



# Aviation Investigation Final Report

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<b>Location:</b>	Apple Valley, California	<b>Accident Number:</b>	GAA16LA056
<b>Date &amp; Time:</b>	November 19, 2015, 11:50 Local	<b>Registration:</b>	N36RX
<b>Aircraft:</b>	Airbus EC135	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Airport occurrence	<b>Injuries:</b>	5 None
<b>Flight Conducted Under:</b>	Part 135: Air taxi & commuter - Non-scheduled		

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## Analysis

According to the airline transport pilot, firefighting personnel were using the helicopter for training to simulate patient loading and unloading. The training consisted of multiple takeoffs and landings from the training center landing site. The pilot reported that, during the third landing, when the helicopter was between 2 and 3 ft above ground level, he felt it shudder unexpectedly. The pilot immediately landed and shut down the helicopter without further incident. The pilot reported that there were no preimpact mechanical failures or malfunctions with the airframe or engine that would have precluded normal operation.

A postflight examination revealed that a towel had been ingested into the fenestron, which resulted in substantial damage to the fenestron tail rotor blades, fenestron housing body, tailboom, and tail rotor drive shaft flex couplings. The pilot reported that the towel had migrated from an unsecured storage container near the landing site. The investigation revealed that, when the towel was ingested, the fenestron hub fairing detached from the hub body, which was then ingested by the fenestron tail rotor blades. The operator's director of maintenance reported that a postaccident examination revealed that all of the main rotor blades "received a small amount of [foreign object damage] FOD...at middle cord line near the tips" and that the "damage was the result of FOD from the Fenestron [hub fairing ingestion] after the towel was ingested." This evidence indicates that the hub fairing body becoming detached due to the ingestion of the towel contributed to the severity of the damage.

## Probable Cause and Findings

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

The ingestion of a towel from an unsecured storage container at the landing site into the helicopter's fenestron during the landing.

## Findings

<b>Environmental issues</b>	Security - Effect on equipment
<b>Environmental issues</b>	Debris/dirt/foreign object - Effect on equipment
<b>Aircraft</b>	(general) - Failure
<b>Aircraft</b>	(general) - Damaged/degraded

## Factual Information

### History of Flight

<b>Prior to flight</b>	Simulated/training event
<b>Landing</b>	Airport occurrence (Defining event)
<b>Landing</b>	Prop/jet/rotor blast/suction
<b>Landing</b>	Sys/Comp malf/fail (non-power)
<b>Landing</b>	Part(s) separation from AC

On November 19, 2015, about 1150 Pacific standard time, an air ambulance Airbus EC-135P2+ helicopter, ingested foreign object debris (FOD) into the Fenestron during an approach to the Victor Valley College Regional Public Safety Training Center in Apple Valley, California. The commercial pilot and four passengers were not injured, and the helicopter sustained substantial damage. The helicopter was registered to and operated by Reach Air Medical Services LLC, Santa Rosa, California, under the provisions of 14 Code of Federal Regulations Part 135 as a day, visual flight rules passenger flight. Visual meteorological conditions prevailed and a company visual flight rules flight plan was filed. The flight originated from the Victor Valley College Regional Public Safety Training Center in Apple Valley, California.

Note: Various photos and diagrams of the Airbus EC-135 Fenestron, including labeling of the various parts, is located in the public docket of this accident under the Airbus EC-135 Fenestron Hub Fairing Report.

According to the pilot, the helicopter was being utilized for training with firefighting personnel to simulate patient loading and unloading. The training consisted of multiple takeoffs and landings from the training center landing site. He reported that during the third landing, between two to three feet above ground level, he felt the helicopter "shutter unexpectedly." The pilot immediately landed and shut down the helicopter without further incident.

A postflight inspection revealed that a towel had been ingested into the Fenestron. The pilot reported that the towel migrated from an unsecured storage container near the landing site. The helicopter sustained substantial damage to the Fenestron tail rotor blades, the Fenestron housing body, the tail boom, and the tail rotor drive shaft flex couplings. During the course of the investigation, it was discovered that when the towel was ingested, the Fenestron hub fairing detached from the hub body and it was ingested by the Fenestron tail rotor blades.

The director of maintenance (DOM) for the operator reported that the tail rotor gearbox was shipped to the manufacturer for an inspection. Additionally, the DOM reported that all of the main rotor blades, "received a small amount of FOD damage at middle cord line near the tips" and that the "damage was the result of FOD from the Fenestron [hub fairing ingestion] after the towel was ingested."

The pilot reported there were no preimpact mechanical failures or malfunctions with the airframe or engine that would have precluded normal operation.

## WRECKAGE AND IMPACT INFORMATION

Photos supplied by the operator showed pieces of the towel attached to various stators in the Fenestron housing body. Large gouges in the Fenestron housing body were present, consistent with impact from FOD. Small gouges were also present on the various Fenestron tail rotor blades, consistent with impact from FOD. The Fenestron hub fairing was not attached in the photos. A photo of the Fenestron hub fairing displayed it in numerous pieces, consistent with being destroyed by the impact of the Fenestron tail rotor blades.

## ADDITIONAL INFORMATION

### Safety Recommendation NORW-2007-073

In 2007, the Accident Investigation Board Norway (AIBN) along with the European Aviation Safety Agency (EASA) filed a formal safety recommendation to Eurocopter (Airbus) regarding the design of the Fenestron hub fairing. This safety recommendation was based on an Airbus EC-135 accident (2007/35) that occurred in Liagardene, Norway in 2006, which sustained similar damage due to similar accident sequence events. This safety recommendation from the AIBN states in part;

The accident has revealed that the hub cover of the Fenestron on EC-135 can loosen when the rotor tips are bent out. A loosened cover will be sucked through the Fenestron and cause extensive damage. AIBN recommends that Eurocopter consider whether the fixing mechanism between the cover and hub could be changed to prevent loosening.

The response from EASA states in part;

EASA agrees with this recommendation. Eurocopter Deutschland (ECD) has launched a technical review of possible design improvements to the Fenestron hub cap installation; this might lead to a future design change if deemed suitable. However, no unsafe design features have been identified so far. In-flight loss (as well as all other three events reported to ECD) was accompanied by contact of the Fenestron/tail boom with obstacles.

This safety recommendation was closed out with no further action. After multiple requests, the manufacturer did not respond to inquiries from the National Transportation Safety Board investigator-in-charge concerning what actions have been taken regarding the inadequate design of the Fenestron hub fairing attachment.

### Airbus EC-135 Fenestron Hub Fairing Information

The Fenestron hub fairing is attached to the hub body with six attachment hardware assemblies. These hardware assemblies are inserted inside of a lip in the hub body, which covers the entire hub body. Once the hardware assemblies are inserted inside of the lip in the hub body, the screws are then tightened by a mechanic. A bore is located at the center of the fairing to aid with detachment, and is sealed with a plastic plug.

Various photos, diagrams, and historical Airbus Fenestron FOD ingestion accident/incident information is located in the public docket of this accident under the Airbus EC-135 Fenestron Hub Fairing Report.

## Pilot Information

<b>Certificate:</b>	Airline transport; Flight instructor	<b>Age:</b>	64, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane; Helicopter	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	February 2, 2015
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	October 2, 2015
<b>Flight Time:</b>	(Estimated) 17000 hours (Total, all aircraft), 580 hours (Total, this make and model), 8500 hours (Pilot In Command, all aircraft), 64 hours (Last 90 days, all aircraft), 33 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

## Passenger Information

<b>Certificate:</b>		<b>Age:</b>	Female
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>		<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Passenger Information

<b>Certificate:</b>		<b>Age:</b>	Female
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>		<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Passenger Information

<b>Certificate:</b>		<b>Age:</b>	Female
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>		<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Passenger Information

<b>Certificate:</b>		<b>Age:</b>	Female
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>		<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Airbus	<b>Registration:</b>	N36RX
<b>Model/Series:</b>	EC135 P2+	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	2009	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	0859
<b>Landing Gear Type:</b>	N/A; Skid	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	October 22, 2015 Continuous airworthiness	<b>Certified Max Gross Wt.:</b>	6414 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo shaft
<b>Airframe Total Time:</b>	2812 Hrs at time of accident	<b>Engine Manufacturer:</b>	Pratt and Whitney
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	PW206B2
<b>Registered Owner:</b>	REACH AIR MEDICAL SERVICES, LLC	<b>Rated Power:</b>	447 Horsepower
<b>Operator:</b>	REACH AIR MEDICAL SERVICES, LLC	<b>Operating Certificate(s) Held:</b>	Commuter air carrier (135)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	JBZA

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KVCV,2885 ft msl	<b>Distance from Accident Site:</b>	10 Nautical Miles
<b>Observation Time:</b>	19:55 Local	<b>Direction from Accident Site:</b>	264°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.12 inches Hg	<b>Temperature/Dew Point:</b>	19°C / -6°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Apple Valley, CA	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>	Apple Valley, CA	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	11:45 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	4 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	5 None	<b>Latitude, Longitude:</b>	34.599166,-117.190551(est)

## Preventing Similar Accidents

### Securing Objects in Your Aircraft (SA-026)

#### The Problem

Forgotten and unsecured items within an aircraft can lead to accidents or incidents as they move during flight. These items can include tools used on the aircraft before flight; aviation-related items such as GPS units, clipboards, and antennas; nonaviation-related portable electronic devices (PED) such as personal phones and computers; and personal items such as jackets or carry-on items.

#### What can you do?

- Inspect the airplane for forgotten or misplaced tools before takeoff. Remember that even experienced pilots and aviation maintenance technicians can make mistakes. If you have recently had maintenance performed on your airplane or if you have conducted maintenance yourself, this action is especially important.
- Conduct an inventory of cockpit items before takeoff, including the number of PEDs, GPS units, and antennas on board the aircraft, and ensure that they are secured. This also helps to ensure their availability throughout the flight.
- Account for all flight gear and personal items such as hats and jackets before and after each flight, and ensure that they are secured.
- Incorporate all of these checks into your preflight actions.



- Remind passengers during the preflight briefing of the importance of item security and proper stowage of PEDs and personal items.

See <https://www.nts.gov/Advocacy/safety-alerts/Documents/SA-026.pdf> for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Hodges, Michael
<b>Additional Participating Persons:</b>	Roy R Peters; FAA Riverside FSDO; Riverside, CA
<b>Original Publish Date:</b>	November 29, 2016
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=92344">https://data.nts.gov/Docket?ProjectID=92344</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).