National Transportation Safety Board
Aviation Accident Final Report

Location:	Meadview, AZ	**Accident Number:**	WPR10LA481
Date & Time:	09/30/2010, 1735 MST	**Registration:**	N822MH
Aircraft:	EUROCOPTER EC130	**Aircraft Damage:**	Substantial
Defining Event:	Collision with terr/obj (non-CFIT)	**Injuries:**	7 None
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled - Sightseeing		

Analysis

The aerial tour flight included a stop at a pre-selected remote landing site. The remote site was equipped with picnic tables and umbrellas for use by the passengers. According to the pilot, this was his third flight of the day, and he landed "closer than usual" to the tables. After the stop, the pilot started the helicopter and picked up into a low hover. He remained in the hover and turned the helicopter to the right in order to slightly delay his departure for another departing helicopter. In close sequence, the pilot noticed a rotor rpm decrease, a loss of tail rotor effectiveness, and a "loud bang" after which he immediately re-landed and shutdown the helicopter. An inspection revealed that the cloth canopy of one of the umbrellas had been partially ingested by the tail rotor, which resulted in substantial damage to the tail rotor, rotor housing, and drive system. The pilot did not report any preaccident problems with the helicopter, and no pre-existing mechanical deficiencies or failures that would have precluded normal operation were observed. Neither the helicopter manufacturer nor the operator provided specific information or recommended guidance regarding operational clearances for the helicopter. The site had no designated or marked landing zones. Pilots were wholly responsible for ensuring the adequacy of the site for their arrivals and departures, as well as for separation from other helicopters in the heavily trafficked area. Although the pilot reported that fatigue was a contributing factor to the accident, there was insufficient evidence to determine whether the pilot was fatigued.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's distraction with another departing helicopter while maneuvering in a hover for departure, which resulted in his failure to maintain clearance between the tail rotor and an umbrella.

Findings

Personnel issues	Monitoring environment - Pilot (Cause)
Environmental issues	Ground equipment - Response/compensation (Cause) Runway markings/signage - Contributed to outcome Obstruction markings/lighting - Contributed to outcome

Factual Information

HISTORY OF FLIGHT

On September 30, 2010, about 1735 mountain standard time, a Eurocopter EC130 B4, N822MH, was substantially damaged when the tail rotor partially ingested an umbrella canopy during an attempted departure from a remote landing site near Meadview, Arizona. The Grand Canyon sightseeing flight was operated by Maverick Helicopters, and the accident occurred when the helicopter was lifting off from a planned intermediate stop. The commercial pilot and six tourist-passengers were uninjured. The on-demand revenue sightseeing flight was operated under the provisions of Title 14 Code of Federal Regulations (CFR) Part 135. Visual meteorological conditions prevailed, and no Federal Aviation Administration (FAA) flight plan was filed for the flight.

The aerial tour began at the operator's base at Henderson Executive Airport (HND), Henderson, Nevada. According to the pilot, the accident flight was his third flight of the day. The typical trips consisted of a departure from the base, an aerial tour, a stop at one or more pre-selected landing sites, and a touring return to the base. The accident occurred during the attempt to depart from the first intermediate stop. The outbound flight leg to that stop was approximately 40 minutes.

According to information provided by the pilot, the operator, and the FAA, the remote landing site was equipped with picnic tables and umbrellas for use by the passengers. The site had no designated or marked landing zones, and was unattended. The operator's pilots were responsible for ensuring the adequacy and safety of the site for their arrivals and departures.

After the planned stop, the passengers reboarded the helicopter, the engine was started, and the pilot picked the helicopter up into a hover about 2 to 3 feet above ground level. Because another helicopter's flight path would interfere with his intended departure flight path, the pilot held the helicopter in the hover for a short time, translated a few feet forward and to the right, and then conducted a right pedal turn in preparation for departing the area. The pilot stated that then, either in close sequence or "simultaneously," he noticed an "rpm decrease," an apparent "loss of tail rotor effectiveness," and a "loud bang." The pilot immediately landed the helicopter. After shutdown, an inspection by the pilot revealed that the cloth canopy of one of the umbrellas had been partially ingested by the tail rotor.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with a rotorcraft-helicopter rating, and a private pilot certificate with an airplane single-engine land rating. According to the pilot, he had approximately 2,750 hours of total flight experience, including 2,650 hours in helicopters. He began flying for the operator in May 2009, and during that time had accumulated approximately 1,200 hours of flight time. All of the pilot's flight time with the operator was in the accident helicopter make and model.

In a second written statement provided to the NTSB several days after the accident, the pilot stated that fatigue was a contributing factor to the accident. The pilot was sent a questionnaire asking about his recent sleep and activities, which he did not return, and he did not provide any additional information that would enable an evaluation of his assertion.

AIRCRAFT INFORMATION

The helicopter was manufactured in 2006, and was registered to the operator in 2008. It was equipped with a Turbomeca 281 Series turboshaft engine, a single main rotor, and a shrouded tail rotor referred to as a "fenestron."

According to the operator, at the time of the event the airframe had a total time in service (TT) of 3,114.7 hours. The most recent 100-hour inspection was completed on September 25, 2010, when the helicopter had a TT of 3,098 hours.

Operator weight and balance records indicated that the calculated "engine start" weight was 5,190 lbs, which included 470 lbs of fuel, and a passenger load of 1,113 lbs. Maximum allowable gross weight was specified as 5,350 lbs. The records indicated that at engine start, the calculated longitudinal center of gravity (CG) was 126.6 inches, and the calculated lateral CG was -0.61 inches. The data indicated that the helicopter was within the allowable weight and balance envelope, and would remain so for the duration of the flight. The records indicated that the pilot was seated in the front left seat for the flight.

METEOROLOGICAL INFORMATION

The 1730 recorded weather information for Grand Canyon West Airport (1G4), Peach Springs, Arizona, was provided to the NTSB by the operator in non-standard units. That airport was located about 3 miles northwest of, and 3,500 feet higher than the accident site, included a temperature of 84 degrees Fahrenheit (F), dew point 42 degrees F, and winds from the "WNW" at 8 mph. The 1745 values were the same, except the reported wind speed was 6 mph.

The accident reporting form that the operator filed with the NTSB stated that the temperature at the site was 95 degrees F. The source of that information was not determined.

LANDING AREA INFORMATION

The site was located on a true heading of about 112 degrees from 1G4. The site was in an arid region on a promontory, at an elevation of approximately 1,350 feet above mean sea level. The overall dimensions and layout of the promontory allowed simultaneous accommodation of several helicopters. The site was primarily rock and/or loose rock, with sparse, low vegetation. Several wood tables, each with two umbrellas, were situated randomly about the area.

The area had no designated or marked touchdown and lift off (TLOF) zones, or any other fixed means (such as lines of rocks) for delineating preferred landing zones or maneuvering areas. The area was normally unattended. The accident occurred at two tables near the northeast corner of the promontory. The tables were located about 130 feet from the southeast edge of the promontory. The helicopter had landed between the tables and that edge of the promontory, with the tables to the left and slightly aft of the helicopter. In his second written statement to the NTSB, the pilot reported that on landing, he had "positioned the helicopter closer than usual to our table and umbrella setup."

WRECKAGE AND IMPACT INFORMATION

The accident helicopter was equipped with an onboard video imaging system that recorded the view forward and outside of the helicopter; the purpose was to provide the passenger-tourists with flight souvenirs/memorabilia of their trip. The video image file from the event was provided for the investigation. It depicted the liftoff, the motions of the helicopter, the apparent event, and the subsequent touchdown. It also captured other helicopter traffic in the vicinity at the time, but it did not capture the tables or umbrellas.

Evaluation of the video image file indicated that at engine start, the helicopter nose was oriented on a true heading of approximately 060 degrees. The helicopter then rose a few feet off the ground, translated forward and right several feet, and then yawed nose right approximately 75 degrees. About 13 seconds after liftoff, the image file was interrupted, but then resumed its normal appearance; this was interpreted as the occurrence of the ingestion event, and its resulting aircraft electrical power fluctuations. The helicopter then yawed left about 45 degrees, and landed about 2 seconds after the image interruption.

The helicopter remained upright and intact. Primary damage sites included the tail rotor, fenestron, and tail rotor drive components. Several tail rotor blades were deformed, and the fenestron had multiple fractures and penetrations. The pilot did not report any pre-accident problems with the helicopter, and no pre-existing mechanical deficiencies or failures that would have precluded normal operation were observed.

ADDITIONAL INFORMATION

Off-Airport Operations

The operator flew both airplanes and helicopters, and provided on-demand aerial sightseeing flights in the Las Vegas area, and to the Grand Canyon. Many of the Grand Canyon tours were conducted by helicopter, and many of those tours included stops at pre-selected off-airport remote sites.

The operator's Director of Operations was queried by the NTSB about the company's specific training and guidance for helicopter pilots, as well as any other company provisions for operations at those remote sites. His response included the following:

"We have no section for remote area landings as most of the time we operate in non-airport environment. We have no set limit at to how close to get to objects, but that the pilot use safe judgment so that the object does not create a hazard to the operation. To some pilots that is a football field and to others with greater skill/knowledge it is 20 feet... These topics are covered in our training requirements and other references like the Basic Helicopter Handbook, GOM, Rotorcraft Flying Handbook, A/C are used to expand the understanding of the pilot in training."

The helicopter manufacturer was queried by the NTSB about whether they produced any guidance regarding "recommended operating clearances for the EC-130," particularly as it related to this accident. The response of the lead flight test pilot included the following:

"There is nothing in the flight manual about tail clearance. As far as the umbrella being ingested, of course that would require adequate thrust at the fenestron, which would be present in a hover, more so if the aircraft was heavy (more power, more torque, more anti-torque required). Obviously the area should be clear on take-off! The amount of air being pulled through the fenestron would vary greatly between idle and hover, and be dependent on conditions (Altitude, temp., weight, wind velocity and direction). Because there are so many variables, it would be hard to say what the minimum distance would be."

Chapter 10 (Advanced Flight Maneuvers) of FAA document FAA-H-8083-21 (Rotorcraft Flying Handbook, or RFH) provided some related guidance in its section entitled "Confined Area Operations." The RFH stated that a confined area "is an area where the flight of the helicopter is limited in some direction by terrain or the presence of obstructions, natural or manmade." The document continued with "There are several things to consider when operating in confined

areas. One of the most important is maintaining a clearance between the rotors and obstacles forming the confined area. The tail rotor deserves special consideration because, in some helicopters, you cannot always see it from the cabin."

Other Helicopter Traffic

As noted, the operator's primary business was aerial sightseeing tours, and the accident site was located 3 miles from 1G4; the FAA Airport/Facility Directory entry for 1G4 included the cautionary statement "Use extreme care due to large volume of high-speed fixed wing and rotary wing [traffic] in and around vicinity of airport."

The 2-minute video excerpt from the accident helicopter substantiated the traffic volume caution and the pilot's recount; it captured three other helicopters during that period. These were as follows:

- Helicopter A - Appeared at file time 00:42 (42 seconds after the start of the file), flew towards the accident helicopter, and passed above and to the right. Disappeared at 00:52

- Helicopter B - Appeared at 01:12, appeared from left side of accident helicopter, flew around the nose, and disappeared off the right side at 01:27

- Helicopter C - Appeared at 01:28 ahead of and coming toward the accident helicopter. Accident helicopter lifted off at 01:31, and helicopter C disappeared off the top of the screen about 01:34, due in part to attitude changes of the accident helicopter. Umbrella collision event occurred about 01:44

History of Flight

Takeoff	Collision with terr/obj (non-CFIT) (Defining event)

Pilot Information

Certificate:	Flight Instructor; Commercial; Private	**Age:**	26, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without Waivers/Limitations	**Last FAA Medical Exam:**	11/24/2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	05/20/2010
Flight Time:	2750 hours (Total, all aircraft), 1187 hours (Total, this make and model), 2650 hours (Pilot In Command, all aircraft), 210 hours (Last 90 days, all aircraft), 140 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	EUROCOPTER	**Registration:**	N822MH
Model/Series:	EC130 B4	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	4142
Landing Gear Type:	Skid	**Seats:**	8
Date/Type of Last Inspection:	09/27/2010, 100 Hour	**Certified Max Gross Wt.:**	5350 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo Shaft
Airframe Total Time:	3115 Hours at time of accident	**Engine Manufacturer:**	TURBOMECA
ELT:	C91A installed, not activated	**Engine Model/Series:**	281
Registered Owner:	Mustang Leasing	**Rated Power:**	849 hp
Operator:	Maverick Helicopter	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	1G4, 4825 ft msl	**Observation Time:**	1730 MDT
Distance from Accident Site:	3 Nautical Miles	**Direction from Accident Site:**	290°
Lowest Cloud Condition:	Few	**Temperature/Dew Point:**	29°C / 6°C
Lowest Ceiling:	None	**Visibility**	100 Miles
Wind Speed/Gusts, Direction:	7 knots, 315°	**Visibility (RVR):**	
Altimeter Setting:		**Visibility (RVV):**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Meadview, AZ	**Type of Flight Plan Filed:**	Company VFR
Destination:	Henderson, NV (HDN)	**Type of Clearance:**	None
Departure Time:	1735 MST	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	6 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	7 None	**Latitude, Longitude:**	35.966389, -113.761389 (est)

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	**Adopted Date:**	08/15/2012
Additional Participating Persons:	Marty Kay; FAA FSDO; Las Vegas, NV		
Publish Date:	08/15/2012		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=77471		