: Dannelly Field, Alabama

DATE OF ACCIDENT: 3 June 2018

BOARD PRESIDENT: COLONEL DAVID R. LOPEZ, USAF

Conducted IAW Air Force Instruction 51-503



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HEADQUARTERS AIR COMBAT COMMAND
JOINT BASE LANGLEY-EUSTIS VA**

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DEC 13 2018

ACTION OF THE CONVENING AUTHORITY

The report of the ground accident investigation board, conducted under the provisions of AFI 51-503, that investigated the 3 June 2018 mishap in Montgomery, Alabama, involving the fatality of an Airman assigned to the 187th Civil Engineer Squadron following a fitness assessment, complies with applicable regulatory and statutory guidance and on that basis is approved.

**JAMES M. HOLMES
General, USAF
Commander**

**EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION**

**FITNESS ASSESSMENT FATALITY
DANNELLY FIELD, ALABAMA
3 JUNE 2018**

On 3 June 2018, at approximately 0841 hours local (L), at Dannelly Field, Alabama, a 39-year-old Airman First Class, hereinafter referred to as the Mishap Airman (MA), collapsed approximately 100 yards from the finish line during the 1.5 mile timed-run component of his Air Force physical fitness assessment (FA). After being treated by Emergency Medical Services (EMS) personnel, he was transported to a local hospital where he subsequently passed away at 1955L. The MA was a traditional guardsman assigned to the 187th Civil Engineer Squadron, 187th Fighter Wing, Dannelly Field, Alabama.

On the day of the mishap, the MA had passed the waist measurement, push-up, and sit-up components of his assessment. When he collapsed during the run component of his assessment, EMS personnel monitoring the run responded immediately and provided medical assistance. At 0842L, an Emergency Medical Technician (EMT) used his radio to call in an alarm requesting additional medical assistance and an emergency response. By 0847L, three additional EMTs from the 187th Fighter Wing Fire Department, a medical doctor from the 187th Medical Group, as well as two EMTs from the Montgomery Fire Department arrived on-scene and assisted with care. At 0905L, a civilian ambulance arrived and transported the MA to Baptist Medical Center South (BMCS), a nearby civilian hospital, arriving at the emergency room at 0919L.

The MA was admitted to BMCS with an initial diagnosis of severe dehydration and heat stroke. By 0942L, his diagnosis had been updated to acute rhabdomyolysis (breakdown of muscle fibers), acute kidney injury, and severe metabolic acidosis (reduction in pH level). The MA's doctor consulted several medical specialists in order to determine the best course of treatment. Over the next ten hours, the MA's condition deteriorated as the rhabdomyolysis continued despite medical interventions. The MA died at 1955L, with his family nearby.

In the 24 hours before the FA, the MA took numerous actions to reduce his abdominal circumference. These actions severely dehydrated the MA, predisposing him to heat illness with severe complications of his inherited sickle cell trait (SCT) medical condition. The coroner listed the MA's cause of death as cardiopulmonary respiratory arrest due to multi-organ system failure as a consequence of electrolyte imbalance; manner of death was determined to be of natural causes.

SUMMARY OF FACTS
Fitness Assessment Fatality
3 June 2018

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ACRONYMS AND ABBREVIATIONS

A1C	Airman First Class	FSS	Force Support Squadron
ABG	Arterial Blood Gases	FSQ	Fitness Screening Questionnaire
ACC	Air Combat Command	G6PD	Glucose-6-Phosphate Dehydrogenase
ACLS	Advanced Cardiac Life Support	GAIB	Ground Accident Investigation Board
AED	Automated External Defibrillator	GPS	Global Positioning System
AF	Air Force	HAF	Headquarters Air Force
AFFMS	Air Force Fitness Management System	HAWC	Health and Wellness Center
AFI	Air Force Instruction	HCO3	Sodium Bicarbonate
AFib	Atrial Fibrillation	HIPAA	Health Insurance Portability and Accountability Act
AFMSA	Air Force Medical Support Agency	HPF	High Power Field
AGR	Active Guard Reserve	IAW	In Accordance With
AL	Alabama	ICU	Intensive Care Unit
ALS	Advanced Life Support	IV	Intravenous
AMI	Acute Myocardial Infarction	K+	Potassium
AMP	Aerospace Medicine Primary	kts	Knots
ANG	Air National Guard	L	Local
ANG-RC	Air National Guard – Readiness Center	l	liter
ASIMS	Aeromedical Services Information Management System	Lt Col	Lieutenant Colonel
AT	Annual Training	Maj	Major
ATP	Adenosine Triphosphate	MAJCOM	Major Command
BDOC	Base Defense Operations Center	M.D.	Medical Doctor
BE	Base Excess	MA	Mishap Airman
BG	Blood Gas	MEPS	Military Entrance Processing Station
BLS	Basic Life Support	Meq	Milli-equivalents
BMCS	Baptist Medical Center South	mg	milligrams
BMT	Basic Military Training	mmol	millimoles
BVM	Bag Valve Mask	MPH	Miles Per Hour
Capt	Captain	NG	National Guard
cc	cubic centimeter	NGB	National Guard Bureau
CBC	Complete Blood Count	MSgt	Master Sergeant
CDC	Career Development Courses	NSTEMI	Non ST T wave Endocardial Myocardial Infarction
CE	Civil Engineer	NA+	Sodium
CK	Creatinine Kinase	NCO	Non-Commissioned Officer
COCOM	Combatant Command	NOK	Next-of-Kin
Col	Colonel	O2	Oxygen
CPR	Cardiopulmonary Resuscitation	OPA	Oropharyngeal Airway
CR	Creatinine	PADD	Person Authorized to Direct Disposition
CT	Computed Tomography	PAS Code	Personnel Accounting System Code
DEERS	Defense Enrollment Eligibility Reporting System	PCR	Patient Care Record
dl	Deciliter	pCXR	Portable chest X-Ray
EKG	Electrocardiogram	PHA	Preventive Health Assessment
EMS	Emergency Medical Services	PHI	Protected Health Information
EMT	Emergency Medical Technician	POC	Point of Care
EPR	Enlisted Performance Report	PT	Physical Training
ER	Emergency Room	PTL	Physical Training Leader
F	Fahrenheit	QTP	Qualification Training Packages
FA	Fitness Assessment	RBC	Red Blood Cells
FIM	Fitness Information Manager	RSD	Regularly Scheduled Drill
FPC	Fitness Program Coordinator	SAV	Staff Assistance Visit
FS	Flight Surgeon	SCD	Sickle Cell Disease

SCT	Sickle Cell Trait	USAFSAM	United States Air Force School of
SGLI	Servicemember's Group Life Insurance		Aerospace Medicine
SMSgt	Senior Master Sergeant	USAFR	United States Air Force Reserves
SNCO	Senior Non-Commissioned Officer	UTA	Unit Training Assembly
Sp O2	Arterial Oxygen Saturation by Pulse Oximeter	V/Q Scan	Ventilation/Perfusion Scan
SrA	Senior Airman	vRED	Virtual Record of Emergency Data
TAMU-C	Texas Agricultural and Mechanical	WBC	White Blood Cell
	University in Commerce	WBGT	Wet Bulb Globe Temperature
TSgt	Technical Sergeant	187 CES	187th Civil Engineer Squadron
UDM	Unit Deployment Manager	187 FSS	187th Force Support Squadron
UFPM	Unit Fitness Program Manager	187 FW	187th Fighter Wing
USAF	United States Air Force		

The above list was compiled from the Summary of Facts, the Index of Tabs, Witness Testimony (Tab V), and the Statements of Injury and Death (Tab X).

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 21 September 2018, General James M. Holmes, Commander, Air Combat Command (ACC), appointed Colonel (Col) David R. Lopez as Board President of a Ground Accident Investigation Board (GAIB) to investigate the death of the Mishap Airman (MA) who died following an Air Force physical fitness assessment (FA) at Dannelly Field Alabama (AL) (Tabs X-3 and Y-3). The GAIB convened from 24 September 2018 through 12 October 2018, and it was conducted in accordance with (IAW) Air Force Instruction (AFI) 51-503, *Aerospace and Ground Accident Investigations*, dated 14 April 2015, incorporating Air Force Guidance Memorandum 2018-01, dated 12 March 2018. Additional members of the GAIB included a Col medical member, a lieutenant colonel (Lt Col) legal advisor, and a technical sergeant (TSgt) paralegal (Tab Y-3).

b. Purpose

IAW AFI 51-503, this GAIB conducted a legal investigation to inquire into all the facts and circumstances surrounding this Air Force ground 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 June 2018, at approximately 0830 hours local (L), the MA, a 39-year-old traditional Air National Guard (ANG) member (Title 32) Airman First Class (A1C) assigned to the 187th Civil Engineer Squadron (187 CES), 187th Fighter Wing (187 FW), Dannelly Field, AL, began the 1.5 mile timed-run component of his FA (Tabs V-1.26, V-2.2, V-2.3, V-3.2, X-16, AA-3 to AA-4, BB-46 and CC-9). Approximately 11 minutes into his run, at 0841L, the MA collapsed (Tab V-1.26 and X-16). 187 CES Fire Department Emergency Medical Technicians (EMTs) responded immediately and provided medical assistance (Tab V-3.1 and V-3.3 to V-3.4). At approximately 0905L, a civilian ambulance arrived and transported the MA to Baptist Medical Center South (BMCS) (Tab X-14 and X-16). At BMCS, his initial diagnosis was severe dehydration and heat stroke (Tab X-8). By 0942L, his diagnosis had been updated to, among other things, acute rhabdomyolysis (breakdown of muscle cells), acute kidney injury, and severe metabolic acidosis (severe reduction in pH level) (Tab X-5 to X-6 and X-9 to X-10). Over the next ten hours, the MA's condition deteriorated despite medical interventions (Tab X-11 to X-12). The MA died at 1955L, with his family nearby (Tabs V-4.16, V-5.11, and X-12).

3. BACKGROUND

a. Air Combat Command (ACC)

ACC is a major command of the United States Air Force (USAF) (Tab CC-3). ACC's mission includes providing combat-ready forces to America's warfighting commands to ensure air, space, cyber, and information superiority (Tab CC-3). As a force provider, ACC organizes, trains, equips, and maintains combat-ready forces (including assigned ANG units) for rapid deployment and employment (Tab CC-3 to CC-4).



b. Alabama Air National Guard (AL ANG)

The federal mission of the AL ANG is to maintain well-trained, well-equipped units available for prompt mobilization during war and assistance during national emergencies (such as natural disasters and civil disturbances) (Tab CC-8). AL ANG units are trained and equipped by the USAF and are operationally gained by a major command of the USAF if federalized (Tab CC-5).



c. 187th Fighter Wing (187 FW)

The 187 FW's primary mission is to provide the nation with a superior F-16C+ Aviation Package; RC-26B Intelligence, Surveillance, and Reconnaissance platform; and Expeditionary Combat Support functions organized, trained, and equipped for rapid world-wide combat deployment, domestic relief, and law enforcement operations (Tab CC-7).



d. 187th Civil Engineer Squadron (187 CES)

The 187 CES mission is to ensure its highly skilled force is ready to immediately respond to emergency taskings to sustain or recover an air base at any location, world-wide (Tab CC-9). During peacetime, they construct, operate and maintain 187 FW air base infrastructure (Tab CC-9). Its duty sections include Engineering, Operations, Emergency Management, Power Production, Electrical, Structures, Heavy Equipment, Utilities, and Heating Ventilation and Air Conditioning (HVAC) (Tab CC-10).

e. Baptist Medical Center South (BMCS), Montgomery, AL

Founded in 1963, BMCS (located approximately 9 miles east of Dannelly Field) is the largest medical facility in Montgomery, AL (Tabs X-14 and CC-11). BMCS is a not-for-profit, faith-based acute care regional referral center (Tab CC-11). BMCS has Emergency Room (ER) services with numerous specialists available, to include cardiovascular, orthopedic, neurology, nephrology, and pulmonology (Tab X-8, X-11 and CC-11 to CC-13).

f. Care Ambulance Services, Montgomery, AL

Care Ambulance Services was established in 1992 and provides Basic Life Support (BLS), Advanced Life Support (ALS), and Ventilator Transports (Tab CC-14 and CC-16). This service is provided to Montgomery, Macon, Autauga, Chilton, Perry, Dallas, Lowndes, Lee, and Russell counties in AL (Tab CC-14 to CC-15).

g. Air Force Physical Fitness Program

Air Force members are required to remain physically fit (Tab BB-12). The Air Force assesses physical fitness using an age and gender specific FA (Tab BB-32). The Air Force FA is comprised of three components: 1) aerobic fitness (1.5 mile run or 2.0 kilometer walk), 2) body composition (abdominal circumference measurement), and 3) muscular fitness (push-ups and sit-ups) (Tab BB-23). Each component is scored based upon the Airman's performance for that component (e.g., faster run time/more push-ups receives higher score) (Tab BB-53). Each component also has minimum, target (score necessary in each component to achieve an overall passing FA score) and maximum requirements (Tab BB-53). To pass the FA, Airmen must achieve a total of 75 points in addition to scoring at least the minimum required score for each component (Tab BB-23). Traditional ANG Airmen in Title 32 status must complete a FA annually (Tab BB-33). If a traditional ANG Airman receives an unsatisfactory score on a FA (below 75 points) they must retest within 180 days (Tab BB-34). Unit Commanders may not mandate ANG Airmen retest sooner than the end of the 180-day reconditioning period; however, Airmen may voluntarily retest at any time (Tab BB-34). Retesting in the first 90 days after an Unsatisfactory FA is not recommended in order to reduce the risk of injury (Tab BB-34). Airmen are individually responsible for knowing when their FA is due and ensuring it is scheduled so that they remain current (Tab BB-21).

h. Acute Rhabdomyolysis

Acute Rhabdomyolysis is a potentially life-threatening medical condition resulting from the breakdown of skeletal muscle cells with corresponding leakage of muscle contents into the blood circulation (Tab X-5 and X-10). Rhabdomyolysis can be caused by strenuous, unaccustomed, prolonged, or repetitive exercise (Tab X-6). Other risk factors include a hot and humid climate, pre-event fatigue, and sickle cell trait (SCT) (Tab X-6). These conditions, especially when combined, can cause clinically significant exertional rhabdomyolysis (Tab X-6). Clinically significant rhabdomyolysis causes pain, muscle swelling, and organ damage including the potential for acute renal failure (kidneys stop working) (Tab X-4 and X-6). Early recognition of rhabdomyolysis and prompt management of complications are crucial to a successful outcome (Tab X-6).

i. Sickle Cell Trait (SCT)

SCT is an inherited condition in which an individual possesses both a normal and abnormal copy of the hemoglobin gene (Tab X-4). The abnormal gene produces sickle hemoglobin which, in the presence of certain risk factors, can cause red blood cell sickling (Tab X-4). Sickle hemoglobin comprises approximately 35-45 percent of hemoglobin in individuals with SCT versus approximately 85-90 percent in those with Sickle Cell Disease (SCD) (Tab X-4). Unlike

SCD, which is significantly more serious and requires ongoing medical care and therefore precludes military service, SCT is a medical condition that does not currently preclude military service and individuals with SCT usually can safely participate in normal physical activity and sports (Tab X-4 to X-5). Risk factors for sickling events include: high temperature and humidity, high altitude, an individual's poor conditioning, poor hydration, age, and high-intensity exercise (Tab X-4 to X-5). Once triggered, a sickling event is a severe and potentially life threatening event whether the individual has SCT or SCD (Tab X-4 to X-5). Normal red blood cells are round and can easily pass through blood vessels, whereas sickled red blood cells are rigid and can block blood vessels (Tab X-5). This may lead to rhabdomyolysis (the rapid breakdown of muscle tissue starved of blood), leading to blood chemistry problems and potential sudden death (Tab X-5).

4. SEQUENCE OF EVENTS

a. Events Preceding the Accident

01 June 2018 The MA took an official FA and received a score of unsatisfactory (73.9 out of 100) (Tab AA-14). The MA scored at or above the target values in each component, with the exception of his abdominal circumference, where he scored the minimum value (Tab AA-14 and Tab BB-53). Before leaving the FA, the MA signed acknowledgement of his raw scores (Tabs V-1.16 - 1.17, V-2.8 and AA-11). The MA was in a valid duty status for the accomplishment of this FA (Tabs T-13 and BB-22).

02 June 2018 The MA was informed he did not pass his FA the day before and initiated a phone call with the Fitness Program Manager, referenced herein as the Fitness Program Coordinator (FPC), where he was counseled on the reasons for the unsatisfactory score and encouraged to give his body a chance to rest and recoup and then come back and test again in July (Tab V-1.11 to V-1.12, V-1.18, V-2.8 and BB-16). Following this phone call, the MA discussed retaking his FA on 3 June 2018 with his supervisor (Tab V-2.8). The MA ate his last meal at approximately 1300L (Tab V-3.6). During the afternoon, the MA took two of his Fiancée's blood pressure pills (a prescription diuretic) in an effort to shed water-weight (Tabs V-5.6 to V-5.8, X-7 and Z-5).

b. Accident and Immediate Response - 3 June 2018

0630L The MA reported to his duty section in his Physical Training (PT) uniform and told his supervisor he intended to retake his FA that morning (Tab V-2.9). The MA informed his supervisor he had taken a "water pill" (referring to the prescription diuretic) (Tab V-2.10 and V-5.7). Neither the MA nor his supervisor were concerned about the MA's ability to pass the FA that morning (Tab V-2.9 to V-2.10).

0730L The MA signed-in as a walk-in to take an official FA as part of the 4th and last wave of assessments offered that day (Tab V-1.12 to V.1.13). The MA's waist circumference was recorded as 36.5 inches (2.5 inches smaller than it had been two days earlier on his 1 June 2018 FA) (Tab AA-11 and AA-19). The MA also scored considerably higher on the push-up and sit-up components of his FA than he had two days earlier (Tab AA-11 and AA-19). The MA was in a valid duty status for the accomplishment of this FA (Tabs AA-4 and BB-22).

0830L The MA began the 1.5 mile run component of his FA (Tabs V-1.26 and X-16). Approximately 10 minutes and 54 seconds into the run the MA was approaching 100 yards from the finish line, indicating he ran at a considerably faster pace than he had two days earlier during his 1 June 2018 FA, where he completed his run in 13 minutes and 8 seconds (Tabs V-1.26, Z-3, and AA-14).



(Figure 1) Google Maps screenshot indicating Last 100 yards of the FA course (Tab Z-3)

0842L The MA collapsed approximately 100 yards from the finish line (Tabs V-1.26 and Z-3). Three EMTs monitoring the run responded immediately and initiated an alarm requesting additional medical support and an emergency response (Tabs V-1.26, V-3.3 to V-3.4, and X-16). By 0847L, three additional EMTs from the 187 CES Fire Department, a doctor from the 187th Medical Group, and two Montgomery Fire Department EMTs had arrived on scene and began assisting with care (Tabs V-1.27, V-1.34, V-3.4 to V-3.6, and X-16). Among other efforts, EMTs inserted an oropharyngeal airway (OPA) and provided Bag Valve Mask (BVM) assisted ventilations and intravenous (IV) fluids (Tab V-3.5 to V-3.6).

0905L Care Ambulance Services arrived, quickly loaded the MA into the ambulance, and departed for BMCS arriving at 0919L at the emergency room (Tab X-14 and X-16). The MA's frontline supervisor and EMT-4 rode in the ambulance with the MA to BMCS (Tab V-2.18 and V-3.6).

During transport, the MA regained consciousness and told EMT-4 he had not had anything to eat or drink since 1300L on 2 June 2018 (Tab V-3.6).

0919L The MA arrived at BMCS and was initially diagnosed with severe dehydration and heat stroke (Tab X-8 and X-14). The MA self-reported having taken two “water pills” (referring to his Fiancée prescription diuretic) in an attempt to lose water-weight on 2 June 2018 (Tabs V-5.7 and X-8).

0942L The MA’s diagnosis was updated to acute rhabdomyolysis (breakdown of muscle cells), acute kidney injury, and severe metabolic acidosis (severe reduction in pH level) (Tab X-5 to X-6 and X-9 to X-10). The MA’s doctor consulted several medical specialists to determine the best course of treatment (Tab X-11 to X-12).

1754L Kidney dialysis was started as part of a comprehensive medical treatment program (Tab X-12). Despite appropriate medical interventions, the MA’s condition deteriorated as the rhabdomyolysis continued (Tab X-11).

1955L The MA was pronounced dead at BMCS, with his family nearby (Tab V-4.16 and V-5.11).

c. Search and Rescue

Not applicable.

d. Recovery of Remains

Not applicable

5. MAINTENANCE

Not applicable.

6. EQUIPMENT, VEHICLES, FACILITIES, AND SYSTEMS

The 1.5 mile FA run was conducted outdoors along the perimeter road of the ANG facility on Dannelly Field IAW an approved course identified as “Course 3” (Tabs V-1.5 and BB-68).



(Figure 2) Google Maps screenshot indicating the 1.5 mile FA Course (Tab Z-4)

The course was clear of traffic, with start line, half way point, turn points, and finish lines marked IAW AFI 36-2905 attachment 6 and local policy (Tabs V-1.5, V-1.7, V-1.34, and BB-50 to BB-51). Post-mishap, a civilian ambulance was used to transport the MA to a civilian hospital, and civilian medical equipment was used to treat the MA’s injuries (Tab X-8 to X-14). There is no evidence that equipment, vehicles, facilities, or systems were a factor in this mishap.

7. ENVIRONMENTAL CONDITIONS

a. Forecast Weather

The weather forecast for 3 June 2018 called for morning fog, calm winds, and a Heat Index (HI) of 84 degrees Fahrenheit (F) by 0900L (Tab W-3 to W-4).

b. Observed Weather

Approximately 30 minutes before the MA began his 0830L run, the observed weather on 3 June 2018 was skies clear, winds West-South-West at 3.5 miles per hour (MPH), temperature 79 degrees F, dew point 77 degrees F, with humidity of 94% (based on temperature and dew point) (Tab W-6). Approximately 30 minutes after the MA began his run, at 0853L, the observed weather was skies clear, winds calm, temperature 84.9 degrees F, dew point 77 degrees F, with humidity 72% (Tab W-6). The first Wet Bulb Globe Temperature (WBGT) measurement was taken well after the mishap, at 1041L, at which time the WBGT was 91.2 degrees F, and a black flag condition was reported to the 187 FW command post (Tab W-7).

c. Other Environmental Conditions

Not applicable.

d. Restrictions, Warnings, and Procedures

IAW AFI 36-2905, paragraphs A6.2.13 and A6.2.15, the WBGT must be less than or equal to 86 degrees F at the start of the run, and wind speed cannot exceed 15 MPH sustained or 20 MPH gusting (Tab BB-51). WBGT is a composite temperature used to estimate the effect of

temperature, humidity, wind speed, and solar radiation on humans (Tab BB-47). WBGT is used by industrial hygienists, athletes, and the military to determine appropriate exposure levels to high temperatures (Tab BB-47). Observed weather data was used in conjunction with the National Weather Service prototype WBGT tool to estimate a worst case WBGT of 86 degrees F at the time the MA began the 1.5 mile run component of his FA (Tabs V-1.26, W-6, W-8, and X-16). This estimate assumes no wind and clear skies, whereas an assumption of a 3 MPH breeze would lower the WBGT estimate at the start of the run to 85 degrees F (Tab W-6, W-8 and W-9).

8. PERSONNEL QUALIFICATIONS

a. Mishap Airman

The MA was a very reliable member of the 187 CES with an above-average work ethic (Tab V-2.4). His supervisor praised him for knowing what needed to be done and doing it, and was actively working to bring the MA on temporary full-time status (Tab V-2.3 to V-2.4). The MA completed Basic Military Training (BMT) in April 2016, Technical School for Power Production in July of 2016, and had recently earned his 5-level certification in power production (Tabs T-6, T-10, and V-2.4). In his two and a half years of ANG service, the MA had never received disciplinary action, and was described by his frontline supervisor as “an above average troop” and “very dependable” (Tab V-2.4). The 187 CES had mandatory physical training (PT) formations every RSD weekend, and outside these scheduled physical fitness sessions the MA routinely set aside time for personal physical fitness training to include running or walking several times a week (Tabs V-2.7, V-3.2, and V-4.10 to V-4.12).

b. Fitness Assessment Personnel

The FPC organized and oversaw the administration of all the FAs conducted on 3 June 2018 (Tab V-1.3). A review of training records indicated the FPC was appropriately trained as a Physical Training Leader (PTL) and Unit Fitness Program Manager (UFPM), to include Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) certification (Tabs AA-8 to AA-10 and BB-16 to BB-17). Similarly, the 12 PTLs that assisted the FPC in running the FA on 3 June 2018 were all appropriately trained (Tabs V-1.3 to V-1.4 and AA-26 to AA-32).

c. EMT Personnel

Initial medical response was from ANG personnel assigned to the 187 CES Fire Department (Tab V-3.1 and V-3.3 to V-3.4). In total, six EMTs from the 187 CES responded to the scene (Tab V-3.5). All six were certified and current in all appropriate training requirements (Tab AA-33). A civilian ambulance service (Care Ambulance) responded to the 9-1-1 call (Tab X-14). The ambulance was staffed by two civilian crewmembers (Tabs V-3.6 and X-14).

d. Treating Physicians

BMCS is fully accredited by the Joint Commission on Accreditation of Healthcare Organizations (Tab CC-11). The MA’s primary attending physician was properly credentialed at BMCS,

attended medical school at the Medical University of South Carolina, was board certified in Emergency Medicine, and licensed in Alabama (Tab X-13). All other physicians treating the MA at various times were appropriately supervised or licensed and board certified (Tab X-13). A review of the MA's medical records revealed he received appropriate care (Tab X-13).

9. MEDICAL FACTORS

a. Pre-Mishap Medical Conditions

The MA was SCT positive and aware of his family's history of SCT long before he enlisted (Tab V-4.6 to V-4.8). He played multiple sports in high school and worked physically demanding jobs where he was routinely exposed to the Alabama heat both before and after he enlisted (Tab V-2.5 to V-2.6 and V-4.1 to V-4.2). The MA actively participated in physical activities during his time on active status with the ANG and during his civilian life (Tab V-2.6 to V-2.7 and V-4.10). There is no evidence he experienced any symptoms related to his SCT status prior to his enlistment (Tab V-4.8). Studies have shown, in military populations, exercise-related deaths are 30-40 times higher in those with SCT compared to those without SCT (Tab X-5). Department of Defense policy is for SCT screening to be done according to Service-specific operational requirements (Tab BB-3). The Air Force screens all service members for SCT after accession, and those identified SCT positive receive medical education in a face-to-face visit documented in their medical record (Tabs X-4 and BB-60). For the Air Force enlisted force, SCT screening occurs at BMT (Tab BB-64). During BMT, the MA screened positive for SCT and was counseled on the increased potential for severe complications (up to and including death) related to heat illness as a consequence of SCT (Tab X-6). He signed an acknowledgment of this risk at BMT, and he agreed to maintain good hydration and to ensure his health care providers were aware of his condition if he ever developed a fever or infection (Tab X-6). During his time at BMT and IAW local guidance, the MA wore a white reflective armband signifying his vulnerability to heat-related injury (or death) based on prolonged strenuous exercise during all BMT activities (Tabs T-8 and BB-63).

There is reference to SCT in the Fitness Screening Questionnaire (FSQ) filled out by every Airman prior to taking a FA (Tabs AA-12 and BB-21). Question 1 of the FSQ lists SCT as a medical condition which may prevent an Airman from safely participating in the FA if not evaluated, optimally treated, or already addressed in a Duty Limiting Condition Report specifying FA component exemptions (Tabs AA-12 and BB-17). If the Airman answers "yes" to question 1, he/she is to be evaluated by a medical professional before taking a FA (Tab AA-12). If the Airman answers "no" to question 1, then the FSQ directs the Airman to answer additional questions to determine if they need to see a medical professional before taking the FA (Tab AA-12). When the MA filled out the FSQ for his 1 June and 3 June 2018 FAs, he marked "no" in answer to question 1, attesting to the fact that his SCT condition had been medically evaluated and he had been cleared for unrestricted participation in a physical training program (Tab AA-12 and AA-20). A review of the MA's pre-mishap medical records indicate no other underlying medical conditions related to this mishap (Tab X-6 to X-7).

b. Injuries and Pathology

According to a medical review of the facts and circumstances of this mishap, the combination of the MA's poor hydration (from low fluid intake and from taking a prescription diuretic), his maximum effort physical exertion, and the high temperature and humidity during the FA on 3 June 2018 resulted in the MA suffering a heat illness with severe complications from his SCT (Tab X-4, X-7 and X-12). The MA's dehydration combined with prolonged anaerobic exertion for approximately 11 minutes during the 1.5 mile run caused acidosis (reduction in pH level) and hypoxemia (lower oxygen level in the blood), triggering a sickling event (Tabs X-9 to X-10 and X-12). The sickled red blood cells further decreased the supply of oxygen to the muscles throughout his body (both because of their decreased ability to carry oxygen and because of their tendency to block small blood vessels) (Tab X-12). This led to ischemic injury (a decreased supply of oxygenated blood to a body part) and muscle cell death (Tab X-4 and X-12). As muscle tissue died (rhabdomyolysis), myoglobin and electrolytes were released from the dead cells into the MA's bloodstream (Tab X-13). The myoglobin further blocked blood flow through the smallest blood vessels and the electrolytes worsened the acidosis resulting in increased muscle death, which in turn led to more myoglobin and potassium being released (Tab X-13). Once started this chain reaction was very difficult to stop or effectively treat (Tab X-13). This pathology led to multi-organ failure including kidney failure, and ultimately to a massive heart attack as the heart muscles were deprived of oxygen due to blockages of the tiny blood vessels feeding the heart muscles themselves (Tab X-13). The coroner listed the MA's cause of death as cardiopulmonary respiratory arrest due to multi-organ system failure as a consequence of electrolyte imbalance; manner of death was determined to be of natural causes (Tab X-17). Toxicology results for the MA were negative for illicit drugs (Tab X-8).

c. Lifestyle

The MA was under a great deal of financial stress to pass the FA on 3 June 2018 (Tab V-1.23, V-2.3 to V-2.6, and V-5.5). The MA had failed an official FA on 1 June 2018 and knew he needed a passing FA in order to receive an available temporary-Active Guard Reserve (AGR) position (full-time job with the ANG) as well as his promotion to Senior Airman (SrA) (Tab V-1.11, V-2.5, and V-5.5). The MA had completed the required on-the-job training and had recently passed his Career Development Courses (CDCs) for promotion to SrA (Tab V-2.5). The combination of the promotion and the temporary-AGR position would have greatly improved the MA's financial situation (Tab V-2.6 and V-5.5). The MA took numerous actions the 24 hours prior to his 3 June 2018 FA to reduce his waist measurement and increase his chances of receiving a passing score on his FA (Tab V-2.10, V-3.6 and V-5.6). These actions were consistent with techniques described as commonly known among unit personnel (Tab V-2.16). On 2 June 2018, the MA used a combination of Preparation H cream and plastic wrap around his mid-section in an effort to shrink his waist measurement (Tab V-2.16 and V-5.6). Also, on 2 June 2018, at some point during the afternoon, the MA took two of his Fiancée's blood pressure pills (a prescription diuretic) in an effort to shed water-weight (Tabs V-5.6 and Z-5). Additionally, the MA did not eat or drink from approximately 1300L on 2 June 2018 until just prior to his 0730L FA on 3 June 2018, when he consumed a carbonated energy drink (Tabs V-3.6, V-5.6 to V-5.8 and X-7). According to a medical expert, these actions severely dehydrated the MA and predisposed him to heat injury with severe complication from his SCT during his 3 June 2018 FA (Tab X-12).

10. OPERATIONS AND SUPERVISION

a. Operations

The FPC for 187 FW administers the Air Force FA every month on the Friday before regularly scheduled drill (RSD) weekend and on the Sunday of RSD weekend (Tab V-1.1 to V-1.2 and V-1.4 to V-1.5). The FA operations on the morning of 3 June 2018 were described by the FPC as a mass testing (Tab V-1.9). Four FA sessions were planned and a total of 139 individuals took their FA that morning (Tab V-1.9 and V-1.13). The sessions began at 0600 with subsequent sessions scheduled to start every half hour (Tab V-1.13). Participants in each session were scheduled ahead of time, with a maximum of fifty participants in each session, so as to maintain a good ratio of observers to participants (Tab V-1.11 and V-1.13). Including the MA, there were 27 individuals participating in the 0730 FA session, which was the fourth and last session accomplished on 3 June 2018 (Tabs V-1.13 and AA-17). Due to delays in the sessions that preceded it, session four started the 1.5 mile run portion of their FA at approximately 0830L (Tabs V-1.12, V-1.20, V-1.26, V-1.30, and X-16).

b. Supervision

The FPC was aware temperatures would quickly rise that morning and deliberately scheduled the FAs to begin early so as to avoid prohibitive WBGTs (Tab V-1.9 and V-1.20 to V-1.21). The observed weather, however, was warmer than forecasted, and the delays experienced during execution meant conditions at the start of the MA's 1.5 mile run were at the upper limit of what is allowable by AFI (Tab W-3 to W-4, W-5 to W-6, and BB-51). The FPC did not verify the WBGT was within AFI limits at the time the fourth FA session began their 1.5 mile run (Tab V-1.20).

11. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

- (1) AFI 51-503, *Aerospace and Ground Accident Investigations*, dated 14 April 2015, incorporating AFGM 2018-01, dated 12 March 2018
- (2) DoDI 6465.01, *Erythrocyte Glucose-6-Phosphate Dehydrogenase Deficiency (G6PD) and Sickle Cell Trait Screening Program*, dated 17 July 2015
- (3) AFI 36-2905, *Fitness Program*, dated 21 October 2013, incorporating change 1, dated 27 August 2015
- (4) AFI 48-123, *Medical Examinations and Standards*, dated November 2013
- (5) AFI 44-170, *Preventive Health Assessment*, dated 30 January 2014
- (6) ANGI 36-2001, *Management of Training and Operational Support within the Air National Guard*, dated 19 October 2009

NOTICE: The publications listed above are available digitally on the Department of Defense Executive Services Directorate website at: <http://www.esd.whs.mil/Directives/issuances/dodi/> and the Air Force Departmental Publishing Office website at: <http://www.e-publishing.af.mil> respectively.

b. Other Directives and Publications Relevant to the Mishap

(1) 737 TRG Operating Instruction 36-3, *Basic Military Training (BMT)*, dated 17 March 2015

c. Known or Suspected Deviations from Directives or Publications

IAW AFI 48-123, paragraph 10.14.1.3, the Preventive Health Assessment (PHA) is an annual requirement for members of the ANG (Tab BB-61). Furthermore, IAW AFI 44-170, paragraph 2.2.14, as part of the PHA, Airmen are to be medically evaluated for clearance to participate in a physical fitness-training program to meet fitness requirements IAW AFI 36-2905, *Fitness Program* (Tab BB-58). There is no evidence the MA completed a PHA after the physical he received at BMT in 2016 (Tab X-5). The MA had not been medically evaluated for clearance to participate in a physical fitness program for 27 months at the time of his FA on 1 June 2018 (Tab X-5).

IAW AFI 36-2905, paragraph 3.11.1.2, traditional ANG Airmen must complete an official FA at least annually and must be tested by the last day of the month, 12 calendar months following the previous Satisfactory test (Tab BB-33). The last official FA the MA took, prior to 1 June 2018, was at BMT on 11 April 2016 (Tabs V-4.5 and AA-14).

IAW ANGI 36-2001, paragraph 1.14, ANG members must maintain fitness currency and medical examination currency as participation requirements when taking part in a pay or points gaining activity (Tab BB-56). From 1 May 2017 until 1 June 2018, the MA was non-current on his FA yet continued to participate in pay and point gaining activities (Tabs V-2.2 to V-2.3, X-5 and AA-14). Additionally, the MA was non-current on his annual medical examination after 1 March 2017 yet continued to participate in pay and point gaining activities (Tab V-2.2 to V-2.3 and X-5).

7 December 2018

DAVID R. LOPEZ, Colonel, USAF
President, Ground Accident Investigation Board

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* Tabs A through S of the GAIB report are to be identical to Part 1 of the Safety Investigation Board (SIB) report's Tabs A through S; however, ACC did not complete a SIB on this medical mishap.