UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION
BOARD REPORT

Air Force Operational Test and Evaluation Center, Detachment 2
Eglin Air Force Base, Florida

TYPE OF MISHAP: Fitness Assessment Fatality

LOCATION: Eglin Air Force Base, FL

DATE OF MISHAP: 16 August 2019

BOARD PRESIDENT: Brigadier General John C. Kubinec, USAF

Conducted IAW Air Force Instruction 51-307

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE OHIO

MAY 15 2020

ACTION OF THE CONVENING AUTHORITY

The report of the ground accident investigation board, conducted under the provisions of AFI 51-307, that investigated the 16 August 2019 mishap at Eglin Air Force Base, involving a Fitness Assessment fatality of an Airman assigned to the Air Force Operational Test and Evaluation Center (AFOTEC), Detachment 2, complies with the applicable regulatory and statutory guidance and on that basis is approved.

CARL E. SCHAEFER
Major General, USAF
Deputy Commander

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION

FITNESS ASSESSMENT FATALITY
EGLIN AIR FORCE BASE, FLORIDA
16 AUGUST 2019

On 16 August 2019 at approximately 0812 local time (L) at Eglin Air Force Base (AFB), Florida, shortly after completing the 1.5-mile run portion of the Air Force Fitness Assessment, the Mishap Airman (MA), a 29-year old Active Duty Air Force Captain assigned to the Air Force Operational Test and Evaluation Center (AFOTEC), Detachment 2, Eglin AFB, began to complain of dizziness and double vision. The MA was unable to stand, and a Fitness Assessment Cell (FAC) augmentee called another FAC member for help, at which time she noticed the MA became unresponsive and stopped breathing. FAC members called 911 and performed Cardio Pulmonary Resuscitation until a pulse was palpable. Minutes later, emergency services arrived on scene and rapidly transported the MA to the Eglin AFB Emergency Room (ER).

Medical providers took actions to stabilize the MA and treat her respiratory failure. Lab results showed acute kidney failure with critically high levels of potassium, leading the medical authorities at the Eglin AFB ER to transfer the MA to the Fort Walton Beach Medical Center (FWBMC) for emergent dialysis. The MA was treated for kidney failure; however, her condition continued to deteriorate throughout the day and into the evening. The damage to the MA's vital organs continued to worsen, as did the damage to skeletal muscles and failure of her blood clotting system. The MA went into another cardiac arrest at approximately 0100L on 17 August 2019 and was unable to be revived. She was pronounced dead at 0138L on 17 August 2019 with her father at her bedside.

Following the MA's death, an autopsy was completed at Eglin AFB Hospital. The Medical Examiner (ME) determined the cause of death to be multi-organ system failure due to cardiac arrhythmia of uncertain etiology. The MA had a known diagnosis of sickle cell trait (SCT), but had no prior complications related to this condition nor any previous medical complications during or after exercise or prior fitness assessments. A blood smear obtained from the MA at FWBMC showed no sickled cells and tissue samples obtained during autopsy had no evidence of sickling. The ME concluded while there is no direct evidence that the presence of the SCT was the initiating event, it cannot be ruled out due to the transient nature of a sickle cell crisis. For that reason, SCT is listed as a contributing factor to the MA's death in the autopsy report. The manner of death was declared as natural.

The MA was highly respected by peers, subordinates, and superiors alike. She was a dedicated Airman who served her nation with distinction and left a lasting positive impact on everybody she met. She will be missed by her family, friends, and the United States Air Force.

SUMMARY OF FACTS
Fitness Assessment Fatality
16 August 2019

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ACRONYMS AND ABBREVIATIONS

301	AFOTEC Induction Schooling
A1C	Airman First Class
A-line	Arterial Line
ABC	Airway, Breathing, Circulation
AC	Air Conditioning
ACLS	Advanced Cardiac Life Support
AED	Automated External Defibrillator
AF	Air Force
AFB	Air Force Base
AFFMS	Air Force Fitness Management System
AFI	Air Force Instruction
AFMC	Air Force Materiel Command
AFOTEC	Air Force Operational Test and Evaluation Center
AFPC	Air Force Personnel Center
AFSAS	Air Force Safety Automated System
AHLTA	Armed Forces Health Longitudinal Technology Application
ASIMS	Aeromedical Services Information Management System
BMI	Body Mass Index
BP	Board President
BVM	Bag-Valve Mask
CAC	Common Access Card
Capt	Captain
CBT	Computer Based Training
CC	Commander
CE	Civil Engineering
CGO	Company Grade Officer
CIV	Civilian
Col	Colonel
CPG	Clinical Practice Guideline
CPR	Cardio Pulmonary Resuscitation
CRRT	Continuous Renal Replacement Therapy
CSS	Communication Support Squadron
CT	Computed Tomography (Scan)
DAFSC	Duty Air Force Specialty Code
DEROS	Date Eligible for Return from Overseas
DIC	Disseminated Intravascular Coagulation
DNA	Deoxyribonucleic acid
DNF	Did Not Finish
DO	Director of Operations
DoD	Department of Defense
DRU	Direct Reporting Unit
DS	Director of Staff
ED	Emergency Department
EKG	Electrocardiogram
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EPR	Enlisted Performance Report
ER	Emergency Room
F	Fahrenheit
FA	Fitness Assessment
FAC	Fitness Assessment Cell
FACA	Fitness Assessment Cell Augmentee
FACM	Fitness Assessment Cell Manager
FIP	Fitness Improvement Program
FOA	Field Operating Agency
FSQ	Fitness Screening Questionnaire
FSS	Force Support Squadron
FWBMC	Fort Walton Beach Medical Center
GAIB	Ground Accident Investigation Board
GTC	Government Travel Card
HIPAA	Health Insurance Portability and Accountability Act
HQ	Headquarters
IAW	In Accordance With
IC	Intercollegiate
ICU	Intensive Care Unit
ID	Identification
IO	Intraosseous
IO	Investigating Officer
IM	Instant Messenger
IMR	Individual Medical Readiness
IV	Intravenous
IVC	Inferior Vena Cava

JTS	Joint Trauma System
K	Potassium
KVPS	Eglin AFB, Valparaiso
LA	Legal Advisor
LAN	Local Area Network
LT	Lieutenant
Lt Col	Lieutenant Colonel
MA	Mishap Airman
Maj	Major
MAJCOM	Major Command
MDG	Medical Group
MDGI	Medical Group Instruction
MM	Medical Member
Mph	Miles Per Hour
MSgt	Master Sergeant
NCOIC	Noncommissioned Officer In Charge
OI	Operational Instruction
OPR	Officer Performance Report
Ops Tempo	Operations Tempo
OSI	Office of Special Investigations
PCM	Primary Care Manager
PCS	Permanent Change of Station
PE	Physical Education
PE	Pulmonary Embolism
pH	Potential Hydrogen
PHA	Preventive Health Assessment
POC	Point of Contact
PT	Physical Training
PTL	Physical Training Leader
PTSD	Post Traumatic Stress Disorder
RA	Resource Advisor
RNLTD	Report No Later Than Date
RSI	Rapid Sequence Intubation
SAT	Oxygen Saturation
SCO	Security Cooperation Organization
SCT	Sickle Cell Trait
SEG	System Effectiveness Group
SIB	Safety Investigation Board
SOP	Standard Operating Procedure
SOS	Squadron Officer School
SrA	Senior Airman
SSgt	Staff Sergeant
SSN	Social Security Number
SURF	Single Unit Retrieval Format
SVT	Supraventricular Tachycardia
TD	Test Director
TDY	Temporary Duty
TMO	Traffic Management Office
TSgt	Technical Sergeant
TW	Test Wing
UFPM	Unit Fitness Program Manager
UPTL	Unit Physical Training Leader
USA	United States of America
USAF	United States Air Force
USC	United States Code
VP	Vice President
vPC	Virtual Personnel Center
vRED	Virtual Record of Emergency Data
WAPS	Weighted Airman Promotion System
WBGT	Wet Bulb Globe Temperature

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 17 September 2019, Major General Carl E. Schaefer, Deputy Commander, Air Force Materiel Command (AFMC), appointed Brigadier General John C. Kubinec, United States Air Force, (USAF), as Board President of a Ground Accident Investigation Board (GAIB) to investigate the fitness assessment (FA) fatality of a USAF member under Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations* (Tab Y-3 to Y-4). The GAIB conducted its investigation at Eglin Air Force Base (AFB), Florida, from 4 to 15 November 2019 and then the board members returned to their home units to await the results of a lab test from the Medical Examiner's office (Tab T-30). They continued their investigation electronically from 29 to 31 January 2020 (Tab T-30). The following Board Members were appointed: a Major Medical Member, a Major Legal Advisor, and a Technical Sergeant Recorder (Tab Y-3 and Y-5).

b. Purpose

In accordance with (IAW) AFI 51-307, *Aerospace and Ground Accident Investigations*, this GAIB conducted a legal investigation to inquire into all the facts and circumstances surrounding this Air Force ground mishap, 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 16 August 2019 at approximately 0800 local time (L) at Eglin AFB, Florida, the Mishap Airman (MA), a 29-year old Air Force Captain assigned to the Air Force Operational Test and Evaluation Center (AFOTEC), Detachment 2, Eglin AFB, completed her Air Force FA on the outdoor track of the Eglin AFB Fitness Assessment Cell (FAC) (Tabs G-9, G-12, V-13.5, and Y-3). Shortly after completing the run portion of her FA, the MA sat down on a bench next to the track to catch her breath at which time she was responsive and communicating with FAC and other personnel (Tab V-13.5 to V-13.6). At approximately 0814L, the MA stated she began to "see double" and the FAC augmentee present called the FAC office to send help, at which time the FAC augmentee noted the MA to be unresponsive (Tabs G-12, R-116, and V-13.5 to V-13.7). Members of the FAC ran out to the track while one member called 911 (Tabs G-12 and V-13.7). When the other FAC members arrived, they found the MA unresponsive, not breathing and without a pulse, so they performed chest compressions until she gasped for air, began labored breathing, and regained a weak pulse (Tab V-11.6 and V-12.5). Emergency Medical Services (EMS) and the Fire Department arrived on scene at approximately 0820L and provided care as they transported her by ambulance to the Eglin AFB Emergency Department (ED) (Tab V-9.2 to V-9.5).

The MA arrived at the ED at 0833L where she was diagnosed with respiratory failure (inability to adequately breathe and supply the body with oxygen) and a supraventricular tachycardia (SVT, an abnormal heart rhythm) (Tab T-31). Laboratory results later identified hypoxia (evidence of low blood oxygen levels), cardiac ischemia (injury to the heart muscle), and acute kidney failure with

hyperkalemia (critically high blood levels of potassium) (Tabs T-31 and X-3). At approximately 1156L, the MA was transported to Fort Walton Beach Medical Center (FWBMC) for emergent dialysis (mechanical filtration of toxins and electrolytes from the body) for treatment of critically high levels of potassium (Tabs T-31 and X-3). Laboratory evaluation throughout the day identified evidence of worsening organ damage in the heart, liver, and kidneys in addition to rhabdomyolysis (damage and breakdown of skeletal muscles) and disseminated intravascular coagulation (DIC, failure of the MA's blood clotting system) (Tabs T-31 to T-32 and X-3). At approximately 0100L on 17 August 2019, the MA went into another cardiac arrest and was unable to be revived (Tab T-32). She was pronounced dead at 0138L with her father at her bedside (Tab T-32).

3. BACKGROUND

a. Air Force Materiel Command (AFMC)

AFMC is a Major Command of the USAF (Tab CC-3). Headquartered at Wright-Patterson AFB in Ohio, the USAF established AFMC on 1 July 1992 (Tab CC-3). Its mission is to deliver and support agile war-winning through conducting research, development, test and evaluation, and providing acquisition management services and logistics support (Tab CC-3). AFMC oversees six centers: the Air Force Research Laboratory, Air Force Test Center, Air Force Life Cycle Management Center, Air Force Sustainment Center, Air Force Installation and Mission Support Center, and the Air Force Nuclear Weapons Center (Tab CC-3 to CC-6).

b. Air Force Operational Test and Evaluation Center (AFOTEC)

AFOTEC is headquartered at Kirtland AFB, New Mexico and is a direct reporting unit under Headquarters, USAF (Tab CC-7). Its mission is to test and evaluate new capabilities in operationally realistic environments to inform warfighters and influence national resource decisions (Tab CC-7). Its test program conducts independent and objective evaluations of how well the systems will meet operational requirements, which in turn affects acquisition decisions (Tab CC-7 to CC-8). It has five detachments, including one at Eglin AFB, Florida (Tab CC-7).

c. AFOTEC, Detachment 2

AFOTEC Detachment 2 is located at Eglin AFB (Tab CC-9). Its purpose includes conducting operational test and evaluation on electronic warfare, mission planning, air armament, combat support, special operations, and advanced systems (Tab CC-9). Their results are used to inform program decisions that lead to the production and fielding of systems (Tab CC-9).

d. 96th Test Wing (96 TW)

The 96 TW is located at Eglin AFB (Tab CC-10). Its purpose is developmental test and evaluation, enabling the warfighter to put weapons on target in all battlespace media (Tab CC-10). Additionally, it is the host installation wing for Eglin AFB, providing all of the services of a small city, including security, personnel, and medical (Tab CC-10).

e. 96th Medical Group (96 MDG)

The 96 MDG serves 92,000 eligible beneficiaries (active duty, retirees, and their families) through a broad scope of inpatient and outpatient medical care (Tab CC-12). The Eglin AFB Hospital is a fully accredited 53-bed inpatient facility including a six-bed Intensive Care Unit (ICU) (Tab CC-12). The outpatient clinic offers the full spectrum of primary care (including Family Medicine, Internal Medicine, Pediatrics, Obstetrics and Gynecology) as well as over 30 specialty clinics (Tab CC-13 to CC-16). The 96 MDG is home to Family Medicine and Dental graduate medical training programs (Tab CC-12).

f. Fort Walton Beach Medical Center (FWBMC)

FWBMC is located approximately six miles from Eglin AFB Hospital (Tab Z-3). It is a 257-bed hospital with a 23-bed ICU (Tab CC-17 and CC-21). FWBMC is recognized as the only acute care hospital within Okaloosa, Walton, and Santa Rosa counties that offers accredited chest pain, cancer and primary stroke centers as well as a comprehensive cardiovascular program and level II neonatal intensive care (Tab CC-17 and CC-19). Additionally, FWBMC has an acute inpatient rehabilitation unit and an adult inpatient behavioral health center (Tab CC-19). FWBMC is a Level II Trauma Center and equipped to care for critically ill patients (Tab CC-22).

g. Air Force Physical Fitness Program

The USAF requires its members to remain physically fit (Tab BB-11). To assess a member's physical fitness, the USAF uses a three-factor FA: abdominal circumference, muscular fitness (the number of push-up repetitions in a minute and the number of sit-up repetitions in a minute), and a timed 1.5 mile run (Tab BB-15). A 2.0-kilometer walk is available for members not medically cleared for the run (Tab BB-15). Component scores are based on age and gender (Tab BB-22). Minimum scores are set for each component but the member must also obtain a composite score of 75 or above in order to pass (Tab BB-15). A score below 75 requires the member to test again in 90 days; a score between 75 and 89.9 is termed Satisfactory and the member must test again in six months; a score above 90 is termed Excellent and the member must test again in one year (Tab BB-16 to BB-17).

The FA is administered by the FAC and is led by the FAC Manager (FACM) (Tab BB-13 to BB-14). The FACM provides Physical Training Leader-Basic (PTL-B) training to all FAC

Augmentees (FACAs) prior to administering any FAs; provides refresher training on proper FA procedures, to include instructions pertinent to local administration; and trains Unit Fitness Program Managers (UFPMs) on their responsibilities (Tab BB-14). The FACM also provides UFPMs, or designated unit representatives, blocks of testing dates and times for FAs; procures, maintains, and replaces FA equipment as needed; and ensures the FAC administers all portions of the FA IAW AFIs, among other responsibilities (Tab BB-14).

FACAs are military UFPMs or unit PTLs who are selected to augment the FAC in the administration of FAs (Tab BB-12). FACAs must possess a minimum PTL-B certification and complete FAC-provided refresher training on FA procedures at the beginning of their FAC rotation (Tab BB-12). In addition, FACAs review Fitness Screening Questionnaires (FSQs) completed the day of a FA and notify an Airman's UFPM if responses on the FSQ indicate a higher risk and the need for referral to a health care provider (Tab BB-13).

h. Sickle Cell Trait (SCT)

SCT is an autosomal recessive genetic condition in which the individual is a carrier of the mutation but generally does not manifest symptoms or complications related to the condition (Tab CC-62 and CC-67). Normal hemoglobin in the blood is comprised of two beta-globin and two alpha-globin subunits (Tab CC-51). In contrast, SCT has a heterozygous mutation in which one of the beta-globin is replaced with hemoglobin S (Tab CC-24, CC-33, CC-51, and CC-63). When both beta-globin are replaced, either with hemoglobin S or another mutation, sickle cell disease arises (Tab CC-63). Diagnosis of SCT is made via genetic testing which is done routinely at birth in all 50 states in the United States since 2006 and, if carrier status is unknown, may be repeated at time of entry into collegiate sports or some military positions (Tab CC-64 to CC-65). In the United States, 7.3% of blacks, 0.7% of Hispanics and 1.6% of the overall population have SCT (Tab CC-33 and CC-63).

It is safe for individuals with SCT to engage in sports and other physical endeavors, but there are certain risk factors that, when present, can lead to sickling of the red blood cells (Tab CC-66). These risk factors include dehydration, hypoxia, lactic acidosis (buildup of acid in the tissues and blood stream, usually as a result of strenuous exercise), hyperthermia (high core body temperature), and altitude (Tab CC-25 to CC-26, CC-41 to CC-42, and CC-54). Clinical signs of an exertion related sickling event include collapse without losing consciousness with severe or progressive pain in working muscles (usually legs, buttocks, low back) and weakness out of proportion to pain symptoms (Tab CC-48 and CC-53). Upon evaluation of the individual, muscles of concern are not contracted (Tab CC-49 and CC-53). The individual may complain of shortness of breath and will be found to have tachypnea but good air movement on auscultation (Tab CC-49 and CC-53). These events are rarely associated with heat injury; body temperature is usually normal or mildly elevated (Tab CC-48 and CC-53).

Normal red blood cells are round, flexible and freely mobile within the blood vessels (Tab CC-41). Sickle cells, which are stiff and sticky, can block the blood vessels and lead to decreased blood flow to tissues and vital organs in the body (Tab CC-41). Once triggered, sickling events can result in a catastrophic, self-perpetuating, life-threatening spiral of events in the body (Tab CC-41). These events include injury and breakdown of the skeletal muscle, acidosis (elevated

blood acid levels) and electrolyte abnormalities (Tab CC-58 and CC-66). These metabolic events often lead to multi-system organ failure, cardiac arrest, and even death (Tab CC-58 and CC-77). Once this cascade is in motion, it is difficult to stop, even with appropriate medical management (Tab CC-58).

There are mixed outcomes in the literature regarding the association of increased risk of sudden death in individuals who have SCT (Tab CC-33 and CC-36 to CC-38). Early studies report a 20-30% increased risk in sudden death, whereas a recent study found that there is no increased risk of sudden death for black soldiers with SCT when compared to a similar population of black soldiers without SCT (Tab CC-32, CC-33, CC-36 to CC-38 and CC-66). There is however, a clear association between SCT and exertional rhabdomyolysis (injury and breakdown of the skeletal muscle) with as high as a 54% increased risk of rhabdomyolysis events in this population (Tab CC-36). The military and many other organizations have adopted universal precautions to help mitigate known risk factors that could precipitate the "perfect storm" required for SCT individuals to experience a sickle crisis (Tab CC-29, CC-38, CC-40, CC-42, CC-53 and CC-68). Some of these precautions include progressive heat and exercise acclimatization, guidance for alterations of work/rest cycles related to certain Wet Bulb Globe Temperatures (WBGT), appropriate maintenance of hydration, and education for military members as well as their command and training instructors (Tab CC-25, CC-29 and CC-58).

Both sickling and exertional rhabdomyolysis can be subclinical (without overt signs and symptoms) and reversible with aggressive hydration (Tab CC-42 to CC-43 and CC-55). However, there is suspicion that a number of close interval, subclinical episodes could increase the risk of developing the "perfect storm" for severe sickling and exertional rhabdomyolysis events (Tab CC-42). Sports medicine and military experts recommend that military members should wait a minimum of 48 hours after strenuous field duties before performing a FA, though the exact timeframe to protect from this compounding effect is unknown (Tab CC-57).

i. Rhabdomyolysis

Rhabdomyolysis is a life-threatening condition in which the muscle cells break down and release muscle proteins and electrolytes into the blood stream (Tab CC-69 and CC-73). Causes of rhabdomyolysis can be broken down into three categories: traumatic (direct trauma or crush injury to the muscle), non-traumatic exertion (usually the result of strenuous, prolonged or unaccustomed activity) and non-traumatic non-exertional (a result of infection, toxins, or electrolyte disorders) (Tab CC-70). For non-traumatic, exertional rhabdomyolysis, energy stores are depleted below the level needed to maintain the delicate electrolyte balance at the muscle cell membrane, which causes cell death (Tab CC-70). The dying cells cause fluid to shift from the blood vessels into the injured tissue resulting in lowered blood pressure (hypotension) and further tissue damage (Tab CC-74). As the muscle cells breakdown, their proteins and electrolytes are released into the blood stream (Tab CC-72 and CC-74 to CC-75). The muscle cell protein, myoglobin, clogs the kidney and, in combination with hypotension, can result in acute kidney failure (Tab CC-74 to CC-75). When the kidneys are not functioning properly, the electrolyte and acid levels become severely elevated and cause damage in other organ systems (Tab CC-77). This ultimately can result in abnormal and potentially lethal heart rhythms (Tab CC-58, CC-74 and CC-77).

There are several known risk factors for exertional rhabdomyolysis, including the presence of SCT and participation in high-intensity or strenuous exercise, particularly if unaccustomed to the activity or participation is prolonged beyond usual training (Tab CC-71). Male sex, heat and humidity, elevated body mass index (BMI>25), tobacco use, recent prescriptions for antipsychotic and statin (cholesterol) medications, and increased age (>36 years of age) also substantially increase the risk of exertional rhabdomyolysis events (Tab CC-36 to CC-38 and CC-71). Prompt medical evaluation and treatment is critical if exertional rhabdomyolysis is suspected, especially in an individual who has SCT (Tab CC-43 and CC-76).

DIC (failure of an individual's blood clotting system) can be seen with severe rhabdomyolysis due to release of factors that promote clotting in the blood stream during muscle breakdown (Tab CC-75 to CC-76). This can lead to a propensity to bleed due to rapid consumption of the body's clotting factors (Tab CC-78 to CC-80).

4. SEQUENCE OF EVENTS

a. Summary of Background and Events Preceding the Mishap

The MA had taken all components of every required FA since entering Active Duty and had received an "Excellent" on her most recent test 13 months prior to the mishap (Tab G-5). Review of the MA's medical records from before the mishap reveal known diagnosis of SCT but no prior complications related to this genetic condition (Tabs T-30 and X-3).

b. Summary of the Mishap and Immediate Response

At 0700L on 16 August 2019, the MA arrived at the FAC and checked in for the FA as part of the second of three sessions offered per the FAC's summer schedule (Tab V-12.2 and V-12.4). The MA's Fitness Screening Questionnaire (FSQ) was reviewed by the FAC personnel and based on the responses of "No" to question one (assessing for concerning symptoms that have not been evaluated by medical personnel) and "Yes" to question 2 (verifying that the member is aware of their SCT screening test result and had received appropriate counseling if positive), the MA was cleared to take the FA (Tab G-9 to G-10). The MA completed the height, weight, abdominal circumference, sit-up, and pushup portions of the FA with satisfactory completion of each category (Tab G-9). The MA was noted to complete the strength components of the test without difficulty and seemed to be in good health (Tab V-13.3 and V-13.8).

By approximately 0730L, the FAC staff released testers to make their way to the outdoor track to warm up for the run portion of the FA (Tab V-13.3 to V-13.4 and V-13.8). The FACAs went to their office to calculate run times needed for their Airmen to pass and achieve a score of at least 90 (Tab V-13.4). The MA overheard a conversation between Tester 2 and a Pacer, and asked if the Pacer would run the final portion of the FA with her once Tester 2 had finished (Tab V-14.2 to V-14.3).

The FACAs arrived at the track around 0745L along with one full-time FAC member, and the MA and other testers began the run portion of the FA (Tab V-13.4 and V-13.8). The MA completed the first five of six laps and was noted by FACA 2 to slow down but did not seem to be in any distress (Tabs G-8 and V-13.8). Per FACA 2, slowing down during the middle laps is a commonly

observed occurrence among testers (Tab V-13.8). The Pacer caught up to the MA during the final lap and verbally encouraged the MA as the elapsed time was getting close to the MA's minimum required time (Tab V-14.3). The MA increased speed and completed the run in 16 minutes and 22 seconds, which was the exact minimum required time to pass the FA (Tabs G-9, V-14.3 to V-14.4 and BB-22).

At approximately 0802L, the MA sat down on a bench on the outside of the track (Tab V-13.5 and V-14.4). The Pacer congratulated her on passing and they engaged in a short interaction before the Pacer and Tester 2 left the track (Tabs R-150, R-199 and V-14.4). FACA 2 completed the calculation of the MA's score, informed the MA of her score and attempted to get her signature on the scorecard (Tab V-13.6). The MA mentioned that she was embarrassed that she was still out of breath and FACA 2 retrieved the MA's water bottle (Tab V-13.6).

About ten minutes later, the MA asked FACA 2 if she still needed to sign the scoresheet and FACA 2 provided her with the FA scoresheet, which she signed (Tab V-13.6). After signing the FA scoresheet, the MA stated she began to experience double vision and FACA 2 attempted to assist the MA into the building where there was air conditioning (Tab R-119 to R-120). The MA was unable to stand and FACA 2 used a personal cell phone to call Fitness Assessment Cell personnel 2 (FAC 2) to ask for help (Tab V-13.6). During the phone call, FACA 2 noticed the MA become unresponsive, at which time she yelled into the phone for help (Tab V-13.7).

Within a couple minutes, all FAC personnel responded to the track with the Automated External Defibrillator (AED) and one of the FAC members placed a call to 911 (Tab V-13.7). The MA was found to be unresponsive, not breathing, and without a pulse (Tab V-11.6). FACA 1 and FAC 2 lowered the MA to the ground and performed chest compressions at which time the MA gasped for air but continued to have labored breathing (Tab V-11.6 and V-12.5). Per FACA 1, the AED was opened but the AED pads were not placed on the MA because the EMS arrived quickly (Tab V-12.5).

c. Medical Response and Treatment

The Eglin AFB Fire Department responded first at 0820L and Eglin AFB EMS responded almost immediately after (Tab V-9.2). The Emergency Medical Technician (EMT) confirmed labored breathing and a "weak and thready" pulse, and directed a firefighter to start rescue breaths using a bag-valve mask (Tabs R-75, R-185, and V-9.2). The MA was connected to the LifePak (cardiac monitor and defibrillator) system using the AED pads only and there was no shock advised (Tab V-9.3). The MA was loaded into the ambulance and a member from the Fire Department drove to allow the two EMTs to render aid in the ambulance during transport (Tab R-75).

At 0833L, the EMS team arrived at the ED at the Eglin AFB Hospital and a report was given to the ED Physician (Tabs T-31 and V-9.2). At 0839L, the MA remained unresponsive and unable to maintain her airway (Tabs R-185 to 186 and T-31). The initial set of vital signs (blood pressure, heart rate, oxygen saturation, etc.) in the ED were stable so medication was given to relax the MA and allow for intubation, and mechanical ventilation was started (Tabs R-185 to 186 and T-31).

The MA was noted at 0857L to develop an abnormal heart rhythm called supraventricular tachycardia (SVT) and her blood pressure began to drop (Tabs R-186 and T-31). Electrical shock was delivered but was unsuccessful so medication was used to correct the heart rhythm (Tabs R-186 and T-31). The MA continued to have critically low blood pressure, which required continuous intravenous (IV) fluids and medication (Tabs R-186 and T-31).

The ED physician was notified at 1013L of a change in heart tracing that is consistent with high blood potassium levels (Tabs R-186 and T-31). Labs at that time revealed elevated blood acid and potassium levels as well as injury to the heart muscle and kidneys and abnormal blood clotting factors (Tab T-31). The MA was given multiple medications in attempt to correct the blood acid and potassium levels (Tabs R-186 and T-31).

At 1134L, the decision was made to transfer the MA to a medical treatment facility that was capable of dialysis (mechanical filtration of the kidneys) to rid the MA's body of toxins and significant electrolyte imbalances (Tabs R-186 and T-31). Report was given to the FWBMC ED who accepted transfer (Tabs R-186 and T-31). The Eglin AFB ED Physician notified the MA's chain of command as well as the MA's father of the MA's condition (Tab R-186).

The MA was transported by ambulance to FWBMC at 1156L (Tab T-31).

The MA was received by the FWBMC ED staff at 1234L, where the MA required additional medications to support her blood pressure and attempt to correct the elevated blood acid and potassium levels (Tab T-31). Initial labs drawn at FWBMC revealed worsening damage to the MA's vital organs and persistent electrolyte abnormalities (Tab T-31).

At approximately 1340L, the MA was transferred to the ICU where she continued to receive active management of these conditions (Tab T-31).

At 1700L, the MA began to bleed from multiple sites due to failure of her blood clotting system and required blood transfusion (Tab T-32). Breakdown of the skeletal muscle was noted on subsequent labs and dialysis was performed (Tab T-32). The MA's father arrived at the hospital and was updated on the MA's prognosis (Tab T-32).

At approximately 0100L on 17 August 2019, the ICU team was notified that the MA's heart rhythm had changed to ventricular tachycardia with a pulse (Tab T-32). Medication was given in an attempt to correct the abnormal heart rhythm but instead, the MA went into asystole (flat-line and without a pulse) (Tab T-32). Cardio Pulmonary Resuscitation (CPR) and life-saving medications were administered but the MA did not respond to resuscitative efforts (Tab T-32). The MA was pronounced dead at 0138L with her father at the bedside (Tab T-32).

d. Search and Rescue

Not applicable.

e. Recovery of Remains

Not applicable.

5. MAINTENANCE

Not applicable.

6. EQUIPMENT, VEHICLES, FACILITIES, AND SYSTEMS

The FAC conducted the run portion of the FA at the Eglin AFB FAC track (Tab V-11.2 to V-11.3). The FAC track is an outdoors, six-lap track (Tabs G-8 and S-3). A typical six-lap track should be 440 yards per lap or six laps on a 400-meter track plus an additional 46 feet for 1.5-miles (Tab BB-20). Any certified course should have limited exposure to traffic, clearly marked start and finish lines, and should not have much change in slope (Tab BB-20). In an undated memorandum, the FAC track was approved by the 96 TW Vice Commander as the primary track, with three additional tracks listed as alternatives (Tab BB-5).

7. ENVIRONMENTAL CONDITIONS

a. Forecasted Weather

The forecasted weather for Eglin AFB for 16 August 2019 called for a low temperature of 73 degrees Fahrenheit (F), high of 90 degrees F, partly cloudy in the morning, with a chance of thunderstorms in the afternoon (Tab F-3). Zero rain forecasted for the morning, but forecasted rain fall of .26 inches in the afternoon (Tab F-3).

b. Observed Weather

The observed weather at Eglin AFB at 0700L, 16 August 2019 was clear skies, calm winds, temperature of 76.5 degrees F, dew point of 73.6 degrees F, and humidity of 91% (Tab F-4 and F-6 to F-7).

c. Other Environmental Conditions

Not applicable.

d. Restrictions, Warnings, and Procedures

There were no relevant heat stress restrictions or warnings in place on 16 August 2019 during the timeline of the mishap (Tab F-13). Environmental conditions were within allowable criteria to conduct an outdoor FA: wind speed was less than or equal to 15 miles per hour (mph) sustained or less than or equal to 20 mph gusting; the air temperature was greater than or equal to 20 degrees F; and the WBGT was less than or equal to 86 degrees F at the start of the walk or run (Tabs F-4, F-13, and BB-21).

8. PERSONNEL QUALIFICATIONS

a. Mishap Airman (MA)

The MA was a 2012 graduate of the Air Force Academy, with a major in English (Tab G-3). From November 2015 onward, she held several positions around the world in Intelligence Squadrons, earning two Air Force Commendation Medals (Tab G-3 to G-4). She arrived at Eglin AFB in May 2019 to serve as the Intelligence Officer for AFOTEC Detachment 2, excited for and embracing the opportunity her new role presented (Tabs G-4 and V-2.2). Individuals described her as friendly, bubbly, and a wonderful person who is missed (Tab V-3.2, V-5.4, and V-8.2).

b. Fitness Assessment Cell (FAC) Personnel

All FAC personnel involved in FA testing on 16 August 2019 received PTL-A and PTL-B training as appropriate, as well as certification in CPR, as required (Tabs T-3 to T-21 and BB-12 to BB-14).

c. Medical Personnel

In addition to chest compressions at the track performed by FAC personnel, the MA received medical attention from three groups of individuals: the paramedics dispatched to the track, the medical personnel at the Eglin AFB Hospital, and the medical personnel at FWMBC (Tabs R-185 to R-186, V-9.2 to 9.4, and V-11.6). All Eglin AFB medical personnel involved throughout this mishap were appropriately licensed, certified, and/or trained to perform their duties (Tab T-33). FWBMC did not provide credentialing information for its medical personnel; however, public records were found for the majority of the providers, and of those found, all were properly credentialed (Tab T-34).

9. MEDICAL FACTORS

a. Health Summary

Review of the MA's medical records from before the mishap reveal a known diagnosis of SCT but no prior complications related to this genetic condition (Tabs T-30 and X-3). In compliance with AFI 44-170, *Preventive Health Assessment*, the MA had a current Preventive Health Assessment (PHA) (Tab T-30). During the PHA and independent review of the medical records by the GAIB, the MA was found to have no active or chronic medical conditions that would preclude military duty or maintaining required fitness standards (Tabs T-30 and X-3). Additionally, according to her responses on the FSQ at the time of the mishap, the MA reported no concerning symptoms, and was aware and adequately counseled about her SCT status (Tab G-10).

b. Injuries or Medical Conditions Sustained in the Mishap

Immediately after becoming unresponsive on the track, FAC 2 determined that there was no pulse, lowered the MA to the ground, and performed chest compressions until the MA gasped and a pulse was palpable (Tab V-11.6). FACA 1, who is a trained EMT, was serving as a FACA on the date

of this mishap, and was immediately available and helped render aid until the ambulance arrived (Tab V-12.2 and V-12.5). Care was transferred to the EMT team who obtained vitals, attempted to obtain IV access, and loaded the MA into the ambulance for transport (Tab V-9.2). The MA was evaluated for intubation (placement of a breathing tube in the airway) but due to the presence of a gag reflex, the EMT was unable to obtain this definitive airway and rescue breaths were continued (Tabs T-31 and V-9.4).

At the time of arrival in the ED at Eglin AFB Hospital, the MA was found to have respiratory failure and an elevated heart rate (Tabs R-186 and T-31). Multiple attempts to gain IV access failed and interosseous (through the bone) access was obtained (Tab T-31). The MA was intubated and mechanical ventilation was used (Tabs R-185 and T-31). Shortly after, the MA developed an abnormal heart rhythm, SVT, and became hemodynamically unstable (low blood pressure with high pulse) (Tabs R-186 and T-31). Emergent cardioversion (electrical shock) was performed three times but was unsuccessful (Tabs R-186 and T-31). Two medications were then given which resolved the abnormal heart rhythm (Tab T-31). The MA's blood pressure remained low and required IV fluid and medication to support adequate blood pressure (Tabs R-186 and T-31). Labs revealed critically high blood potassium and acid levels, injury to the heart tissue, abnormal blood clotting factors, and acute kidney injury (Tab T-31).

CT scans that were performed of the brain and chest were only notable for a collapsed inferior vena cava which likely represented low blood volume (dehydration) despite the administration of two liters of IV fluid before the study (Tabs R-187 and T-31). After returning from Radiology, the MA's heart tracing was noted to have changes consistent with high blood potassium levels (Tab T-31). Numerous medications were administered in an attempt to correct the blood acid and potassium levels (Tab T-31). It was at this time that the decision was made to transfer the MA to FWBMC due to an impending need for dialysis to rid the body of the toxins and correct electrolyte abnormalities in the setting of kidney failure (Tabs R-186, R-188 to R-189, and T-31).

The MA was transferred to FWBMC ED (Tab T-31). Upon arrival, the MA required additional medication to support her blood pressure (Tab T-31). Labs revealed worsening injury to the heart, kidneys, and liver, as well as persistently high potassium and development of DIC (failure of the blood clotting system) (Tab T-31). Medication was again given in an attempt to correct the potassium levels and an antibiotic was administered to treat any potential infection (Tab T-31). The MA was transferred to the FWBMC ICU for further treatment (Tab T-31). An echocardiogram revealed normal heart structure and function, and a dialysis catheter was placed (Tab T-31 to T-32). Early that evening, the MA was noted to be bleeding from multiple sites, a common occurrence in DIC, resulting in anemia, and blood transfusions were needed (Tab T-32). Subsequent labs revealed severe breakdown of the skeletal muscle and dialysis was performed (Tab T-32). The medical records at this time note that on a peripheral smear (microscopic review of blood cells) there was hemolysis (breakdown of the red blood cells) but no definitive evidence of sickled blood cells (Tab T-32). Sickling events can be transient, so this finding cannot be used to determine whether or not sickling contributed to the initial event (Tabs T-32 and CC-53). The MA continued to have critically low blood pressure requiring three medications to maintain adequate blood pressure (Tab T-32). Despite ongoing medical treatment, early on the morning of 17 August 2019, the MA was noted to be in another abnormal heart rhythm called ventricular tachycardia (Tab T-32). Medication was given in an attempt to correct the abnormal heart rhythm

but instead, the MA went into asystole (flat-line) and a Code Blue was called (Tab T-32). CPR and life-saving medications were administered, but the MA did not respond to resuscitative efforts (Tab T-32). The MA was pronounced dead at 0138L with her father at her bedside (Tab T-32).

c. Pathology

An autopsy was completed IAW Title 10 U.S.C., Section 1471 at Eglin AFB Hospital, Eglin AFB, Florida, at approximately 0800L on 21 August 2019 (Tab X-3). The Armed Forces Medical Examiner System, Defense Health Agency, Dover, Delaware performed the autopsy with assistance from 96 MDG personnel (Tab X-3).

Positive identification was obtained by ante-mortem and post-mortem dental and deoxyribonucleic acid (DNA) comparisons (Tab X-3). There was no evidence of external injuries with the exception of a few superficial scrapes and bruises (Tab X-3). Radiographs obtained at the time of autopsy did not reveal any recent or remote trauma (Tab X-3). Hematoma (blood collection) was present in the left side of the neck and tongue but no noted indication as to the etiology of this bleeding (Tab X-3). Visual and microscopic examination of the body and organ tissues was performed (Tab X-3). The organs of the abdomen and chest were swollen (contained extra fluid) but without evidence of blood clot or other abnormality (Tab X-3). The brain showed evidence of hypoxic injury but was otherwise normal (Tab X-3). The heart cells were mildly enlarged but measurement of the heart walls was within normal limits (Tab X-3). The heart structure and associated blood vessels were normal (Tab X-3). The kidneys had superficial scarring but microscopic examination was normal (Tab X-3). All other organs were normal (Tab X-3).

The toxicology panel obtained during the hospitalization was negative for ethanol, acetaminophen, or salicylates (Tab T-31). This is congruent with the post-mortem toxicology analysis that only detected a therapeutic level of metoprolol (medication administered in the Eglin AFB ED to control heart rate) (Tab X-3).

The Medical Examiner determined the cause of death to be multi-organ system failure due to cardiac arrhythmia of uncertain etiology (Tab X-3). Genetic testing for genetic variants associated with sudden cardiac death was completed but no abnormal genetic variants were found other than confirmation of SCT (a variant in the hemoglobin beta gene) (Tab X-3). Histologic review (microscopic examination of body tissue) showed that there was no definitive evidence that a sickling event precipitated the fatality, though sickling events can be transient (Tab X-3). The Medical Examiner found SCT to be a contributing, rather than causative, factor (Tab X-3). The manner of death was declared as natural (Tab X-3).

d. Lifestyle

There is no evidence to suggest that the MA performed any unsafe practices that contributed to her death (Tabs T-30 and X-3).

The MA had verified on the FSQ that she was aware of her SCT screening result and she completed at least two counseling sessions with a health care provider and watched the required educational video within the past year (Tab G-10).

The MA had been clinically overweight or obese for the entirety of her Air Force career (Tab T-30). However, there is consistent evidence that the MA took numerous measures to live a healthy lifestyle including regular exercise, healthy eating, and medical counseling on weight loss (Tabs R-62, T-30, and V-5.2 to V-5.3). The MA was active and played sports in both high school and college (Tab R-136). She was known to enjoy running and completed a five-kilometer distance almost every other day, usually on the treadmill (Tabs R-136 and V-5.2). The MA was observed to eat a low carbohydrate diet but was not attempting to achieve ketosis or any other extreme dietary measures (Tabs R-142 and V-5.3). There is no evidence to suggest that the MA abused drugs, alcohol, or caffeine, nor is there any evidence that she consumed any supplements (legal or illegal) that contributed to the mishap (Tabs R-137, R-139, R-142 to R-143, and T-30).

Prior to the mishap, the MA stated to witnesses that it was difficult to maintain a normal diet while traveling for work to various locations, but in discussing the FA in the days prior to the fatality, the MA gave no indication that she was nervous about satisfactory completion of the test (Tabs R-136, V-1.5, V-3.4, and V-5.3). The MA notably performed "well in everything she did" (Tab R-9). Despite being new to the unit, the MA quickly established good rapport and was well liked by her coworkers (Tab V-3.2 and V-5.4).

10. OPERATIONS AND SUPERVISION

a. Operations

The MA had been on temporary duty (TDY) twice since arriving at Eglin AFB (Tab V-2.2 to V-2.4). The MA was previously scheduled to take the FA in July, but a short notice TDY caused it to be rescheduled (Tab V-7.2). The UFPM sent the MA an email asking when she would like to reschedule her test (Tab BB-8). The UFPM was unaware of the length of the MA's TDY, and there is no evidence that the MA was aware that she was authorized a 42-day acclimatization period upon return to Eglin AFB prior to taking her FA due to her TDY being longer than 30 days (Tabs V-7.3, BB-6 to BB-9, and BB-18 to BB-19). However, there was no evidence indicating that the MA had any concerns about taking her FA and the MA chose to schedule her test for 16 August 2019 (Tabs R-136, V-3.4, and V-7.3, and BB-6 to BB-9).

b. Supervision

The unit fitness policy of AFOTEC Detachment 2 was well understood by unit members and unit members felt they had adequate time to engage in physical training (PT) activities in a way that best fit their schedules and the mission (Tabs V-5.3, V-8.2, and BB-4). The FAC was operated by full time staff and augmentees, and led by an experienced, trained manager (Tabs T-3 to T-21 and V-10.2).

11. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publically Available Directives and Publications Relevant to the Mishap

(1) AFI 36-2905, *Fitness Program*, dated 21 October 2013, incorporating change 1, dated 27 August 2015
(2) AFI 44-119, *Medical Quality Operations*, dated 16 August 2011

(3) AFI 44-170, *Preventive Health Assessment*, dated 30 January 2014
(4) AFI 48-123, *Medical Examinations and Standards*, dated 5 November 2013
(5) AFI 48-151, *Thermal Injury Prevention Program*, dated 7 April 2016
(6) AFI 51-307, *Aerospace and Ground Accident Investigations*, dated 18 March 2019

NOTICE: All directives and publications listed above are available digitally on the Air Force Departmental Publishing Office website at: https://www.e-publishing.af.mil.

b. Other Directives and Publications Relevant to the Mishap

Not applicable.

c. Known or Suspected Deviations from Directives or Publications

Not applicable.

21 April 2020

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JOHN C. KUBINEC
Brigadier General, USAF
President, Ground Accident Investigation Board

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