UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION
BOARD REPORT

SEARCH AND RESCUE TACTICAL VEHICLE – SIDE BY VEHICLE
S/N SRTVSXVD21AFM060

36th Expeditionary Contingency Response Wing
13th Expeditionary Air Force
Andersen AFB, Guam

TYPE OF ACCIDENT:
Tactical Vehicle Serious Injury

LOCATION: North Field, Tinian, Northern Mariana Islands

DATE OF ACCIDENT: 17 February 2023
BOARD PRESIDENT: Colonel Brendan M. Noone

Conducted IAW Air Force Instruction 51-307

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

9 April 2024

ACTION OF THE CONVENING AUTHORITY

The report of the Ground Accident Investigation Board, conducted under the provisions of Air Force Instruction 51-307, *Aerospace and Ground Accident Investigations*, that investigated the 17 February 2023 Class A mishap occurring near North Field, Tinian, Northern Mariana Islands, involving a Search and Rescue Tactical Vehicle Rollover, 13th Expeditionary Air Force, substantially complies with applicable regulatory and statutory guidance and on that basis is approved.

KEVIN B. SCHNEIDER
General, USAF
Commander, Pacific Air Forces

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
GROUND ACCIDENT INVESTIGATION

TACTICAL VEHICLE MISHAP
Search and Rescue Tactical Vehicle – Side by Vehicle, S/N SRTVSXVD21AFM060
North Field, Tinian, Northern Mariana Islands

17 February 2023

On 17 February 2023, at approximately 1500 local time (L), Mishap Airman 1 (MA1), a male captain in the United States Air Force then assigned to the 25th Air Support Operations Squadron, and Mishap Airman 2 (MA2), a female staff sergeant in the United States Air Force then assigned to the 1st Combat Camera Squadron, sustained serious bodily injuries near North Field, Tinian, Northern Mariana Islands. MA1 was the operator of the Mishap Vehicle (MV), an SRTV-SXV Tactical Vehicle, Serial Number (S/N) SRTVSXVD21AFM060, when the MV departed the road, completing a counterclockwise right side leading rollover. MA2 was the only passenger in the MV. Both members were Regular Air Force personnel on Tinian to participate in COPE NORTH 23 (CN23), a joint/combined, tri-lateral Field Training Exercise designed to increase interoperability of Pacific Air Forces, Royal Australian Air Forces, and Japan Air Self Defense Forces (JASDF). The MV was property of the 31st Rescue Squadron, Kadena Air Base, Japan. MA1 and MA2 arrived on Tinian on 16 February 2023 and departed on 17 February 2023.

Multiple units were operating out of Tinian for CN23. The exercise scenario for the afternoon of 17 February 2023 involved pararescuemen (PJ) being dropped into the water for an over the beach insertion to recover an isolated person. MA1, a Tactical Air Control Party Officer, was not trained on the planned insertion and extraction, so would join the PJs on the beach to provide communication support. The Guardian Angel team lead requested that MA2, Combat Camera, be present to document events for Public Affairs purposes.

At approximately 1500L, the MV, operated by MA1 (left seat), was traveling westbound towards Chulu Beach on narrow roads. MA2 was seated in the front passenger (right) seat. The MV, traveling in a westerly direction, departed the road to the left into thick vegetation. The MV completed a counterclockwise right side leading rollover. MA1 and MA2 were not wearing seatbelts or personal protective equipment. MA1 and MA2 were both ejected from the MV. MA1 sustained serious injuries, resulting in permanent paralysis below the waist. MA2 sustained life-threatening injuries, to include a pelvic fracture and internal abdominal injuries, resulting in numerous corrective surgeries and an above-the-knee amputation.

A local civilian alerted nearby security forces personnel to the mishap shortly after the mishap occurred. Two responding security forces personnel provided tactical first aid to MA1 and MA2, while a third returned to the flightline to request help. Multiple exercise personnel and vehicles responded. MA2 was deemed most critical and was quickly moved to the flightline. MA2 was transported to Guam aboard a US Air Force C-130 aircraft. MA1 was moved to the flightline later that day and was transported to Guam aboard a JASDF UH-60J rescue helicopter.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

a	Centripetal acceleration
AB	Air Base
ACC	Air Combat Command
AE	Aeromedical Evaluation
AFB	Air Force Base
AFI	Air Force Instruction
AFLCMC	Air Force Life Cycle Management Center
AFMAN	Air Force Manual
AFPD	Air Force Policy Directive
AP1	Aerial Port 1
ASOS	Air Support Operations Squadron
CCS	Combat Camera Squadron
COMCAM	Combat Camera
CRO1	Combat Rescue Officer 1
CRO2	Combat Rescue Officer 2
DAFI	Department of the Air Force Instruction
DODI	Department of Defense Instruction
FR1	First Responder 1
g	Gravitational acceleration
GA	Guardian Angel
GAIB	Ground Accident Investigation Board
GRMC	Guam Regional Medical City
HSC	Helicopter Sea Combat
IAW	In Accordance With
IP	Isolated Personnel
ITV	Internally Transportable Vehicle
JASDF	Japan Air Self Defense Force
L	Local
LLC	Limited Liability Company
LTI	Limited Technical Inspection
MA1	Mishap Airman 1
MA2	Mishap Airman 2
MAJCOM	Major Command
MPH	Miles Per Hour
MV	Mishap Vehicle
NATC	Nevada Automotive Test Center
OEM	Original Equipment Manufacturer
PA	Public Affairs
PERSCO	Personnel Support for Contingency Operations
PJ	Pararescueman
PJ1	Pararescueman 1
PJ2	Pararescueman 2
PO1	Police Officer 1
PPE	Personal Protective Equipment
r	Turning radius
RQS	Rescue Squadron
RST	Rapid Steering Technology
SERE	Survival, Evasion, Resistance, Escape
SERE1	Survival, Evasion, Resistance, Escape 1
SIB	Safety Investigation Board
S/N	Serial Number
SOTR	Sufficiency of Test Review
SRD	Systems Required Document
SRTV-SXV	Search and Rescue Tactical Vehicle - Side by Vehicle
ST	Special Tactics
SW	Special Warfare
TACP	Tactical Air Patrol Party
US	United States
USAF	United States Air Force
USINDOPACOM	United States Indo-Pacific Command
v	Velocity
VM1	Vehicle Maintenance 1

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 30 June 2023, General Kenneth S. Wilsbach, Commander, Pacific Air Forces (PACAF), appointed Colonel Brendan M. Noone as Board President of a Ground Accident Investigation Board (GAIB) to investigate a tactical vehicle mishap on Tinian, Northern Mariana Islands, on 17 February 2023 (Tab Y-3). The GAIB conducted its investigation at Andersen Air Force Base (AFB), Guam from 9 July 2023 to 28 July 2023 in accordance with (IAW) Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, dated 18 March 2019 (Tab Y-3). Additional members of the GAIB included a Legal Advisor (Captain), a Medical Subject Matter Expert (Lieutenant Colonel), Traffic Investigator Subject Matter Expert (Civilian), and a Recorder (Staff Sergeant) (Tab Y-5).

b. Purpose

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 (AF) 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

At approximately 1500L, the Mishap Vehicle (MV) traveled westbound from the exercise camp site towards Chulu Beach via narrow overgrown roads (Tabs R-21, V-4.8and Z-3 to Z-5). There were two occupants in the MV, Mishap Airman 1 (MA1), a captain in the United States Air Force, and Mishap Airman 2 (MA2), a staff sergeant in the United States Air Force (Tabs V-4.2 and V-8.1). MA1 operated the MV, while MA2 sat in the front passenger (right) seat (Tab V-8.6). The MV departed the road and entered thick vegetation (Tabs V-8.6 to 8.7). As the MV completed a counterclockwise right leading rollover, MA1 and MA2 were ejected from the MV (Tabs V-4.9 and V-8.7). MA1 and MA2 were not wearing their seatbelts or required personal protective equipment (Tabs R-21, V-8.4 to V-8.5). During ejection from the MV, MA1 sustained serious injuries, resulting in permanent paralysis below the waist (Tab X-4). MA2 sustained life-threatening injuries, to include a pelvic fracture and internal abdominal injuries, which has resulted in numerous corrective surgeries and an above-the-knee amputation (Tabs X-4 to X-5). MA1 was transported to US Naval Hospital Guam Emergency Department via Japan Air Self-Defense Force (JASDF) UH-60J for initial evaluation and was then transferred to Guam Regional Medical City (GRMC) (Tab R-73 and X-3). MA2 was transported via US Air Force C-130 aircraft to Andersen AFB, Guam, and then via ground ambulance to GRMC (Tab V-1.5 to V-1.6).

3. BACKGROUND

a. Pacific Air Forces (PACAF)

PACAF, headquartered at Joint Base Pearl Harbor-Hickam, Hawaii, is the Air Component to the United States Indo-Pacific Command (Tab CC-4) . PACAF's primary mission is to provide the United States Indo-Pacific Command (USINDOPACOM) with continuous unrivaled air, space, and cyberspace capabilities to ensure regional stability and security (Tab CC-4).

b Air Force Public Affairs Agency (AFPAA)

AFPAA, headquartered at Joint Base San Antonio-Randolph, Texas, is a field operating agency that reports to the Secretary of the Air Force for Public Affairs (SAF/PA) at the Pentagon (Tab CC-9). AFPAA provides operational control over one combat camera squadron and two audiovisual squadrons, and administrative control over five SAF/PA operating locations (Tab CC-9). AFPAA serves as the Functional Area Manager for all Air Force Combat Camera (COMCAM) forces (Tab CC-9).

c. 31st Rescue Squadron (RQS)

31 RQS, headquartered at Kadena Air Base (AB), Japan, trains, equips, and employs combat-ready pararescue specialists (Tab CC-3). The pararescuemen are experts in medical care and small-unit tactics, providing survivor contact, treatment, and extraction during combat rescue operations in hostile or denied territory (Tab CC-3). The 31 RQS uses various fixed- and rotary-wing insertion and extraction assets providing combat and humanitarian search, rescue, and medical assistance in all environments (Tab CC-3).

d. 25th Air Support Operations Squadron (ASOS)

25 ASOS is a tenant unit at Wheeler Army Airfield, Hawaii (Tab CC-19). 25 ASOS's primary mission is to deter, neutralize, defeat, and survive in the USINDOPACOM area of responsibility (Tab CC-19). They provide joint all-domain command and control at a tactical level from the edge of the battlespace, supporting the US Air Force Chief of Staff's priority to deliver airpower anytime, anywhere (Tab CC-19).

e. 1st Combat Camera Squadron (CCS)

1 CCS is a tenant unit at Joint Base Charleston, South Carolina (Tab CC-6). 1 CCS's primary mission is to provide senior Department of Defense and joint leaders with a directed imagery capability in support of strategic, operational, and planning requirements during wartime operations, worldwide crisis, contingencies, joint exercises, and humanitarian operations (Tab CC-6).

f. North Field

North Field is an airfield on Tinian originally built to support B-29 bomber operations during World War II, with some limited improvement work done in recent years (Tab CC-12). The area is primarily suitable for training related to conducting transport and air assault aviation operations from remote or austere locations (Tab CC-12).

g. Search and Rescue Tactical Vehicle – Side by Vehicle (SRTV-SXV)

The SRTV-SXV is a commercial off-the-shelf, diesel-powered, all terrain tactical vehicle used to transport Guardian Angel personnel (Tab BB-75). It is tailorable with multiple configurations and transportable on the V-22 Osprey and airdrop capable from C-130 aircraft (Tab BB-75). It can accommodate a six-person crew or transport up to four litters (Tab BB-75). The SRTV-SXV in this mishap is S/N SRTVSXVD21AFM060 and was manufactured in 2021 (Tab S-91).

Figure 1 – SRTV-SXV (Tab O-8)

h. COPE NORTH (CN)

CN is an annual United States Pacific Air Forces-sponsored joint/combined, tri-lateral field training exercise designed to increase interoperability of PACAF, Royal Australian Air Forces, and Japan Air Self-Defense Forces (Tab AA-7). COPE NORTH 2023 (CN23) focused on Combat Air Force, Mobility Air Force, Agile Combat Employment, Dispersal, and Humanitarian Assistance/Disaster Response operations (Tab AA-8). CN23 involved more than 100 aircraft and 2,000 personnel from four nations participating in the overall exercise, with small teams spread out across seven remote Pacific islands, including Tinian (Tab CC-18).

i. Guardian Angel (GA)

GA is comprised of Combat Rescue Officers, Pararescuemen, Survival, Evasion, Resistance, and Escape (SERE) Specialists, and uniquely trained support personnel dedicated to the Air Force core function of Personnel Recovery (Tab CC-21). GA is uniquely designed and dedicated to conduct Personnel Recovery across the full range of military operations and during all phases of joint, coalition, and combined operations (Tab CC-21).

j. Tactical Air Control Party (TACP)

TACP airmen integrate air combat power and surface fires into the ground scheme of maneuver, enabling synergetic and lethal firepower (Tab CC-16). TACPs embed with ground forces to perform all air-to-ground integration, surface-to-surface fire integration (artillery), rotary wing and fixed wing air combat support, naval gunfire, medical evacuations, and electronic warfare, such as jamming and intelligence (Tab CC-16).

k. Combat Camera (COMCAM)

COMCAM are Air Force public affairs technical experts in both ground and aerial photojournalism, broadcast, and video documentation who acquire still and motion imagery in support of classified and unclassified air, sea, and ground military operations (Tab CC-6).

4. SEQUENCE OF EVENTS

a. Narrative

CN23 was scheduled to occur between 8-24 February 2023, with exercise locations at Andersen AFB and Northwest Field on Guam, along with the islands of Rota, Tinian, and Saipan (Tab AA-7). The focus of the field training exercise was a Combat Air Forces/Large Force Employment exercise to develop Agile Combat Employment concepts via hub and spoke operations (Tab AA-7).

MA1, a TACP Officer from 25 ASOS, traveled to Kadena AB, Japan to partner up, and travel, with members of 31 RQS to Guam, arriving on 2 February 2023 to participate in CN23 (Tabs R-48 and V-4.3). MA1 was tasked to work alongside GA operators and integrate joint fires and manage air-to-ground communication during CN23 (Tab V-2.6). MA2, a COMCAM Craftsman from 1 CSS, traveled from Charleston AFB, South Carolina to CN23 on or about 4 February 2023 (Tab V-8.3). MA2 was tasked to provide Public Affairs (PA) support to any CN23 entity with photography and video documentation of activities completed during the exercise (Tab V-8.3 and 8.4). The MV was transported from Kadena AB, Japan to Andersen AFB, Guam for the exercise (Tab V-6.4).

Upon arrival to Guam, CN23 participants received a mass Personnel Support for Contingency Operations (PERSCO) briefing (Tabs V-2.3 and V-8.3). Safety topics included local conditions, water safety, high risk activity, road hazards, personal protective equipment, and vehicle safety on Guam (Tabs K-29 to K-32). The PERSCO briefing highlighted that seatbelts are required and

that the maximum speed on Guam is 35 miles per hour (mph) (Tab K-30). A similar PERSCO briefing, specific to the island of Tinian was not provided to all units who would be performing exercise activities on Tinian (Tabs V-2.3, V-4.3, V-6.3, and V-8.3).

While on Guam, MA1 and GA personnel conducted integration training with multi-national forces in preparation for full mission profile (FMP) exercise scenarios (Tab V-2.4). They conducted part-task training with the Royal Australian Air Force, including talk throughs and familiarization on the C-27 aircraft (Tab V-2.4). They conducted part-task training with the JASDF UH-60J rescue helicopters and took local area familiarization flights with the US Navy Helicopter Sea Combat (HSC) Squadron MH-60S helicopters (Tabs V-2.4 to V-2.5). During a mission planning conference on 15 February 2023, Combat Rescue Officer 1 (CRO1) requested PA support to document the exercise events on Tinian (Tabs V2.9 to-2.10, V-4.8and V-8.4). On 16 February 2023, MA1 and MA2 traveled to Tinian with other ground support personnel aboard an HSC MH-60S helicopter (Tabs R-27, V-4.4 and V-8.3). The MV was flown to Tinian aboard a C-130 aircraft to facilitate the planned FMP events and for team transportation around Tinian (Tabs V-2.7 and V-7.4).

On 17 February 2023, MA2 packed up her belongings in preparation for a scheduled return to Guam that evening after documenting a FMP exercise (Tab V-8.4). The exercise scenario called for dropping GA operators into the waters off the coast of Tinian to conduct an over the beach insertion to recover a downed and isolated pilot (Tabs V-2.9 and V-4.7 to 4.8). The team would encounter enemy contact, and MA1 would coordinate close air support fires from MQ-9 reaper drones and MH-60S helicopters (Tabs V-2.9 and V-6.11). MA1 was not qualified on the planned insertion and extraction techniques and would join the GA operators when they arrived on the beach (Tabs R-33, V-2.9, and V-6.11). Survival, Evasion, Resistance, and Escape 1 (SERE1) requested that MA2 first document the GA operators loading the helicopters and taking off before heading to Chulu Beach with MA1 to cover the personnel recovery exercise (Tabs R-34 and V-8.5).

There were two vehicles available for the members of the GA team to use at their camp site, including the MV and a rental vehicle (Tabs V-6.7 and V-8.5). SERE1 was not qualified to operate the MV, so planned to take the “downed pilot” exercise role player in the rental vehicle to Chulu Beach (Tabs R-24, R-34 and V-8.5). Since MA1 volunteered to put fuel in the MV and meet SERE1 at the beach, SERE1 assumed that MA1 was familiar with and qualified to operate the MV (Tab R-26).

At approximately 1500L after the helicopters departed with the GA operators, MA1 and MA2 got into the MV (Tab R-34). MA2 had never been a passenger in the MV before and was unfamiliar with how to buckle the seatbelt harness (Tab V-8.5). MA2 informed the board that she requested assistance with the harness buckle in the MV from MA1, but MA1 stated that because it was only a 5-minute drive, they did not need to wear seatbelts (Tab V-8.5). Ankle covering, boots, pants, gloves, eye protection, helmet, and seatbelts are all required when operating the MV (Tab V-6.7). MA1 did not provide MA2 with a safety briefing or instruct her to wear personal protective equipment (Tab V-8.4 to 8.5).

During her interview, MA2 informed the board that as the MV was on its way to Chulu Beach she developed a nervous feeling about the MV speed and made multiple requests to MA1 that he slow down; however, MA1 did not acknowledge or respond to those requests (Tabs R-57 and V-8.6). MA2 could tell that the MV was traveling too fast because the tires were kicking up gravel from the poorly maintained roads and the MV was swerving in and out of the vegetation overgrowth along the sides of the road (Tab V-8.6). As MA2 got struck in the face by the vegetation, she requested, again, that MA1 slow down as the MV turned onto the road to Chulu Beach (Tab V-8.6). MA1 asserted during his interview that while operating the MV on the way to Chulu Beach, an issue arose with the steering and MA2's side of the vehicle was in the brush, which prompted MA1 to overcorrect then placing MA1's side of the vehicle into the brush (Tab V-4.9). MA1 could not recall what else happened after this moment (Tab V-4.9). MA1 did not recount receiving any warnings from MA2, nor did MA1 notice any obstructions on the roadway as he drove (Tab V-4.9). Further, MA1 could not recount the speed at which he was driving prior to the MV departing the road (Tab V-4.9 and V-4.11). A visit to the accident site, review of post-accident scene pictures, and an informed understanding of the surrounding vegetation where the MV came to rest indicates that the MV was going approximately 40-50 mph immediately before the mishap (Tab V-5.5). There were no posted speed limit signs on the road where the mishap occurred; however, the local police officer responding to the mishap said that given the narrowness of the road and overgrown vegetation, law enforcement would assess a speed limit of about 15 miles per hour (Tab V-5.6).

Figure 2: Map of Tinian with mishap site highlighted (Tab Z-3)

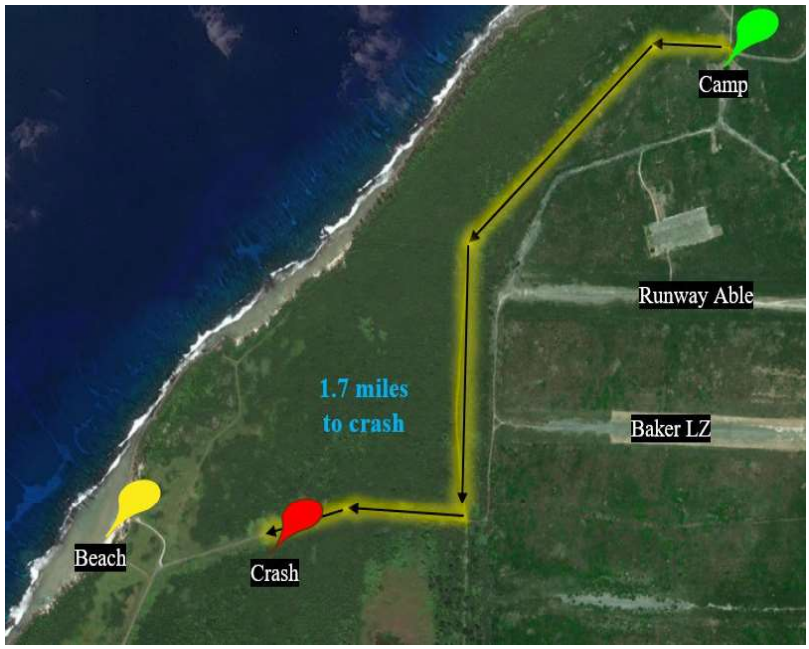

Figure 3: Highlighted area showing camp site, MV route towards Chulu Beach, and mishap site (Tab Z-4)

The MV departed the road to the left and entered the thick vegetation (Tabs R-77, R-97, and V-4.9). The MV completed a counterclockwise right leading rollover, coming to rest back on its tires against trees more than 30 feet from the road (Tabs R-77, R-97, O-4, and V-5.4.). Neither MA1 nor MA2 were wearing seatbelts or other personal protective equipment (Tabs V-3.6 and V-8.4 to V-8.5). MA1 was ejected from the MV and sustained serious injuries, resulting in permanent paralysis below the waist (Tabs V-4.9 and Tab X-4). MA2 was ejected from the MV (Tabs V-3.6 and V-8.6). During the rollover and after ejection, the MV struck MA2 causing life-threatening injuries to include a pelvic fracture and internal abdominal injuries, which has resulted in numerous corrective surgeries and an above-the-knee amputation (Tabs V-8.7 and Tab X-5 to X-6).

Figure 4: Vegetation flattened by MV after departing road (view - direction of travel) (Tab S-150)

Figure 5: (a) Road narrowed by vegetation overgrowth, (b) and (c) MV tire marks departing road (view - opposite direction of travel) (Tab S-158)

Figure 6: Passenger side of MV at mishap site (Tab S-172)

Figure 7: Driver side of MV at mishap site (Tab S-189)

b. Search and Rescue

After the mishap, an unidentified civilian, who either heard or saw the mishap occur, approached MA2 in an attempt to render aid (Tab V-8.7). That individual informed MA2 that they would go get help (Tabs V-3.5 and V-8.7). At approximately 1515L, three exercise personnel driving nearby were alerted by the civilian of the mishap (Tab V-3.5). Upon arrival at the mishap site, two military personnel immediately assessed MA1 and MA2 and administered tactical first aid while one returned to the flightline to seek additional help (Tabs R-69 and V-3.7). MA1, who was on his back next to the MV, stated that he could neither walk nor feel his legs, but informed first responders that MA2 was in more critical condition and to attend to MA2 first (Tab V-3.6 and R-93). MA1 did not have any visible injuries, but one first responder noted MA1's foot had no distal pulse (Tab V-3.6, R-95). MA2's injuries were evident to first responders who administered tactical life-saving care, to include the application of bandages to stop the bleeding and binders to stabilize fractures (Tab R-90, 91 and 93). Multiple personnel responded in trucks and tactical vehicles (Tabs R-21 and V-3.8). MA2 was deemed most critical, so was moved quickly to the flightline to board a US Air Force C-130 aircraft (Tabs R-56, V-1.5, and V-3.6). Upon arrival to Andersen AFB, MA2 was taken by ground ambulance to GRMC (Tabs V-1.6, X-3 and X-5). MA1 was moved to the flightline later that day and flown directly to US Navy Hospital Guam by a JASDF UH-60J helicopter (Tabs R-70, R-73 and X-3).

Figure 8: First responders moving MA1 to JASDF UH-60J (Tab S-185)

c. Recovery of Remains

There were no fatalities in this mishap (Tabs X-4 and X-5).

5. MAINTENANCE

a. Maintenance Documents

The SRTV-SXV, S/N SRTVSXVD21AFM060, had recently been delivered to 31 RQS, with the acceptance limited technical inspection (LTI) dated 17 January 2023 (Tab U-3). No maintenance documentation or evidence of inspections were present on the MV at the time the GAIB took custody (Tabs A-7 to A-11 and V-11.3-11.4).

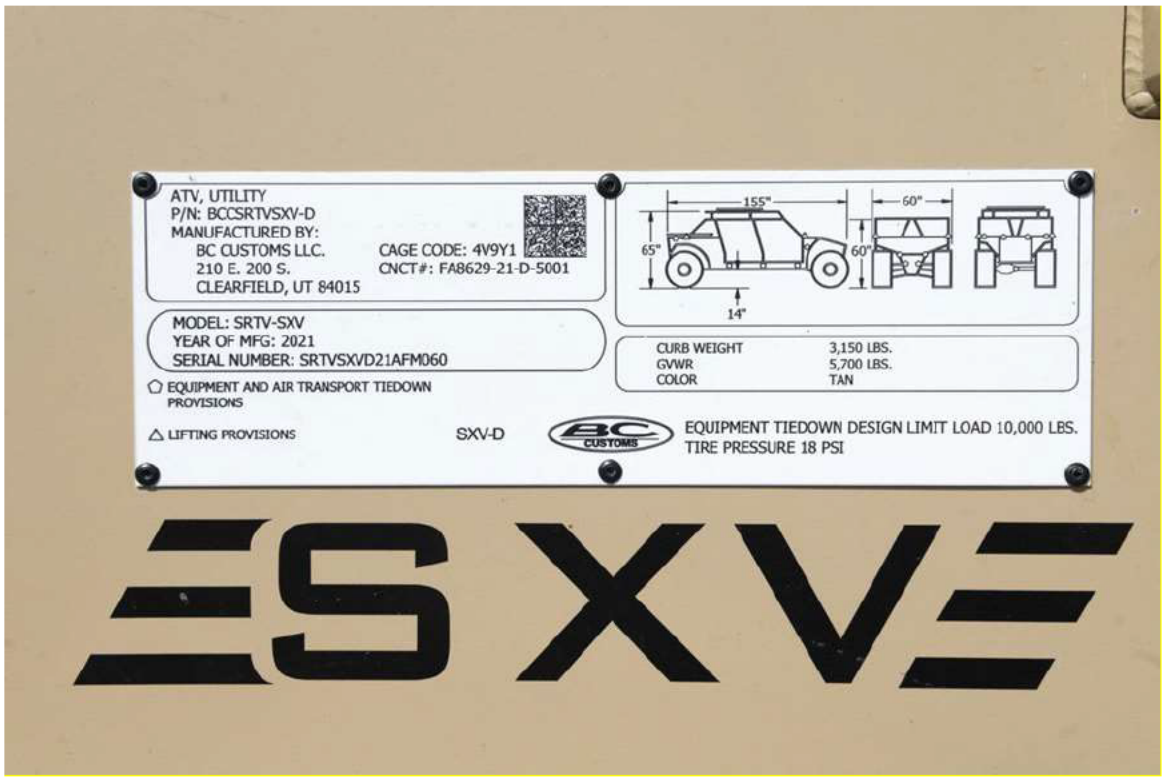

Figure 9: MV data plate identifying OEM and S/N (Tab S-91)

b. Maintenance Forms

A maintenance log for the MV was provided to the Board, which lists the acceptance inspection dated 17 January 2023, a wheel spacer modification dated 26 January 2023, and a Temporary Duty LTI dated 2 February 2023 (Tab D-3). There is no history of maintenance work performed on the MV (Tab D-3 and V-11.3).

c. Scheduled Inspections

All scheduled inspections for the MV are done in accordance with (IAW) Original Equipment Manufacturer (OEM) maintenance recommendations outlined in the hard copy manual provided to the unit (Tab V-11.3).

d. Maintenance Procedures

All maintenance procedures for the MV are done IAW OEM maintenance recommendations located in the hard copy manual provided to the unit (Tab D-3 and V-11.3).

e. Maintenance Personnel and Supervision

One Vehicle Maintenance Craftsman, Vehicle Maintenance 1 (VM1), is assigned to 31 RQS and had attended the 2-week OEM maintenance course in Utah (Tab V-11.2). VM1 completed the 1-week OEM driver course in Utah as well (Tab V-11.3). VM1 serves as the Vehicle Control

Officer and is the only individual in the unit that performs maintenance and repairs on their tactical vehicles, which include Polaris MV850s and SRTV-SXVs (Tabs V-11.2 and U-4).

f. Unscheduled Maintenance

The MV had no unscheduled maintenance since it had recently been delivered to the unit (Tab V-11.3).

6. EQUIPMENT, VEHICLES, FACILITIES, AND SYSTEMS

a. Vehicle Acquisition and Background

Air Force Special Operations Command (AFSOC) and Air Combat Command (ACC) established a Joint requirement for a standardized Special Warfare (SW) V-22 Osprey Internally Transportable Vehicle (ITV) (Tab BB-41). The SW Branch within the Air Force Life Cycle Management Center (AFLCMC) was tasked in the spring of 2018 to identify and deliver a Ground Mobility capability for both AFSOC Special Tactics (ST) and ACC GA (Tab BB-92). A Joint Systems Requirement Document (SRD) for the ITV was drafted and signed on March 2019 (Tab BB-92). While the SRD was being drafted, the SW team simultaneously conducted Market Research and identified that the SRTV-SXV, built by BC Customs, LLC was the only solution meeting the desired requirements (Tab BB-92).

The SRTV-SXV provides GA operators with an air-deployable, surface rescue platform that fits inside transport vehicles with limited space provisioning (Tab O-73). The ITV is capable of maneuvering over adverse terrain to search for and recover Isolated Personnel (IP) and/or equipment, while providing capability for the transport of rescue team members and the IP from an area of high threat to a defendable location for recovery by aircraft or self-recovery to the final destination (Tab O-73).

The first ITV contract (FA8629-19-C-5004) was awarded to W.S. Darley & Co. in July 2019 to provide 15 vehicles for AFSOC and 14 vehicles for ACC (Tab BB-92). BC Customs was awarded the follow-on contract (FA8629-21-D-5000) in June 2020 to provide 70 ITVs for AFSOC and 58 ITVs for ACC (Tab BB-93). Both contracts included contractor support and operator and maintenance training support (Tab BB-92 to BB-93).

The Nevada Automotive Test Center (NATC) conducted performance, durability, and safety assessment testing for the SRTV-SXV from December 2018 to January 2020 (Tab BB-75). Due to the increased weight of the diesel motor and transmission, the 53rd Wing (88th Test and Evaluation Squadron), Nellis AFB, Nevada provided a Sufficiency of Test Review (SOTR) for the GA SRTV-SXV Diesel on 21 July 2020 (Tabs BB-77 to BB-78). Fielding approval of the GA SRTV-SXV Diesel was approved on 3 September 2020 by ACC/A5/8/9 (Tabs BB-75 to BB-76).

b. Rollover Risk

During the acquisition process, AFLCMC was made aware that the ITV had a propensity to rollover due to its narrow wheelbase, high center of gravity, and its intended environment for use (Tab BB-67). During a rollover, roof crush was also noted to be a concern, but analysis showed that the roll cage could support approximately 2 times the gross vehicle weight (Tab BB-67). Rollover risk mitigation included the incorporated roll cage and driver training, which would include rollover prevention and procedures, with continued analysis and testing (Tab BB-68).

The ITV is equipped with automatic locking differential lockers, making all 4 wheels drive to traction (Tab O-76). Designed with an intended use of 70% austere remote undulating terrain, the ITV is equipped with rapid steering technology (RST), which allows the operator in an unknown austere environment to perform steering maneuvers quicker than OEM vehicles (Tab O-77). RST allows for more control and less fatigue as the driver can turn the wheel to full lock without crossing hands (Tab O-77).

Per the OEM, RST can cause the ITV to be "twitchier" at high speeds (Tab O-81). While enhancing the capabilities of the vehicle in overland application, it can cause issues to a driver not versed on this feature, causing the driver to oversteer (Tab O-77). PJ1 and VM1 described the steering of the MV as very different than other vehicles, that it is "not user friendly" and difficult to maneuver without training (Tabs V-6.6 and V-11.4). For these reasons, BC Customs recommended a maximum speed of 45 MPH on paved surfaces (Tab O-77).

Testing conducted by NATC (NATC Document Number 22135-FR-REV 0) determined that the tipping point occurs at an acceleration of 0.63 g, where g is the gravitational acceleration at sea level (Tab BB-73). Using the equation, $a = v2/r$, where a is the centripetal acceleration at the tipping point, v is velocity of the ITV, and r is turning radius, a stock ITV can make a turn with a radius of 50 yards at 38 mph before tipping (Tab BB-73).

BC Customs provided a response brief to address the Air Force's ITV rollover concerns (Tab O-71). The brief suggested that the Air Force rollovers were not the result of vehicle deficiencies but were due to user error (Tab O-72). Air Force personnel were encountering two different rollover scenarios, both at low and high speed, which BC Customs claimed were due to a lack of understanding of the vehicle's design and function and its intended purposes (Tabs O-76 and O-77).

Figure 10: Warning label above steering wheel: "Fasten seatbelts before use. ALWAYS wear personal protective equipment, helmet, gloves, eye protection" (Tab S-202)

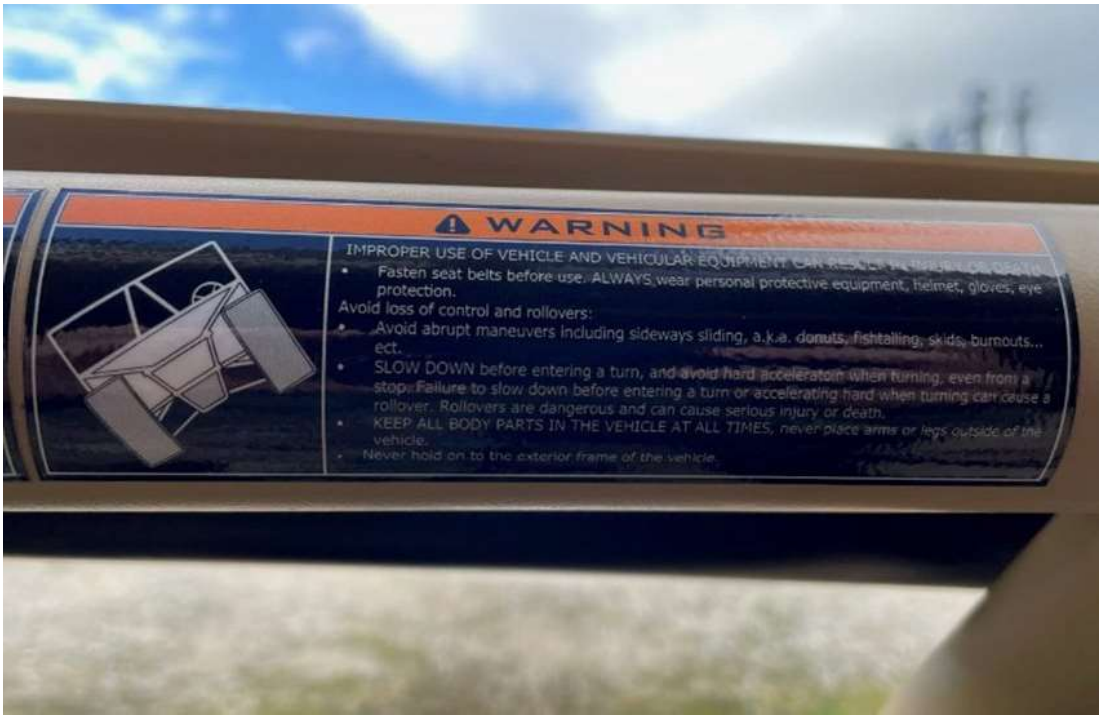

Figure 11: Warning label above steering wheel: "SLOW DOWN before entering a turn and avoid hard acceleration when turning even from a stop. Rollovers are dangerous and can cause serious injury or death" (Tab S-203)

BC Customs offered 2-inch wheel space modifications in an effort to mitigate the rollover risk (Tab O-83). The wheel spacer bolts between the vehicle hub and the wheel space make the wheel 2 inches wider per wheel, effectively widening the wheel-track of the vehicle by 4 inches (Tab O-83). This widening was believed to enhance both the physical stance and the vehicle center of gravity distance to the footprint of the tires (Tab O-83). If enough inertia is presented to the vehicle to induce a rollover, there would likely still be enough inertia to induce a rollover even with the spacer modifications (Tab O-83). BC Customs believed that Safety Briefings and improved vehicle operator understanding of the vehicle's special features would help mitigate rollover risks (Tab O-83). Proper training was identified as the key to operator safety (Tab O-83).

The NATC analysis (NATC Document Number 22135-FR-REV 0) conducted on the addition of 2 inches to the wheel track showed a 7% increase to the acceleration needed to tip the ITV, or 0.67 g (Tab BB-73). Keeping the same turn radius of 50 yards, the tipping speed increased to 39 mph (Tab BB-73). Adding the wheel spacers to the ITV increased the lever arm, which increased the torque felt by the suspension (Tab BB-73). There is a direct proportional relationship between the lever arm length and torque (Tab BB-73). If the lever arm is increased by 10%, the torque is also increased by the same (Tab BB-73). This increase could cause those components to wear out sooner, especially the bushings and shocks (Tab BB-73).

The AFLCMC SW Branch issued a notice to AFSOC and ACC on 27 December 2022 requesting the removal of any wheel spacers that have been installed on ITVs, and that no others be installed unless further guidance was provided (Tab BB-73). The notice stated that the proposed change in performance supported not adding wheel spacers to aid in rollover prevention and that no change to the baseline configuration was approved (Tab BB-73). The notice also stated that user operation adhering to the provided trainings and guidance in the OEM manuals should mitigate rollover risk (Tab BB-73). VM1 was unaware of this recommendation and completed the 2-inch spacer modification to the MV on 26 January 2023 (Tabs V-11.3 to 11.4 and U-3).

d. Functional Status

The MV was delivered to 31 RQS on 17 January 2023 (Tab D-3). No other maintenance paperwork related to the MV was available for the GAIB to review (Tab D).

e. Vehicle Condition Post-Mishap

The MV was inspected by the GAIB, which noted that damage was almost entirely on the passenger (right) side (Tabs J-3 to J-6).

Figure 12: Missing passenger side windshield and bent frame (Tab S-73)

Figure 13: Passenger side wheel well damage (Tab S-69)

Figure 14: (a) Bent roll cage by passenger seat, (b) Bent windshield frame, (c) Damage to cargo bin on rear passenger side, (d) Crushed bins on passenger side roof (Tab S-142)

Figure 15: Turret mount packed with dirt and vegetation on roof of the driver side (Tab S-136)

Figure 16: Missing diesel fuel cap on the passenger side hood (Tab S-88)

7. ENVIRONMENTAL CONDITIONS

a. Forecasted Weather

The forecast on 17 February 2023 called for partly sunny skies and isolated showers, with easterly winds of 15-20 mph (Tab W-3). The high for the day was forecasted to be 86 degrees (Tab W-3).

b. Observed Weather

The observed weather at the time of the mishap was consistent with the forecasted weather described above (Tab V-8.5). There were few scattered showers observed during the evening on 16 February 2023, but no precipitation at the time or location of the incident (Tab V-8.5).

c. Post-Accident Weather

The post-mishap weather was similar to the observed weather (Tabs, S-147, S-159 to 161, S-184 to 185, and V-8.5).

d. Environmental Conditions

Most roads on Tinian were designed, developed, and constructed in 1944, with many of the existing roads now in poor condition (Tab BB-84). The unnamed roads in the North Field area are typically unpaved, moderately to severely overgrown with vegetation, and experience low traffic volumes (Tab BB-86). These roads have not been improved or resurfaced since their original construction during World War II (Tab V-5.6).

Figure 17 - Unnamed Road Where Mishap Occurred (Tab S-13)

The unnamed single-lane road where the incident occurred connects Lennox Road and Riverside Road on the western edge of North Field and the terrain is generally flat (Tabs V-5.3, Z-4 to Z-6).

8. PERSONNEL QUALIFICATIONS

a. Relevant Training

MA1 completed technical training, upgrade training, on-the-job training, and specialty training, and was a fully qualified in his duties as a TACP (Tabs G-5 to G-68).

MA1 stated that he had completed formal training on the MRZR tactical vehicle (Tab V-4.5). MA1 stated that he had also been trained on the High Mobility Multipurpose Wheeled Vehicle and Mine-Resistant Ambush Protected vehicle (Tab V-4.5). Tactical vehicle training should be documented on AF Form 2293 (BB-99 to BB-100). MA1's record shows that a Recreational Off-Highway Vehicle Association Basic Driver Course was completed on 7 June 2021 (Tab G-78). This tactical vehicle training addresses rocky terrain, sandy terrain, near trees, muddy terrain, on hills, and side hilling experiences (Tab G-78). MA1's training record did not reflect documentation of any formal or on-the-job training related to specific types of tactical vehicles, including no documentation related to the MV (Tabs G-5 to G-68).

MA1 stated that he received familiarization training on the operation of the MV from PJ1 on 16 February 2023 (Tab V-4.5). MA1 stated that the training lasted approximately two hours, but that it was not documented (Tabs V-4.5 to 4.6). PJ1 stated that he did not provide MV familiarization training to anyone during CN23 (Tab V-6.8). PJ1 stated that he did not believe that MA1 had received any MV training when they were at Kadena, Guam, or Tinian (Tabs V-

6.8 to 6.9). IAW AFMAN 24-306, 3.17., vehicle training in TDY status must be accomplished by a designated vehicle trainer and documented on the AF Form 171 (Tab BB-79). The student operator will retain the AF Form 171 to certify the training received (Tab BB-79). The AF Form 171 may be used in-lieu-of an AF Form 2993, USAF Motor Vehicle Operator Identification Card, when accompanied by official TDY orders (Tab BB-79). MA1 did not possess the training documentation required to operate the MV on 17 February 2023 (Tab V-4.5).

Per AFMAN 24-306, para. 4.2., one of the basic responsibilities of government vehicle operators is to ensure the safety of passengers, which includes ensuring that seat and shoulder belts are safely fastened (Tab BB-99). The AFMAN also states that the operator will ensure that passengers comply before operating the vehicle (Tab BB-99).

b. Training Currency

MA1 was current and qualified to perform TACP duties during CN23 (Tabs G-5 to G-68).

9. MEDICAL FACTORS

a. Qualifications

MA1 and MA2 were medically qualified for duty (Tabs X-4 and X-5).

b. Health

MA1 and MA2 had no indications of illness or other abnormal medical symptoms at the time of the mishap (Tabs X-4 and X-5).

c. Pathology

MA1 was ejected and sustained serious injuries during the rollover (Tab X-4). MA1 was initially taken to US Navy Hospital Guam, then transferred to GRMC (Tab X-4). On 19 February 2023, MA1 was transferred to Tripler Army Medical Center, Hawaii (Tab X-4). On 3 April 2023, MA1 was transferred to James A. Haley VA Medical Center, Tampa, Florida (Tab X-3). MA1 suffered permanent disability with below the waist paralysis (Tab X-4).

MA2 was ejected and sustained life-threatening injuries during the rollover (Tab X-5). MA2 was initially treated at GRMC (Tab X-5). On 20 February 2023, MA2 was transferred to Tripler Army Medical Center, Hawaii (Tab X-3). On 21 February 2023, MA2 was transferred to Navy Medical Center San Diego, California (Tab X-3). On 18 April 2023, MA2 was transferred to Walter Reed National Military Medical Center, Maryland (Tab X-3). MA2 suffered permanent disability with an above knee amputation of the right leg and significant scarring and motor/sensory limitations on the left leg (Tab X-6).

d. Toxicology

Toxicology testing was not completed on MA1 or MA2, but initial trauma laboratory testing done for each did not suggest prior impairment (Tabs X-4 to X-5).

e. Crew Rest and Crew Duty Time

There is nothing to indicate that crew rest or crew duty time were a factor in this mishap (Tabs V-4.6 to 4.7 and V-8.4).

10. OPERATIONS AND SUPERVISION

a. Operations

The CN23 Operational Order accounted for sustained operations on Tinian through 24 February 2023 (Tab AA-7). MA1 and MA2 arrived on Tinian on 16 February 2023 (Tabs V-4.4 and V-8.3). Both MA1 and MA2 departed Tinian on 17 February 2023 via medical evacuation to hospitals on Guam (Tabs X-4 and X-5).

b. Vehicle Oversight

The MV procurement contract included operator training provided by the OEM (Tab BB-18). The OEM training was at their facility in Clearfield, Utah and lasted 5 days (Tabs BB-18 and V-6.5). There were four GA operators at CN23 who had attended that formal OEM training, but only three deployed forward to Tinian (Tabs G-79 and V-7.4). Only GA operators were trained and signed off to operate the MV in their training records and authorized to operate the MV during CN23 (Tab V-7.4). There were two vehicles on Tinian available for use by GA ground personnel during CN23, one rental vehicle and the MV (Tab V-4.7). Keys are not required to start and operate the MV (Tab V-4.7). At the time MA1 took control of the MV, both authorized GA operators were aboard helicopters actively participating in the FMP exercise scenario (Tabs V-6.9 and V-7.5).

11. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Directives and Publications Relevant to the Mishap

(1) AFPD 24-3, Management, Operation and Use of Transportation Vehicles, 14 December 2017
(2) DAFI 91-207, The US Air Force Traffic Safety Program, 26 July 2019
(3) AFI 51-307, Aerospace and Ground Accident Investigations, 18 March 2019
(4) AFI 24-301, Ground Transportation, 22 October 2019
(5) AFI 24-302, Vehicle Management, 21 February 2020
(6) AFMAN 24-306, Operation of Air Force Government Motor Vehicles, 30 July 2020

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. Known or Suspected Deviations from Directives or Publications

All deviations previously discussed.

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President, Ground Accident Investigation Board

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