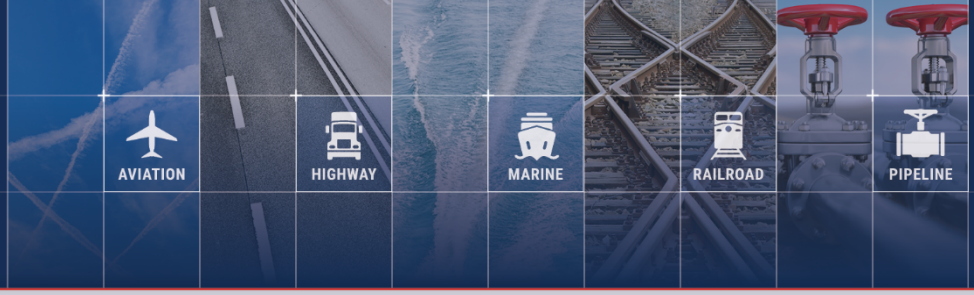

Aviation Investigation Final Report

Location:	Austin, Texas	**Accident Number:**	CEN15FA210
Date & Time:	April 27, 2015, 21:50 Local	**Registration:**	N392TC
Aircraft:	EUROCOPTER DEUTSCHLAND GMBH MBB BK 117 C-2	**Aircraft Damage:**	None
Defining Event:	External load event (Rotorcraft)	**Injuries:**	1 Fatal, 2 None
Flight Conducted Under:	Public aircraft		

Analysis

A helicopter with a pilot, a hoist operator, and a helicopter rescue specialist (rescuer) on board was dispatched to transport an injured person out of an area of rough terrain. Based on the patient's location and the time of the call, a night hoist operation was planned. The helicopter arrived on scene, and the hoist operator lowered the rescuer and equipment from the helicopter. While the rescuer and ground personnel prepared the patient for transport, the pilot and hoist operator looked for a nearby landing zone. Upon hearing radio calls from the rescuer that the patient was ready, the helicopter returned to the patient's location, and the hoist operator lowered the hoist hook. The patient, who was in a Bauman bag, and the rescuer were then lifted from the ground by the hoist. The hoist operator continued to reel in the patient and the rescuer as the helicopter transitioned from a hover to forward flight. When the patient and rescuer were about 10 ft below the helicopter's skids, the rescuer fell about 100 ft to the ground.

The ground personnel who helped the rescuer prepare the patient for transport did not report seeing anything unusual. They said that, during the initial part of the lift, the rescuer and patient went into some tree branches, the helicopter maneuvered away from the tree, and then the rescuer and patient were lifted up towards the helicopter.

Examination of the rescuer's equipment did not reveal any failures or malfunctions that would explain the fall. Additionally, examination of the hoist hook and helicopter equipment did not reveal any abnormities. Also, review of video from a camera located on the hoist did not identify any failures in the equipment nor did it show how the rescuer was initially hooked into the hoist. In the absence of any equipment failure, it is likely that the rescuer was not properly fastened to the hoist.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The helicopter rescue specialist was not properly attached to the hoist system, which resulted in a fall during a night hoist operation.

Findings

Personnel issues	Incomplete action - Flight crew

Factual Information

History of Flight

Maneuvering-low-alt flying	External load event (Rotorcraft) (Defining event)

HISTORY OF FLIGHT

On April 27, 2015, about 2150 central daylight time, a helicopter rescue specialist (rescuer) fell during an external hoist rescue operation. The rescuer received fatal injuries; the pilot, flight paramedic and patient were not injured. The Eurocopter MBB BK 117 helicopter, N392TC, was not damaged during the accident. The helicopter was registered to the Travis County Purchasing office and operated by STAR Flight, Austin, Texas, as a public aircraft operation. Night visual meteorological conditions prevailed during the local rescue flight.

STAR Flight operations was contacted in response to an injured individual located on the greenbelt of Barton Creek. First responders, consisting of ground units assessed that based on the patient's condition and the difficulty in transporting the patient out difficult/steep terrain, that an air rescue was necessary.

The pilot, hoist operator (paramedic), and helicopter rescue specialist, gathered the required equipment and before departure and en route, completed the normal equipment checks. Shortly after arriving at the patient's location, the rescuer and the medical equipment were hoisted to the ground. The helicopter's hoist operator later deployed a backboard for the patient.

During the time the rescuer was on the ground and was preparing the patient for the hoist operation, the flight crew had chosen a running track, located near a school, for a landing zone.

After the rescuer had secured the patient in the Bauman bag, she radioed the helicopter; the helicopter moved into position and extended the hook to her. After receiving "ready for extraction", the hoist operator initiated the lift to the helicopter. Once the rescuer and patient cleared the trees, the patient and rescuer, began a steady spin. To arrest the spin, the pilot started moving the helicopter forward. The spin slowed and had essentially stopped as they were hoisted upwards. As they neared the helicopter, the rescuer then fell away from the patient and hoist.

With the patient slightly below the helicopter, the flight crew continued to the rendezvous location, where the patient would be transferred via ambulance to the hospital. Once the helicopter arrived at the landing zone, emergency personnel disconnected the patient from the hoist connection. The pilot then landed the helicopter, and the hoist operator retrieved the medical bag that was on the hoist. The pilot and hoist operator then departed to assist in looking for the rescuer.

Shortly, afterwards the helicopter landed back at the landing zone.

Witness interviews

The pilot reported that they were dispatched to rescue an injured hiker in the green belt area. The wind was reported from 350 degrees at 5 knots, but noted that it could be a bit more turbulent in the rescue area; so they would approach the area from the north. They deployed the rescuer and a little later, a backboard, to the rescuer. They then looked for a 7 meter [landing zone/rendezvous] location, and then loitered in the green belt area, waiting for the rescuer's call for extraction. After receiving the radio call from the rescuer, they proceeded to the rescuer's area and conducted the hoist operation. Upon hearing "axis clear" from the hoist operator, he transitioned to forward flight; he added that they were approximately 100-120 feet AGL, with the rescuer and patient just below the skids when the hoist operator stated the rescuer was gone and had fallen from the hook.

The hoist operator reported that they were dispatched for a wilderness rescue. He and the rescuer completed the safety checks of their equipment prior to launch. Once at the rescuer area, he reported they deployed the rescuer from an altitude of 100 feet AGL; during the delivery of rescuer, medical and Bauman bag some incidental contact with tree branches occurred. Once the rescuer was on the ground, she reported "hook clear", and he retracted the hoist. During the retraction, a small tree branch came back wedged on the hoist bumper. He removed the branch and discarded it over a vacant area and then inspected the hook and cable, to confirm no damage. They then lowered a backboard via rope to ground personnel who were with the rescuer. They then departed to look for a 7 meter location. When the rescuer said "ready for pickup", they elected to do the extraction 50 feet higher, to minimize the effect of rotor wash on the ground personnel. Upon hearing "ready for extraction" on the radio, he brought the hoist cable up. He added that during the lift, the rescuer and victim made light contract with tree branches. Once clear of the trees, the rescuer and victim started to spin; he asked the pilot for some forward airspeed, after announcing "axis clear", to stop the spin. He added that it appeared the rescuer's legs were parallel to the victim, and thought it was due to the spinning. The hoist operator stated that after the helicopter gained forward airspeed, the spin had slowed and almost stopped. He noticed that the rescuer was riding in a position lower than normal. At which time, she fell from the rigging leaving the patient and medical bag still attached to the hoist hook.

Several fire department emergency personnel were with the patient, when the STAR Flight helicopter arrived on scene. Emergency personnel reported that the rescuer was inserted below their location and had to climb slightly uphill to the patient. One of the persons stated that there was plenty of lighting, but didn't recall if people were using headlamps. They had also retrieved the backboard for the rescuer. He added that then the rescuer said she was about to call the helicopter in, he asked what else do you need, and she responded to just get the catch hook. One of the other individuals got the hook and handed it to her. He added that he didn't see the hookup and she gave the 'thumbs up" and they took off into the air with no hesitation. The rescuer and patient looked "okay". They moved into a small tree and looked like the rescuer was protecting the patient. He added that they stopped, lowered and moved over, or moved over and lowered at the same time; that it looked controlled or surgical, and then they took off into the sky.

Another one of the fire department personnel added, that he asked the rescuer if she needed one of them to safety her gear, and she responded that she was fine. He added that he didn't see the hookup or signal; the rescuer and victim departed quickly and everything looked like other calls by STAR Flight. He stated that the patient's left foot went into trees a little bit, and he thought, that might hurt. They repositioned to get out of the trees, and then disappeared above the tree line. He added the rescuer looked chest level with the patient; he had seen three of these (type rescues) and it didn't look abnormal.

Another fire department personnel reported that he was holding the HRV for the rescuer. She then took it from him and it looked like she hooked up the Bauman bag and backpack. He didn't see her hookup, but he didn't notice everything that was going on. He saw the "thumbs up" and they took off. He added that when the rescuer and patient went into the tree, he thought he heard someone holler; he was the only one that heard it, but figured it was the patient because every time they moved the patient or something hit her ankle, she'd holler out. He added that he didn't hear it clear enough to know who or what was hollered. He added that during the lift off from the ground, the rescuer was hunched over the patient. When they got into the tree they stopped, he couldn't tell if they were lowered down, but they moved over and they were gone.

Another emergency personnel added that the rescuer had the HRV in her possession. She called the helicopter in and the hook came, which had two spot lights and a big orange boom around it. One of the other individuals handed her the hook, and she hooked into a bull ring; it happened fast. The rescuer gave a "thumbs up", and then they started lifting her. On the rise up, they got into the tree slightly, looked like they lowered her, backed up a couple feet to clear the tree, and they were gone. He added they were riding good and it looked like the rescuer was slightly above and over the patient, protecting the patient from the tree, and departed without a hiccup.

Additional fire department emergency personnel were located at the landing zone (7 meter location) and positioned around the track so the helicopter would have a clear spot to land. They reported that the helicopter came in, entered a hover, and lowered the patient to the ground. Typically, the helicopter crew will disconnect the patient, so initially; they did not approach the helicopter while it was in a hover. The noise of the helicopter also made radio transmissions difficult to hear. One of the personnel was able to radio contact with helicopter crew to confirm they wanted one of the firemen to disconnect the patient. The person reported that there was one connection to get the big hoist off; the big bull ring had the medical bag and the Bauman bag on it. After disconnecting the patient, the helicopter landed nearby. He added that the crew chief asked for the medical bag and stated that they needed to go look for their rescuer. He added that he asked the patient if she remembered, at what point was the rescuer not with you. He stated that the patient responded that she did not know that the rescuer was with her at any point.

A citizen came upon the fallen rescuer and called 911; emergency personnel who responded to the injured hiker were first on scene. The rescuer's helmet was off; the vest was zipped up, the leg straps on, and the triangle [Tri-link] was closed. In order to provide medical care, an officer opened the triangle, and the EMT opened the vest, and cut the belts and leg straps.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for helicopter; airplane single and multi-engine land, and instrument ratings for airplane and helicopter. He held a first class medical certificate that was issued on November 11, 2014. The pilot had accumulated 5,512 total flight hours with 5,197 hours in helicopters and 315 in the Eurocopter BK 117. The pilot had previous Army and Coast Guard experience; and had been employed by STAR Flight since August 2012.

The hoist operator (paramedic) had been employed by STAR Flight since March 2010. He was qualified both as a hoist operator and a helicopter rescue specialist (HRS).

The rescuer (flight nurse) was qualified both as a hoist operator and helicopter rescue specialist. She also held a registered nurse license and paramedic certificates. She had been employed by STAR Flight since October 2008.

STAR Flight staffs one helicopter at the University Medical Center at Brackenridge, 24 hours per day and one helicopter at STAR Flight's facilities or at Dell Children's Medical Center, 12 hours per day. Both of these base locations have facilities for crew rest. Crews are normally scheduled for 3, 12 hour shifts (1st shift 0700-1900, 2nd shift 1000-2200, 3rd shift 1900-0700) followed by 3 to 4 consecutive days off the flight schedule. The rotating schedule is to distribute days, nights, and weekends across the crews. The pilot, flight nurse, and flight paramedic are assigned as a crew and generally work the same schedule. The rescuer was on the third night (1900-0700) of her scheduled work shift.

STAR Flight reported that they comply with Federal Aviation Administration pilot duty day and rest requirements for flight nurses and flight paramedics.

AIRCRAFT/EQUIPMENT INFORMATION

Aircraft Information

The MBB BK117 is a twin-engine, medium utility transport helicopter. It is powered by powered by two Turbomeca Arriel 1E2 engines. The helicopter was modified for STAR Flight operations by Metro Aviation, Inc. Shreveport, Louisiana. The helicopter was equipped with a Goodrich external mount, hoist system. The hoist is fitted with a D-LOK rescue hook, manufactured by Lifesavings Systems Corporation. The D-LOK rescue hoist hook is designed to eliminate problems such as inadvertent engagement and self-release (ring roll-out).

The helicopter was equipped with a North Flight Data Systems Outerlink cockpit video and voice recorder system. In addition, the helicopter was equipped with an Avalex AVR-8240 DVR recorder mounted on the hoist system that records operations and communications.

A post-accident examination of the hoist and helicopter by the operator, NTSB, FAA, and a technical representative from Airbus Helicopters, Inc., did not reveal any abnormalities that contributed to the accident.

[Equipment descriptions are noted below; photos of select equipment are included in the docket for this case]

Equipment Information

The crew wears a flight suit. During hoist operations the rescuer and hoist operator will wear a Tac-Air Rappel vest, with pockets on the front of the vest. One of the vest pockets will contain a mobile radio for communications with the hoist operator and/or the helicopter pilot.

The vest is a variant of the TAC-AIR survival vest with two hoisting positions located on the chest (insertion-extraction loops) and one mid-scapular back. The vest is adjustable with removable leg straps. The rappelling hardware can be stored in a pocket until needed. Once attached with two cobra buckles, the repelling hardware is exposed by a two-way zipper allowing access, but not complete separation.

STAR Flight's radio for the vest is a Motorola APX 7000 multi-band (UHF/800) and is used to communicate with aircraft and ground personnel. In conjunction with the radio, a remote, push-to-talk switch allows the rescuer to communicate to the aircraft or ground personnel through their flight helmet.

The Bauman bag provides a single-point suspension for lifting a patient during a hoist or short-haul evacuation. The bag can be used with backboards or litters.

Tri-link (10 mm Maillon Rapide Delta Link- Aluminum) Quick Links, also commonly known as screw links, are used where carabineers are not recommended. The tri-link has a delta shape. They are used on the vest's insertion-extraction loops, and is the attachment point for the HRV's carabineer.

The HRV (Helicopter-Rescuer-Victim) manufactured by the California Mountain Company, consists of a steel O-ring, a blue and red webbing attachment points. Each webbing attachment point, has a 1/2" Modified D Red NFPA Captive Eye Carabineer.

During a rescue, the steel O-Ring is the attachment point to the hoist hook. The blue webbing and carabineer are utilized for patient and/or equipment connection. The red webbing and carabineer are utilized for the rescuer's connection point. The carabineer is connected to the rescuer's Tri-Link, which is connected to the TAC Air Vest Insertion-Extraction Loops.

The rescuer, Bauman and medical bag connections are all made prior to calling the helicopter in for the extraction. As result, when the helicopter deploys the hoist hook, only one connection is required; the HRV's steel O-ring to the hoist hook.

The helmet the rescue crews wear is a Gentex Corporation HGU-56, equipped with headphones, one clear and one tinted visor, and a detachable maxillofacial shield. The helmet also has provisions to attach night vision goggles.

During night operations STAR Flight crew members utilize NVG's (night vision goggles). ITT Model F4949F, AN/AVS-9 Aviator Night Vision Goggles.

Equipment is either supplied as personalized; issued to the individual, or available at each aircraft base as corporate crew equipment. The HRV and Bauman bag are not personalized equipment and is part of the aircraft configuration when dispatched on rescues. Personalized equipment issued depends on the individual's crew position; however, for the rescuer and hoist operator, this typically includes the flight helmet, Tac-Air vest, and equipment such as the Tri-Link. Personalized equipment is inspected by the member and is replaced "on condition". Common equipment is inspected before/after each use, by a member of the crew, and then annually by the equipment custodian, and is replaced "on condition" or per manufacturer's guidelines.

METEOROLOGICAL INFORMATION

At 2151, the Camp Mabry/Austin automated weather observation facility located about 6 miles northeast from the accident site recorded; wind from 360 degrees at 4 knots, 10 miles visibility, a clear sky, temperature 73 degrees Fahrenheit (F), dew point 54 F, and a barometric pressure of 29.78 inches of mercury.

At 2153, the automated weather observation facility located at the Austin-Bergstrom International (KAUS) airport about 8 miles southeast from the accident site recorded; wind calm, 10 miles visibility, scattered clouds at 9500 feet, temperature 66 degrees Fahrenheit (F), dew point 62 F, and a barometric pressure of 29.77 inches of mercury.

According to the United States Naval Observatory, Astronomical Applications Department Sun and Moon Data, the sunset was recorded at 2006 and the end of civil twilight was 2031. The Moon rose at 1441, and set at 0306 on the following day. The moon was waxing gibbous with 66% of the moon's visible disk.

The flight and rescue operations were conducted in night conditions; each STAR Flight crew member is equipped with NVG's and was wearing them on the accident flight. However, the rescuer is not hoisted while wearing NVG's.

SCENE INFORMATION

Barton Creek Greenbelt in Austin, Texas is a recreational area with about with 809 acres. The Barton Creek Greenbelt consists of three areas: the Lower Greenbelt, the Upper Greenbelt and the Barton Creek Wilderness Park. The area provides sheer cliff walls, dense vegetation, swimming, hiking, and climbing areas. There are several access points around Austin for the recreational area.

MEDICAL AND PATHOLOGICAL INFORMATION

The Travis County Office of the Medical Examiner, Austin, Texas conducted an autopsy on the rescuer. The cause of death was determined to be, "blunt force injuries".

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted toxicological testing on the rescuer. The specimens were negative for tested drugs and alcohol.

TEST AND RESEARCH

Examination of the rescuer's Tac-Air vest was conducted; the vest's insertion/extraction loops displayed no evidence of failure or suspicious marks. Belt buckles and leg straps also were absent any evidence that might have contributed to the rescuer's fall.

The HRV and Tri-link were also examined. An on-site visual inspection found no evidence of a malfunction. An examination at the NTSB laboratory under a high power microscope, also found no evidence of witness marks or abnormalities that would indicate a failure of the units.

The hoist and cockpit video data cards were shipped to the National Transportation Safety Board (NTSB) Vehicle Recorder Laboratory in Washington, DC, for review.

A video group that consisted of representatives from the NTSB, Federal Aviation Administration, Airbus Helicopters, and the operator was formed. The group was convened at the NTSB Recorders Laboratory, Washington, DC, to view and document the video from the hoist camera.

(The group chairman's factual report, including transcript, is located in public docket for this accident)

Based on the details of the accident, the video/recorder review board only viewed a portion of the helicopter's cockpit video for the relevant safety checks and the accident sequence. It was determined that the video did not contain information relevant to the accident. (The video report is located in public docket for this accident).

ORGANIZATIONAL AND MANAGEMENT INFORMATION

STAR Flight (Shock Trauma Air Rescue) is a public safety, government based air rescue program provided by Travis County. Based in Austin, Texas, the program is funded by and reports to the Travis County Commissioners Court through the County Manager over Emergency Services. The program operates under 14 CFR Part 135 and in public aircraft operations depending on the mission. The program provides transport and emergency assistance from scenes, inter-facility transfers with and without specialty teams, firefighting, search and rescue, and law enforcement support. Normal service area includes nineteen central Texas counties; however, STAR Flight is regularly requested to provide service outside the normal area.

The STAR Flight Public Mission Committee (PMC) is responsible for developing, reviewing, and suggesting policies, procedures and protocols related to STAR Flight public missions, and the Aircrew Standards Manual (ASM). The committee consists of the following at a minimum:

- Chief Medical Supervisor
- Director of Operations or Chief Pilot
- Two Line Crew Chiefs/Hoist Operators
- Two Line Helicopter Rescue Specialists
- Two Line Pilots

The committee uses the cockpit and hoist recording systems and a formalized Public Mission Debrief / AAR form (completed by the crew) to evaluate all public mission events (training and response) compliance with established standards, individual and crew feedback, and areas of improvement that include standardization, training or equipment changes.

The committee is to meet monthly or as required.

The committee did not review the video recording for this accident.

Pilot Information

Certificate:	Commercial	**Age:**	44
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	November 11, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5512 hours (Total, all aircraft), 315 hours (Total, this make and model), 3604 hours (Pilot In Command, all aircraft)		

Other flight crew Information

Certificate:		**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Rear
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	Yes
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Other flight crew Information

Certificate:		**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Rear
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	EUROCOPTER DEUTSCHLAND GMBH	**Registration:**	N392TC
Model/Series:	MBB BK 117 C-2	**Aircraft Category:**	Helicopter
Year of Manufacture:	2009	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	9286
Landing Gear Type:	Skid	**Seats:**	
Date/Type of Last Inspection:	January 5, 2015 AAIP	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Turbo shaft
Airframe Total Time:	1467.5 Hrs at time of accident	**Engine Manufacturer:**	Turbomeca
ELT:	C126 installed, not activated	**Engine Model/Series:**	Arriel
Registered Owner:	TRAVIS COUNTY PURCHASING OFFICE	**Rated Power:**	
Operator:	Star Flight	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KATT	**Distance from Accident Site:**	
Observation Time:	21:51 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.78 inches Hg	**Temperature/Dew Point:**	23°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Austin, TX	**Type of Flight Plan Filed:**	Company VFR
Destination:	Austin, TX	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal, 2 None	**Aircraft Damage:**	None
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 2 None	**Latitude, Longitude:**	30.242221,-97.789443(est)

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig
Additional Participating Persons:	Scott Tyrrell; FAA Rotorcraft Directorate ; Fort Worth, TX Frank Fortman; FAA FSDO; San Antonio, TX Seth Buttner; Airbus Helicopters; Grand Praire, TX Casey Ping; STAR Flight ; Austin, TX
Original Publish Date:	March 14, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91089